

**QUERY ANSWERING SYSTEM OF SHAHIH HADITH MUTTAFaqUN  
'ALAIH USING INDONESIAN THESAURUS BASED ON QUERY EXPANSION  
AND NAïVE BAYES CLASSIFIER**

**UNDERGRADUATE THESIS**

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**JURUSAN TEKNIK INFORMATIKA  
FAKULTAS SAINS DAN TEKNOLOGI  
UNIVERSITAS ISLAM NEGERI MAULANA MALIK IBRAHIM  
MALANG  
2019**

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'ALAIH USING INDONESIA N THESAURUS BASED ON QUERY  
EXPANSION AND NAİVE BAYES CLASSIFIER**

**UNDERGRADUATE THESIS**

**Presented to:**  
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**Untuk Memenuhi Salah Satu Persyaratan Dala**  
**Memperoleh Gelar Sarjana Komputer (S. Kom)**

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## APPROVAL SHEET

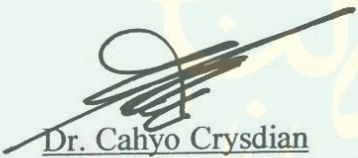
### QUERY ANSWERING SYSTEM OF SHAHIH HADITH MUTTAF AQUN 'ALAIH USING INDONESIA THE SAURUS BASED ON QUERY EXPANSION AND NAÏVE BAYES CLASSIFIER

#### UNDERGRADUATE THESIS

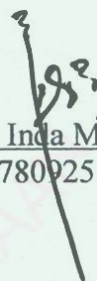
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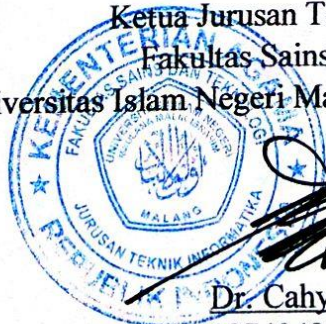
  
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## VALIDITY SHEET

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Declares that the thesis I wrote to fulfill the requirement for the degree of Sarjana Komputer (S.Kom) in Computer Science Department, Science and Technology Faculty, the State Islamic University of Maulana Malik Ibrahim Malang entitled Query Answering System of Shahih Hadith Muttafaqun ‘Alaih Using Indonesian Thesaurus Based on Query Expansion and Naïve Bayes Classifier is truly my original work. It does not incorporate any materials previously written or published by another person except those indicated in quotations and bibliography.

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## MOTTO

**Nothing is impossible as long as  
you have God.**



## DEDICATION

This thesis is especially dedicated to my beloved mother and father, also my brother who always supports and advises me.



## ACKNOWLEDGEMENT

### السلام عليكم ورحمة الله وبركاته

Alhamdulillah, all praise to Allah SWT for all the Blesses so that the researcher can accomplish this undergraduate thesis. Also, my peace and salutation be given to Prophet Muhammad SAW who has guided us from the darkness to the lightness.

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5. All of my friends especially in the Computer Science Department who always supported me to finish my undergraduate thesis.



Hopefully, my Allah SWT always blesses those mentioned above. The researcher realizes that this research is far from being perfect. Therefore, any constructive criticism and suggestion will be gladly accepted. Finally, it is expected that this undergraduate thesis will be beneficial for the readers.

ولسلام عليكم ورحمة الله وبركاته

Malang, .....

The Researcher

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## ABSTRAK

Rounaqi, Muhammad Fairuz Zumar. 2019. **Query Answering System of Shahih Hadith Muttafaqun 'Alaih Using Indonesian Thesaurus Based on Query Expansion and Naïve Bayes Classifier**. Skripsi. Jurusan Teknik Informatika, Fakultas Sains dan Teknologi, Universitas Islam Negeri Maulana Malik Ibrahim Malang. Pembimbing: (I) Dr. Cahyo Crysdian, (II) Roro Inda Melani, M. Sc.

**Kata Kunci:** *Hadits, Information Retrieval, Query Expansion, Naïve Bayes Classifier*

Hadits merupakan sumber hukum Islam yang kedua setelah Al-Qur'an. Hadits adalah semua perkataan, perbuatan dan ketetapan Nabi Muhammad SAW yang digunakan sebagai hukum Islam. Salah satu kitab himpunan hadits yang terkenal adalah kitab Lu' Lu' Wal Marjan karangan Muhammad Fuad Bin Abdul Baqi. Kitab ini berisi hadits-hadits shahih dari dua orang Imam yang terkemuka yakni Imam Bukhari dan Imam Muslim. Sebagai kitab himpunan hadits yang terkenal, pasti banyak orang yang menggunakan kitab tersebut sebagai referensi hadits, dengan membuat sebuah sistem *Information Retrieval* yang dinamakan *Query Answering System*, diharapkan dapat memudahkan pengguna dalam mencari dan menemukan dokumen hadits yang sesuai dengan kebutuhan pengguna. Penelitian ini mengimplementasikan metode *Naïve Bayes Classifier* yang dikombinasikan dengan tesaurus Indonesia sebagai *query expansion* untuk menemukan dokumen hadits yang sesuai dengan query masukan. Tujuan dari penelitian ini adalah untuk mengukur akurasi, presisi, dan *recall* dari hasil penerapan metode *Naïve Bayes Classifier* yang dikombinasikan dengan tesaurus Indonesia sebagai *query expansion*. Berdasarkan pengujian dari 50 data query, hasil pengujian menunjukkan bahwa penggunaan *query expansion* menunjukkan hasil yang lebih baik dibandingkan dengan tanpa menggunakan *query expansion*. Berdasarkan dari pengujian 1 data teratas tanpa menggunakan *query expansion* didapatkan nilai rata-rata *recall* sebesar 62%, nilai rata-rata *precision* sebesar 62%, nilai rata-rata *accuracy* sebesar 92.4% dan nilai rata-rata *f-measure* sebesar 62%, sedangkan pengujian dengan menggunakan *query expansion* didapatkan nilai rata-rata *recall* sebesar 66%, nilai rata-rata *precision* sebesar 66%, nilai rata-rata *accuracy* sebesar 93.2% dan nilai rata-rata *f-measure* sebesar 66%. Berdasarkan hasil pengujian tersebut penggunaan *query expansion* menunjukkan peningkatan pada nilai rata-rata *recall* sebesar 4%, peningkatan pada nilai rata-rata *precision* sebesar 4%, dan peningkatan pada nilai rata-rata *accuracy* sebesar 0.08% dan peningkatan pada nilai rata-rata *f-measure* sebesar 4% dibandingkan dengan tanpa menggunakan *query expansion*.



## ABSTRACT

Rounaqi, Muhammad Fairuz Zumar. 2019. **Query Answering System of Shahih Hadith Muttafaqun 'Alaih Using Indonesian Thesaurus Based on Query Expansion and Naïve Bayes Classifier**. Undergraduate Thesis. Computer Science Department, Science and Technology Faculty, State Islamic University of Maulana Malik Ibrahim Malang. Advisor: (I) Dr. Cahyo Crysdian, (II) Roro Inda Melani, M. Sc.

**Index Terms:** Hadith, Information Retrieval, Query Expansion, Naïve Bayes Classifier

Hadith is the second source of Islamic law after Al-Qur'an. Hadith are all the words, deeds and provisions of the Prophet Muhammad SAW that are used as Islamic law. One of the best-known hadith collection books is the book of Al Lu' Lu' Wal Marjan by Muhammad Fuad Bin Abdul Baqi. This book contains authentic hadiths from two prominent Imams namely Imam Bukhari and Imam Muslim. As a famous collection of hadith books, surely many people who use the book as a hadith reference, by creating an Information Retrieval system called the Query Answering System, is expected to facilitate users in searching and finding the hadith documents as the user's needs. This research implements the Naïve Bayes Classifier method combined with Indonesian thesaurus as a query expansion to find the hadith documents that relevant to the input query. The purpose of this study is to measure the accuracy, precision, and recall from the results of the implementation of the Naïve Bayes Classifier method combined with Indonesian thesaurus as a query expansion. Based on the testing of 50 query data, the test results show that the use of query expansion shows better results than without using query expansion. Based on testing the top 1 data without using query expansion obtained an average recall value of 62%, an average precision value of 62%, an average accuracy value of 92.4% and an average value of the f-measure of 62%, while testing using query expansion obtained an average recall value of 66%, an average precision value of 66%, an average accuracy value of 93.2% and an average f-measure value of 66%. Based on the test results, the use of query expansion shows an improvement in the average recall value of 4%, an improvement in the average precision value of 4%, and an improvement in the average accuracy value of 0.8% and an improvement in the average f-measure value of 4% compared on without using query expansion.

## المستخلص

رونافي، محمد فيروز زمر. ٢٠١٩. نظام الرد على الأسئلة لصاحب الحديث متفق عليه باستخدام المعجم الإندونيسي المعتمد على توسيع الاستعلام و Naïve Bayes Classifier . الأطروحة. قسم التكنولوجيا والمعلومات، كلية العلوم والتكنولوجيا، جامعة مولانا مالك إبراهيم الإسلامية الحكومية مالانج. المشرف: (الأول) الدكتور جاحيو جريس ديان، (الثاني) رورو إندا ميلاني، الماجستير

الكلمات الرئيسية: الحديث، استرجاع المعلومات، استعلام التوسعة، تصنيف بايز باي

الحديث هو المصدر الثاني للشريعة الإسلامية بعد القرآن. الحديث هو كل أقوال وأفعال وأحكام النبي محمد كقانون إسلامي. إحدى الكتب المشتمل على مجموعة الأحاديث الأكثر والشاهرة هي كتاب لؤلؤ والمرجان للكاتب محمد فؤاد بن عبد الباقي. يحتوي هذا الكتاب على أحاديث صحيحة من إمامين بارزين هما الإمام البخاري والإمام مسلم. هذا الكتاب يستخدمه عديد من الأشخاص كمرجع الحديث، من خلال إنشاء نظام لاسترجاع المعلومات يسمى نظام الرد على الاستعلام، من المتوقع أن هذا الكتاب يسهل المستخدمين في العثور على وثائق الحديث التي تناسب احتياجات المستخدمين. يقوم هذا البحث بتطبيق طريقة تصنيف Naïve Bayes Classifier مع قاموس المرادفات الإندونيسي كتوسيع استعلام للعثور على مستندات الحديث التي تطابق استعلام الإدخال. أهداف البحث هي قياس دقة واستدعاء نتائج تنفيذ طريقة تصنيف Naïve Bayes Classifier مع قاموس المرادفات الإندونيسي كتوسيع في الاستعلام. اعتمادا على اختبار ٥٠ من استعلام البيانات، توضح نتائج الاختبار أن استخدام توسيع الاستعلام يُظهر نتائج أفضل من دون استخدام توسيع الاستعلام. اعتمادا على اختبار أعلى ١ من البيانات دون استخدام توسيع الاستعلام، وحصل على قيمة استدعاء متوسطة تبلغ ٦٢٪، ومتوسط قيمة الدقة ٦٢٪، ومتوسط قيمة الدقة ٩٢,٤٪ ومتوسط قيمة المقياس ٦٢٪، بينما حصل الاختبار باستخدام توسيع الاستعلام على قيمة استدعاء متوسطة تبلغ ٦٦٪، ومتوسط قيمة الدقة قدرها ٦٦٪، ومتوسط قيمة الدقة قدرها ٩٣,٢٪ ومتوسط قيمة المقياس "ف" البالغ ٦٦٪. اعتمادا على نتائج الاختبار، يُظهر استخدام توسيع الاستعلام زيادة في متوسط قيمة الاستدعاء بنسبة ٤٪، وزيادة في متوسط قيمة الدقة ٤٪، وزيادة في متوسط قيمة الدقة ٠,٠٨٪ وزيادة في متوسط قيمة مقياس "ف" ٤٪ مقارنة دون استخدام توسيع الاستعلام.

## CHAPTER I

### INTRODUCTION

This chapter explains about the research background, research question, research objectives, and research scope.

#### 1.1 Research Background

Hadith is the second source of Islamic law after Al-Qur'an. Hadith is very influential in Islam to determine the activities, both of life or the afterlife. When Muslims find cases that are not preferred in Al-Qur'an, Muslims use the hadith as a source of law. Hadith is everything that is done by the Prophet Muhammad SAW, in terms of words, deeds, and approval (Baqi, 2015). The hadith is divided into several types, i.e. based on the Sanad Hadith, based on the Narrator's Hadith, and based on the Shahih Hadith.

Based on Sanad Hadith, hadith is classified into 6 types, namely Mursal Hadith, Munqathi Hadith, Mu'dlal Hadith, Mu'allaq Hadith, Mudallas Hadith, and Musnad Hadith. Then, based on the Narrator of Hadith is classified into 2 types, namely Mutawatir Hadith and Ahad Hadith. And then, based on Shahih Hadith is classified into 4 types, namely Shahih Hadith, Hasan Hadith, Dhoif Hadith, and Maudlu' Hadith (Amzah, 2009).

Shahih hadith is the highest level of hadith based on the quality of the hadith with certain terms. The Hadith narrated by Imam Bukhari and Imam Muslim and classified as Shahih Hadith is called "Muttafaqun Alaih". Dr. Mahmud At-Thahan said in his book entitled Tafsir Mushthalhul Hadith. Shahihain is an Islamic term that refers to the shahih book of Imam Bukhari and Imam Muslim.

The hadith that can be used as a way of life is a hadith that claims it is truth by the Ulama of hadith experts. One type of hadith that can be used as a way of life is the shahih hadith, narrated by Imam Bukhari and Imam Muslim. The book of hadith written by Imam Bukhari and Imam Muslim has been approved by the Ulama of hadith experts as the most authentic hadith that can be used as a reference for Islamic law after Al-Qur'an.

Shahih hadith is widely used by Ulama to determine the law of certain disputes. One of the books of the collection of authentic hadith written by Imam Bukhari and Imam Muslim is the book of Al-Lu'Lu' Wal Marjan by Muhammad Fuad Bin Abdul Baqi. To facilitate the users for finding references to the hadith in the book of Al-Lu'Lu' Wal Marjan that accommodates with the users needs, it is important to develop an Information Retrieval system as a simple data search system where users only posed a query to the system, then the system will look for hadith that match from the database and displays search results to the users. A simple search like this sometimes displays data that is irrelevant to the query posed by the user.

Information Retrieval is used to find information from unstructured data (usually text) that satisfies the information needed from large data collections (usually stored on a computer). Implementation of an Information Retrieval system is to facilitate the users in finding data that is relevant to the query posed by the user. To find a piece of relevant information with the query posed by the user, we apply the query expansion based on Indonesian thesaurus to scale up the searching data process. So, the use of query expansion can improve recall (Manning, 2008).

To find a relevant information, it is necessary to measure the similarity between queries and documents in the database. Many methods can be applied in this study



to measure and find documents that are relevant to the queries posed by the users. In this study, the Naïve Bayes method is used to measure the probability of queries on documents in the database. Then the probability search results will be ranked and sorted from the highest probability value, where the hadith data will be displayed based on the ranking results as feedback from the query posed by the users.

## 1.2 Research Question

How high is the accuracy, precision, and recall of Naïve Bayes to retrieve information from hadith utilizing the combination of Indonesian thesaurus?

## 1.3 Research Objectives

To measure the accuracy, precision, and recall of the Naïve Bayes to retrieve information from hadith utilizing the combination of Indonesian thesaurus.

## 1.4 Research Scope

The research scope of this study is limited by the following:

1. The hadith used in this study is a translation of the authentic hadith of Bukhari and Muslim from book of Al Lu' Lu' Wal Marjan which was narrated by Muhammad Fuad Abdul Baqi has the follow Indonesian term such as "*Iman, Thaharah, Haidh, Shalat, Mushala, Shalat Orang Musafir, Al-Jum'ah, Shalat Dua Hari Raya, Shalat Istisqaa', Salat Gerhana, Janazah*".
2. The thesaurus used in this study is the Indonesian Thesaurus which has a connection with the query, it is taken from the book of Tesaurus Bahasa Indonesia Pusat Bahasa Kemendiknas, 2008.

### 1.5 Research Benefit

The output of the research could be utilized for users to find the hadith references based on the hadith from the book of Lu' Lu' Wal Marjan.



## CHAPTER II

### LITERATURE REVIEW

This chapter presents several studies that are related to this study. Cover an explanation about hadith, information retrieval, query expansion, and several related studies.

#### 2.1 Hadith

Al-Hafidz Imam Ibn Hajar Al Asqalany explains in the book of Bulughul Maram that the hadith are all the words, deeds and decrees of the Prophet Muhammad which are used as provisions or Islamic law (Hidayat, 2010). Hadith is the second source of Islamic law after the Qur'an, where the Hadith is very influential in taking the law of every activity and case encountered in Islamic life, both relating to world life and the hereafter.

In general, the Hadith is in line with the Qur'an, where the hadith explains the mubham (something that requires explanation), details the mujmal (something general), limits the absolute, specifies the general and elaborates on the laws and the aims of its purpose, in besides explaining the laws that have not been explicitly explained by the Qur'an whose contents are in line with its rules which are the realization of its aims and objectives. The position of the hadith is close to the position of the Qur'an. The Hadith functions to interpret the text and explain its meaning. The scholars agree that the hadith serves as an explanation for the Qur'an, therefore we must follow it as it follows the Qur'an.

Many verses in the Qur'an explain the obligation to obey the Messenger of Allāh SWT like the word of God in Surah Al-Hasyr verse 7 below.

... وَمَا آتَاكُمُ الرَّسُولُ فَخُذُوهُ وَمَا نَهَاكُمْ عَنْهُ فَانْتَهُوا ...

*“..... And whatever the Messenger has given you - take; and what he has forbidden you - refrain from. ....” (QS Al Hasyr, 7).*

Based on the number of narrators, the hadith is divided into 2 types (Amza, 2009):

#### 1. Mutawatir Hadith

Mutawatir hadith is a hadith narrated by many narrators and agreed not to lie. In this category, several conditions must be fulfilled so that the hadith can be considered as a mutawatir. Below are the requirements:

- a. The contents of the hadith are things that can be achieved by the senses.
- b. The narrator who said it must be a lot of people who have an impossible habit to lie.
- c. The narrator must live in the same generation.

#### 2. Hadith Ahad

The Hadith Ahad is a hadith narrated by one or more narrators but does not reach the step of the mutawatir hadith. In this case, the narrators agree to divide this hadith into 2 types: Sahih Hadith and Da'eef Hadith. But then Imam At-Turmudzi divided this hadith into 3 types: Sahih Hadith, Hasan Hadith, and Dhaif Hadith.

1. Shahih hadith is a hadith that has continuing sanad. The hadith can be regarded to be shahih hadith if this follows terms are fulfilled. That is the terms follows:

- a. The content is not a contradiction with Al-Qur'an
- b. Must have continuing sanad.



- c. Narrated by the fair narrators.
- d. Narrated by the narrators who have a strong memory (dhobit)
- e. The hadith is not contradiction with other hadith that more shahih  
(No syadz)
- f. Not disabled even if hidden

## 2. Hasan Hadith

Hasan hadith is the source and the narrator of hadith no one presumed a lie or not syadz.

## 3. Dhaif Hadith

Dhaif hadith is hadith that is unrelated to his sanad and narrated by unfair people and not dhobit, syadz and disable.

The hadith data that use to this study is referred from the book of Al Lu 'Lu' Wal Marjan which contains a collection of authentic hadith narrated by Imam Bukhari and Muslim Imam written by Muhammad Fuad Bin Abdul Baqi.

## 2.2 Information Retrieval

Hundred million peoples engage in information retrieval every day when they use a web search engine or search their email. Information retrieval is finding material of an unstructured that satisfied an information need from within large collections (Manning, 2008). This is mean, Information retrieval system is the way to find the correct document with query input that inserted by the user in the searching process. Information Retrieval system will return the correct feedback like the desired user.

The information retrieval system will recall the same or similar result to the queries based on the level of document similarity. Figure 2.1 will give you an idea about a simple role model of Information Retrieval.

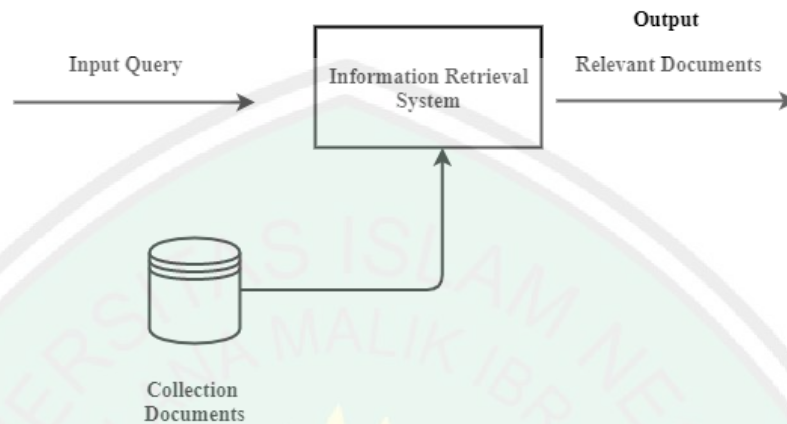


Figure 2. 1 Simple role model of Information Retrieval

An example of an information retrieval system is a search engine, where users can search and get appropriate feedback that is desired by the user. In the field of information retrieval system, precision and recall determine the performance of the system. Both elements determine the effectiveness of a search engine.

Buttcher, *et al.* (2010) explain in his book “*Information Retrieval and Evaluating Search Engine*”, the information retrieval is related to the representation, search, and manipulation of data (usually text or documents) or other data. Information retrieval is the foundation of a modern search engine. In this book also given the example of systems that apply the information retrieval system, among others:

- a. Search engine, document routing, filtering and selection.
- b. Text clustering and categorizing system.
- c. Summarization system.

- d. Information extraction system.
- e. Topic detection and tracking system.
- f. Question answering system.
- g. Multimedia information system.

Information Retrieval System performs to return the document in response to a query entered by the user. Documents generated by the System Information Retrieval are categorized into two, namely relevant documents and retrieved documents. That's why a system evaluation is needed to find out how effective the information retrieval system is. A general measure commonly used to measure the quality of an information retrieval system is a combination of recall and precision. The recall is used to evaluate the ability of the system to find back information. While precision is used to evaluate the ability of the system to retrieve information that is relevant to the user's query (Darmawan *et al*, 2011). The value of precision and recall depends on the level of relevance of the document. Relevance is a match between what is queried with what is found (Pendit, 2007).

The calculation of precision and recall is very important to evaluate the information retrieval system, but there is a trade-off between recall and precision. The condition of a trade-off between precision and recall results in the following 2 situations (Cios, 2007).

1. If the precision is too high and the recall is low, the system will return several documents and almost all of them are relevant, but a large number of other relevant documents are ignored.

2. If the recall is very high and the precision is relatively low, the system can return a large number of documents that include almost all relevant documents but also cover most unexpected documents.

Therefore, it is also necessary to measure accuracy and f-measure. Where the measure of accuracy aims to determine the closeness between the predicted value with the actual value. While the f-measure calculation is used to evaluate the information retrieval system by combining the results of precision and recall calculations. The F-measure represents the relative effect between precision and recall. F-measure is the mean harmonic weight of precision and recall which is a reciprocal measure between these.

### 2.3 Query Expansion

Query Expansion is the set of techniques for modifying a query in order to satisfy an information Need. (Selberg, 1997) Query Expansion techniques can be partitioned into three sets:

1. Manual Query Expansion (MQE)

Manual Query Expansion refers to techniques that a user may employ to modify the query. The system does not aid the user at all.

2. Automatic Query Expansion (AQE)

Automatic Query Expansion refers to techniques that modify a query without user control. For Example, a system that always adds thesaurus terms to a query would be considered an AQE system.

3. Interactive Query Expansion (IQE)



Interactive Query Expansion refers to techniques where the user has some interaction with the system in the query expansion process. This set of techniques encompasses relevance feedback and this is the focus of this study.

Query Expansion added to this research is in the form of word synonyms and/or thesaurus. Query Expansion aims to broaden user queries and deepen the search process.

## **2.4 Related Research**

Ginting & Trinada (2014) examines the implementation of the Naïve Bayes Classifier method as a technique for constructing a classification model based on documents contained in libraries. In their research, the Naïve Bayes Classifier method is used to classify several titles and categories of documents that are already in the library database, then the search process is carried out by involving descriptions of each document so that it can display more references as search results. The results of this study, the information retrieval system that has been made can display more documents based on user queries so that users get more document references. However, this research does not measure the amount of recall and precision of the documents retrieved, so it is not known how much the percentage of relevant documents to the user query.

Santoso & Rachmat (2008) examines text mining for journal classification and search systems using the Naïve Bayes method and Vector Space Model with the Cosine Similarity approach. The stages of the process of text mining begin with preprocessing text with parsing, a transformation of text with stemming and stopwords removal, feature selection, and pattern discovery. As a result, the

classification process using the Naive Bayes method applied in this study can produce good predictions if the vectors formed can represent each category. While searching for the Vector Space Model with the Cosine Similarity approach produces a recall of 54.8% and a precision of 60.7%.

Rasyidi, *et al.* (2013) examines the application of the thesaurus in the Indonesian Hadith retrieval system. In this research it is said that the hadith retrieval system in Indonesia only executes input requests directly to the DBMS, resulting in low-quality search results. To overcome this problem, they tried to implement a thesaurus in the system. In this study, the thesaurus document is used in the query expansion process during the search process. The results of this study indicate that the use of a thesaurus can improve accuracy for precision. Where, the accuracy calculation results for precision show a 34% increase in searches using the thesaurus as query expansion, compared to searches without using a thesaurus as query expansion.

Rahman & Bakar (2010) examines the use of Thesaurus as a query expansion in increasing the hadith information generated from the Malay Hadith Information Retrieval. Thesaurus used is Malay Thesaurus. The results of this study indicate that the use of thesaurus as an expansion query can improve search results. The use of the thesaurus also helps the user to get documents relevant to the request entered.

Aulia, *et al.* (2017) studies the development of the Al-Hadith Information Retrieval system in Bahasa, the Bukhari Hadith case study. Information Retrieval system was built using Nazief and Andriani stemming algorithms. The results of this study indicate that the Information Retrieval System created can produce a recall of 1 and a precision of 0.961. This shows that the retrieval process returns a

large number of relevant documents and also includes most or some irrelevant documents.

Yadav (2014) applies the document similarity matrix and Naïve Bayes classification to do web information retrieval. In this research, the document-document similarity matrix was used after performing pre-processing and feature construction. Then, a Naïve Bayes Classifier was used to find the relevant category of information that is required for the user. The purpose of this research is to analyze the proposed algorithm with sensitivity, specificity, and accuracy. The result of this research is the proposed algorithm can increase 3% of sensitivity as compared with the existing algorithm. Also, it increased the specificity and accuracy as compared with the existing algorithm.

Yang (2002) proposes the efficient technique to address the word mismatch for searching distributed collection based on query expansion and naïve bayes method. They are present, this technique can make a system automatically add other topics terms related to the same concepts in a user query to effectively rank collections and search the subset efficiently.

Wang, *et al.* (2003) presents an automatic classification system namely WebDoc. One of the classification method that used to this system is naïve bayes classification method. That method used to build the knowledge base. This research also compare the performance of WebDoc with each method in terms of recall, precision, and f-measure. The result of this research is WebDoc that use the naïve bayes classification method can classify web documents effectively and efficiently.

Amalia (2017) studies the application of the Dice Similarity method to the query answering system. Dice Similarity is used to measure the similarity of keywords to a collection of hadith documents. Also, this study applies thesaurus as a query expansion to expand the query by redefining the original query by adding several word terms to the query based on Indonesian Thesaurus. The results of this study indicate that the use of expansion queries can increase recall, precision, and f-measure.

Shahabadkar, *et al.* (2017) proposes a new Enhanced Query Expansion based Classifier (EQC) technique for web document retrieval. Where expansion of demand is used to improve document retrieval. Original user requests are reformulated and feedback is given to the dataset to find relevant documents. The results of this study showed an increase in the value of precision by 1%, an increase in the value of recall by 3% and an increase in the value of the f-measure by 3.5%. That is measurements of precision, recall, and f-measure show an increase in document retrieval schemes relevant to reduced computational complexity.



## CHAPTER III

### RESEARCH METHODOLOGY

This chapter discusses the research procedures, data collection, system design which includes the design process and interface design, and the experimental process conducted while the study.

#### 3.1 Research Procedure

Research procedure is a step that used to collect data and answer questions in the research. The process of the research procedure is given by Figure 3.1 below.

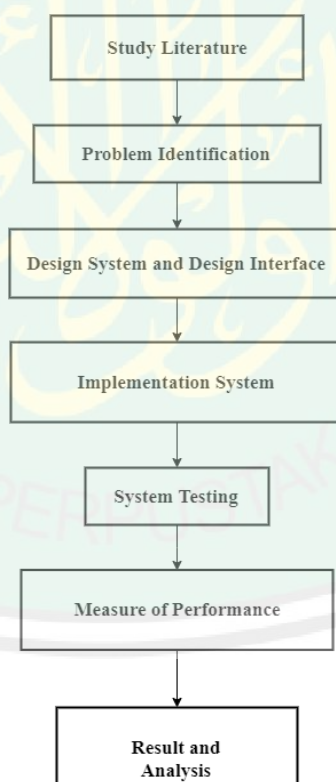


Figure 3. 1 Research Procedure

Figure 3.1 shows the process that must be carried out to complete this research. The process began with study literature on Sahih hadith narrated by Imam Bukhari and Muslim. In addition to supporting this research, it is also necessary to study literature about Information Retrieval, Query Expansion, Naive Bayes Classifier method, and related research. The next step is the process of problem identification, at this stage will be determined the several questions of this study, the research objective of this study, the research scope of this study, and the research benefits of this study. The next step is the system design process, where this stage aims to create a process design and interface design which will be applied to the system. The next step is the implementation of the system based on the system design that has been made in the previous stage. In the next step, after the system implementation is complete, the system testing process will be carried out and perform precision, recall, accuracy, and f-measure calculations to evaluate the effectiveness of the system that has been built.

### 3.2 Data Collection

The data used in this study was taken from the book Al Lu 'Lu' Wal Marjan which contains a collection of Sahih hadith narrated by Imam Bukhari and Muslim Imam by Muhammad Fuad Bin Abdul Baqi. The hadith topics taken from the book are about Iman, Thaharah, Haidh, Shalat, Mushala, Shalat Orang Musafir, Al-Jum'ah, Shalat Dua Hari Raya, Shalat Istisqaa ', Salat Gerhana, Janazah. Then the documents that have been determined will be stored in the database. Table 3.1 is an example of the hadith data that has been stored in a database with fields that have been adapted to the composition of the hadith in the book Al-Lu 'Lu' Wal Marjan.

Table 3. 1 Table of Hadith data

| Hadith Number | Book        | Chapter   | Hadith   | Hadith Translation  |
|---------------|-------------|---|--|---|
| 1             | <i>Iman</i> | <i>Shalat lima waktu salah satu rukun islam</i> | <p>حَدَّثَنَا طَلْحَةُ بْنُ عُبَيْدٍ قَالَ: جَاءَ رَجُلٌ إِلَى رَسُولِ اللَّهِ صَلَّى اللَّهُ عَلَيْهِ وَسَلَّمَ مِنْ أَهْلِ نَجْدٍ ثَائِرُ الرَّأْسِ يُسْمَعُ دَوِيُّ صَوْتِهِ وَلَا يُفْقَهُ مَا يَقُولُ، حَتَّى دَنَا فَإِذَا هُوَ يَسْأَلُ عَنِ الْإِسْلَامِ؛ فَقَالَ رَسُولُ اللَّهِ صَلَّى اللَّهُ عَلَيْهِ وَسَلَّمَ: خَمْسُ صَلَوَاتٍ فِي الْيَوْمِ وَاللَّيْلَةِ فَقَالَ: هَلْ عَلَيَّ غَيْرُهَا قَالَ: لَا إِلَّا أَنْ تَطُوعَ قَالَ رَسُولُ اللَّهِ صَلَّى اللَّهُ عَلَيْهِ وَسَلَّمَ: وَصِيَامُ رَمَضَانَ قَالَ: هَلْ عَلَيَّ غَيْرُهُ قَالَ: لَا إِلَّا أَنْ تَطُوعَ قَالَ، وَذَكَرَ لَهُ رَسُولُ اللَّهِ صَلَّى اللَّهُ عَلَيْهِ وَسَلَّمَ الزَّكَاةَ قَالَ هَلْ عَلَيَّ غَيْرُهَا قَالَ لَا إِلَّا أَنْ تَطُوعَ قَالَ فَأَدْبَرَ الرَّجُلُ وَهُوَ يَقُولُ: وَاللَّهِ لَا أَزِيدُ عَلَى هَذَا وَلَا أَنْقُصُ قَالَ رَسُولُ اللَّهِ صَلَّى اللَّهُ عَلَيْهِ وَسَلَّمَ: أَفَلَمْ يَنْصَحْكَ أَخْرَجَهُ الْبُخَارِيُّ فِي: ٢ كِتَابِ الْإِيمَانِ: ٣٤ بَابِ الزَّكَاةِ مِنَ الْإِسْلَامِ</p> | <p><i>Thalhah bin Ubaidillah r.a. berkata: Seorang dari Najed datang kepada Nabi saw. sedang ia terurai rambutnya, lalu ia mendekat kepada Nabi saw. dapat didengar dengung suaranya tetapi tidak dapat ditangkap (dimengerti) apa yang ditanyakannya, tiba-tiba ia menanya tentang Islam. Maka Rasulullah saw. bersabda: Lima kali shalat dalam sehari semalam. Ia bertanya: Apakah ada kewajiban bagiku selain itu? Jawab Nabi saw. : Tidak, kecuali jika anda akan shalat sunnat. Lalu Nabi saw. bersabda: Dan puasa pada bulan Ramadhan. Orang itu bertanya: Apakah ada lagi puasa yang wajib atasku selain itu? Jawab Nabi saw.: Tidak, kecuali jika anda puasa sunnat. Lalu Nabi saw. menerangkan kewajiban zakat. Maka ia tanya: Apakah ada kewajiban selain itu? Jawab Nabi saw.: Tidak, kecuali jika anda bersedekah sunnat. Maka pergilah orang itu, sambil berkata: Demi Allah saya tidak akan melebihi atau mengurangi dari itu. Maka Rasulullah saw. bersabda: Sungguh bahagia ia jika benar-benar. (Ya'ni dalam ucapannya tidak akan mengurangi atau melebihi itu). (Bukhari, Muslim)</i></p> |

|   |      |                                      |  |   |
|---|------|--------------------------------------|--|---|
| 2 | Iman | Iman yang dapat memasukkan ke syurga | <p>حديث أبي أيوب الأنصاري رضي الله عنه أن رجلاً قال: يا رسول الله أخبرني بعمل يُدخلني الجنة، فقال القوم: مَا لَهُ مَالَهُ فقال رسول الله صلى الله عليه وسلم: أَرَبُّ مَا لَهُ فقال النبي صلى الله عليه وسلم: تعبد الله لا تُشْرِكْ بِهِ شَيْئاً وَتُقِيمِ الصَّلَاةَ وَتُؤْتِيَ الزَّكَاةَ وَتَصِلَ الرَّجِمَ ذَرْهَا قَالَ كَأَنَّهُ كَانَ عَلَى رَاجِلَيْهِ أَخْرَجَهُ البخاري في: ٧٨ كتاب الأدب: ١٠ باب فضل صلة الرحم</p> | <p>Abu Ayyub Al-Anshari r.a. berkata: Seorang Badwi menghadang Nabi saw. di tengah jalan, lalu memegang kendali onta kendaraan Nabi saw. dan bertanya: Ya Rasulullah, beritakan padaku amal yang dapat memasukkan aku ke surga. Maka sahabat bertanya-tanya: Mengapa, mengapa orang itu? Jawab Nabi saw.: Ada kepentingannya. Lalu Nabi saw. menjawab: Hendaknya anda menyembah Allah dan tidak mempersekutukannya dengan suatu apa pun, dan mendirikan shalat, dan menunaikan (mengeluarkan) zakat dan menghubungi famili (kerabat). Kemudian Nabi saw. berkata padanya: Lepaskan kendali onta itu. (Bukhari, Muslim).</p> |
| 3 | Iman | Rukun Islam Lima                     | <p>حديث ابن عمر رضي الله عنهما قال: قَالَ رَسُولُ اللَّهِ صَلَّى اللَّهُ عَلَيْهِ وَسَلَّمَ: بُنِيَ الْإِسْلَامُ عَلَى خَمْسٍ: شَهَادَةِ أَنْ لَا إِلَهَ إِلَّا اللَّهُ وَأَنَّ مُحَمَّدًا رَسُولُ اللَّهِ وَإِقَامِ الصَّلَاةِ وَإِيتَاءِ الزَّكَاةِ وَالْحَجِّ وَصَوْمِ رَمَضَانَ أَخْرَجَهُ الْبُخَارِيُّ فِي: ٢ كتاب الإيمان: ٢ باب دعاؤكم إيمانكم</p>   | <p>Ibn Umar r.a. berkata: Rasulullah saw. bersabda: Islam didirikan di atas lima: 1. Percaya bahwa tiada Tuhan melainkan Allah, dan bahwa Nabi Muhammad utusan Allah. 2. Mendirikan shalat. 3. Mengeluarkan zakat. 4. Haji ke baitullah jika kuat perjalanannya. 5. Puasa bulan Ramadhan. (Bukhari, Muslim)</p>   |

### 3.3 System Design

This section discusses the process design and interface design that will be implemented in this study.

### 3.3.1 Process Design

The design process proposes to create a flow system that will be implemented in this study, an overview of the design process that has been made is given by Figure 3.2 below.

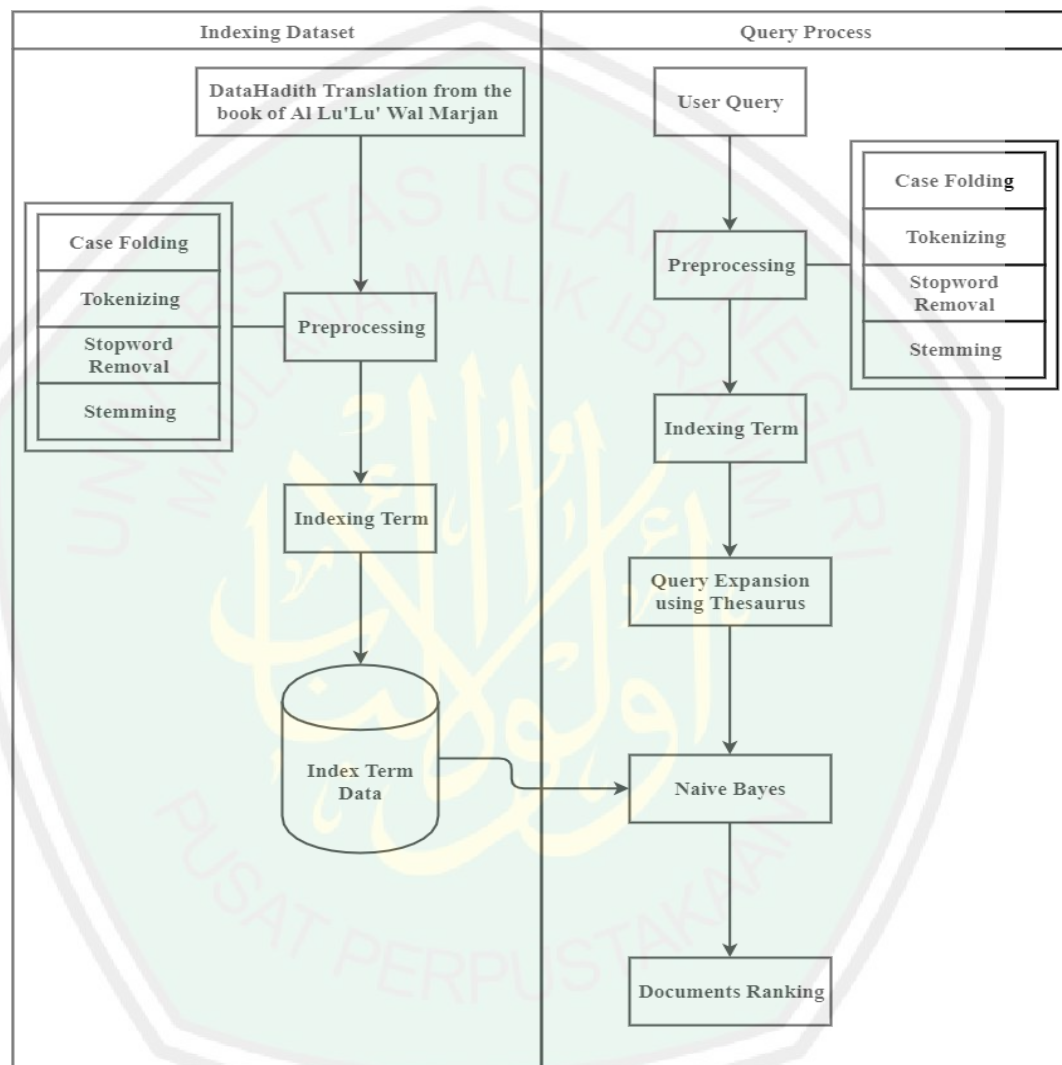


Figure 3. 2 Flowchart System Design

#### 3.3.1.1 Indexing Dataset

The indexing dataset is taken to process the data of the hadith that has been stored in the database to facilitate the process of searching hadith.



### 3.3.1.1.1 Dataset Hadith

The first step is collecting hadith data and saving the data to the database. At this stage, the authors exemplify the 3 hadith documents which is given by Table 3.2 below.

Table 3. 2 Dataset Hadith

|    |   |
|----|---|
| D1 | <i>Shalat lima waktu salah satu rukun islam. Shalat lima waktu wajib dikerjakan bagi setiap muslim yang baligh dan berakal.</i> |
| D2 | <i>Shalat adalah tiang agama yang wajib dijalankan bagi umat muslim.</i>  |
| D3 | <i>Shalat wajib ada 5 waktu, yaitu : Shubuh, Dzuhur, Asar, Maghrib, dan Isya'</i>   |

### 3.3.1.1.2 Preprocessing

Based on the irregular structure of text data, the information retrieval or query answering system that will develop requires several initial stages, so that the text data can be changed to be more structured. Preprocessing is the first step that has to do before the system can analyze the dataset. The implementation of preprocessing covering 4 steps, follows case folding, tokenizing, stopword removal, and stemming.

#### 1. Case Folding

The case folding process is needed to convert the entire text in documents into a standard form (usually is lowercase). This process is done because not all text documents are consistent to use capital letters. This process can make the system to be easier to analyze data. The case folding process for hadith documents is given by Figure 3.3 below.

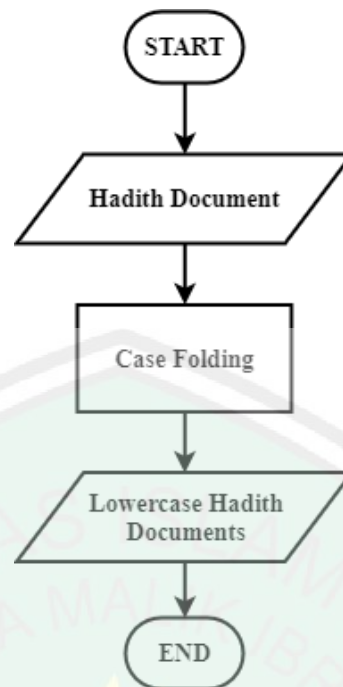


Figure 3. 3 Flowchart case folding of Hadith documents

Based on Figure 3.3, the case folding process changes the text in the hadith document that is represented in Table 3.2 into lowercase letters. The results of the folding case process is given by Table 3.3 below.

Table 3. 3 Dataset after case folding process

|    |   |
|----|---|
| D1 | <i>shalat lima waktu salah satu rukun islam. shalat lima waktu wajib dikerjakan bagi setiap muslim yang baligh dan berakal.</i> |
| D2 | <i>shalat adalah tiang agama yang wajib dijalankan bagi umat muslim.</i>  |
| D3 | <i>shalat wajib ada 5 waktu, yaitu : shubuh, dzuhur, asar, maghrib, dan isya'</i>   |

## 2. Tokenizing

In this section, tokenizing is needed to splitting the text in the hadith documents into smaller pieces, called token. Words, punctuation marks and the other can be considered as tokens. The tokenizing process for the text in the hadith documents is given by Figure 3.4 below.

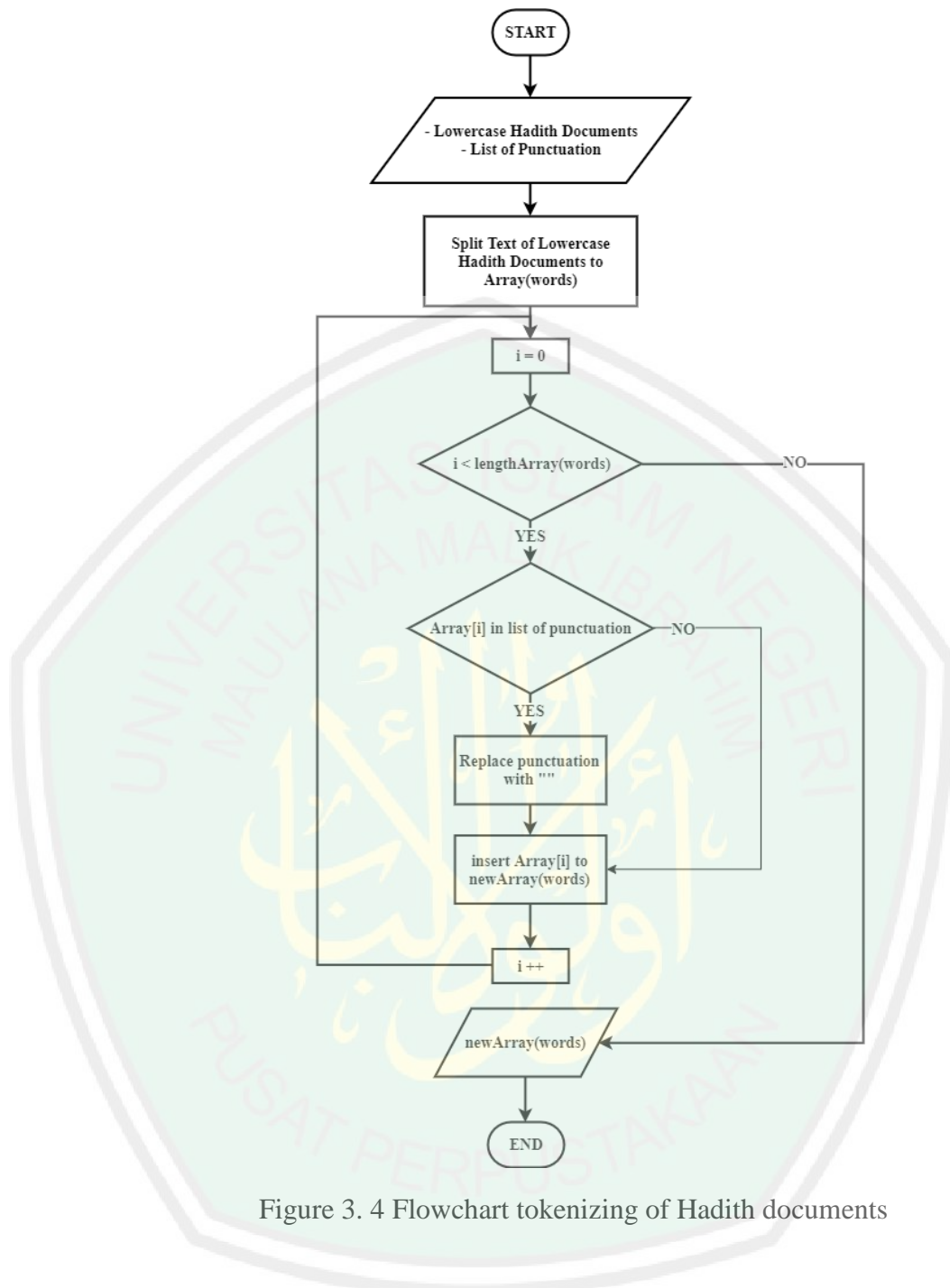


Figure 3. 4 Flowchart tokenizing of Hadith documents

Based on Figure 3.4 above, the tokenizing proses started with use the text documents as the result of case folding process. The punctuation marks that are contain in the text documents will removed and the text documents will split into the pieces of word. Table 3.4 below is the example of tokenizing result. The text documents are converted in the pieces of word, called terms.

Table 3. 4 Dataset after tokenizing process

|    |                   |    |                   |    |                |
|----|-------------------|----|-------------------|----|----------------|
| 1  | <i>shalat</i>     | 15 | <i>muslim</i>     | 29 | <i>muslim</i>  |
| 2  | <i>lima</i>       | 16 | <i>yang</i>       | 30 | <i>shalat</i>  |
| 3  | <i>waktu</i>      | 17 | <i>baligh</i>     | 31 | <i>wajib</i>   |
| 4  | <i>salah</i>      | 18 | <i>dan</i>        | 32 | <i>ada</i>     |
| 5  | <i>satu</i>       | 19 | <i>berakal</i>    | 33 | <i>5</i>       |
| 6  | <i>rukun</i>      | 20 | <i>shalat</i>     | 34 | <i>waktu</i>   |
| 7  | <i>islam.</i>     | 21 | <i>adalah</i>     | 35 | <i>yaitu</i>   |
| 8  | <i>shalat</i>     | 22 | <i>tiang</i>      | 36 | <i>shubuh</i>  |
| 9  | <i>lima</i>       | 23 | <i>agama</i>      | 37 | <i>dzuhur</i>  |
| 10 | <i>waktu</i>      | 24 | <i>yang</i>       | 38 | <i>asar</i>    |
| 11 | <i>wajib</i>      | 25 | <i>wajib</i>      | 39 | <i>maghrib</i> |
| 12 | <i>dikerjakan</i> | 26 | <i>dijalankan</i> | 40 | <i>dan</i>     |
| 13 | <i>bagi</i>       | 27 | <i>bagi</i>       | 41 | <i>isya</i>    |
| 14 | <i>setiap</i>     | 28 | <i>umat</i>       |    |                |

### 3. Stop word Removal

Stopword removal is needed to delete each word that is not important, such as conjunctions and others. So that there are only important words, which are ready to be processed to the next step. The stopwords removal process for hadith documents is given by Figure 3.5 below.

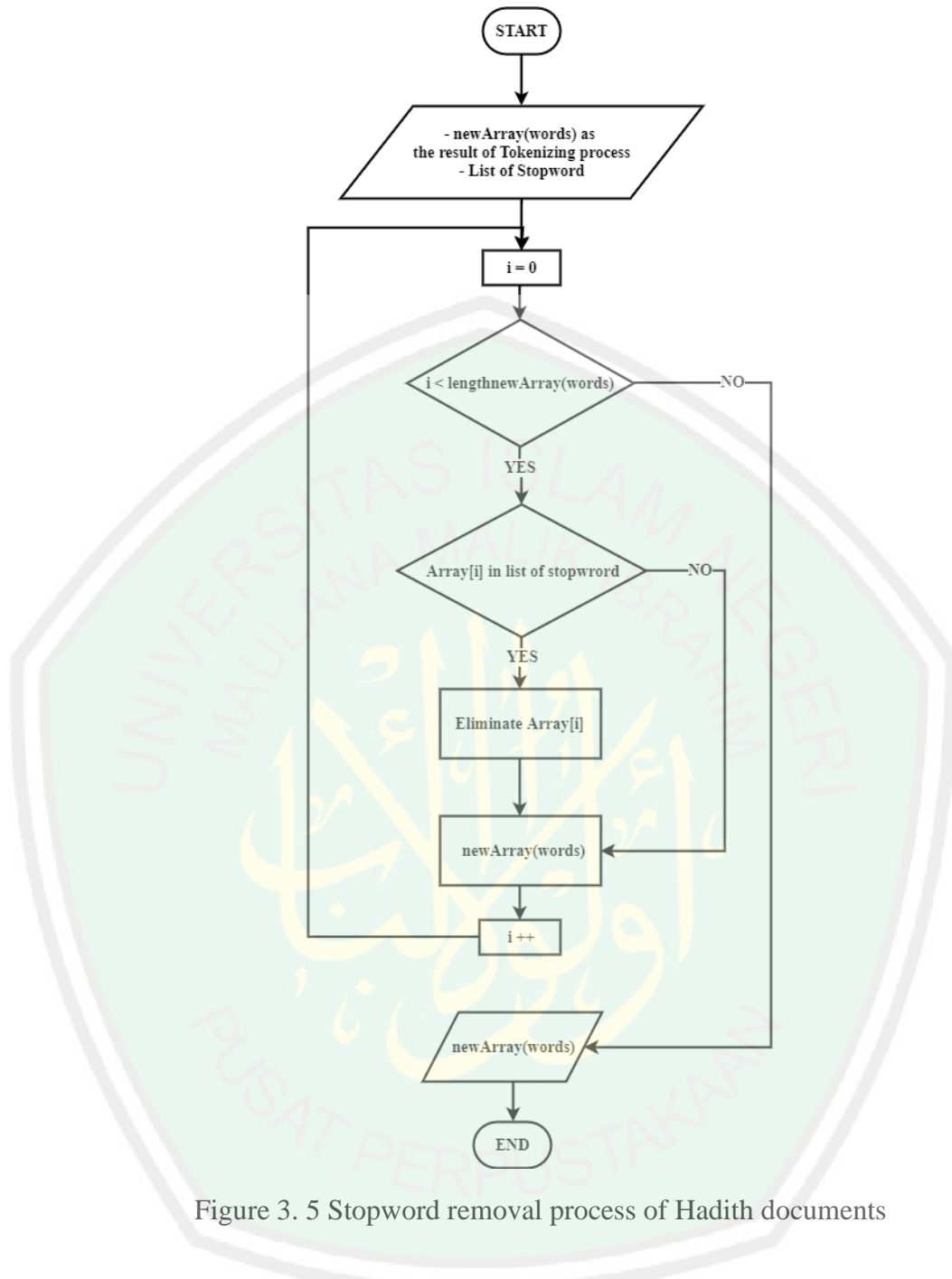


Figure 3. 5 Stopword removal process of Hadith documents

Based on Figure 3.5, If the system found the word from array words are contained in the list of stopwords, so that word will be removed. And the result of this process is leaving important words. Table 3.5 below is the example of stopwords removal results. Where the conjunction the other words that are not important was removed and leaves the important words.



Table 3. 5 Dataset after stopwords removal process

|    |               |    |                   |    |                   |    |                |
|----|---------------|----|-------------------|----|-------------------|----|----------------|
| 1  | <i>shalat</i> | 11 | <i>wajib</i>      | 21 | <i>wajib</i>      | 31 | <i>shubuh</i>  |
| 2  | <i>lima</i>   | 12 | <i>dikerjakan</i> | 22 | <i>dijalankan</i> | 32 | <i>dzuhur</i>  |
| 3  | <i>waktu</i>  | 13 | <i>bagi</i>       | 23 | <i>bagi</i>       | 33 | <i>asar</i>    |
| 4  | <i>salah</i>  | 14 | <i>setiap</i>     | 24 | <i>umat</i>       | 34 | <i>maghrib</i> |
| 5  | <i>satu</i>   | 15 | <i>muslim</i>     | 25 | <i>muslim</i>     | 35 | <i>isya</i>    |
| 6  | <i>rukun</i>  | 16 | <i>baligh</i>     | 26 | <i>shalat</i>     |    |                |
| 7  | <i>islam</i>  | 17 | <i>berakal</i>    | 27 | <i>wajib</i>      |    |                |
| 8  | <i>shalat</i> | 18 | <i>shalat</i>     | 28 | <i>ada</i>        |    |                |
| 9  | <i>lima</i>   | 19 | <i>tiang</i>      | 29 | <i>5</i>          |    |                |
| 10 | <i>waktu</i>  | 20 | <i>agama</i>      | 30 | <i>waktu</i>      |    |                |

#### 4. Stemming

The stemming process is needed to reduce words into their root words.

The words prefix, suffix, and others are removed to get the root word. The flow of stemming hadith documents is given by Figure 3.6 below.

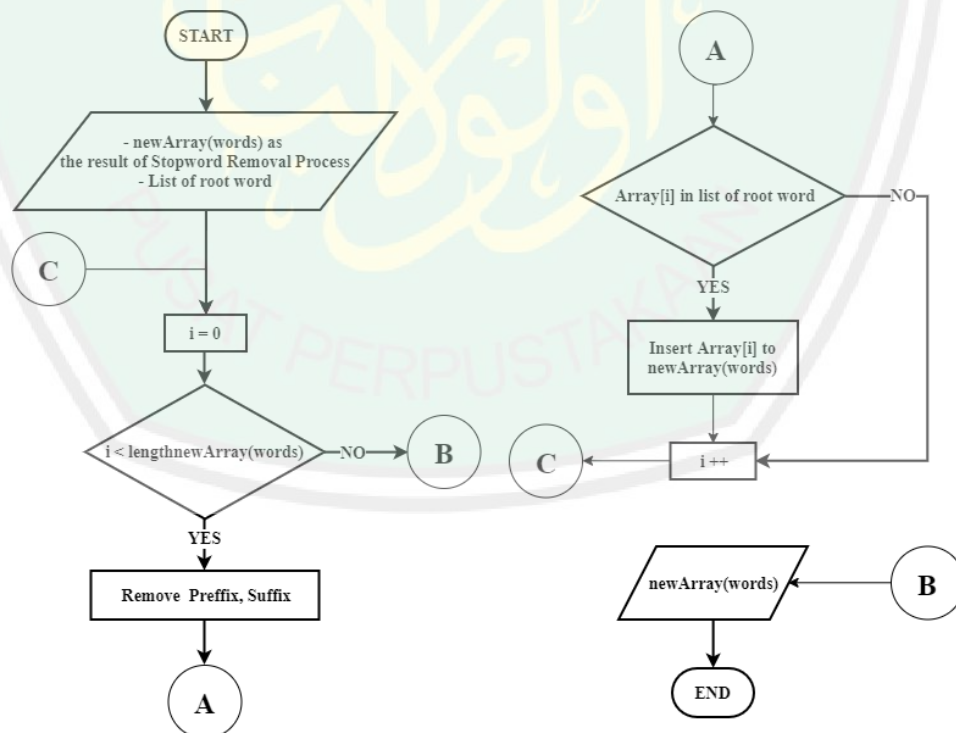


Figure 3. 6 Flowchart stemming of Hadith documents

Based on Figure 3.6, the system will remove the prefix and suffix contained in each word so that the basic word of the word is obtained, then the system will check whether the word is in the base word list or not, if there is, then the system will be stored in the database. Table 3.6 below is an example of stemming results, where words have turned into basic words.

Table 3. 6 Dataset after stemming process

|    |               |    |                |
|----|---------------|----|----------------|
| 1  | <i>shalat</i> | 15 | <i>tiang</i>   |
| 2  | <i>lima</i>   | 16 | <i>agama</i>   |
| 3  | <i>waktu</i>  | 17 | <i>jalan</i>   |
| 4  | <i>salah</i>  | 18 | <i>umat</i>    |
| 5  | <i>satu</i>   | 19 | <i>ada</i>     |
| 6  | <i>rukun</i>  | 20 | <i>5</i>       |
| 7  | <i>islam</i>  | 21 | <i>shubuh</i>  |
| 8  | <i>wajib</i>  | 22 | <i>dzuhur</i>  |
| 9  | <i>kerja</i>  | 23 | <i>asar</i>    |
| 10 | <i>bagi</i>   | 24 | <i>maghrib</i> |
| 11 | <i>setiap</i> | 25 | <i>isya</i>    |
| 12 | <i>muslim</i> |    |                |
| 13 | <i>baligh</i> |    |                |
| 14 | <i>akal</i>   |    |                |

### 3.3.1.1.3 Indexing Term

This section is needed to count the number of words based on the number of hadith documents. The word that is counted is the word contained in the document that has gone through the process of preprocessing data. The flow of this section is given by Figure 3.7 below.

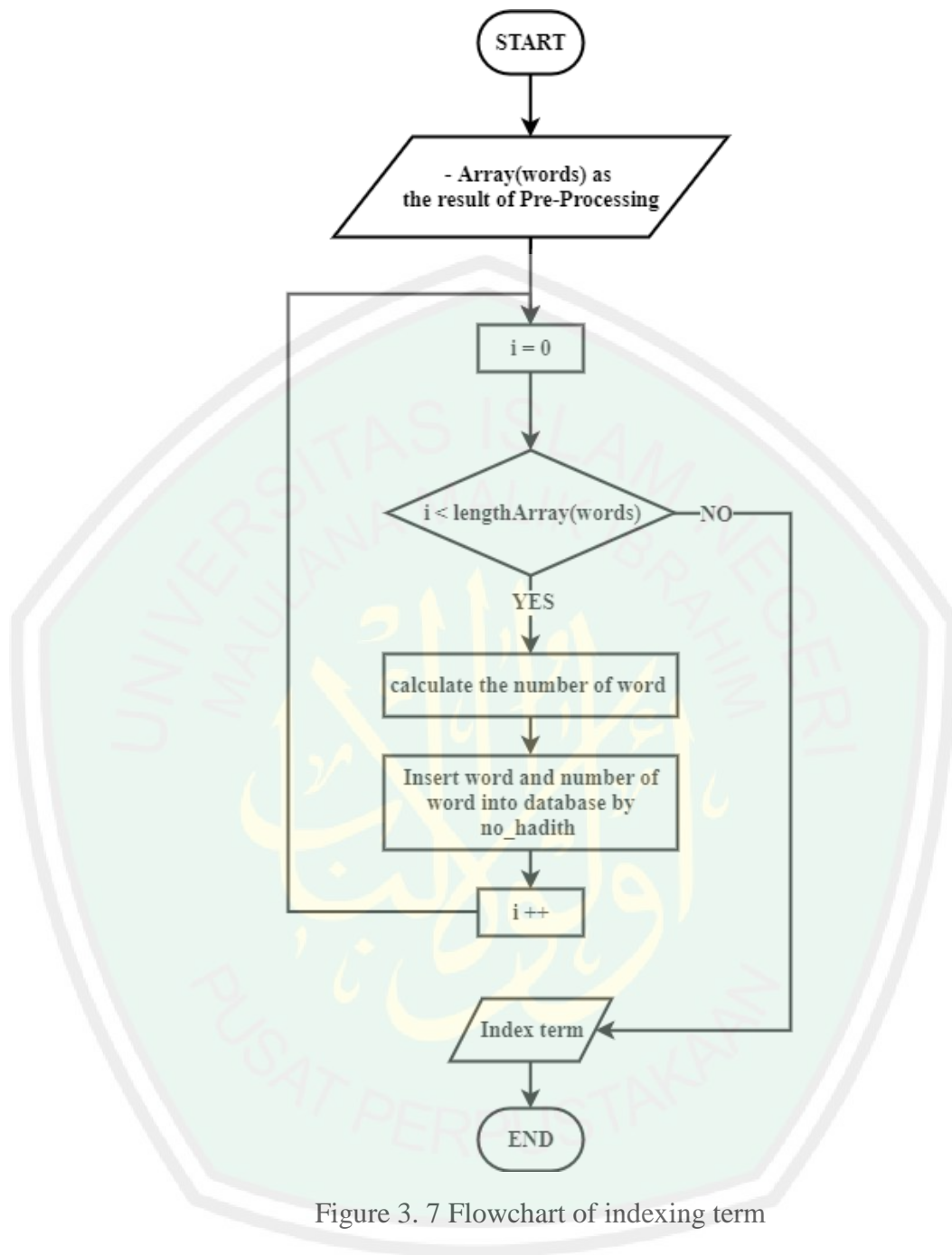


Figure 3. 7 Flowchart of indexing term

Based on Figure 3.7, each term or word that results from the preprocessing process will be counted according to each document's hadith. Then, the data will be saved to the index table in the database. Table 3.7 below is an example of the results of the indexing term process.

Table 3. 7 Table indexing term

| Term           | Doc1 | Doc2 | Doc3 |
|----------------|------|------|------|
| <i>shalat</i>  | 2    | 1    | 1    |
| <i>lima</i>    | 2    | 0    | 0    |
| <i>waktu</i>   | 2    | 0    | 1    |
| <i>salah</i>   | 1    | 0    | 0    |
| <i>satu</i>    | 1    | 0    | 0    |
| <i>rukun</i>   | 1    | 0    | 0    |
| <i>islam</i>   | 1    | 0    | 0    |
| <i>wajib</i>   | 1    | 1    | 1    |
| <i>kerja</i>   | 1    | 0    | 0    |
| <i>bagi</i>    | 1    | 1    | 0    |
| <i>setiap</i>  | 1    | 0    | 0    |
| <i>muslim</i>  | 1    | 1    | 0    |
| <i>baligh</i>  | 1    | 0    | 0    |
| <i>akal</i>    | 1    | 0    | 0    |
| <i>tiang</i>   | 0    | 1    | 0    |
| <i>agama</i>   | 0    | 1    | 0    |
| <i>jalan</i>   | 0    | 1    | 0    |
| <i>umat</i>    | 0    | 1    | 0    |
| <i>ada</i>     | 0    | 1    | 0    |
| <i>5</i>       | 0    | 1    | 0    |
| <i>shubuh</i>  | 0    | 1    | 0    |
| <i>dzuhur</i>  | 0    | 1    | 0    |
| <i>asar</i>    | 0    | 1    | 0    |
| <i>maghrib</i> | 0    | 1    | 0    |
| <i>isya</i>    | 0    | 1    | 0    |

### 3.3.1.2 Query Process

This section describes the process when a user searches, starting from input a query to get information that matches the query posed by the user.

### 3.3.1.2.1 Query Input

Query input is a query posed by the user to the system as a keyword to find the hadith document. The example of the keyword is given by Table 3.8 below.

Table 3. 8 Table query

|   |                         |
|---|-------------------------|
| Q | <i>Kewajiban Shalat</i> |
|---|-------------------------|

### 3.3.1.2.2 Preprocessing

At this stage, the input query will go through a preprocessing process to get the root words from the query, so that it can be easier for the next process. This preprocessing stage includes 4 steps, namely: Case Folding, Tokenizing, Stopword Removal, and Stemming. Examples of the results of preprocessing queries is given by Table 3.9 below.

Table 3. 9 Table of query after preprocessing

|   |               |
|---|---------------|
| 1 | <i>wajib</i>  |
| 2 | <i>shalat</i> |

### 3.3.1.2.3 Query Expansion

In this section, query expansion process is needed to increase query from the user that has been posted to the system. Also, query expansion process is purposed to increase the recall of hadith documents. The terms of query that are obtained from the preprocessing process will compared with data list of thesaurus that has been prepared in the database system. The flow process of query expansion is given by Figure 3.8 below.



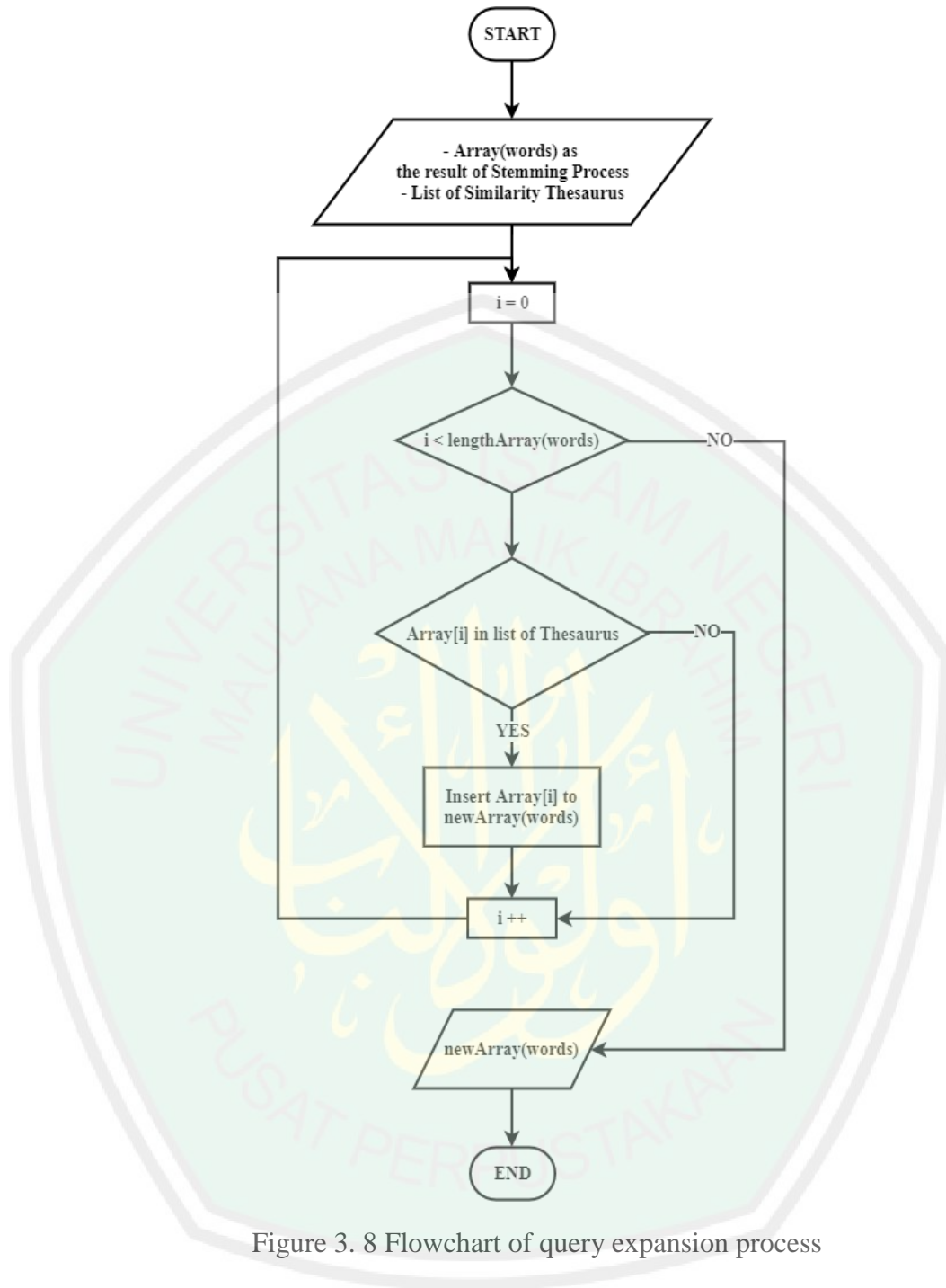


Figure 3. 8 Flowchart of query expansion process

Based on Figure 3.8, if terms of query are found in the list of thesaurus, the system will propose the query expansion for the terms. Table 3.10 below is the example of thesaurus data that used to this study.

Table 3. 10 Table of thesaurus

| No | Term             | Thesaurus  |
|----|------------------|--|
| 1  | <i>wajib</i>     | <i>harus hendaklah kudu mesti patut perlu tentu tetap</i>  |
| 2  | <i>harus</i>     | <i>kudu layak mesti pantas patut perlu wajar wajib</i>   |
| 3  | <i>hendaklah</i> | <i>harusnya mestinya sepatutnya seharusnya sudilah</i>   |
| 4  | <i>mesti</i>     | <i>harus hendaklah jangan tidak kudu niscaya pasti patutu perlu puguh sudah pasti sudah tentu tentu terdesak terpaksa tetap wajar wajib</i>  |
| 5  | <i>patut</i>     | <i>apik berpatutan cocok cukup elok etis harmonis laik layak lumayan luwes memadai mengena merdesa mustahak pantas rapi sedang senonoh sepadan serasi</i>  |
| 6  | <i>perlu</i>     | <i>butuh demi harus ingin krusial kudu mendesak mesti niscaya penting untuk urgen usah vital wajib</i>   |
| 7  | <i>tentu</i>     | <i>absolut definit jelas kentara mati mesti niscaya nyata pasti persis positif sabit sahik tegas terang tetap</i>  |
| 8  | <i>tetap</i>     | <i>ajek konsisten konstan kukuh malar mantap permanen regular stabil teguh tunak mati pasti tentu selalu selama-lamanya senantiasa sepanjang masa terus abadi abid baka baki daim kekal langgeng lestari</i> |

#### 3.3.1.2.4 Naive Bayes Classifier

This study proposed the Naïve Bayes Classifier Method. That method will implemented on the searching process to found the relevant hadith. According to Ginting & Trinada (2014) Naïve Bayes Classifier is one of machine learning method that utilizes the probability and statistical calculations proposed by Thomas Bayes. According to Dr. Suyanto (2017) probability or conditional probability is expressed as comparison 3.1:

$$P(H|X) = P(X|H) * P(H) / p(X) \quad (3.1)$$

Where X is proof, H is the hypothesis, P(H|X) is the probability that the hypothesis H is true for the proof of X in other words P(H|X) is the posterior probability H with terms X, P(H|X) is the probability that the proof of X is true for

the hypothesis  $H$  or probability  $X$  with the condition  $H$ ,  $P(H)$  is the probability of the prior hypothesis  $H$ , and  $P(X)$  is the probability of prior proof of  $X$ . The flow process of naïve bayes that used in this study is given by Figure 3.9 below.

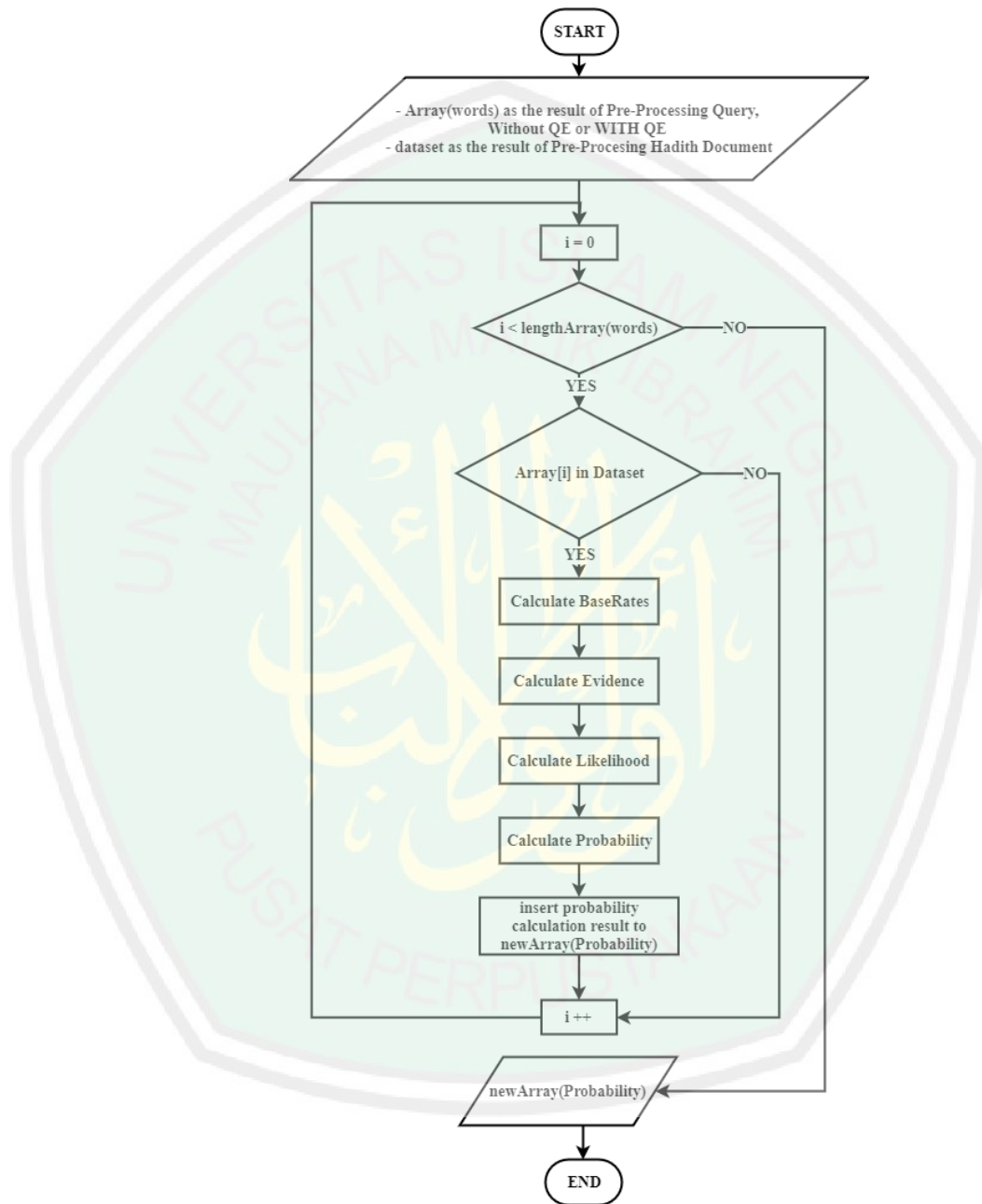


Figure 3. 9 Flowchart of Naive Bayes Classifier

Based on Figure 3.9, the terms of query that was processed will be used to find the hadith documents from dataset hadith. Where the terms of query will be

compared with dataset to be a training set. After that, the system will calculate the probability covering each steps, such us: calculate the value of base rates, calculate the value of evidence, calculate the value of likelihood, and the last step is calculate the value of probability. Below is the example of naïve bayes classifier process. Where the example of dataset is given by Table 3.2 and the example of keyword in Indonesian term is “*Kewajiban Shalat*”.

Where:

- Doc1, Doc2, and Doc3 are the number of documents that has been collected in the dataset. The table 3.11 below is the example of index term from dataset after preprocessing.

Table 3. 11 Index term

| Doc | Term          | TF |
|-----|---------------|----|
| D1  | <i>shalat</i> | 2  |
| D1  | <i>lima</i>   | 2  |
| D1  | <i>waktu</i>  | 2  |
| D1  | <i>salah</i>  | 1  |
| D1  | <i>satu</i>   | 1  |
| D1  | <i>rukun</i>  | 1  |
| D1  | <i>islam</i>  | 1  |
| D1  | <i>wajib</i>  | 1  |
| D1  | <i>kerja</i>  | 1  |
| D1  | <i>bagi</i>   | 1  |
| D1  | <i>setiap</i> | 1  |
| D1  | <i>muslim</i> | 1  |
| D1  | <i>baligh</i> | 1  |
| D1  | <i>akal</i>   | 1  |
| D2  | <i>shalat</i> | 1  |
| D2  | <i>tiang</i>  | 1  |
| D2  | <i>agama</i>  | 1  |
| D2  | <i>wajib</i>  | 1  |
| D2  | <i>jalan</i>  | 1  |
| D2  | <i>bagi</i>   | 1  |
| D2  | <i>umat</i>   | 1  |

|    |                |   |
|----|----------------|---|
| D2 | <i>muslim</i>  | 1 |
| D3 | <i>shalat</i>  | 1 |
| D3 | <i>wajib</i>   | 1 |
| D3 | <i>ada</i>     | 1 |
| D3 | <i>5</i>       | 1 |
| D3 | <i>waktu</i>   | 1 |
| D3 | <i>shubuh</i>  | 1 |
| D3 | <i>dzuhur</i>  | 1 |
| D3 | <i>asar</i>    | 1 |
| D3 | <i>maghrib</i> | 1 |
| D3 | <i>isya</i>    | 1 |

- Training set from terms of query compared with dataset.

Table 3. 12 Query compared with dataset

| NO    | TERM         |                    |               |                     | TOTAL |
|-------|--------------|--------------------|---------------|---------------------|-------|
|       | <i>wajib</i> | <i>bukan wajib</i> | <i>shalat</i> | <i>bukan shalat</i> |       |
| Doc1  | 1            | 16                 | 2             | 15                  | 17    |
| Doc2  | 1            | 7                  | 1             | 7                   | 8     |
| Doc3  | 1            | 9                  | 1             | 9                   | 10    |
| TOTAL | 3            | 32                 | 4             | 31                  | 35    |

- Base rates calculation results

Table 3. 13 Base Rates

|          |      |
|----------|------|
| P (Doc1) | 0,49 |
| P (Doc2) | 0,23 |
| P (Doc3) | 0,29 |

- Probability of “Evidence”

Table 3. 14 Evidence

|                     |      |
|---------------------|------|
| P ( <i>wajib</i> )  | 0,09 |
| P ( <i>shalat</i> ) | 0,11 |

- Probability of “Likelihood”

Table 3. 15 Likelihood

|                                |      |
|--------------------------------|------|
| P ( <i>wajib</i>   Doc1)       | 0,06 |
| P ( <i>bukan wajib</i>   Doc1) | 0,94 |



|  |      |
|--|------|
| $P(\text{shalat}   \text{Doc1})$       | 0,13 |
| $P(\text{bukan shalat}   \text{Doc1})$ | 0,88 |
| $P(\text{wajib}   \text{Doc2})$        | 0,13 |
| $P(\text{bukan wajib}   \text{Doc2})$  | 0,88 |
| $P(\text{shalat}   \text{Doc2})$       | 0,13 |
| $P(\text{bukan shalat}   \text{Doc2})$ | 0,88 |
| $P(\text{wajib}   \text{Doc3})$        | 0,1  |
| $P(\text{bukan wajib}   \text{Doc3})$  | 0,9  |
| $P(\text{shalat}   \text{Doc3})$       | 0,1  |
| $P(\text{bukan shalat}   \text{Doc3})$ | 0,9  |

- The last process is classify the data above to get the result by the comparison 3.2:

$$P(\text{Doc} | \text{wajib, shalat}) = \frac{P(\text{wajib} | \text{Doc}) * P(\text{shalat} | \text{Doc}) * P(\text{Doc})}{P(\text{evidence})} \quad (3.2)$$

Table 3. 16 Probability Calculation

|   |   |  |
|---|---|--|
| $P(\text{Doc1}   \text{wajib, shalat})$ | = | $P(\text{wajib}   \text{Doc1}) * P(\text{shalat}   \text{Doc1}) * P(\text{Doc1}) / P(\text{evidence})$ |
|   | = | $0,06 * 0,12 * 0,49 / P(\text{evidence})$  |
|   | = | 0,36   |
| $P(\text{Doc2}   \text{wajib, shalat})$ | = | $P(\text{wajib}   \text{Doc2}) * P(\text{shalat}   \text{Doc2}) * P(\text{Doc2}) / P(\text{evidence})$ |
|   | = | $0,13 * 0,13 * 0,23 / P(\text{evidence})$  |
|   | = | 0,38   |
| $P(\text{Doc3}   \text{wajib, shalat})$ | = | $P(\text{wajib}   \text{Doc3}) * P(\text{shalat}   \text{Doc3}) * P(\text{Doc3}) / P(\text{evidence})$ |
|   | = | $0,1 * 0,1 * 0,29 / P(\text{evidence})$  |
|   | = | 0,29   |

Based on Table 3.16, the document that accordance with the keyword in Indonesian term “*Kewajiban Shalat*” is Doc2. Where the Doc2 has the maximum value. So, the system will sort according the result of the calculation of probability above.

### 3.3.2 Interface Design

At this stage, the interface design of the system to be built will be proposed.

Below is the interface design:

#### 1. Home Page

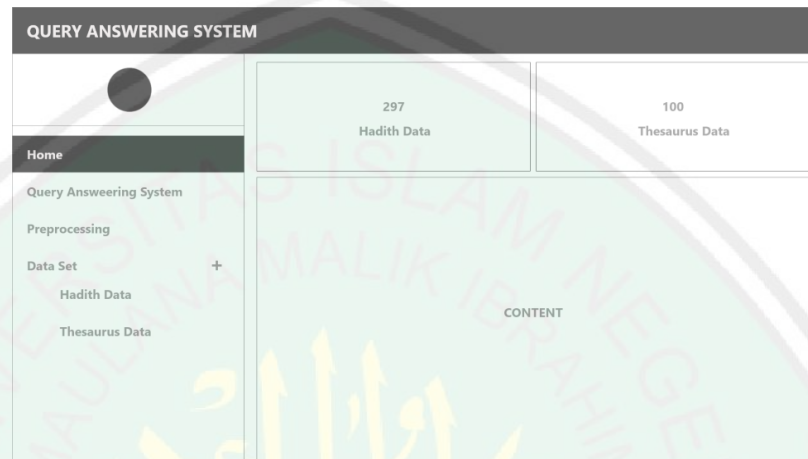


Figure 3. 10 Home page

Figure 3.10 is the home page. This page will provide the number of data hadith and data thesaurus that used to this study and explain about the definition of query answering system.

#### 2. Preprocessing Page

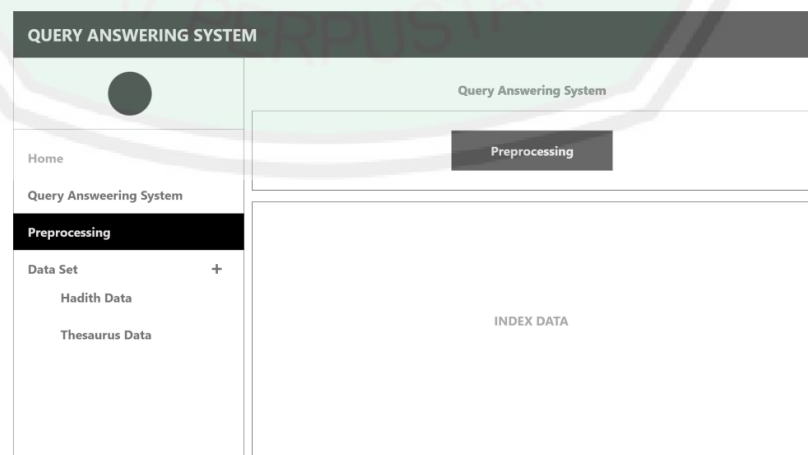


Figure 3. 11 Page of preprocessing data

Figure 3.11 is the page of preprocessing data. This page will use to preprocessing data hadith and presents all of the data index after preprocessing was done.

### 3. Searching Hadith Page

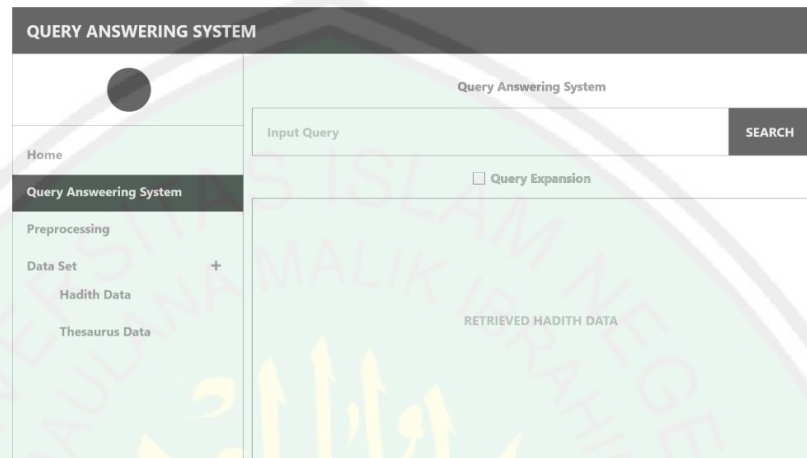


Figure 3. 12 Page of searching Hadith

Figure 3.12 is the page of searching hadith. This page will use to search data hadith and presents all of the result that are relevant with the query input.

### 4. Data Hadith Page

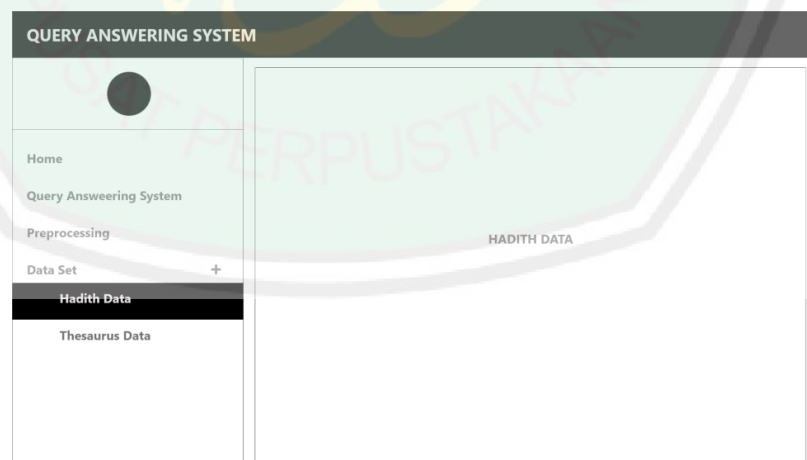


Figure 3. 13 Page of Hadith data

Figure 3.13 is the page of hadith data. This page presents all of the data hadith that used in this study.

## 5. Data Thesaurus Page

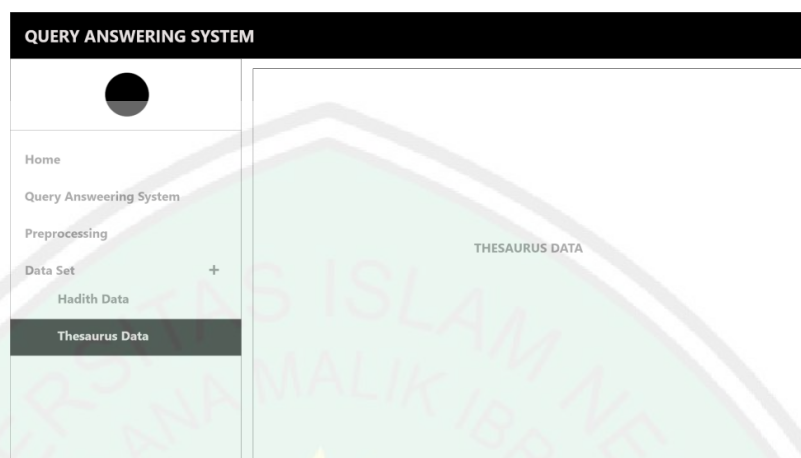


Figure 3. 14 Page of thesaurus data

Figure 3.14 is the page of thesaurus data. This page presents all of the data thesaurus that used to this study.

## 3.4 Experiment

The experiment done by evaluating the results of testing. There are two things that can be used as a reference assessment to measure the effectiveness of an information retrieval, that is precision and recall (Hasugian, 2006). The experiment performed on several user inputs, from the 1st test until the nth test. From each test can be obtained the value for evaluation of the system. Table 3.18 shows the formula for measuring accuracy, precision, and recall.

Table 3. 17 Confusion matrix of accuracy, precision, and recall

|              | Relevant            | Irrelevant            | Total         |
|--------------|---------------------|-----------------------|---------------|
| Retrieve     | a ( <i>hits</i> )   | b ( <i>noise</i> )    | a + b         |
| Not Retrieve | c ( <i>misses</i> ) | d ( <i>rejected</i> ) | c + d         |
| Total        | a + c               | b + d                 | a + b + c + d |

Based on the table 3.17, the accuracy, recall, and precision formula becomes:

$$\text{Recall} = [a / (a+c)] \times 100\% \quad (3.3)$$

$$\text{Precision} = [a / (a+b)] \times 100\% \quad (3.4)$$

$$\text{Accuracy} = [a+d / (a+b+c+d)] \times 100\% \quad (3.5)$$

To evaluate the information retrieval system also necessary to measure the f-measure. Where the f-measure calculation is used to evaluate the information retrieval system by combining the results of precision and recall calculations. The F-measure represents the relative effect between precision and recall. F-measure is the mean harmonic weight of precision and recall. Below is the formula of the f-measure calculation.

$$\text{F-Measure} = 2 \times \frac{\text{Precision} \times \text{Recall}}{\text{Precision} + \text{Recall}} \quad (3.6)$$



## CHAPTER IV

### RESULTS AND DISCUSSION

This chapter discusses the testing process and analyzing the results of the study.

#### 4.1 Testing Process

This section covers an explanation about two steps of testing, such as system test and expert test.

##### 4.1.1 System Testing

The test scenario starts with submitting each query into the system to get relevant documents. Before starting the test scenario, this section will explain the interface system as well. The Figure 4.1 below is the homepage of the Query Answering System.

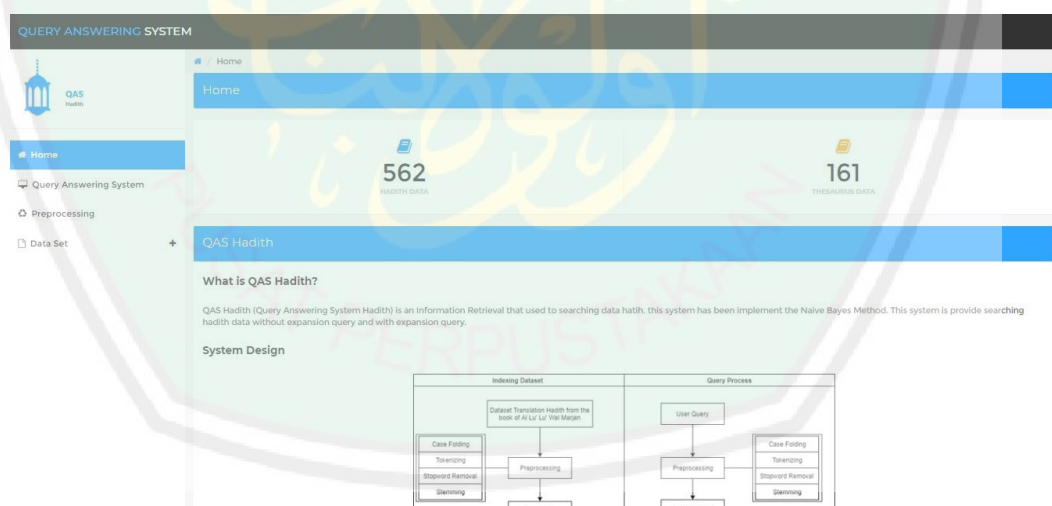


Figure 4. 1 Home page

Based on Figure 4.1, the system shows information about the number of data hadith and data thesaurus that used to this study, and explain the definition of query answering system hadith. This system provides several menus on the sidebar to

support this study, follows Query Answering System Menu, Preprocessing Menu, and Data Set Menu covering the Data Hadith Menu and Data Thesaurus Menu. After the required hadith data has been stored in the database, the next step is to do a system preprocessing the hadith data which can be done in the preprocessing menu as shown in Figure 4.2 below.

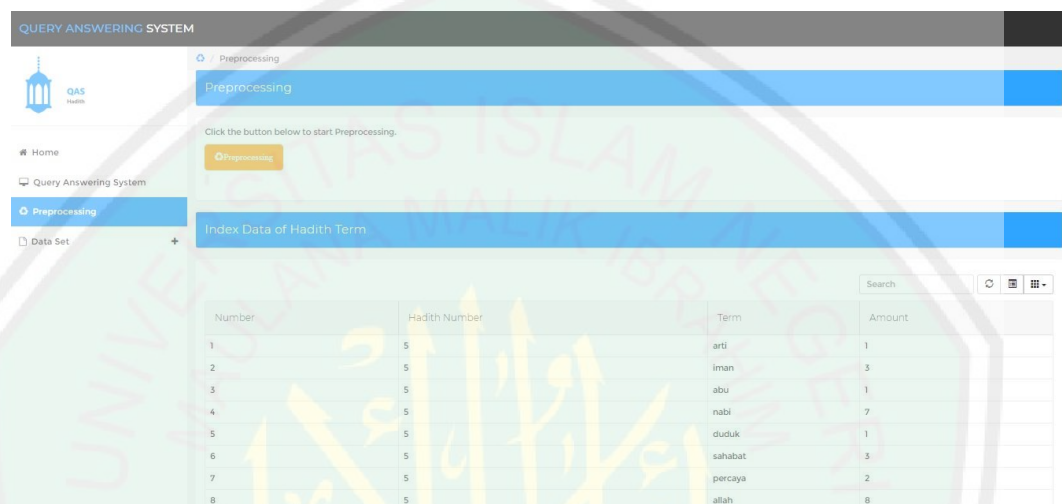


Figure 4. 2 Page of preprocessing menu

Based on Figure 4.2, the system provide button preprocessing that use to start preprocess when the user klick the button. Preprocessing step covering the several process as follows:

- Case Folding

All of the hadith documents are converted into lowercase. The case folding process is shown on Figure 4.3.

```
$hadis = strtolower(trim($hadis));
return $hadis;
```

Figure 4. 3 Source code of case folding

- Tokenizing

Tokenizing is used to splitting the hadith documents into smaller pieces, called token or terms. The tokenizing process is shown on Figure 4.4.

```
$pieces = explode(" ", $hadis);
```

Figure 4. 4 Source code of tokenizing

- Stop Word Removal

The each word or term that are not important, such as conjunctions and others would be removed. The stopword removal process is shown on Figure 4.5.

```
$query = mysqli_query($connect, "SELECT * from tb_stopword");
while ($row_stopword = mysqli_fetch_array($query)) {
    $stopword[] = trim($row_stopword['stopword']);
}
$pieces = explode(" ", $hadis);
$jml = count($pieces) - 1;
for ($i = 0; $i <= $jml; $i++) {
    if (in_array($pieces[$i], $stopword)) {
        unset($pieces[$i]);
    }
}
```

Figure 4. 5 Source code of stopwords removal

- Stemming

All of the words or terms would be changed into the root word. Figure 4.6 is the source code of the stemming process.

```

$kataAsal = $kata;
$cekKata = cekKamus($kata);
if ($cekKata == true) { // Cek Kamus
    return $kata; // Jika Ada maka kata tersebut adalah kata dasar
}
else { //jika tidak ada dalam kamus maka dilakukan stemming
    $kata = Del_Inflection_Suffixes($kata);
    if (cekKamus($kata)) {
        return $kata;
    }
    $kata = Del_Derivation_Suffixes($kata);
    if (cekKamus($kata)) {
        return $kata;
    }
    $kata = Del_Derivation_Prefix($kata);
    if (cekKamus($kata)) {
        return $kata;
    }
}

```

Figure 4. 6 Source code of stemming process

After all of the process that are covered from preprocessing was done, the system will count the number of terms to get the term frequency of each term based on the hadith number. The process of indexing term is shown on Figure 4.7.

```

$rescount = mysqli_query($connect, "SELECT Count FROM tb_index
    WHERE Term = '$ahadis[$j]'" AND nomor_hadis = $nomor_hadis");
$jml_data = mysqli_num_rows($rescount);
if ($jml_data > 0) {
    $rowcount = mysqli_fetch_array($rescount);
    $count = $rowcount['Count'];
    $count++;
    mysqli_query($connect, "UPDATE tb_index SET Count = $count
    WHERE Term = '$ahadis[$j]'" AND nomor_hadis = $nomor_hadis");
} else {
    mysqli_query($connect, "INSERT INTO tb_index (Term, nomor_hadis, Count)
    VALUES ('$ahadis[$j]'", $nomor_hadis, 1)");
}

```

Figure 4. 7 Source code of counting terms

After that, the system will store all of terms into the database and this page will shows the data index into the table that was provided on this page. In this process, the system was store 11643 terms data from 562 hadith data into the database. Table 4.1 below is the result of preprocessing data hadith that was stored in the database on table index.

Table 4. 1 Table index

| id | term            | nomor_hadis | count |
|----|-----------------|-------------|-------|
| 1  | <i>arti</i>     | 5           | 1     |
| 2  | <i>iman</i>     | 5           | 3     |
| 3  | <i>abu</i>      | 5           | 1     |
| 4  | <i>nabi</i>     | 5           | 7     |
| 5  | <i>duduk</i>    | 5           | 1     |
| 6  | <i>sahabat</i>  | 5           | 3     |
| 7  | <i>percaya</i>  | 5           | 2     |
| 8  | <i>allah</i>    | 5           | 8     |
| 9  | <i>malaikat</i> | 5           | 2     |
| 10 | <i>hadap</i>    | 5           | 1     |
| 11 | <i>utus</i>     | 5           | 1     |
| 12 | <i>bangkit</i>  | 5           | 1     |
| 13 | <i>kubur</i>    | 5           | 1     |
| 14 | <i>islam</i>    | 5           | 2     |
| 15 | <i>sembah</i>   | 5           | 2     |
| 16 | <i>sekutu</i>   | 5           | 1     |
| 17 | <i>diri</i>     | 5           | 1     |
| 18 | <i>shalat</i>   | 5           | 1     |
| 19 | <i>ihsan</i>    | 5           | 2     |



|    |               |   |   |
|----|---------------|---|---|
| 20 | <i>tahu</i>   | 5 | 1 |
| 21 | <i>lihat</i>  | 5 | 1 |
| 22 | <i>berita</i> | 5 | 1 |
| 23 | <i>pada</i>   | 5 | 1 |
| 24 | <i>syarat</i> | 5 | 1 |
| 25 | <i>tiba</i>   | 5 | 1 |

The purpose of pre-processing hadith document is used to simplify the searching process by making a list of terms that can be characteristic of each hadith document. The next process is calculating the similarity of thesaurus data from table thesaurus. This process also started before searching hadith process. The system will proposed one term from table similarity thesaurus as a term of thesaurus with the highest number from the calculation result. This process is used to simplify searching hadith with query expansion to find the appropriate of thesaurus terms. Table 4.2 below is the result of calculating the similarity of thesaurus that stored into the similarity thesaurus table on the database.

Table 4. 2 Table similarity thesaurus

| id | term           | sin                 | sim  |
|----|----------------|---------------------|------|
| 1  | <i>iman</i>    | <i>iman</i>         | 0,99 |
| 2  | <i>iman</i>    | <i>percaya</i>      | 0,3  |
| 3  | <i>iman</i>    | <i>yakin</i>        | 0,09 |
| 4  | <i>iman</i>    | <i>religiositas</i> | 0,37 |
| 5  | <i>iman</i>    | <i>taat</i>         | 0,08 |
| 6  | <i>percaya</i> | <i>percaya</i>      | 0,99 |
| 7  | <i>percaya</i> | <i>itikad</i>       | 0    |
| 8  | <i>percaya</i> | <i>iman</i>         | 0,17 |
| 9  | <i>percaya</i> | <i>yakin</i>        | 0,03 |
| 10 | <i>percaya</i> | <i>benar</i>        | 0,04 |
| 11 | <i>yakin</i>   | <i>yakin</i>        | 0,99 |
| 12 | <i>yakin</i>   | <i>percaya</i>      | 0,31 |

|    |              |                |      |
|----|--------------|----------------|------|
| 13 | <i>yakin</i> | <i>sungguh</i> | 0    |
| 14 | <i>yakin</i> | <i>serius</i>  | 0,21 |

When the preprocessing data was done, we can start to search hadith in the Query Answering System Menu. Figure 4.8 below is the page of query answering system.



Figure 4. 8 Page of Query Answering System

Based on Figure 4.8 above, the system provide searching hadith without query expansion and searching hadith with query expansion. System testing is done by posting the 50 queries into the system, and the system provides feedback in the form of relevant document hadith. The one example of a query that was tested in this study is “Rukun Iman”. Firstly, the query will go through on the preprocessing steps. And then the system will make a validation request, if the query expansion checkbox are checked, the query would be the keyword to find the list of thesaurus from database. The process of query expansion process is given by Figure 4.9 below.

```

$arrQuery = explode(" ", $query);
$lengthq = count($arrQuery);
for($i=0; $i<$lengthq; $i++){
    $sql = mysqli_query($connect, "SELECT * FROM tb_tesaurus
        WHERE kata = '$arrQuery[$i]'");
    while($row = mysqli_query_fetch_array($sql)){
        $sinonim = $row['sinonim'];
        $asinonim = explode(",", $sinonim);
        $length = count($asinonim);
        for($j=0; $j<$length; $j++){
            array_push($arrQuery, $asinonim[$j]);
        }
    }
}

```

Figure 4. 9 Source code of query expansion

The query as the result of preprocessing step either using query expansion or not is given by Table 4.3 and Table 4.4 below.

Table 4. 3 Terms of query without query Expansion

|   |              |
|---|--------------|
| 1 | <i>rukun</i> |
| 2 | <i>iman</i>  |

Table 4. 4 Terms of query with query Expansion

|   |                     |
|---|---------------------|
| 1 | <i>rukun</i>        |
| 2 | <i>iman</i>         |
| 3 | <i>asas</i>         |
| 4 | <i>religiositas</i> |

The next process is probability calculation based on naïve bayes method. The probability calculation is shown on Figure 4.10.

```

//Base Rates
$baserates = array();
foreach($datasetResTotal as $key => $valueKey){
    if($key != "term"){
        $jumlah = array_sum($datasetResTotal);
        $baserates[$key] = $valueKey / $jumlah;
    }
}
//Evidence
$evidence = array();
foreach($merge as $key => $valueKey){
    $jumlah = array_sum($datasetResTotal);
    $evidence[] = $merge[$key]["total"] / $jumlah;
}
//Likelihood
$likelihood = array();
$hitung = array();
foreach($merge as $keyMerge => $valueMerge){
    foreach($valueMerge as $key => $value){
        if($key != "term" && $key != "total"){
            $hitung = $value / $datasetResTotal[$key];
            if(key_exists($key, $likelihood)){
                $likelihood[$key][$valueMerge["term"]] = $hitung;
            }else{
                $likelihood[$key] = array($valueMerge["term"] => $hitung);
            }
        }
    }
}
//Probability Calculation
$probabilityCalculation = array();
foreach($baserates as $keyBaserate => $valueBaserate){
    $hitung = $valueBaserate;
    foreach($likelihood[$keyBaserate] as $keyLikelihood => $valueLikelihood){
        $key = explode(" ", $keyLikelihood);
        if(sizeof($key) == 1){
            $hitung = $hitung * $valueLikelihood;
            $probabilityCalculation[$keyBaserate] = $hitung * 100;
        }
    }
}
}

```

Figure 4. 10 Source code of probability calculation

Figure 4.11 is the result of searching hadith without query expansion with a query test in Indonesian term is “*Rukun Iman*”.


| QUERY ANSWERING SYSTEM   |      |  |  |  |               |                   |
|--|------|--|--|--|---------------|-------------------|
| Query Answering System   |      |  |  |  |               |                   |
| <div> <div>  <div>QAS</div> <div>Hadith</div> </div> <div> <div>Home</div> <div>Query Answering System</div> <div>Preprocessing</div> <div>Data Set</div> </div> </div> <div> <div>Input query</div> <div>Search</div> </div> <div> <input type="checkbox"/> Query Expansion         </div> |      |  |  |  |               |                   |
| Query Input : Kewajiban Beriman Kepada Allah.  |      |  |  |  |               |                   |
| Number   | Book | Chapter  | Hadith   | Hadith Translation   | Hadith Number | Probability value |
| 1  | IMAN | WAJIB BERIMAN KEPADA ALLAH DAN RASULULLAH SERTA MENJALANKAN SEMUA SYARI'AT AGAMA | حدث ابن عباس أن النبي صلى الله عليه وسلم قال: «لا يدخل الجنة من لم يأت الله بالدين الذي أتاه به» | Ibn Abbas r.a. berkata: Ketika Nabi saw. mengutus Mu'adz r.a. ke Yaman berpesan padanya: Berhati-hatilah dari do anyo orang dianiaya, sebab antaranya dengan Allah tidak ada hijab (dinding). (Bukhari, Muslim).   | 12            | 0.0000460996      |
| 2  | IMAN | WAJIB BERIMAN KEPADA ALLAH DAN RASULULLAH SERTA MENJALANKAN SEMUA SYARI'AT AGAMA | حدث ابن عباس أن النبي صلى الله عليه وسلم قال: «لا يدخل الجنة من لم يأت الله بالدين الذي أتاه به» | Ibn Abbas r.a. berkata: Ketika Rasulullah saw. mengutus Mu'adz bin Jabal r.a. ke Yaman, berpesan: Anda akan menghadapi orang-orang ahli kitab, karena itu harus pertama yang anda ajarkan kepada mereka tauhid dalam beribadat kepada Allah, maka bila mereka telah mengerti benar, beritahukan pada mereka bahwa Allah mewajibkan atas mereka shalat lima waktu tiap sehari semalam, dan bila mereka telah mengerjakan itu, beritakan pada mereka bahwa Allah mewajibkan mereka mengeluarkan zakat harta untuk diberikan kepada fakir miskin mereka, maka bila mereka laat pada itu, maka anda terima dari mereka, dan berhati-hati jangan mengambil milik kesayangan mereka. (Bukhari, Muslim) | 11            | 0.0000442556      |

Figure 4. 11 Result of searching Hadith without QE

And Figure 4.12 is the result of searching hadith with query expansion with a query test in Indonesian term is “Rukun Iman”.

| QUERY ANSWERING SYSTEM   |      |  |  |  |               |                   |
|--|------|--|--|--|---------------|-------------------|
| Query Answering System   |      |  |  |  |               |                   |
| <div> <div>  <div>QAS</div> <div>Hadith</div> </div> <div> <div>Home</div> <div>Query Answering System</div> <div>Preprocessing</div> <div>Data Set</div> </div> </div> <div> <div>Input query</div> <div>Search</div> </div> <div> <input type="checkbox"/> Query Expansion         </div> |      |  |  |  |               |                   |
| Query Input : Kewajiban Beriman Kepada Allah   |      |  |  |  |               |                   |
| Query Expansion : wajib iman Allah religioisitas   |      |  |  |  |               |                   |
| Number   | Book | Chapter  | Hadith   | Hadith Translation   | Hadith Number | Probability value |
| 1  | IMAN | WAJIB BERIMAN KEPADA ALLAH DAN RASULULLAH SERTA MENJALANKAN SEMUA SYARI'AT AGAMA | حدث ابن عباس أن النبي صلى الله عليه وسلم قال: «لا يدخل الجنة من لم يأت الله بالدين الذي أتاه به» | Ibn Abbas r.a. berkata: Ketika Nabi saw. mengutus Mu'adz r.a. ke Yaman berpesan padanya: Berhati-hatilah dari do anyo orang dianiaya, sebab antaranya dengan Allah tidak ada hijab (dinding). (Bukhari, Muslim).   | 12            | 0.0030002881      |
| 2  | IMAN | WAJIB BERIMAN KEPADA ALLAH DAN RASULULLAH SERTA MENJALANKAN SEMUA SYARI'AT AGAMA | حدث ابن عباس أن النبي صلى الله عليه وسلم قال: «لا يدخل الجنة من لم يأت الله بالدين الذي أتاه به» | Ibn Abbas r.a. berkata: Ketika Rasulullah saw. mengutus Mu'adz bin Jabal r.a. ke Yaman, berpesan: Anda akan menghadapi orang-orang ahli kitab, karena itu harus pertama yang anda ajarkan kepada mereka tauhid dalam beribadat kepada Allah, maka bila mereka telah mengerti benar, beritahukan pada mereka bahwa Allah mewajibkan atas mereka shalat lima waktu tiap sehari semalam, dan bila mereka telah mengerjakan itu, beritakan pada mereka bahwa Allah | 11            | 0.0030000106      |

Figure 4. 12 Result of searching Hadith with QE

#### 4.1.2 Expert Testing

The expert testing was done by giving a questionnaire to the expert user, who is an expert in the field of hadith. Where the expert user is asked to determine the relevance of query with the hadith data that has been retrieved by the system. The expert user also asked to sort the hadith data that are relevant to the query. The



result of this test will be used to measure recall, precision, and accuracy at the next steps.

## 4.2 Result and Analysis

This section discusses the results and discussion related to system testing based on the testing process that has been explained in section 4.1. System testing is done by providing the results of the hadith search retrieved by the system based on a specified query list as in Table 4.5 to the expert user. Where expert users can help in determining and sorting the hadiths that are relevant to the query. Table 4.5 below is a table that lists the queries tested along with the query expansion.

Table 4. 5 List of query test

| Table of Query Test |   |   |
|---------------------|---|---|
| No                  | Query in Indonesian Term                          | Query Expansion in Indonesian Term        |
| 1                   | <i>Rukun Iman</i>                                 | <i>Rukun Iman Tiang Religiositas</i>      |
| 2                   | <i>Rukun Islam</i>                                | <i>Rukun Islam Tiang</i>                  |
| 3                   | <i>Menghormati Tetangga</i>                       | <i>Hormat Tetangga Segan Jiran</i>        |
| 4                   | <i>Tanda Orang Munafik</i>                        | <i>Tanda Munafik Ciri Munafiq</i>         |
| 5                   | <i>Meratakan Saf Saat Shalat</i>                  | <i>Saf Shalat Jajar Salat</i>             |
| 6                   | <i>Tanda Orang Beriman</i>                        | <i>Tanda Iman Ciri Religiositas</i>       |
| 7                   | <i>Hukum Bunuh Diri</i>                           | <i>Hukum Bunuh Atur</i>                   |
| 8                   | <i>Syafaat Nabi</i>                               | <i>Syafaat Nabi Mediasi</i>               |
| 9                   | <i>Ahli Surga</i>                                 | <i>Ahli Surga Kaum Janah</i>              |
| 10                  | <i>Ahli Neraka</i>                                | <i>Ahli Neraka Kaum</i>                   |
| 11                  | <i>Anjuran Bersuci Sebelum Shalat</i>             | <i>Suci Shalat Murni Salat</i>            |
| 12                  | <i>Anjuran Bersiwak</i>                           | <i>Siwak</i>                              |
| 13                  | <i>Hukum Jilatan Anjing</i>                       | <i>Hukum Jilat Anjing Atur</i>            |
| 14                  | <i>Hukum Kencing Bayi</i>                         | <i>Hukum Kencing Bayi Atur Ompol</i>      |
| 15                  | <i>Hukum Menggauli Istri Saat Sedang Haidh</i>    | <i>Hukum Gaul Istri Haidh Atur</i>        |
| 16                  | <i>Tata Cara Mandi Janabat</i>                    | <i>Tata Mandi Janabat Siram Junub</i>     |
| 17                  | <i>Menjaga Aurat</i>                              | <i>Jaga Aurat Tutup</i>                   |
| 18                  | <i>Cara Tayammum</i>                              | <i>Tayammum</i>                           |
| 19                  | <i>Fadilat Shalat Jama'ah</i>                     | <i>Fadilat Shalat Jamaah Rahmat Salat</i> |
| 20                  | <i>Larangan Kencing dalam Air yang Menggenang</i> | <i>Larang Kencing Air Genang Ompol</i>    |
| 21                  | <i>Larangan Berjalan didepan Orang Shalat</i>     | <i>Larang Jalan Shalat Salat</i>          |
| 22                  | <i>Dosa Besar</i>                                 | <i>Dosa Maksiat</i>                       |

|    |   |  |
|----|---|--|
| 23 | <i>Bacaan dalam Shalat</i>                                | <i>Baca Shalat Salat</i>                       |
| 24 | <i>Kewajiban Beriman kepada Allah</i>                     | <i>Wajib Iman Allah Kudu Religiositas</i>      |
| 25 | <i>Kewajiban Beriman kepada Rasulullah</i>                | <i>Wajib Iman Rasulullah Kudu Religiositas</i> |
| 26 | <i>Adab Buang Air</i>                                     | <i>Adab Buang Air Akhlak</i>                   |
| 27 | <i>Cara Membersihkan Kulit Bangkai</i>                    | <i>Bersih Kulit Bangkai Suci</i>               |
| 28 | <i>Amal yang Utama</i>                                    | <i>Amal Utama Kebaji Baik</i>                  |
| 29 | <i>Mengangkat Kedua Tangan pada saat Takbiratul Ihram</i> | <i>Angkat Tangan Takbiratul Ihram Naik</i>     |
| 30 | <i>Cara Berwudhu</i>                                      | <i>Wudhu Suci</i>                              |
| 31 | <i>Larangan Bicara Ketika Shalat</i>                      | <i>Larang Bicara Shalat Salat</i>              |
| 32 | <i>Bacaan Dalam Ruku' dan Sujud</i>                       | <i>Baca Ruku Sujud Sembah</i>                  |
| 33 | <i>Shalatnya Orang Musafir</i>                            | <i>Shalat Musafir Salat</i>                    |
| 34 | <i>Fadilat Menghafal Qur'an</i>                           | <i>Fadilat Hafal Quran Rahmat</i>              |
| 35 | <i>Shalat Sunnat</i>                                      | <i>Shalat Sunnat Salat</i>                     |
| 36 | <i>Shalat Dua Hari Raya</i>                               | <i>Shalat Raya Salat</i>                       |
| 37 | <i>Shalat Malam</i>                                       | <i>Shalat Malam Salat</i>                      |
| 38 | <i>Menjamak Shalat</i>                                    | <i>Jamak Shalat Salat</i>                      |
| 39 | <i>Cara Sujud Tilawah</i>                                 | <i>Sujud Tilawah Sembah</i>                    |
| 40 | <i>Perubahan Arah Qiblat</i>                              | <i>Rubah Arah Ganti</i>                        |
| 41 | <i>Shalat Sunnat yang dilarang</i>                        | <i>Shalat Sunnat Larang Salat</i>              |
| 42 | <i>Hukum Shalat Memakai Sepatu</i>                        | <i>Hukum Shalat Sepatu Atur Salat</i>          |
| 43 | <i>Imam Shalat</i>  | <i>Imam Shalat Pimpin Salat</i>                |
| 44 | <i>Meminta Hujan</i>                                      | <i>Hujan</i>                                   |
| 45 | <i>Membersihkan Najis</i>                                 | <i>Bersih Najis Suci</i>                       |
| 46 | <i>Wajib Mandi</i>  | <i>Wajib Mandi Kudu Siram</i>                  |
| 47 | <i>Shalat Gerhana</i>                                     | <i>Shalat Gerhana Salat</i>                    |
| 48 | <i>Shalat di Kendaraan</i>                                | <i>Shalat Kendara Salat</i>                    |
| 49 | <i>Memandikan Orang Mati</i>                              | <i>Mandi Mati Siram</i>                        |
| 50 | <i>Ingat Mati</i>   | <i>Mati Maut</i>                               |

The results of system testing based on the query in Table 4.5 without using query expansion or by using query expansion is given by Appendix 1 and Appendix 2. While for the test results from expert user as a ground truth is given by Appendix 3. To find out the performance of applying the method to the system that has been made, the test is carried out in 3 stages, the first stage is testing on top 5 data, then testing on top 3 data and testing on top 1 data. The test is carried out on the system without using query expansion and by using query expansion.

Based on Appendix 4, the test results of the top 5 data without query expansion obtained an average recall value of 79.8%, an average precision value of 51.2%, an average accuracy value of 68%, and an average f-measure value of 59.12%. Whereas based on Appendix 5, the test results of the top 5 data with query expansion obtained an average recall value of 81.97%, an average precision value of 53.2%, an average accuracy value of 70.08%, and an average f-measure value of 61.18%. Figure 4.13 below shows a comparison graph of using query expansion and without query expansion for testing of the top 5 data.

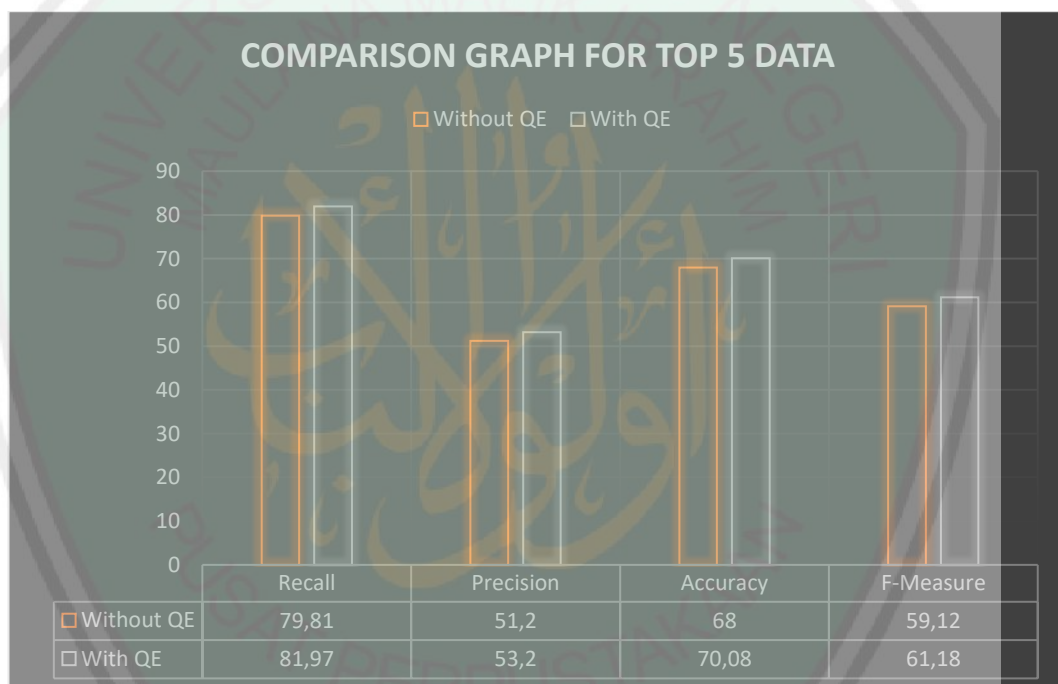


Figure 4. 13 Comparison graph for top 5 data

Based on Appendix 6, the test results of the top 3 data without query expansion obtained an average recall value of 68.34%, an average precision value of 58.01%, an average accuracy value of 79.2%, and an average f-measure value of 61.14%. Whereas based on Appendix 7, the test results of the top 3 data with query expansion obtained an average recall value of 72.67%, an average precision value

of 60.67%, an average accuracy value of 80.6%, and an average f-measure value of 64.07%. Figure 4.14 below shows a comparison graph of using query expansion and without query expansion for testing of the top 3 data.

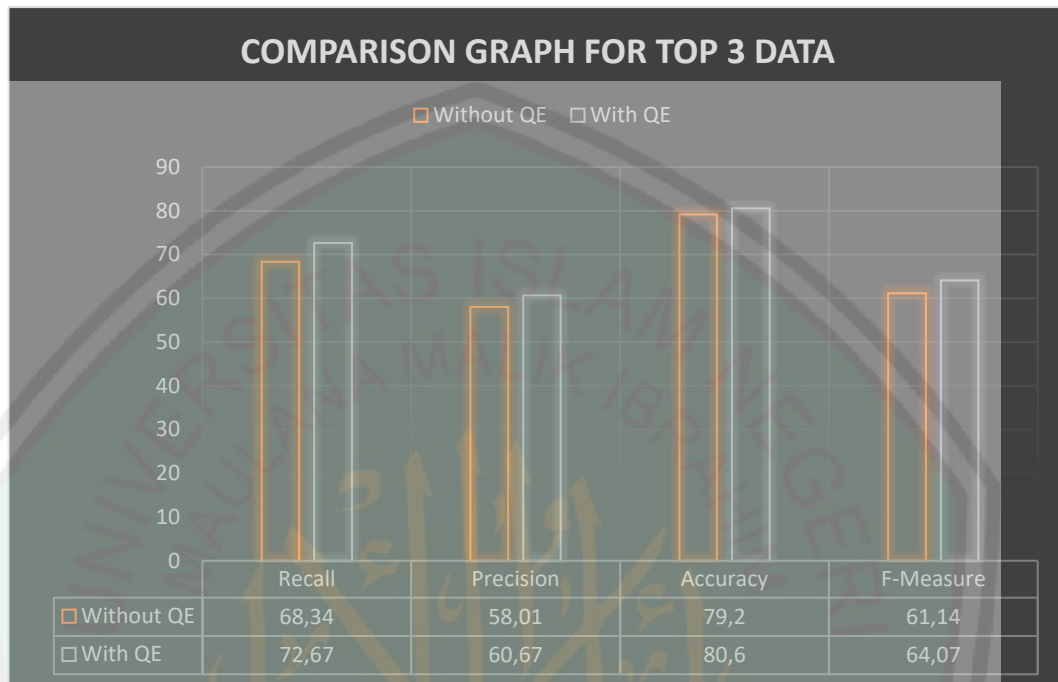


Figure 4. 14 Comparison graph for top 3 data

Based on Appendix 8, the test results of the top 1 data without query expansion obtained an average recall value of 62%, an average precision value of 62%, an average accuracy value of 92.4%, and an average f-measure value of 62%. Whereas based on Appendix 9, the test results of the top 1 data with query expansion obtained an average recall value of 66%, an average precision value of 66%, an average accuracy value of 93.2%, and an average f-measure value of 66%. Figure 4.15 below shows a comparison graph of using query expansion and without query expansion for testing of the top 1 data.



Figure 4. 15 Comparison graph for top 1data

Figure 4.15 also shows the comparison graph of the accuracy based on the correct result that has been collected from the number of true positive data that equals 1. The result of without using query expansion obtained an average value of 62%, and the result of using query expansion obtained an average value of 66%.

Based on the results of testing, it shows the naïve bayes classifier can be applied in the information retrieval system, either using query expansion or without using query expansion. In this study, the use of query expansion is proven to make the results of information retrieval to be better. This can be seen from the average result of recall, precision, and accuracy that has been calculated. For example on the comparison graph for threshold top 5 data on Figure 4.13. Where the use of query expansion shows an improvement in average recall of 2.16%, an improvement in average precision of 2%, an improvement in average accuracy of 2.08% and an improvement in average f-measure of 2.06% compared with the result of testing



without using query expansion. It is mean, the use of query expansion in the query answering system could give a better result than without using query expansion.

The results of these calculations shows that the smaller of the search results document tested, the recall value becomes smaller, while the precision value, accuracy value, and f-measure value increases, as shown in Figure 4.16 and Figure 4.17.

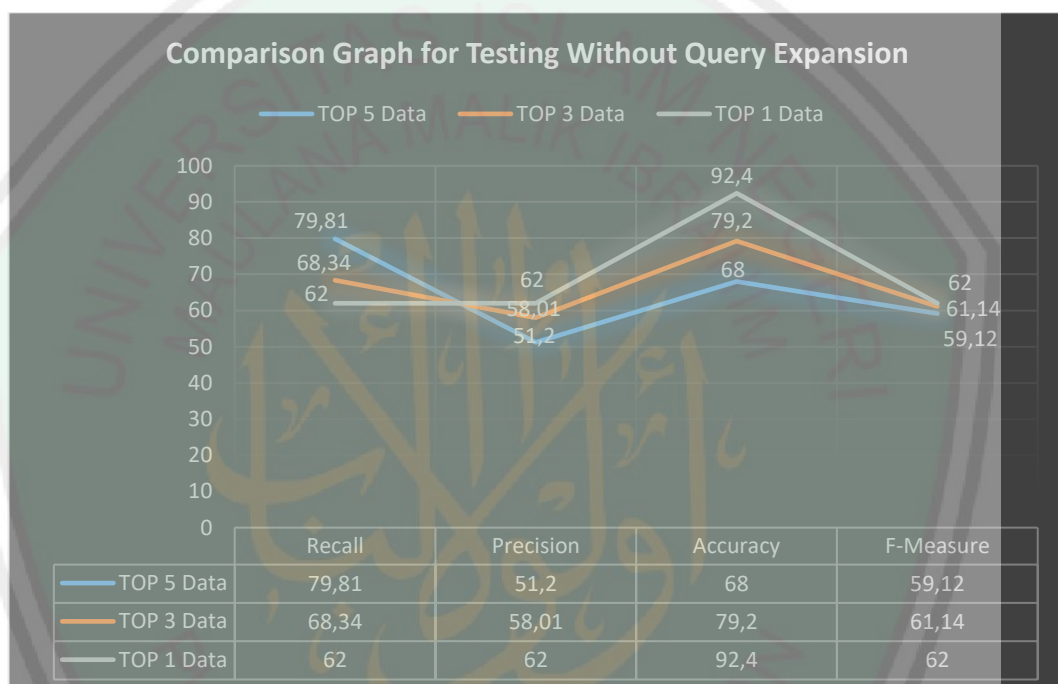


Figure 4. 16 Comparison graph for testing without query expansion

Based on Figure 4.16, in the top 5 data testing, the average recall value was 79.81%, the average precision value was 51.2%, the average accuracy value was 68% and the average f-measure value was 59.12%, whereas in the top 3 data test obtained an average recall value of 68.34%, an average precision value of 58.01%, an average accuracy value of 79.2% and an average value of the f-measure of 61.14%, and the top 1 data test obtained the average recall value was 62%, the

average precision value was 62%, the average accuracy value was 92.4% and the average f-measure value was 62%.

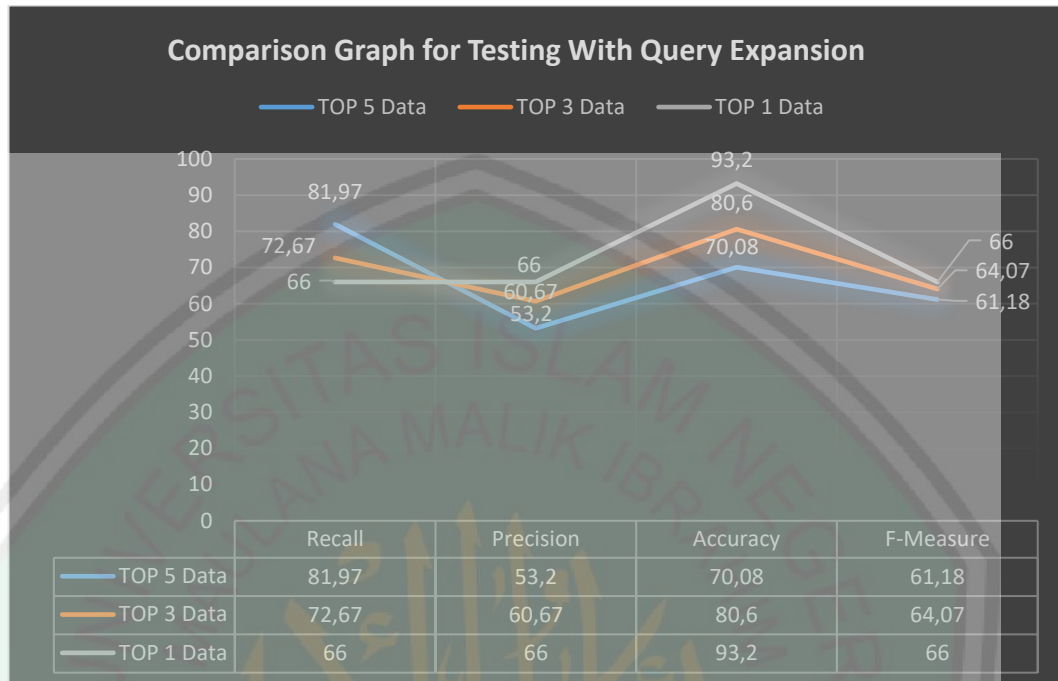


Figure 4. 17 Comparison graph for testing with query expansion

Based on the picture, the top 5 data obtained an average recall value of 81.97%, an average precision value of 53.2%, an average accuracy value of 70.08% and an average value of the f-measure of 61.18%, whereas at the top 3 data test obtained an average recall value of 72.67%, an average precision value of 60.67%, an average accuracy value of 80.6% and an average value of the f-measure of 64.07%, and in the top 1 data testing obtained the average recall value is 66%, the average precision value is 66%, the average accuracy value is 93.2% and the average f-measure value is 66%.

#### 4.3 Integration with Al-Qur'an

The purpose of this study is to make an information retrieval system called Query Answering Hadith. Where the system can give the right information about

hadith that are relevant with the query posed by the user. So the system is required to understand the information about hadith that used to this study. Because, hadith is used as a source of law and references in several case.

In the process of finding information, Muslims are ordered to tabayyun, it is mean a Muslim have to selective and critics in finding the truth of information. Tabayyun is an attempt to find the truth from a fact or information so that the contents can be accounted. Allah SWT command to validate information as in surah Al Hujurat verse 6:

يَا أَيُّهَا الَّذِينَ آمَنُوا إِن جَاءَكُمْ فَاسِقٌ بِنَبَأٍ فَتَبَيَّنُوا أَن تُصِيبُوا  
قَوْمًا بِجَهْلَةٍ فَتُصْبِحُوا عَلَىٰ مَا فَعَلْتُمْ نَادِمِينَ ﴿٦﴾

*“O ye who believe! If an evil-liver bring you tidings, verify it, lest ye smite some folk in ignorance and afterward repent of what ye did.” (Al-Hujurat: 6).*

Based on that verse, this study implement the naïve bayes classifier method to the query answering system, this is one way to find the truth of information is also one of the efforts in tabayyun. The result of this study shows by using that method, query answering system can give the relevant document based on the query posed by the user more than 50%.

## CHAPTER V

### CONCLUSION AND SUGGESTION

#### 5.1 Conclusion

Based on the results of the implementation and testing that have been conducted by the researcher, get the conclusion: based on testing of the top 5 data without query expansion obtained an average recall value of 79.8%, an average precision value of 51.2%, an average accuracy value of 68%, and an average f-measure value of 59.12%, while testing using query expansion obtained an average recall value of 81.97%, an average precision value of 53.2%, an average accuracy value of 70.08%, and an average f-measure value of 61.18%. It is means, the use of query expansion shows an improvement in the average recall of 2.16%, an improvement in the average precision of 2%, an improvement in the average accuracy of 2.08%, and an improvement in the average f-measure of 2.06% compared by without using query expansion.

Moreover, based on testing of the top 3 data without query expansion obtained an average recall value of 68.34%, an average precision value of 58.01%, an average accuracy value of 79.2%, and an average f-measure value of 61.14%, while testing using query expansion obtained an average recall value of 72.67%, an average precision value of 60.67%, an average accuracy value of 80.6%, and an average f-measure value of 64.07%. It is means, the use of query expansion shows an improvement in the average recall of 4.33%, an improvement in the average precision of 2.66%, an improvement in the average accuracy of 1.4% and an

improvement in the average f-measure of 2.93% compared by without using query expansion.

Finally, based on testing of the top 1 data with query expansion obtained an average recall value of 62%, an average precision value of 62%, an average accuracy value of 92.4%, and an average f-measure value of 62%, while testing using query expansion obtained an average recall value of 66%, an average precision value of 66%, an average accuracy value of 93.2%, and an average f-measure value of 66%. It is means, the use of query expansion shows an improvement in the average recall of 4%, an improvement in the average precision of 4%, an improvement in the average accuracy of 0.8% and an improvement in the average f-measure of 4% compared by without using query expansion.

Based on the explanation about the results of the implemenitations above, it can take a conclusion that the use of Indonesian thesaurus based on query expansion could give the better result than without using query expansion.

## **5.2 Suggestion**

The use of Indonesian thesaurus based on query expansion that has been implemented in this study is to use the manual way to collect thesaurus data. Hopefully, the next study can use the automatically thesaurus data and get a better result.



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## APPENDIXES

Appendix 1: Table of system testing result without query expansion

| RESULT OF SYSTEM TESTING WITHOUT QUERY EXPANSION |  |  |     |     |     |     |     |     |     |     |     |
|--|--|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| No   | Query  | Ranked result in term of hadith number |     |     |     |     |     |     |     |     |     |
|  |  | 1                                      | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  |
| 1  | Rukun Iman   | 36                                     | 97  | 29  | 28  | 22  | 21  | 47  | 23  | 30  | 34  |
| 2  | Rukun Islam  | 9                                      | 6   | 25  | 24  | 77  | 75  | 63  | 64  | 62  | 89  |
| 3  | Menghormati Tetangga                               | 29                                     | 30  | 53  | 88  | 471 | 370 | 400 | 509 | 23  | 403 |
| 4  | Tanda Orang Munafik                                | 38                                     | 47  | 28  | 48  | 37  | 49  | 194 | 370 | 471 | 23  |
| 5  | Meratakan Saf Saat Shalat                          | 248                                    | 282 | 251 | 506 | 403 | 400 | 342 | 294 | 508 | 510 |
| 6  | Tanda Orang Beriman                                | 47                                     | 28  | 48  | 36  | 97  | 29  | 49  | 22  | 21  | 23  |
| 7  | Hukum Bunuh Diri                                   | 95                                     | 61  | 70  | 69  | 175 | 55  | 85  | 73  | 96  | 163 |
| 8  | Syafaat Nabi                                       | 122                                    | 121 | 126 | 125 | 120 | 66  | 215 | 118 | 119 | 115 |
| 9  | Ahli Surga   | 8                                      | 114 | 72  | 71  | 102 | 115 | 113 | 127 | 369 | 33  |
| 10   | Ahli Neraka  | 72                                     | 116 | 127 | 114 | 71  | 117 | 133 | 115 | 16  | 102 |
| 11   | Anjuran Bersuci Sebelum Shalat                     | 269                                    | 420 | 419 | 421 | 134 | 268 | 192 | 386 | 270 | 422 |
| 12   | Anjuran Bersiwak                                   | 143                                    | 144 | 490 | 142 | 269 | 422 | 419 | 491 | 492 | 421 |
| 13   | Hukum Jilatan Anjing                               | 160                                    | 175 | 96  | 370 | 471 | 163 | 290 | 291 | 403 | 23  |
| 14   | Hukum Kencing Bayi                                 | 163                                    | 164 | 190 | 155 | 161 | 442 | 175 | 162 | 96  | 370 |
| 15   | Hukum Menggauli Istri Saat Sedang Haidh            | 169                                    | 168 | 171 | 173 | 174 | 170 | 172 | 253 | 179 | 197 |
| 16   | Tata Cara Mandi Janabat                            | 183                                    | 171 | 176 | 177 | 178 | 181 | 197 | 179 | 198 | 196 |
| 17   | Menjaga Aurat                                      | 195                                    | 422 | 369 | 312 | 367 | 194 | 368 | 104 | 533 | 370 |
| 18   | Cara Tayammum                                      | 207                                    | 206 | 208 | 396 | 209 | 14  | 11  | 10  | 566 | 7   |
| 19   | Fadilat Shalat Jama'ah                             | 381                                    | 387 | 383 | 350 | 380 | 353 | 377 | 351 | 447 | 388 |
| 20   | Larangan Kencing dalam Air yang Menggenang         | 161                                    | 151 | 163 | 543 | 154 | 186 | 164 | 153 | 150 | 204 |
| 21   | Larangan Berjalan didepan Orang Shalat             | 285                                    | 284 | 317 | 283 | 286 | 282 | 400 | 370 | 403 | 475 |
| 22   | Dosa Besar   | 118                                    | 76  | 81  | 536 | 62  | 120 | 284 | 389 | 53  | 80  |
| 23   | Bacaan dalam Shalat                                | 265                                    | 260 | 266 | 264 | 263 | 450 | 341 | 224 | 262 | 256 |
| 24   | Kewajiban Beriman kepada Allah                     | 12                                     | 94  | 11  | 19  | 18  | 93  | 29  | 8   | 10  | 134 |
| 25   | Kewajiban Beriman kepada Rasulullah                | 12                                     | 94  | 11  | 18  | 27  | 19  | 10  | 50  | 29  | 83  |
| 26   | Adab Buang Air                                     | 149                                    | 148 | 150 | 154 | 157 | 158 | 172 | 153 | 186 | 185 |
| 27   | Cara Membersihkan Kulit Bangkai                    | 205                                    | 189 | 471 | 370 | 400 | 23  | 509 | 403 | 186 | 294 |
| 28   | Amal yang Utama                                    | 50                                     | 51  | 25  | 24  | 75  | 429 | 77  | 52  | 369 | 381 |
| 29   | Mengangkat Kedua Tangan pada saat Takbiratul Ihram | 217                                    | 218 | 516 | 317 | 244 | 349 | 277 | 370 | 471 | 143 |
| 30   | Cara Berwudhu                                      | 135                                    | 136 | 437 | 140 | 176 | 204 | 159 | 178 | 181 | 141 |
| 31   | Larangan Bicara Ketika Shalat                      | 323                                    | 312 | 311 | 317 | 475 | 473 | 351 | 476 | 474 | 350 |
| 32   | Bacaan Dalam Ruku' dan Sujud                       | 220                                    | 275 | 272 | 521 | 234 | 224 | 232 | 217 | 341 | 522 |
| 33   | Shalatnya Orang Musafir                            | 400                                    | 398 | 402 | 399 | 401 | 342 | 362 | 508 | 403 | 354 |
| 34   | Fadilat Menghafal Qur'an                           | 453                                    | 452 | 460 | 454 | 472 | 304 | 461 | 451 | 93  | 259 |
| 35   | Shalat Sunnat                                      | 480                                    | 447 | 413 | 474 | 420 | 399 | 362 | 414 | 421 | 477 |
| 36   | Shalat Dua Hari Raya                               | 508                                    | 509 | 507 | 506 | 510 | 511 | 278 | 505 | 342 | 362 |
| 37   | Shalat Malam                                       | 436                                    | 432 | 428 | 433 | 439 | 374 | 431 | 404 | 406 | 438 |
| 38   | Menjamak Shalat                                    | 411                                    | 409 | 410 | 342 | 508 | 362 | 400 | 403 | 398 | 354 |
| 39   | Cara Sujud Tilawah                                 | 341                                    | 338 | 340 | 339 | 277 | 246 | 276 | 335 | 272 | 220 |
| 40   | Perubahan Arah Qiblat                              | 303                                    | 302 | 407 | 406 | 250 | 31  | 304 | 291 | 320 | 150 |
| 41   | Shalat Sunnat yang dilarang                        | 473                                    | 474 | 475 | 351 | 476 | 477 | 350 | 310 | 420 | 421 |
| 42   | Hukum Shalat Memakai Sepatu                        | 325                                    | 155 | 403 | 400 | 370 | 342 | 294 | 374 | 508 | 509 |
| 43   | Imam Shalat  | 235                                    | 482 | 239 | 503 | 270 | 354 | 243 | 268 | 238 | 233 |
| 44   | Meminta Hujan                                      | 517                                    | 46  | 518 | 405 | 515 | 404 | 5   | 384 | 11  | 566 |
| 45   | Membersihkan Najis                                 | 189                                    | 210 | 166 | 349 | 162 | 167 | 100 | 471 | 370 | 23  |
| 46   | Wajib Mandi  | 487                                    | 199 | 196 | 489 | 180 | 488 | 175 | 197 | 490 | 198 |
| 47   | Shalat Gerhana                                     | 530                                    | 527 | 526 | 529 | 522 | 528 | 524 | 523 | 525 | 342 |
| 48   | Shalat di Kendaraan                                | 406                                    | 407 | 279 | 408 | 313 | 282 | 232 | 342 | 301 | 362 |
| 49   | Memandikan Orang Mati                              | 546                                    | 544 | 545 | 487 | 489 | 58  | 85  | 534 | 555 | 185 |
| 50   | Ingat Mati   | 72                                     | 85  | 560 | 537 | 530 | 58  | 71  | 60  | 66  | 65  |

Appendix 2: Table of system testing result with query expansion

| RESULT OF SYSTEM TESTING WITH QUERY EXPANSION |  |  |     |     |     |     |     |     |     |     |     |
|---|--|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| No  | Query  | Ranked result in term of hadith number |     |     |     |     |     |     |     |     |     |
|   |  | 1                                      | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  |
| 1   | Rukun Iman   | 23                                     | 28  | 22  | 47  | 83  | 471 | 370 | 29  | 32  | 36  |
| 2   | Rukun Islam  | 9                                      | 24  | 25  | 63  | 64  | 6   | 75  | 77  | 89  | 479 |
| 3   | Menghormati Tetangga                               | 29                                     | 30  | 471 | 370 | 509 | 23  | 400 | 403 | 294 | 67  |
| 4   | Tanda Orang Munafik                                | 38                                     | 47  | 48  | 37  | 28  | 370 | 471 | 400 | 23  | 403 |
| 5   | Meratakan Saf Saat Shalat                          | 510                                    | 400 | 403 | 370 | 282 | 342 | 294 | 248 | 508 | 509 |
| 6   | Tanda Orang Beriman                                | 47                                     | 28  | 23  | 48  | 22  | 83  | 471 | 370 | 29  | 32  |
| 7   | Hukum Bunuh Diri                                   | 95                                     | 55  | 175 | 69  | 70  | 61  | 96  | 471 | 370 | 163 |
| 8   | Syafaat Nabi                                       | 122                                    | 121 | 126 | 125 | 294 | 370 | 471 | 215 | 66  | 400 |
| 9   | Ahli Surga   | 519                                    | 395 | 72  | 8   | 146 | 370 | 393 | 471 | 369 | 113 |
| 10  | Ahli Neraka  | 72                                     | 127 | 116 | 115 | 40  | 395 | 117 | 71  | 519 | 394 |
| 11  | Anjuran Bersuci Sebelum Shalat                     | 134                                    | 403 | 400 | 370 | 342 | 294 | 192 | 386 | 508 | 509 |
| 12  | Anjuran Bersiwak                                   | 143                                    | 144 | 142 | 490 | 493 | 492 | 491 | 375 | 376 | 379 |
| 13  | Hukum Jilatan Anjing                               | 160                                    | 370 | 471 | 400 | 509 | 175 | 23  | 403 | 294 | 186 |
| 14  | Hukum Kencing Bayi                                 | 163                                    | 164 |     |     |     |     |     |     |     |     |
| 15  | Hukum Menggauli Istri Saat Sedang Haidh            | 169                                    | 168 | 171 | 174 | 170 | 173 |     |     |     |     |
| 16  | Tata Cara Mandi Janabat                            | 177                                    | 183 | 171 | 181 | 210 | 179 | 176 | 197 | 182 | 546 |
| 17  | Menjaga Aurat                                      | 549                                    | 295 | 422 | 195 | 369 | 471 | 370 | 112 | 312 | 23  |
| 18  | Cara Tayammum                                      | 207                                    | 206 | 208 | 396 | 209 | 14  | 11  | 10  | 566 | 7   |
| 19  | Fadhilah Shalat Jama'ah                            | 381                                    | 400 | 403 | 350 | 370 | 383 | 377 | 342 | 294 | 380 |
| 20  | Larangan Kencing dalam Air yang Menggenang         | 161                                    | 151 | 543 | 186 | 163 | 154 | 155 |     |     |     |
| 21  | Larangan Berjalan didepan Orang Shalat             | 284                                    | 282 | 317 | 285 | 475 | 388 | 403 | 400 | 370 | 473 |
| 22  | Dosa Besar   | 80                                     | 53  | 364 | 81  | 324 | 389 | 435 | 284 | 231 | 229 |
| 23  | Bacaan dalam Shalat                                | 260                                    | 265 | 264 | 225 | 263 | 522 | 450 | 341 | 222 | 504 |
| 24  | Kewajiban Beriman kepada Allah                     | 12                                     | 29  | 83  | 11  | 134 | 94  | 23  | 344 | 19  | 93  |
| 25  | Kewajiban Beriman kepada Rasulullah                | 12                                     | 27  | 83  | 197 | 23  | 490 | 509 | 19  | 28  | 549 |
| 26  | Adab Buang Air                                     | 149                                    | 148 | 150 | 154 | 157 | 186 | 153 | 158 | 172 | 185 |
| 27  | Cara Membersihkan Kulit Bangkai                    | 205                                    | 189 | 154 | 152 | 370 | 471 | 134 | 400 | 403 | 23  |
| 28  | Amal yang Utama                                    | 50                                     | 24  | 25  | 77  | 51  | 467 | 75  | 370 | 471 | 550 |
| 29  | Mengangkat Kedua Tangan pada saat Takbiratul Ihram | 217                                    | 218 | 516 | 317 |     |     |     |     |     |     |
| 30  | Cara Berwudhu                                      | 135                                    | 136 | 437 | 140 | 176 | 204 | 159 | 178 | 181 | 141 |
| 31  | Larangan Bicara Ketika Shalat                      | 317                                    | 323 | 312 | 475 | 311 | 400 | 403 | 370 | 473 | 342 |
| 32  | Bacaan Dalam Ruku' dan Sujud                       | 272                                    | 275 | 220 | 234 | 521 | 341 | 273 | 232 | 340 | 217 |
| 33  | Shalatnya Orang Musafir                            | 400                                    | 398 | 402 | 401 | 399 | 510 | 403 | 366 | 342 | 294 |
| 34  | Fadilat Menghafal Qur'an                           | 451                                    | 453 | 471 | 370 | 509 | 403 | 23  | 400 | 452 | 294 |
| 35  | Shalat Sunnat                                      | 477                                    | 420 | 421 | 414 | 480 | 474 | 422 | 413 | 399 | 445 |
| 36  | Shalat Dua Hari Raya                               | 510                                    | 509 | 508 | 507 | 506 | 403 | 400 | 366 | 342 | 294 |
| 37  | Shalat Malam                                       | 432                                    | 439 | 433 | 428 | 436 | 431 | 374 | 441 | 404 | 427 |
| 38  | Menjamak Shalat                                    | 411                                    | 409 | 410 | 342 | 362 | 508 | 398 | 400 | 403 | 354 |
| 39  | Cara Sujud Tilawah                                 | 338                                    | 341 | 340 | 339 | 277 | 276 | 246 | 272 | 293 | 318 |
| 40  | Perubahan Arah Qiblat                              | 303                                    | 302 | 407 | 237 | 250 | 406 | 488 | 471 | 370 | 31  |
| 41  | Shalat Sunnat yang dilarang                        | 477                                    | 475 | 473 | 474 | 476 | 351 | 350 | 420 | 317 | 421 |
| 42  | Hukum Shalat Memakai Sepatu                        | 155                                    | 403 | 370 | 400 | 342 | 294 | 279 | 265 | 439 | 295 |
| 43  | Imam Shalat  | 503                                    | 269 | 268 | 502 | 566 | 400 | 403 | 354 | 270 | 370 |
| 44  | Meminta Hujan                                      | 517                                    | 46  | 518 | 405 | 515 | 404 | 5   | 384 | 11  | 566 |
| 45  | Membersihkan Najis                                 | 189                                    | 162 | 154 | 152 | 134 | 370 | 471 | 163 | 166 | 386 |
| 46  | Wajib Mandi  | 487                                    | 489 | 197 | 488 | 490 | 199 | 175 | 183 | 198 | 196 |
| 47  | Shalat Gerhana                                     | 527                                    | 530 | 529 | 526 | 528 | 522 | 523 | 510 | 525 | 400 |
| 48  | Shalat di Kendaraan                                | 406                                    | 279 | 407 | 510 | 282 | 408 | 400 | 403 | 366 | 342 |
| 49  | Memandikan Orang Mati                              | 546                                    | 183 | 544 | 487 | 186 | 485 | 184 | 181 | 549 | 171 |
| 50  | Ingat Mati   | 58                                     | 85  | 534 | 555 | 530 | 65  | 556 | 549 | 59  | 546 |



Appendix 3: Table of ground truth from expert

| Ground truth from Expert |  |   |     |     |     |     |
|--------------------------|--|---|-----|-----|-----|-----|
| No                       | Query  | Ranked of ground truth in term of hadith number |     |     |     |     |
|                          |  | 1   | 2   | 3   | 4   | 5   |
| 1                        | Rukun Iman   | 28  | 29  | 47  | 22  |     |
| 2                        | Rukun Islam  | 9   | 6   | 25  | 24  |     |
| 3                        | Menghormati Tetangga                               | 29  | 30  |     |     |     |
| 4                        | Tanda Orang Munafik                                | 38  | 47  | 48  |     |     |
| 5                        | Meratakan Saf Saat Shalat                          | 248   | 282 |     |     |     |
| 6                        | Tanda Orang Beriman                                | 47  | 28  | 29  | 22  | 48  |
| 7                        | Hukum Bunuh Diri                                   | 69  | 70  | 55  |     |     |
| 8                        | Syafaat Nabi                                       | 122   | 121 | 126 | 215 | 125 |
| 9                        | Ahli Surga   | 8   | 369 | 113 |     |     |
| 10                       | Ahli Neraka  | 72  | 127 | 115 | 116 | 71  |
| 11                       | Anjuran Bersuci Sebelum Shalat                     | 134   |     |     |     |     |
| 12                       | Anjuran Bersiwak                                   | 142   | 143 | 144 | 490 |     |
| 13                       | Hukum Jilatan Anjing                               | 160   |     |     |     |     |
| 14                       | Hukum Kencing Bayi                                 | 163   | 164 |     |     |     |
| 15                       | Hukum Menggauli Istri Saat Sedang Haidh            | 169   | 168 | 170 |     |     |
| 16                       | Tata Cara Mandi Janabat                            | 183   | 181 | 182 |     |     |
| 17                       | Menjaga Aurat                                      | 195   | 194 |     |     |     |
| 18                       | Cara Tayammum                                      | 207   | 206 | 208 | 209 |     |
| 19                       | Fadilat Shalat Jama'ah                             | 381   | 380 |     |     |     |
| 20                       | Larangan Kencing dalam Air yang Menggenang         | 161   |     |     |     |     |
| 21                       | Larangan Berjalan didepan Orang Shalat             | 284   |     |     |     |     |
| 22                       | Dosa Besar   | 53  | 364 |     |     |     |
| 23                       | Bacaan dalam Shalat                                | 260   | 264 | 265 | 266 | 263 |
| 24                       | Kewajiban Beriman kepada Allah                     | 29  | 94  | 11  | 19  |     |
| 25                       | Kewajiban Beriman kepada Rasulullah                | 27  |     |     |     |     |
| 26                       | Adab Buang Air                                     | 149   | 148 | 150 | 154 | 153 |
| 27                       | Cara Membersihkan Kulit Bangkai                    | 205   |     |     |     |     |
| 28                       | Amal yang Utama                                    | 50  | 51  | 24  | 25  |     |
| 29                       | Mengangkat Kedua Tangan pada saat Takbiratul Ihram | 217   | 218 |     |     |     |
| 30                       | Cara Berwudhu                                      | 135   | 136 | 176 | 159 | 141 |
| 31                       | Larangan Bicara Ketika Shalat                      | 312   | 311 | 351 |     |     |
| 32                       | Bacaan Dalam Ruku' dan Sujud                       | 220   | 275 | 234 | 217 |     |
| 33                       | Shalatnya Orang Musafir                            | 400   | 398 | 402 | 401 | 403 |
| 34                       | Fadilat Menghafal Qur'an                           | 451   | 452 | 453 |     |     |
| 35                       | Shalat Sunnat                                      | 480   | 420 | 447 | 414 | 477 |
| 36                       | Shalat Dua Hari Raya                               | 510   | 508 | 509 | 507 | 506 |
| 37                       | Shalat Malam                                       | 432   | 433 | 428 | 431 | 439 |
| 38                       | Menjamak Shalat                                    | 411   | 409 | 410 |     |     |
| 39                       | Cara Sujud Tilawah                                 | 338   | 339 | 341 | 340 |     |
| 40                       | Perubahan Arah Qiblat                              | 303   | 302 | 304 |     |     |
| 41                       | Shalat Sunnat yang dilarang                        | 473   | 474 | 475 | 476 | 477 |
| 42                       | Hukum Shalat Memakai Sepatu                        | 155   |     |     |     |     |
| 43                       | Imam Shalat  | 269   | 268 | 270 | 566 | 503 |
| 44                       | Meminta Hujan                                      | 517   | 515 |     |     |     |
| 45                       | Membersihkan Najis                                 | 162   | 166 | 189 | 154 | 163 |
| 46                       | Wajib Mandi  | 197   | 199 | 196 | 198 |     |
| 47                       | Shalat Gerhana                                     | 527   | 529 | 530 | 526 | 528 |
| 48                       | Shalat di Kendaraan                                | 406   | 407 | 408 |     |     |
| 49                       | Memandikan Orang Mati                              | 546   | 545 | 544 |     |     |
| 50                       | Ingat Mati   | 58  | 85  | 534 | 59  |     |



Appendix 4: Table of calculation testing for top 5 data without query expansion

|    |  | CALCULATION TESTING WITHOUT QUERY EXPANSION |     |     |     |     |   |     |     |     |     |    |    |    |    |       |        |           |          |           |
|----|--|---|-----|-----|-----|-----|---|-----|-----|-----|-----|----|----|----|----|-------|--------|-----------|----------|-----------|
| NO | Query                                      | Ranked result in term of hadith number      |     |     |     |     | Ranked of ground truth in term of hadith number |     |     |     |     | TP | TN | FP | FN | Total | Recall | Precision | Accuracy | F-Measure |
|    |  | 1   | 2   | 3   | 4   | 5   | 1   | 2   | 3   | 4   | 5   |    |    |    |    |       |        |           |          |           |
| 1  | Rukun Iman                                 | 36  | 97  | 29  | 28  | 22  | 28  | 29  | 47  | 22  |     | 3  | 1  | 2  | 4  | 10    | 75     | 60        | 70       | 66,67     |
| 2  | Rukun Islam                                | 9   | 6   | 25  | 24  | 77  | 9   | 6   | 25  | 24  |     | 4  | 0  | 1  | 5  | 10    | 100    | 80        | 90       | 88,89     |
| 3  | Menghormati Tetangga                       | 29  | 30  | 53  | 88  | 471 | 29  | 30  |     |     |     | 2  | 0  | 3  | 5  | 10    | 100    | 40        | 70       | 57,14     |
| 4  | Tanda Orang Munafik                        | 38  | 47  | 28  | 48  | 37  | 38  | 47  | 48  |     |     | 3  | 0  | 2  | 5  | 10    | 100    | 60        | 80       | 75        |
| 5  | Meratakan Saf Saat Shalat                  | 248   | 282 | 251 | 506 | 403 | 248   | 282 |     |     |     | 2  | 0  | 3  | 5  | 10    | 100    | 40        | 70       | 57,14     |
| 6  | Tanda Orang Beriman                        | 47  | 28  | 48  | 36  | 97  | 47  | 28  | 29  | 22  | 48  | 3  | 2  | 2  | 3  | 10    | 60     | 60        | 60       | 60        |
| 7  | Hukum Bunuh Diri                           | 95  | 61  | 70  | 69  | 175 | 69  | 70  | 55  |     |     | 2  | 1  | 3  | 4  | 10    | 66,67  | 40        | 60       | 50        |
| 8  | Syafaat Nabi                               | 122   | 121 | 126 | 125 | 120 | 122   | 121 | 126 | 215 | 125 | 4  | 1  | 1  | 4  | 10    | 80     | 80        | 80       | 80        |
| 9  | Ahli Surga                                 | 8   | 114 | 72  | 71  | 102 | 8   | 369 | 113 |     |     | 1  | 2  | 4  | 3  | 10    | 33,33  | 20        | 40       | 25        |
| 10 | Ahli Neraka                                | 72  | 116 | 127 | 114 | 71  | 72  | 127 | 115 | 116 | 71  | 4  | 1  | 1  | 4  | 10    | 80     | 80        | 80       | 80        |
| 11 | Anjuran Bersuci Sebelum Shalat             | 269   | 420 | 419 | 421 | 134 | 134   |     |     |     |     | 1  | 0  | 4  | 5  | 10    | 100    | 20        | 60       | 33,33     |
| 12 | Anjuran Bersiwak                           | 143   | 144 | 490 | 142 | 269 | 142   | 143 | 144 | 490 |     | 4  | 0  | 1  | 5  | 10    | 100    | 80        | 90       | 88,89     |
| 13 | Hukum Jilatan Anjing                       | 160   | 175 | 96  | 370 | 471 | 160   |     |     |     |     | 1  | 0  | 4  | 5  | 10    | 100    | 20        | 60       | 33,33     |
| 14 | Hukum Kencing Bayi                         | 163   | 164 | 190 | 155 | 161 | 163   | 164 |     |     |     | 2  | 0  | 3  | 5  | 10    | 100    | 40        | 70       | 57,14     |
| 15 | Hukum Menggauli Istri Saat Sedang Haidh    | 169   | 168 | 171 | 173 | 174 | 169   | 168 | 170 |     |     | 2  | 1  | 3  | 4  | 10    | 66,67  | 40        | 60       | 50        |
| 16 | Tata Cara Mandi Janabat                    | 183   | 171 | 176 | 177 | 178 | 183   | 181 | 182 |     |     | 1  | 2  | 4  | 3  | 10    | 33,33  | 20        | 40       | 25        |
| 17 | Menjaga Aurat                              | 195   | 422 | 369 | 312 | 367 | 195   | 194 |     |     |     | 1  | 1  | 4  | 4  | 10    | 50     | 20        | 50       | 28,57     |
| 18 | Cara Tayammum                              | 207   | 206 | 208 | 396 | 209 | 207   | 206 | 208 | 209 |     | 4  | 0  | 1  | 5  | 10    | 100    | 80        | 90       | 88,89     |
| 19 | Fadilat Shalat Jama'ah                     | 381   | 387 | 383 | 350 | 380 | 381   | 380 |     |     |     | 2  | 0  | 3  | 5  | 10    | 100    | 40        | 70       | 57,14     |
| 20 | Larangan Kencing dalam Air yang Menggenang | 161   | 151 | 163 | 543 | 154 | 161   |     |     |     |     | 1  | 0  | 4  | 5  | 10    | 100    | 20        | 60       | 33,33     |
| 21 | Larangan Berjalan didepan Orang Shalat     | 285   | 284 | 317 | 283 | 286 | 284   |     |     |     |     | 1  | 0  | 4  | 5  | 10    | 100    | 20        | 60       | 33,33     |
| 22 | Dosa Besar                                 | 118   | 76  | 81  | 536 | 62  | 53  | 364 |     |     |     | 0  | 2  | 5  | 3  | 10    | 0      | 0         | 30       | 0         |
| 23 | Bacaan dalam Shalat                        | 265   | 260 | 266 | 264 | 263 | 260   | 264 | 265 | 266 | 263 | 5  | 0  | 0  | 5  | 10    | 100    | 100       | 100      | 100       |
| 24 | Kewajiban Beriman kepada Allah             | 12  | 94  | 11  | 19  | 18  | 29  | 94  | 11  | 19  |     | 3  | 1  | 2  | 4  | 10    | 75     | 60        | 70       | 66,67     |
| 25 | Kewajiban Beriman kepada Rasulullah        | 12  | 94  | 11  | 18  | 27  | 27  |     |     |     |     | 1  | 0  | 4  | 5  | 10    | 100    | 20        | 60       | 33,33     |

|         |  |     |     |     |     |     |     |     |     |     |     |   |   |   |   |    |         |      |      |        |
|---------|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|---|---|---|---|----|---------|------|------|--------|
| 26      | Adab Buang Air                                     | 149 | 148 | 150 | 154 | 157 | 149 | 148 | 150 | 154 | 153 | 4 | 1 | 1 | 4 | 10 | 80      | 80   | 80   | 80     |
| 27      | Cara Membersihkan Kulit Bangkai                    | 205 | 189 | 471 | 370 | 400 | 205 |     |     |     |     | 1 | 0 | 4 | 5 | 10 | 100     | 20   | 60   | 33,33  |
| 28      | Amal yang Utama                                    | 50  | 51  | 25  | 24  | 75  | 50  | 51  | 24  | 25  |     | 4 | 0 | 1 | 5 | 10 | 100     | 80   | 90   | 88,89  |
| 29      | Mengangkat Kedua Tangan pada saat Takbiratul Ihram | 217 | 218 | 516 | 317 | 244 | 217 | 218 |     |     |     | 2 | 0 | 3 | 5 | 10 | 100     | 40   | 70   | 57,14  |
| 30      | Cara Berwudhu                                      | 135 | 136 | 437 | 140 | 176 | 135 | 136 | 176 | 159 | 141 | 3 | 2 | 2 | 3 | 10 | 60      | 60   | 60   | 60     |
| 31      | Larangan Bicara Ketika Shalat                      | 323 | 312 | 311 | 317 | 475 | 312 | 311 | 351 |     |     | 2 | 1 | 3 | 4 | 10 | 66,67   | 40   | 60   | 50     |
| 32      | Bacaan Dalam Ruku' dan Sujud                       | 220 | 275 | 272 | 521 | 234 | 220 | 275 | 234 | 217 |     | 3 | 1 | 2 | 4 | 10 | 75      | 60   | 70   | 66,67  |
| 33      | Shalatnya Orang Musafir                            | 400 | 398 | 402 | 399 | 401 | 400 | 398 | 402 | 401 | 403 | 4 | 1 | 1 | 4 | 10 | 80      | 80   | 80   | 80     |
| 34      | Fadilat Menghafal Qur'an                           | 453 | 452 | 460 | 454 | 472 | 451 | 452 | 453 |     |     | 2 | 1 | 3 | 4 | 10 | 66,67   | 40   | 60   | 50     |
| 35      | Shalat Sunnat                                      | 480 | 447 | 413 | 474 | 420 | 480 | 420 | 447 | 414 | 477 | 3 | 2 | 2 | 3 | 10 | 60      | 60   | 60   | 60     |
| 36      | Shalat Dua Hari Raya                               | 508 | 509 | 507 | 506 | 510 | 510 | 508 | 509 | 507 | 506 | 5 | 0 | 0 | 5 | 10 | 100     | 100  | 100  | 100    |
| 37      | Shalat Malam                                       | 436 | 432 | 428 | 433 | 439 | 432 | 433 | 428 | 431 | 439 | 4 | 1 | 1 | 4 | 10 | 80      | 80   | 80   | 80     |
| 38      | Menjamak Shalat                                    | 411 | 409 | 410 | 342 | 508 | 411 | 409 | 410 |     |     | 3 | 0 | 2 | 5 | 10 | 100     | 60   | 80   | 75     |
| 39      | Cara Sujud Tilawah                                 | 341 | 338 | 340 | 339 | 277 | 338 | 339 | 341 | 340 |     | 4 | 0 | 1 | 5 | 10 | 100     | 80   | 90   | 88,89  |
| 40      | Perubahan Arah Qiblat                              | 303 | 302 | 407 | 406 | 250 | 303 | 302 | 304 |     |     | 2 | 1 | 3 | 4 | 10 | 66,67   | 40   | 60   | 50     |
| 41      | Shalat Sunnat yang dilarang                        | 473 | 474 | 475 | 351 | 476 | 473 | 474 | 475 | 476 | 477 | 4 | 1 | 1 | 4 | 10 | 80      | 80   | 80   | 80     |
| 42      | Hukum Shalat Memakai Sepatu                        | 325 | 155 | 403 | 400 | 370 | 155 |     |     |     |     | 1 | 0 | 4 | 5 | 10 | 100     | 20   | 60   | 33,33  |
| 43      | Imam Shalat  | 235 | 482 | 239 | 503 | 270 | 269 | 268 | 270 | 566 | 503 | 2 | 3 | 3 | 2 | 10 | 40      | 40   | 40   | 40     |
| 44      | Meminta Hujan                                      | 517 | 46  | 518 | 405 | 515 | 517 | 515 |     |     |     | 2 | 0 | 3 | 5 | 10 | 100     | 40   | 70   | 57,14  |
| 45      | Membersihkan Najis                                 | 189 | 210 | 166 | 349 | 162 | 162 | 166 | 189 | 154 | 163 | 3 | 2 | 2 | 3 | 10 | 60      | 60   | 60   | 60     |
| 46      | Wajib Mandi  | 487 | 199 | 196 | 489 | 180 | 197 | 199 | 196 | 198 |     | 2 | 2 | 3 | 3 | 10 | 50      | 40   | 50   | 44,44  |
| 47      | Shalat Gerhana                                     | 530 | 527 | 526 | 529 | 522 | 527 | 529 | 530 | 526 | 528 | 4 | 1 | 1 | 4 | 10 | 80      | 80   | 80   | 80     |
| 48      | Shalat di Kendaraan                                | 406 | 407 | 279 | 408 | 313 | 406 | 407 | 408 |     |     | 3 | 0 | 2 | 5 | 10 | 100     | 60   | 80   | 75     |
| 49      | Memandikan Orang Mati                              | 546 | 544 | 545 | 487 | 489 | 546 | 545 | 544 |     |     | 3 | 0 | 2 | 5 | 10 | 100     | 60   | 80   | 75     |
| 50      | Ingat Mati   | 72  | 85  | 560 | 537 | 530 | 58  | 85  | 534 | 59  |     | 1 | 3 | 4 | 2 | 10 | 25      | 20   | 30   | 22,22  |
| TOTAL   |  |     |     |     |     |     |     |     |     |     |     |   |   |   |   |    | 3990,01 | 2560 | 3400 | 3118,9 |
| AVERAGE |  |     |     |     |     |     |     |     |     |     |     |   |   |   |   |    | 79,81   | 51,2 | 68   | 59,12  |

Appendix 5: Table of calculation testing for top 5 data with query expansion

| CALCULATION TESTING WITH QUERY EXPANSION |  |  |     |     |     |     |   |     |     |     |     |    |    |    |    |       |        |           |          |           |
|--|--|--|-----|-----|-----|-----|---|-----|-----|-----|-----|----|----|----|----|-------|--------|-----------|----------|-----------|
| NO                                       | Query                                      | Ranked result in term of hadith number |     |     |     |     | Ranked of ground truth in term of hadith number |     |     |     |     | TP | TN | FP | FN | Total | Recall | Precision | Accuracy | F-Measure |
|  |  | 1                                      | 2   | 3   | 4   | 5   | 1   | 2   | 3   | 4   | 5   |    |    |    |    |       |        |           |          |           |
| 1  | Rukun Iman                                 | 23                                     | 28  | 22  | 47  | 83  | 28  | 29  | 47  | 22  |     | 3  | 1  | 2  | 4  | 10    | 75     | 60        | 70       | 66,67     |
| 2  | Rukun Islam                                | 9                                      | 24  | 25  | 63  | 64  | 9   | 6   | 25  | 24  |     | 3  | 1  | 2  | 4  | 10    | 75     | 60        | 70       | 66,67     |
| 3  | Menghormati Tetangga                       | 29                                     | 30  | 471 | 370 | 509 | 29  | 30  |     |     |     | 2  | 0  | 3  | 5  | 10    | 100    | 40        | 70       | 57,14     |
| 4  | Tanda Orang Munafik                        | 38                                     | 47  | 48  | 37  | 28  | 38  | 47  | 48  |     |     | 3  | 0  | 2  | 5  | 10    | 100    | 60        | 80       | 75        |
| 5  | Meratakan Saf Saat Shalat                  | 510                                    | 400 | 403 | 370 | 282 | 248   | 282 |     |     |     | 1  | 1  | 4  | 4  | 10    | 50     | 20        | 50       | 28,57     |
| 6  | Tanda Orang Beriman                        | 47                                     | 28  | 23  | 48  | 22  | 47  | 28  | 29  | 22  | 48  | 4  | 1  | 1  | 4  | 10    | 80     | 80        | 80       | 80        |
| 7  | Hukum Bunuh Diri                           | 95                                     | 55  | 175 | 69  | 70  | 69  | 70  | 55  |     |     | 3  | 0  | 2  | 5  | 10    | 100    | 60        | 80       | 75        |
| 8  | Syafaat Nabi                               | 122                                    | 121 | 126 | 125 | 294 | 122   | 121 | 126 | 215 | 125 | 4  | 1  | 1  | 4  | 10    | 80     | 80        | 80       | 80        |
| 9  | Ahli Surga                                 | 519                                    | 395 | 72  | 8   | 146 | 8   | 369 | 113 |     |     | 1  | 2  | 4  | 3  | 10    | 33,33  | 20        | 40       | 25        |
| 10                                       | Ahli Neraka                                | 72                                     | 127 | 116 | 115 | 40  | 72  | 127 | 115 | 116 | 71  | 4  | 1  | 1  | 4  | 10    | 80     | 80        | 80       | 80        |
| 11                                       | Anjuran Bersuci Sebelum Shalat             | 134                                    | 403 | 400 | 370 | 342 | 134   |     |     |     |     | 1  | 0  | 4  | 5  | 10    | 100    | 20        | 60       | 33,33     |
| 12                                       | Anjuran Bersiwak                           | 143                                    | 144 | 142 | 490 | 493 | 142   | 143 | 144 | 490 |     | 4  | 0  | 1  | 5  | 10    | 100    | 80        | 90       | 88,89     |
| 13                                       | Hukum Jilatan Anjing                       | 160                                    | 370 | 471 | 400 | 509 | 160   |     |     |     |     | 1  | 0  | 4  | 5  | 10    | 100    | 20        | 60       | 33,33     |
| 14                                       | Hukum Kencing Bayi                         | 163                                    | 164 |     |     |     | 163   | 164 |     |     |     | 2  | 0  | 3  | 5  | 10    | 100    | 40        | 70       | 57,14     |
| 15                                       | Hukum Menggauli Istri Saat Sedang Haidh    | 169                                    | 168 | 171 | 174 | 170 | 169   | 168 | 170 |     |     | 3  | 0  | 2  | 5  | 10    | 100    | 60        | 80       | 75        |
| 16                                       | Tata Cara Mandi Janabat                    | 177                                    | 183 | 171 | 181 | 210 | 183   | 181 | 182 |     |     | 2  | 1  | 3  | 5  | 11    | 66,67  | 40        | 63,64    | 50        |
| 17                                       | Menjaga Aurat                              | 549                                    | 295 | 422 | 195 | 369 | 195   | 194 |     |     |     | 1  | 1  | 4  | 4  | 10    | 50     | 20        | 50       | 28,57     |
| 18                                       | Cara Tayammum                              | 207                                    | 206 | 208 | 396 | 209 | 207   | 206 | 208 | 209 |     | 4  | 0  | 1  | 5  | 10    | 100    | 80        | 90       | 88,89     |
| 19                                       | Fadilat Shalat Jama'ah                     | 381                                    | 400 | 403 | 350 | 370 | 381   | 380 |     |     |     | 1  | 1  | 4  | 4  | 10    | 50     | 20        | 50       | 28,57     |
| 20                                       | Larangan Kencing dalam Air yang Menggenang | 161                                    | 151 | 543 | 186 | 163 | 161   |     |     |     |     | 1  | 0  | 4  | 5  | 10    | 100    | 20        | 60       | 33,33     |
| 21                                       | Larangan Berjalan didepan Orang Shalat     | 284                                    | 282 | 317 | 285 | 475 | 284   |     |     |     |     | 1  | 0  | 4  | 5  | 10    | 100    | 20        | 60       | 33,33     |
| 22                                       | Dosa Besar                                 | 80                                     | 53  | 364 | 81  | 324 | 53  | 364 |     |     |     | 2  | 0  | 3  | 5  | 10    | 100    | 40        | 70       | 57,14     |
| 23                                       | Bacaan dalam Shalat                        | 260                                    | 265 | 264 | 225 | 263 | 260   | 264 | 265 | 266 | 263 | 4  | 1  | 1  | 4  | 10    | 80     | 80        | 80       | 80        |
| 24                                       | Kewajiban Beriman kepada Allah             | 12                                     | 29  | 83  | 11  | 134 | 29  | 94  | 11  | 19  |     | 2  | 2  | 3  | 3  | 10    | 50     | 40        | 50       | 44,44     |
| 25                                       | Kewajiban Beriman kepada Rasulullah        | 12                                     | 27  | 83  | 197 | 23  | 27  |     |     |     |     | 1  | 0  | 4  | 5  | 10    | 100    | 20        | 60       | 33,33     |

|         |  |     |     |     |     |     |     |     |     |     |     |   |   |   |   |    |         |      |         |         |
|---------|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|---|---|---|---|----|---------|------|---------|---------|
| 26      | Adab Buang Air                                     | 149 | 148 | 150 | 154 | 157 | 149 | 148 | 150 | 154 | 153 | 4 | 1 | 1 | 4 | 10 | 80      | 80   | 80      | 80      |
| 27      | Cara Membersihkan Kulit Bangkai                    | 205 | 189 | 154 | 152 | 370 | 205 |     |     |     |     | 1 | 0 | 4 | 5 | 10 | 100     | 20   | 60      | 33,33   |
| 28      | Amal yang Utama                                    | 50  | 24  | 25  | 77  | 51  | 50  | 51  | 24  | 25  |     | 4 | 0 | 1 | 5 | 10 | 100     | 80   | 90      | 88,89   |
| 29      | Mengangkat Kedua Tangan pada saat Takbiratul Ihram | 217 | 218 | 516 | 317 |     | 217 | 218 |     |     |     | 2 | 0 | 3 | 5 | 10 | 100     | 40   | 70      | 57,14   |
| 30      | Cara Berwudhu                                      | 135 | 136 | 437 | 140 | 176 | 135 | 136 | 176 | 159 | 141 | 3 | 2 | 2 | 3 | 10 | 60      | 60   | 60      | 60      |
| 31      | Larangan Bicara Ketika Shalat                      | 317 | 323 | 312 | 475 | 311 | 312 | 311 | 351 |     |     | 2 | 1 | 3 | 4 | 10 | 66,67   | 40   | 60      | 50      |
| 32      | Bacaan Dalam Ruku' dan Sujud                       | 272 | 275 | 220 | 234 | 521 | 220 | 275 | 234 | 217 |     | 3 | 1 | 2 | 4 | 10 | 75      | 60   | 70      | 66,67   |
| 33      | Shalatnya Orang Musafir                            | 400 | 398 | 402 | 401 | 399 | 400 | 398 | 402 | 401 | 403 | 4 | 1 | 1 | 4 | 10 | 80      | 80   | 80      | 80      |
| 34      | Fadilat Menghafal Qur'an                           | 451 | 453 | 471 | 370 | 509 | 451 | 452 | 453 |     |     | 2 | 1 | 3 | 4 | 10 | 66,67   | 40   | 60      | 50      |
| 35      | Shalat Sunnat                                      | 477 | 420 | 421 | 414 | 480 | 480 | 420 | 447 | 414 | 477 | 4 | 1 | 1 | 4 | 10 | 80      | 80   | 80      | 80      |
| 36      | Shalat Dua Hari Raya                               | 510 | 509 | 508 | 507 | 506 | 510 | 508 | 509 | 507 | 506 | 5 | 0 | 0 | 5 | 10 | 100     | 100  | 100     | 100     |
| 37      | Shalat Malam                                       | 432 | 439 | 433 | 428 | 436 | 432 | 433 | 428 | 431 | 439 | 4 | 1 | 1 | 4 | 10 | 80      | 80   | 80      | 80      |
| 38      | Menjamak Shalat                                    | 411 | 409 | 410 | 342 | 362 | 411 | 409 | 410 |     |     | 3 | 0 | 2 | 5 | 10 | 100     | 60   | 80      | 75      |
| 39      | Cara Sujud Tilawah                                 | 338 | 341 | 340 | 339 | 277 | 338 | 339 | 341 | 340 |     | 4 | 0 | 1 | 5 | 10 | 100     | 80   | 90      | 88,89   |
| 40      | Perubahan Arah Qiblat                              | 303 | 302 | 407 | 237 | 250 | 303 | 302 | 304 |     |     | 2 | 1 | 3 | 4 | 10 | 66,67   | 40   | 60      | 50      |
| 41      | Shalat Sunnat yang dilarang                        | 477 | 475 | 473 | 474 | 476 | 473 | 474 | 475 | 476 | 477 | 5 | 0 | 0 | 5 | 10 | 100     | 100  | 100     | 100     |
| 42      | Hukum Shalat Memakai Sepatu                        | 155 | 403 | 370 | 400 | 342 | 155 |     |     |     |     | 1 | 0 | 4 | 5 | 10 | 100     | 20   | 60      | 33,33   |
| 43      | Imam Shalat  | 503 | 269 | 268 | 502 | 566 | 269 | 268 | 270 | 566 | 503 | 4 | 1 | 1 | 4 | 10 | 80      | 80   | 80      | 80      |
| 44      | Meminta Hujan                                      | 517 | 46  | 518 | 405 | 515 | 517 | 515 |     |     |     | 2 | 0 | 3 | 5 | 10 | 100     | 40   | 70      | 57,14   |
| 45      | Membersihkan Najis                                 | 189 | 162 | 154 | 152 | 134 | 162 | 166 | 189 | 154 | 163 | 3 | 2 | 2 | 3 | 10 | 60      | 60   | 60      | 60      |
| 46      | Wajib Mandi  | 487 | 489 | 197 | 488 | 490 | 197 | 199 | 196 | 198 |     | 1 | 3 | 4 | 2 | 10 | 25      | 20   | 30      | 22,22   |
| 47      | Shalat Gerhana                                     | 527 | 530 | 529 | 526 | 528 | 527 | 529 | 530 | 526 | 528 | 5 | 0 | 0 | 5 | 10 | 100     | 100  | 100     | 100     |
| 48      | Shalat di Kendaraan                                | 406 | 279 | 407 | 510 | 282 | 406 | 407 | 408 |     |     | 2 | 1 | 3 | 4 | 10 | 66,67   | 40   | 60      | 50      |
| 49      | Memandikan Orang Mati                              | 546 | 183 | 544 | 487 | 186 | 546 | 545 | 544 |     |     | 2 | 1 | 3 | 4 | 10 | 66,67   | 40   | 60      | 50      |
| 50      | Ingat Mati   | 58  | 85  | 534 | 555 | 530 | 58  | 85  | 534 | 59  |     | 3 | 1 | 2 | 4 | 10 | 75      | 60   | 70      | 66,67   |
| TOTAL   |  |     |     |     |     |     |     |     |     |     |     |   |   |   |   |    | 4098,35 | 2660 | 3503,64 | 3226,12 |
| AVERAGE |  |     |     |     |     |     |     |     |     |     |     |   |   |   |   |    | 81,97   | 53,2 | 70,08   | 61,18   |

Appendix 6: Table of calculation testing for top 3 data without query expansion

| CALCULATION TESTING WITHOUT QUERY EXPANSION |  |   |     |     |  |     |     |    |    |    |    |       |        |           |          |           |
|---|--|---|-----|-----|--|-----|-----|----|----|----|----|-------|--------|-----------|----------|-----------|
| NO  | Query                                      | Ranked result in term of<br>hadith number |     |     | Ranked of ground truth in term<br>of hadith number |     |     | TP | TN | FP | FN | Total | Recall | Precision | Accuracy | F-Measure |
|   |  | 1   | 2   | 3   | 1  | 2   | 3   |    |    |    |    |       |        |           |          |           |
| 1   | Rukun Iman                                 | 36  | 97  | 29  | 28   | 29  | 47  | 1  | 2  | 2  | 5  | 10    | 33,33  | 33,33     | 60       | 33,33     |
| 2   | Rukun Islam                                | 9   | 6   | 25  | 9  | 6   | 25  | 3  | 0  | 0  | 7  | 10    | 100    | 100       | 100      | 100       |
| 3   | Menghormati Tetangga                       | 29  | 30  | 53  | 29   | 30  |     | 2  | 0  | 1  | 7  | 10    | 100    | 66,67     | 90       | 80        |
| 4   | Tanda Orang Munafik                        | 38  | 47  | 28  | 38   | 47  | 48  | 2  | 1  | 1  | 6  | 10    | 66,67  | 66,67     | 80       | 66,67     |
| 5   | Meratakan Saf Saat Shalat                  | 248                                       | 282 | 251 | 248  | 282 |     | 2  | 0  | 1  | 7  | 10    | 100    | 66,67     | 90       | 80        |
| 6   | Tanda Orang Beriman                        | 47  | 28  | 48  | 47   | 28  | 29  | 2  | 1  | 1  | 6  | 10    | 66,67  | 66,67     | 80       | 66,67     |
| 7   | Hukum Bunuh Diri                           | 95  | 61  | 70  | 69   | 70  | 55  | 1  | 2  | 2  | 5  | 10    | 33,33  | 33,33     | 60       | 33,33     |
| 8   | Syafaat Nabi                               | 122                                       | 121 | 126 | 122  | 121 | 126 | 3  | 0  | 0  | 7  | 10    | 100    | 100       | 100      | 100       |
| 9   | Ahli Surga                                 | 8   | 114 | 72  | 8  | 369 | 113 | 1  | 2  | 2  | 5  | 10    | 33,33  | 33,33     | 60       | 33,33     |
| 10  | Ahli Neraka                                | 72  | 116 | 127 | 72   | 127 | 115 | 2  | 1  | 1  | 6  | 10    | 66,67  | 66,67     | 80       | 66,67     |
| 11  | Anjuran Bersuci Sebelum Shalat             | 269                                       | 420 | 419 | 134  |     |     | 0  | 1  | 3  | 6  | 10    | 0      | 0         | 60       | 0         |
| 12  | Anjuran Bersiwak                           | 143                                       | 144 | 490 | 142  | 143 | 144 | 2  | 1  | 1  | 6  | 10    | 66,67  | 66,67     | 80       | 66,67     |
| 13  | Hukum Jilatan Anjing                       | 160                                       | 175 | 96  | 160  |     |     | 1  | 0  | 2  | 7  | 10    | 100    | 33,33     | 80       | 50        |
| 14  | Hukum Kencing Bayi                         | 163                                       | 164 | 190 | 163  | 164 |     | 2  | 0  | 1  | 7  | 10    | 100    | 66,67     | 90       | 80        |
| 15  | Hukum Menggauli Istri Saat Sedang Haidh    | 169                                       | 168 | 171 | 169  | 168 | 170 | 2  | 1  | 1  | 6  | 10    | 66,67  | 66,67     | 80       | 66,67     |
| 16  | Tata Cara Mandi Janabat                    | 183                                       | 171 | 176 | 183  | 181 | 182 | 1  | 2  | 2  | 5  | 10    | 33,33  | 33,33     | 60       | 33,33     |
| 17  | Menjaga Aurat                              | 195                                       | 422 | 369 | 195  | 194 |     | 1  | 1  | 2  | 6  | 10    | 50     | 33,33     | 70       | 40        |
| 18  | Cara Tayammum                              | 207                                       | 206 | 208 | 207  | 206 | 208 | 3  | 0  | 0  | 7  | 10    | 100    | 100       | 100      | 100       |
| 19  | Fadilat Shalat Jama'ah                     | 381                                       | 387 | 383 | 381  | 380 |     | 1  | 1  | 2  | 6  | 10    | 50     | 33,33     | 70       | 40        |
| 20  | Larangan Kencing dalam Air yang Menggenang | 161                                       | 151 | 163 | 161  |     |     | 1  | 0  | 2  | 7  | 10    | 100    | 33,33     | 80       | 50        |
| 21  | Larangan Berjalan didepan Orang Shalat     | 285                                       | 284 | 317 | 284  |     |     | 1  | 0  | 2  | 7  | 10    | 100    | 33,33     | 80       | 50        |
| 22  | Dosa Besar                                 | 118                                       | 76  | 81  | 53   | 364 |     | 0  | 2  | 3  | 5  | 10    | 0      | 0         | 50       | 0         |
| 23  | Bacaan dalam Shalat                        | 265                                       | 260 | 266 | 260  | 264 | 265 | 2  | 1  | 1  | 6  | 10    | 66,67  | 66,67     | 80       | 66,67     |
| 24  | Kewajiban Beriman kepada Allah             | 12  | 94  | 11  | 29   | 94  | 11  | 2  | 1  | 1  | 6  | 10    | 66,67  | 66,67     | 80       | 66,67     |
| 25  | Kewajiban Beriman kepada Rasulullah        | 12  | 94  | 11  | 27   |     |     | 0  | 1  | 3  | 6  | 10    | 0      | 0         | 60       | 0         |
| 26  | Adab Buang Air                             | 149                                       | 148 | 150 | 149  | 148 | 150 | 3  | 0  | 0  | 7  | 10    | 100    | 100       | 100      | 100       |



|         |  |     |     |     |     |     |     |   |   |   |   |    |         |         |       |         |
|---------|--|-----|-----|-----|-----|-----|-----|---|---|---|---|----|---------|---------|-------|---------|
| 27      | Cara Membersihkan Kulit Bangkok                    | 205 | 189 | 471 | 205 |     |     | 1 | 0 | 2 | 7 | 10 | 100     | 33,33   | 80    | 50      |
| 28      | Amal yang Utama                                    | 50  | 51  | 25  | 50  | 51  | 24  | 2 | 1 | 1 | 6 | 10 | 66,67   | 66,67   | 80    | 66,67   |
| 29      | Mengangkat Kedua Tangan pada saat Takbiratul Ihram | 217 | 218 | 516 | 217 | 218 |     | 2 | 0 | 1 | 7 | 10 | 100     | 66,67   | 90    | 80      |
| 30      | Cara Berwudhu                                      | 135 | 136 | 437 | 135 | 136 | 176 | 2 | 1 | 1 | 6 | 10 | 66,67   | 66,67   | 80    | 66,67   |
| 31      | Larangan Bicara Ketika Shalat                      | 323 | 312 | 311 | 312 | 311 | 351 | 2 | 1 | 1 | 6 | 10 | 66,67   | 66,67   | 80    | 66,67   |
| 32      | Bacaan Dalam Ruku' dan Sujud                       | 220 | 275 | 272 | 220 | 275 | 234 | 2 | 1 | 1 | 6 | 10 | 66,67   | 66,67   | 80    | 66,67   |
| 33      | Shalatnya Orang Musafir                            | 400 | 398 | 402 | 400 | 398 | 402 | 3 | 0 | 0 | 7 | 10 | 100     | 100     | 100   | 100     |
| 34      | Fadilat Menghafal Qur'an                           | 453 | 452 | 460 | 451 | 452 | 453 | 2 | 1 | 1 | 6 | 10 | 66,67   | 66,67   | 80    | 66,67   |
| 35      | Shalat Sunnat                                      | 480 | 447 | 413 | 480 | 420 | 447 | 2 | 1 | 1 | 6 | 10 | 66,67   | 66,67   | 80    | 66,67   |
| 36      | Shalat Dua Hari Raya                               | 508 | 509 | 507 | 510 | 508 | 509 | 2 | 1 | 1 | 6 | 10 | 66,67   | 66,67   | 80    | 66,67   |
| 37      | Shalat Malam                                       | 436 | 432 | 428 | 432 | 433 | 428 | 2 | 1 | 1 | 6 | 10 | 66,67   | 66,67   | 80    | 66,67   |
| 38      | Menjamak Shalat                                    | 411 | 409 | 410 | 411 | 409 | 410 | 3 | 0 | 0 | 7 | 10 | 100     | 100     | 100   | 100     |
| 39      | Cara Sujud Tilawah                                 | 341 | 338 | 340 | 338 | 339 | 341 | 2 | 1 | 1 | 6 | 10 | 66,67   | 66,67   | 80    | 66,67   |
| 40      | Perubahan Arah Qiblat                              | 303 | 302 | 407 | 303 | 302 | 304 | 2 | 1 | 1 | 6 | 10 | 66,67   | 66,67   | 80    | 66,67   |
| 41      | Shalat Sunnat yang dilarang                        | 473 | 474 | 475 | 473 | 474 | 475 | 3 | 0 | 0 | 7 | 10 | 100     | 100     | 100   | 100     |
| 42      | Hukum Shalat Memakai Sepatu                        | 325 | 155 | 403 | 155 |     |     | 1 | 0 | 2 | 7 | 10 | 100     | 33,33   | 80    | 50      |
| 43      | Imam Shalat  | 235 | 482 | 239 | 269 | 268 | 270 | 0 | 3 | 3 | 4 | 10 | 0       | 0       | 40    | 0       |
| 44      | Meminta Hujan                                      | 517 | 46  | 518 | 517 | 515 |     | 1 | 1 | 2 | 6 | 10 | 50      | 33,33   | 70    | 40      |
| 45      | Membersihkan Najis                                 | 189 | 210 | 166 | 162 | 166 | 189 | 2 | 1 | 1 | 6 | 10 | 66,67   | 66,67   | 80    | 66,67   |
| 46      | Wajib Mandi  | 487 | 199 | 196 | 197 | 199 | 196 | 2 | 1 | 1 | 6 | 10 | 66,67   | 66,67   | 80    | 66,67   |
| 47      | Shalat Gerhana                                     | 530 | 527 | 526 | 527 | 529 | 530 | 2 | 1 | 1 | 6 | 10 | 66,67   | 66,67   | 80    | 66,67   |
| 48      | Shalat di Kendaraan                                | 406 | 407 | 279 | 406 | 407 | 408 | 2 | 1 | 1 | 6 | 10 | 66,67   | 66,67   | 80    | 66,67   |
| 49      | Memandikan Orang Mati                              | 546 | 544 | 545 | 546 | 545 | 544 | 3 | 0 | 0 | 7 | 10 | 100     | 100     | 100   | 100     |
| 50      | Ingat Mati   | 72  | 85  | 560 | 58  | 85  | 534 | 1 | 2 | 2 | 5 | 10 | 33,33   | 33,33   | 60    | 33,33   |
| TOTAL   |  |     |     |     |     |     |     |   |   |   |   |    | 3416,72 | 2900,04 | 3960  | 3137,25 |
| AVERAGE |  |     |     |     |     |     |     |   |   |   |   |    | 68,34   | 58,01   | 79,21 | 61,14   |

Appendix 7: Table of calculation testing for top 3 data with query expansion

| CALCULATION TESTING WITH QUERY EXPANSION |  |   |     |     |  |     |     |    |    |    |    |       |        |           |          |           |
|--|--|---|-----|-----|--|-----|-----|----|----|----|----|-------|--------|-----------|----------|-----------|
| NO                                       | Query                                      | Ranked result in term of<br>hadith number |     |     | Ranked of ground truth in term<br>of hadith number |     |     | TP | TN | FP | FN | Total | Recall | Precision | Accuracy | F-Measure |
|  |  | 1   | 2   | 3   | 1  | 2   | 3   |    |    |    |    |       |        |           |          |           |
| 1  | Rukun Iman                                 | 23  | 28  | 22  | 28   | 29  | 47  | 1  | 2  | 2  | 5  | 10    | 33,33  | 33,33     | 60       | 33,33     |
| 2  | Rukun Islam                                | 9   | 24  | 25  | 9  | 6   | 25  | 2  | 1  | 1  | 6  | 10    | 66,67  | 66,67     | 80       | 66,67     |
| 3  | Menghormati Tetangga                       | 29  | 30  | 471 | 29   | 30  |     | 2  | 0  | 1  | 7  | 10    | 100    | 66,67     | 90       | 80        |
| 4  | Tanda Orang Munafik                        | 38  | 47  | 48  | 38   | 47  | 48  | 3  | 0  | 0  | 7  | 10    | 100    | 100       | 100      | 100       |
| 5  | Meratakan Saf Saat Shalat                  | 510                                       | 400 | 403 | 248  | 282 |     | 0  | 2  | 3  | 5  | 10    | 0      | 0         | 50       | 0         |
| 6  | Tanda Orang Beriman                        | 47  | 28  | 23  | 47   | 28  | 29  | 2  | 1  | 1  | 6  | 10    | 66,67  | 66,67     | 80       | 66,67     |
| 7  | Hukum Bunuh Diri                           | 95  | 55  | 175 | 69   | 70  | 55  | 1  | 2  | 2  | 5  | 10    | 33,33  | 33,33     | 60       | 33,33     |
| 8  | Syafaat Nabi                               | 122                                       | 121 | 126 | 122  | 121 | 126 | 3  | 0  | 0  | 7  | 10    | 100    | 100       | 100      | 100       |
| 9  | Ahli Surga                                 | 519                                       | 395 | 72  | 8  | 369 | 113 | 0  | 3  | 3  | 4  | 10    | 0      | 0         | 40       | 0         |
| 10                                       | Ahli Neraka                                | 72  | 127 | 116 | 72   | 127 | 115 | 2  | 1  | 1  | 6  | 10    | 66,67  | 66,67     | 80       | 66,67     |
| 11                                       | Anjuran Bersuci Sebelum Shalat             | 134                                       | 403 | 400 | 134  |     |     | 1  | 0  | 2  | 7  | 10    | 100    | 33,33     | 80       | 50        |
| 12                                       | Anjuran Bersiwak                           | 143                                       | 144 | 142 | 142  | 143 | 144 | 3  | 0  | 0  | 7  | 10    | 100    | 100       | 100      | 100       |
| 13                                       | Hukum Jilatan Anjing                       | 160                                       | 370 | 471 | 160  |     |     | 1  | 0  | 2  | 7  | 10    | 100    | 33,33     | 80       | 50        |
| 14                                       | Hukum Kencing Bayi                         | 163                                       | 164 |     | 163  | 164 |     | 2  | 0  | 0  | 8  | 10    | 100    | 100       | 100      | 100       |
| 15                                       | Hukum Menggauli Istri Saat Sedang Haidh    | 169                                       | 168 | 171 | 169  | 168 | 170 | 2  | 1  | 1  | 6  | 10    | 66,67  | 66,67     | 80       | 66,67     |
| 16                                       | Tata Cara Mandi Janabat                    | 177                                       | 183 | 171 | 183  | 181 | 182 | 1  | 2  | 2  | 5  | 10    | 33,33  | 33,33     | 60       | 33,33     |
| 17                                       | Menjaga Aurat                              | 549                                       | 295 | 422 | 195  | 194 |     | 0  | 2  | 3  | 5  | 10    | 0      | 0         | 50       | 0         |
| 18                                       | Cara Tayammum                              | 207                                       | 206 | 208 | 207  | 206 | 208 | 3  | 0  | 0  | 7  | 10    | 100    | 100       | 100      | 100       |
| 19                                       | Fadilat Shalat Jama'ah                     | 381                                       | 400 | 403 | 381  | 380 |     | 1  | 1  | 2  | 6  | 10    | 50     | 33,33     | 70       | 40        |
| 20                                       | Larangan Kencing dalam Air yang Menggenang | 161                                       | 151 | 543 | 161  |     |     | 1  | 0  | 2  | 7  | 10    | 100    | 33,33     | 80       | 50        |
| 21                                       | Larangan Berjalan didepan Orang Shalat     | 284                                       | 282 | 317 | 284  |     |     | 1  | 0  | 2  | 7  | 10    | 100    | 33,33     | 80       | 50        |
| 22                                       | Dosa Besar                                 | 80  | 53  | 364 | 53   | 364 |     | 2  | 0  | 1  | 7  | 10    | 100    | 66,67     | 90       | 80        |
| 23                                       | Bacaan dalam Shalat                        | 260                                       | 265 | 264 | 260  | 264 | 265 | 3  | 0  | 0  | 7  | 10    | 100    | 100       | 100      | 100       |
| 24                                       | Kewajiban Beriman kepada Allah             | 12  | 29  | 83  | 29   | 94  | 11  | 1  | 2  | 2  | 5  | 10    | 33,33  | 33,33     | 60       | 33,33     |
| 25                                       | Kewajiban Beriman kepada Rasulullah        | 12  | 27  | 83  | 27   |     |     | 1  | 0  | 2  | 7  | 10    | 100    | 33,33     | 80       | 50        |
| 26                                       | Adab Buang Air                             | 149                                       | 148 | 150 | 149  | 148 | 150 | 3  | 0  | 0  | 7  | 10    | 100    | 100       | 100      | 100       |

|         |  |     |     |     |     |     |     |   |   |   |   |    |         |         |      |         |
|---------|--|-----|-----|-----|-----|-----|-----|---|---|---|---|----|---------|---------|------|---------|
| 27      | Cara Membersihkan Kulit Bangkai                    | 205 | 189 | 154 | 205 |     |     | 1 | 0 | 2 | 7 | 10 | 100     | 33,33   | 80   | 50      |
| 28      | Amal yang Utama                                    | 50  | 24  | 25  | 50  | 51  | 24  | 2 | 1 | 1 | 6 | 10 | 66,67   | 66,67   | 80   | 66,67   |
| 29      | Mengangkat Kedua Tangan pada saat Takbiratul Ihram | 217 | 218 | 516 | 217 | 218 |     | 2 | 0 | 1 | 7 | 10 | 100     | 66,67   | 90   | 80      |
| 30      | Cara Berwudhu                                      | 135 | 136 | 437 | 135 | 136 | 176 | 2 | 1 | 1 | 6 | 10 | 66,67   | 66,67   | 80   | 66,67   |
| 31      | Larangan Bicara Ketika Shalat                      | 317 | 323 | 312 | 312 | 311 | 351 | 1 | 2 | 2 | 5 | 10 | 33,33   | 33,33   | 60   | 33,33   |
| 32      | Bacaan Dalam Ruku' dan Sujud                       | 272 | 275 | 220 | 220 | 275 | 234 | 2 | 1 | 1 | 6 | 10 | 66,67   | 66,67   | 80   | 66,67   |
| 33      | Shalatnya Orang Musafir                            | 400 | 398 | 402 | 400 | 398 | 402 | 3 | 0 | 0 | 7 | 10 | 100     | 100     | 100  | 100     |
| 34      | Fadilat Menghafal Qur'an                           | 451 | 453 | 370 | 451 | 452 | 453 | 2 | 1 | 1 | 6 | 10 | 66,67   | 66,67   | 80   | 66,67   |
| 35      | Shalat Sunnat                                      | 477 | 420 | 421 | 480 | 420 | 447 | 2 | 1 | 1 | 6 | 10 | 66,67   | 66,67   | 80   | 66,67   |
| 36      | Shalat Dua Hari Raya                               | 510 | 509 | 508 | 510 | 508 | 509 | 3 | 0 | 0 | 7 | 10 | 100     | 100     | 100  | 100     |
| 37      | Shalat Malam                                       | 432 | 439 | 433 | 432 | 433 | 428 | 2 | 1 | 1 | 6 | 10 | 66,67   | 66,67   | 80   | 66,67   |
| 38      | Menjamak Shalat                                    | 411 | 409 | 410 | 411 | 409 | 410 | 3 | 0 | 0 | 7 | 10 | 100     | 100     | 100  | 100     |
| 39      | Cara Sujud Tilawah                                 | 338 | 341 | 340 | 338 | 339 | 341 | 2 | 1 | 1 | 6 | 10 | 66,67   | 66,67   | 80   | 66,67   |
| 40      | Perubahan Arah Qiblat                              | 303 | 302 | 407 | 303 | 302 | 304 | 2 | 1 | 1 | 6 | 10 | 66,67   | 66,67   | 80   | 66,67   |
| 41      | Shalat Sunnat yang dilarang                        | 477 | 475 | 473 | 473 | 474 | 475 | 2 | 1 | 1 | 6 | 10 | 66,67   | 66,67   | 80   | 66,67   |
| 42      | Hukum Shalat Memakai Sepatu                        | 155 | 403 | 370 | 155 |     |     | 1 | 0 | 2 | 7 | 10 | 100     | 33,33   | 80   | 50      |
| 43      | Imam Shalat  | 503 | 269 | 268 | 269 | 268 | 270 | 2 | 1 | 1 | 6 | 10 | 66,67   | 66,67   | 80   | 66,67   |
| 44      | Meminta Hujan                                      | 517 | 46  | 518 | 517 | 515 |     | 1 | 1 | 2 | 6 | 10 | 50      | 33,33   | 70   | 40      |
| 45      | Membersihkan Najis                                 | 189 | 162 | 154 | 162 | 166 | 189 | 2 | 1 | 1 | 6 | 10 | 66,67   | 66,67   | 80   | 66,67   |
| 46      | Wajib Mandi  | 487 | 489 | 197 | 197 | 199 | 196 | 1 | 2 | 2 | 5 | 10 | 33,33   | 33,33   | 60   | 33,33   |
| 47      | Shalat Gerhana                                     | 527 | 530 | 529 | 527 | 529 | 530 | 3 | 0 | 0 | 7 | 10 | 100     | 100     | 100  | 100     |
| 48      | Shalat di Kendaraan                                | 406 | 279 | 407 | 406 | 407 | 408 | 2 | 1 | 1 | 6 | 10 | 66,67   | 66,67   | 80   | 66,67   |
| 49      | Memandikan Orang Mati                              | 546 | 183 | 544 | 546 | 545 | 544 | 2 | 1 | 1 | 6 | 10 | 66,67   | 66,67   | 80   | 66,67   |
| 50      | Ingat Mati   | 58  | 85  | 534 | 58  | 85  | 534 | 3 | 0 | 0 | 7 | 10 | 100     | 100     | 100  | 100     |
| TOTAL   |  |     |     |     |     |     |     |   |   |   |   |    | 3633,37 | 3033,35 | 4030 | 3306,36 |
| AVERAGE |  |     |     |     |     |     |     |   |   |   |   |    | 72,67   | 60,67   | 80,6 | 64,07   |

Appendix 8: Table of calculation testing for top 1 data without query expansion

|    |  | CALCULATION TESTING WITHOUT QUERY EXPANSION  |   |    |    |    |    |       |        |           |          |                                     |           |  |
|----|--|--|---|----|----|----|----|-------|--------|-----------|----------|-------------------------------------|-----------|--|
| NO | Query                                      | Ranked result in<br>term of hadith<br>number | Ranked of ground truth<br>in term of hadith<br>number | TP | TN | FP | FN | Total | Recall | Precision | Accuracy | Accuracy Based<br>on Correct Result | F-Measure |  |
|    |  | 1  | 1   |    |    |    |    |       |        |           |          |                                     |           |  |
| 1  | Rukun Iman                                 | 36   | 28  | 0  | 1  | 1  | 8  | 10    | 0      | 0         | 80       | 0                                   | 0         |  |
| 2  | Rukun Islam                                | 9  | 9   | 1  | 0  | 0  | 9  | 10    | 100    | 100       | 100      | 1                                   | 100       |  |
| 3  | Menghormati Tetangga                       | 29   | 29  | 1  | 0  | 0  | 9  | 10    | 100    | 100       | 100      | 1                                   | 100       |  |
| 4  | Tanda Orang Munafik                        | 38   | 38  | 1  | 0  | 0  | 9  | 10    | 100    | 100       | 100      | 1                                   | 100       |  |
| 5  | Meratakan Saf Saat Shalat                  | 248  | 248   | 1  | 0  | 0  | 9  | 10    | 100    | 100       | 100      | 1                                   | 100       |  |
| 6  | Tanda Orang Beriman                        | 47   | 47  | 1  | 0  | 0  | 9  | 10    | 100    | 100       | 100      | 1                                   | 100       |  |
| 7  | Hukum Bunuh Diri                           | 95   | 69  | 0  | 1  | 1  | 8  | 10    | 0      | 0         | 80       | 0                                   | 0         |  |
| 8  | Syafaat Nabi                               | 122  | 122   | 1  | 0  | 0  | 9  | 10    | 100    | 100       | 100      | 1                                   | 100       |  |
| 9  | Ahli Surga                                 | 8  | 8   | 1  | 0  | 0  | 9  | 10    | 100    | 100       | 100      | 1                                   | 100       |  |
| 10 | Ahli Neraka                                | 72   | 72  | 1  | 0  | 0  | 9  | 10    | 100    | 100       | 100      | 1                                   | 100       |  |
| 11 | Anjuran Bersuci Sebelum Shalat             | 269  | 134   | 0  | 1  | 1  | 8  | 10    | 0      | 0         | 80       | 0                                   | 0         |  |
| 12 | Anjuran Bersiwak                           | 143  | 142   | 1  | 0  | 0  | 9  | 10    | 100    | 100       | 100      | 1                                   | 100       |  |
| 13 | Hukum Jilatan Anjing                       | 160  | 160   | 1  | 0  | 0  | 9  | 10    | 100    | 100       | 100      | 1                                   | 100       |  |
| 14 | Hukum Kencing Bayi                         | 163  | 163   | 1  | 0  | 0  | 9  | 10    | 100    | 100       | 100      | 1                                   | 100       |  |
| 15 | Hukum Menggauli Istri Saat Sedang Haidh    | 169  | 169   | 1  | 0  | 0  | 9  | 10    | 100    | 100       | 100      | 1                                   | 100       |  |
| 16 | Tata Cara Mandi Janabat                    | 183  | 183   | 1  | 0  | 0  | 9  | 10    | 100    | 100       | 100      | 1                                   | 100       |  |
| 17 | Menjaga Aurat                              | 195  | 195   | 1  | 0  | 0  | 9  | 10    | 100    | 100       | 100      | 1                                   | 100       |  |
| 18 | Cara Tayammum                              | 207  | 207   | 1  | 0  | 0  | 9  | 10    | 100    | 100       | 100      | 1                                   | 100       |  |
| 19 | Fadilat Shalat Jama'ah                     | 381  | 381   | 1  | 0  | 0  | 9  | 10    | 100    | 100       | 100      | 1                                   | 100       |  |
| 20 | Larangan Kencing dalam Air yang Menggenang | 161  | 161   | 1  | 0  | 0  | 9  | 10    | 100    | 100       | 100      | 1                                   | 100       |  |
| 21 | Larangan Berjalan didepan Orang Shalat     | 285  | 284   | 0  | 1  | 1  | 8  | 10    | 0      | 0         | 80       | 0                                   | 0         |  |
| 22 | Dosa Besar                                 | 118  | 55  | 0  | 1  | 1  | 8  | 10    | 0      | 0         | 80       | 0                                   | 0         |  |
| 23 | Bacaan dalam Shalat                        | 265  | 260   | 0  | 1  | 1  | 8  | 10    | 0      | 0         | 80       | 0                                   | 0         |  |
| 24 | Kewajiban Beriman kepada Allah             | 12   | 29  | 0  | 1  | 1  | 8  | 10    | 0      | 0         | 80       | 0                                   | 0         |  |

|         |  |     |     |   |   |   |   |    |      |      |      |    |         |
|---------|--|-----|-----|---|---|---|---|----|------|------|------|----|---------|
| 25      | Kewajiban Beriman kepada Rasulullah                | 12  | 27  | 0 | 1 | 1 | 8 | 10 | 0    | 0    | 80   | 0  | 0       |
| 26      | Adab Buang Air                                     | 149 | 149 | 1 | 0 | 0 | 9 | 10 | 100  | 100  | 100  | 1  | 100     |
| 27      | Cara Membersihkan Kulit Bangkai                    | 205 | 205 | 1 | 0 | 0 | 9 | 10 | 100  | 100  | 100  | 1  | 100     |
| 28      | Amal yang Utama                                    | 50  | 50  | 1 | 0 | 0 | 9 | 10 | 100  | 100  | 100  | 1  | 100     |
| 29      | Mengangkat Kedua Tangan pada saat Takbiratul Ihram | 217 | 217 | 1 | 0 | 0 | 9 | 10 | 100  | 100  | 100  | 1  | 100     |
| 30      | Cara Berwudhu                                      | 135 | 135 | 1 | 0 | 0 | 9 | 10 | 100  | 100  | 100  | 1  | 100     |
| 31      | Larangan Bicara Ketika Shalat                      | 323 | 312 | 0 | 1 | 1 | 8 | 10 | 0    | 0    | 80   | 0  | 0       |
| 32      | Bacaan Dalam Ruku' dan Sujud                       | 220 | 220 | 1 | 0 | 0 | 9 | 10 | 100  | 100  | 100  | 1  | 100     |
| 33      | Shalatnya Orang Musafir                            | 400 | 400 | 1 | 0 | 0 | 9 | 10 | 100  | 100  | 100  | 1  | 100     |
| 34      | Fadilat Menghafal Qur'an                           | 453 | 451 | 0 | 1 | 1 | 8 | 10 | 0    | 0    | 80   | 0  | 0       |
| 35      | Shalat Sunnat                                      | 480 | 480 | 1 | 0 | 0 | 9 | 10 | 100  | 100  | 100  | 1  | 100     |
| 36      | Shalat Dua Hari Raya                               | 508 | 510 | 0 | 1 | 1 | 8 | 10 | 0    | 0    | 80   | 0  | 0       |
| 37      | Shalat Malam                                       | 436 | 432 | 0 | 1 | 1 | 8 | 10 | 0    | 0    | 80   | 0  | 0       |
| 38      | Menjamak Shalat                                    | 411 | 411 | 1 | 0 | 0 | 9 | 10 | 100  | 100  | 100  | 1  | 100     |
| 39      | Cara Sujud Tilawah                                 | 341 | 338 | 0 | 1 | 1 | 8 | 10 | 0    | 0    | 80   | 0  | 0       |
| 40      | Perubahan Arah Qiblat                              | 303 | 303 | 1 | 0 | 0 | 9 | 10 | 100  | 100  | 100  | 1  | 100     |
| 41      | Shalat Sunnat yang dilarang                        | 473 | 473 | 1 | 0 | 0 | 9 | 10 | 100  | 100  | 100  | 1  | 100     |
| 42      | Hukum Shalat Memakai Sepatu                        | 325 | 155 | 0 | 1 | 1 | 8 | 10 | 0    | 0    | 80   | 0  | 0       |
| 43      | Imam Shalat  | 235 | 269 | 0 | 1 | 1 | 8 | 10 | 0    | 0    | 80   | 0  | 0       |
| 44      | Meminta Hujan                                      | 517 | 517 | 1 | 0 | 0 | 9 | 10 | 100  | 100  | 100  | 1  | 100     |
| 45      | Membersihkan Najis                                 | 189 | 162 | 0 | 1 | 1 | 8 | 10 | 0    | 0    | 80   | 0  | 0       |
| 46      | Wajib Mandi  | 487 | 197 | 0 | 1 | 1 | 8 | 10 | 0    | 0    | 80   | 0  | 0       |
| 47      | Shalat Gerhana                                     | 530 | 527 | 0 | 1 | 1 | 8 | 10 | 0    | 0    | 80   | 0  | 0       |
| 48      | Shalat di Kendaraan                                | 406 | 406 | 1 | 0 | 0 | 9 | 10 | 100  | 100  | 100  | 1  | 100     |
| 49      | Memandikan Orang Mati                              | 546 | 546 | 1 | 0 | 0 | 9 | 10 | 100  | 100  | 100  | 1  | 100     |
| 50      | Ingat Mati   | 72  | 58  | 0 | 1 | 1 | 8 | 10 | 0    | 0    | 80   | 0  | 0       |
| TOTAL   |  |     |     |   |   |   |   |    | 3100 | 3100 | 4620 | 31 | 3710,36 |
| AVERAGE |  |     |     |   |   |   |   |    | 62   | 62   | 92,4 | 62 | 62      |



Appendix 9: Table of calculation testing for top 1 data with query expansion

|    |  | CALCULATION TESTING WITH QUERY EXPANSION     |   |    |    |    |    |       |        |           |          |                                     |           |  |
|----|--|--|---|----|----|----|----|-------|--------|-----------|----------|-------------------------------------|-----------|--|
| NO | Query                                      | Ranked result in<br>term of hadith<br>number | Ranked of ground truth<br>in term of hadith<br>number | TP | TN | FP | FN | Total | Recall | Precision | Accuracy | Accuracy Based<br>on Correct Result | F-Measure |  |
|    |  | 1  | 1   |    |    |    |    |       |        |           |          |                                     |           |  |
| 1  | Rukun Iman                                 | 23   | 28  | 0  | 1  | 1  | 8  | 10    | 0      | 0         | 80       | 0                                   | 0         |  |
| 2  | Rukun Islam                                | 9  | 9   | 1  | 0  | 0  | 9  | 10    | 100    | 100       | 100      | 1                                   | 100       |  |
| 3  | Menghormati Tetangga                       | 29   | 29  | 1  | 0  | 0  | 9  | 10    | 100    | 100       | 100      | 1                                   | 100       |  |
| 4  | Tanda Orang Munafik                        | 38   | 38  | 1  | 0  | 0  | 9  | 10    | 100    | 100       | 100      | 1                                   | 100       |  |
| 5  | Meratakan Saf Saat Shalat                  | 510  | 248   | 0  | 1  | 1  | 8  | 10    | 0      | 0         | 80       | 0                                   | 0         |  |
| 6  | Tanda Orang Beriman                        | 47   | 47  | 1  | 0  | 0  | 9  | 10    | 100    | 100       | 100      | 1                                   | 100       |  |
| 7  | Hukum Bunuh Diri                           | 95   | 69  | 0  | 1  | 1  | 8  | 10    | 0      | 0         | 80       | 0                                   | 0         |  |
| 8  | Syafaat Nabi                               | 122  | 122   | 1  | 0  | 0  | 9  | 10    | 100    | 100       | 100      | 1                                   | 100       |  |
| 9  | Ahli Surga                                 | 519  | 8   | 0  | 1  | 1  | 8  | 10    | 0      | 0         | 80       | 0                                   | 0         |  |
| 10 | Ahli Neraka                                | 72   | 72  | 1  | 0  | 0  | 9  | 10    | 100    | 100       | 100      | 1                                   | 100       |  |
| 11 | Anjuran Bersuci Sebelum Shalat             | 134  | 134   | 1  | 0  | 0  | 9  | 10    | 100    | 100       | 100      | 1                                   | 100       |  |
| 12 | Anjuran Bersiwak                           | 143  | 142   | 0  | 1  | 1  | 8  | 10    | 0      | 0         | 80       | 0                                   | 0         |  |
| 13 | Hukum Jilatan Anjing                       | 160  | 160   | 1  | 0  | 0  | 9  | 10    | 100    | 100       | 100      | 1                                   | 100       |  |
| 14 | Hukum Kencing Bayi                         | 163  | 163   | 1  | 0  | 0  | 9  | 10    | 100    | 100       | 100      | 1                                   | 100       |  |
| 15 | Hukum Menggauli Istri Saat Sedang Haidh    | 169  | 169   | 1  | 0  | 0  | 9  | 10    | 100    | 100       | 100      | 1                                   | 100       |  |
| 16 | Tata Cara Mandi Janabat                    | 177  | 183   | 0  | 1  | 1  | 8  | 10    | 0      | 0         | 80       | 0                                   | 0         |  |
| 17 | Menjaga Aurat                              | 549  | 195   | 0  | 1  | 1  | 8  | 10    | 0      | 0         | 80       | 0                                   | 0         |  |
| 18 | Cara Tayammum                              | 207  | 207   | 1  | 0  | 0  | 9  | 10    | 100    | 100       | 100      | 1                                   | 100       |  |
| 19 | Fadilat Shalat Jama'ah                     | 381  | 381   | 1  | 0  | 0  | 9  | 10    | 100    | 100       | 100      | 1                                   | 100       |  |
| 20 | Larangan Kencing dalam Air yang Menggenang | 161  | 161   | 1  | 0  | 0  | 9  | 10    | 100    | 100       | 100      | 1                                   | 100       |  |
| 21 | Larangan Berjalan didepan Orang Shalat     | 284  | 284   | 1  | 0  | 0  | 9  | 10    | 100    | 100       | 100      | 1                                   | 100       |  |
| 22 | Dosa Besar                                 | 80   | 55  | 0  | 1  | 1  | 8  | 10    | 0      | 0         | 80       | 0                                   | 0         |  |
| 23 | Bacaan dalam Shalat                        | 260  | 260   | 1  | 0  | 0  | 9  | 10    | 100    | 100       | 100      | 1                                   | 100       |  |
| 24 | Kewajiban Beriman kepada Allah             | 12   | 29  | 0  | 1  | 1  | 8  | 10    | 0      | 0         | 80       | 0                                   | 0         |  |

|         |  |     |     |   |   |   |   |    |      |      |      |    |         |
|---------|--|-----|-----|---|---|---|---|----|------|------|------|----|---------|
| 25      | Kewajiban Beriman kepada Rasulullah                | 12  | 27  | 0 | 1 | 1 | 8 | 10 | 0    | 0    | 80   | 0  | 0       |
| 26      | Adab Buang Air                                     | 149 | 149 | 1 | 0 | 0 | 9 | 10 | 100  | 100  | 100  | 1  | 100     |
| 27      | Cara Membersihkan Kulit Bangkai                    | 205 | 205 | 1 | 0 | 0 | 9 | 10 | 100  | 100  | 100  | 1  | 100     |
| 28      | Amal yang Utama                                    | 50  | 50  | 1 | 0 | 0 | 9 | 10 | 100  | 100  | 100  | 1  | 100     |
| 29      | Mengangkat Kedua Tangan pada saat Takbiratul Ihram | 217 | 217 | 1 | 0 | 0 | 9 | 10 | 100  | 100  | 100  | 1  | 100     |
| 30      | Cara Berwudhu                                      | 135 | 135 | 1 | 0 | 0 | 9 | 10 | 100  | 100  | 100  | 1  | 100     |
| 31      | Larangan Bicara Ketika Shalat                      | 317 | 312 | 0 | 1 | 1 | 8 | 10 | 0    | 0    | 80   | 0  | 0       |
| 32      | Bacaan Dalam Ruku' dan Sujud                       | 272 | 220 | 0 | 1 | 1 | 8 | 10 | 0    | 0    | 80   | 0  | 0       |
| 33      | Shalatnya Orang Musafir                            | 400 | 400 | 1 | 0 | 0 | 9 | 10 | 100  | 100  | 100  | 1  | 100     |
| 34      | Fadilat Menghafal Qur'an                           | 451 | 451 | 1 | 0 | 0 | 9 | 10 | 100  | 100  | 100  | 1  | 100     |
| 35      | Shalat Sunnat                                      | 477 | 480 | 0 | 1 | 1 | 8 | 10 | 0    | 0    | 80   | 0  | 0       |
| 36      | Shalat Dua Hari Raya                               | 510 | 510 | 1 | 0 | 0 | 9 | 10 | 100  | 100  | 100  | 1  | 100     |
| 37      | Shalat Malam                                       | 432 | 432 | 1 | 0 | 0 | 9 | 10 | 100  | 100  | 100  | 1  | 100     |
| 38      | Menjamak Shalat                                    | 411 | 411 | 1 | 0 | 0 | 9 | 10 | 100  | 100  | 100  | 1  | 100     |
| 39      | Cara Sujud Tilawah                                 | 338 | 338 | 1 | 0 | 0 | 9 | 10 | 100  | 100  | 100  | 1  | 100     |
| 40      | Perubahan Arah Qiblat                              | 303 | 303 | 1 | 0 | 0 | 9 | 10 | 100  | 100  | 100  | 1  | 100     |
| 41      | Shalat Sunnat yang dilarang                        | 477 | 473 | 0 | 1 | 1 | 8 | 10 | 0    | 0    | 80   | 0  | 0       |
| 42      | Hukum Shalat Memakai Sepatu                        | 155 | 155 | 1 | 0 | 0 | 9 | 10 | 100  | 100  | 100  | 1  | 100     |
| 43      | Imam Shalat  | 503 | 269 | 0 | 1 | 1 | 8 | 10 | 0    | 0    | 80   | 0  | 0       |
| 44      | Meminta Hujan                                      | 517 | 517 | 1 | 0 | 0 | 9 | 10 | 100  | 100  | 100  | 1  | 100     |
| 45      | Membersihkan Najis                                 | 189 | 162 | 0 | 1 | 1 | 8 | 10 | 0    | 0    | 80   | 0  | 0       |
| 46      | Wajib Mandi  | 487 | 197 | 0 | 1 | 1 | 8 | 10 | 0    | 0    | 80   | 0  | 0       |
| 47      | Shalat Gerhana                                     | 527 | 527 | 1 | 0 | 0 | 9 | 10 | 100  | 100  | 100  | 1  | 100     |
| 48      | Shalat di Kendaraan                                | 406 | 406 | 1 | 0 | 0 | 9 | 10 | 100  | 100  | 100  | 1  | 100     |
| 49      | Memandikan Orang Mati                              | 546 | 546 | 1 | 0 | 0 | 9 | 10 | 100  | 100  | 100  | 1  | 100     |
| 50      | Ingat Mati   | 58  | 58  | 1 | 0 | 0 | 9 | 10 | 100  | 100  | 100  | 1  | 100     |
| TOTAL   |  |     |     |   |   |   |   |    | 3300 | 3300 | 4660 | 33 | 3863,82 |
| AVERAGE |  |     |     |   |   |   |   |    | 66   | 66   | 93,2 | 66 | 66      |