

Documents

Khazani, M.M.M.^a, Mohamed, H.^a, Yusop, N.M.M.^b, Sembok, T.M.T.^a, Wani, S.^c, Halip, M.H.M.^a, Marzukhi, S.^a, Yunos, Z.^d

A Framework for Semantic Knowledge Representation of Al-Quran Based on Word Dependencies

(2021) *Proceedings - CAMP 2021: 2021 5th International Conference on Information Retrieval and Knowledge Management: Digital Technology for IR 4.0 and Beyond*, pp. 8-13. Cited 2 times.

DOI: 10.1109/CAMP51653.2021.9497925

^a National Defence University of Malaysia, Cyber Security and Digital Industrial Revolution Centre, Kuala Lumpur, Malaysia

^b National Defence University of Malaysia, Faculty of Defense Science and Technology, Kuala Lumpur, Malaysia

^c International Islamic University Malaysia, Kuliyah of Ict, Kuala Lumpur, Malaysia

^d CyberSecurity Malaysia, Selangor, Malaysia

Abstract

A variety of applications have been built in recent years with the aim to extract knowledge from Al-Quran. Current knowledge representations of Al-Quran give attention primarily on conceptual ontology models that describe the semantic relations between the Quranic concepts or entities. There seems to be minimal effort towards recognizing the semantic relations between words in Quranic text, which is relatively more complex. This paper aims to present a framework for semantic knowledge representation of Al-Quran using dependency relations between words, in an attempt to boost the retrieval accuracy for Al-Quran. The semantic analysis is performed on Quranic verses according to word dependency relations using dependency parsing. Based on parsed dependencies, a set of rules are formulated to build a semantic graph of Surah Ali Imran of Al-Quran. The efficiency of the semantic representation was tested by developing a prototype question answering system. The framework was evaluated using precision and recall, First Hit Success, First Answer Reciprocal Rank and Total Reciprocal Rank by comparing the retrieved and actual answers. The results indicate that the performance of the proposed framework using word dependencies improves the semantic representation of knowledge. © 2021 IEEE.

Author Keywords

Al-Quran; dependency parsing; knowledge representation; question answering system; semantic

Index Keywords

Character recognition, Information retrieval, Knowledge management, Natural language processing systems, Semantics; Dependency parsing, Dependency relation, Precision and recall, Question answering systems, Retrieval accuracy, Semantic knowledge, Semantic representation, Word dependency relations; Knowledge representation

References

- Brachman, R.J., Levesque, H.J.
(2004) *Knowledge Representation and Reasoning*,
San Francisco: Elsevier
- Singh, M., Kangri Vishwavidyalaya, G., Tanwar, P., Prasad, T.V., Aswal, M.S., Professor, A.
Comparative study of three declarative knowledge representation techniques
(2010) *Artic. Int. J. Adv. Trends Comput. Sci. Eng*,
- **Techniques of knowledge representation**
JavaTpoint,
JavaTpoint, [Accessed: 24-Sep-2020]
- Nguyen, H.T., Nguyen, V.H., Vu, V.A.
A knowledge representation for vietnamese legal document system
(2017) *Proc.-2017 9th Int. Conf. Knowl. Syst. Eng. Kse 2017*, pp. 30-35.
2017-Janua
- Hammo, B., Lytinen, S.
Qarab: A question answering system to support the arabic language
(2002) *ACL2002Computational Approaches to Semit. Lang*,

- Abdelnasser, H.
Al-bayan : An arabic question answering system for the holy quran
(2014) *Proceedings of the Emnlp 2014 Workshop on Arabic Natural Language Processing (ANLP)*, pp. 57-64.
- Hakkoum, A., Raghay, S.
Semantic q&a system on the qur'an
(2016) *Arab. J. Sci. Eng*,
- Ta'a, A., Abed, Q.A., Ahmad, M.
Al-quran ontology based on knowledge themes
(2018) *J. Fundam. Appl. Sci*,
- Wani, S., Mohd, T., Sembok, T., Wahiddin, M.R.
Constructing a knowledge base for al-qur ' an utilizing principles of human communication
(2018) *2018 Fourth Int. Conf. Inf. Retr. Knowl. Manag*, pp. 1-5.
no. March
- Beirade, F., Azzoune, H., Zegour, D.E.
Semantic query for quranic ontology
(2019) *J. King Saud Univ.-Comput. Inf. Sci*, (40).
- Yauri, A.R., Kadir, R.A., Azman, A., Murad, M.A.A.
Semantic web application for historical concepts search in al-quran
(2014) *Int. J. Islam. Appl. Comput. Sci. Technol*,
- Hakkoum, A., Raghay, S.
Ontological approach for semantic modeling and querying the qur ' an
(2016) *Int. J. Islam. Appl. Comput. Sci. Technol*,
- Yauri, A.R., Kadir, R.A., Azman, A., Murad, M.A.A.
Ontology semantic approach to extraction of knowledge from holy quran
(2013) *2013 5th International Conference on Computer Science and Information Technology, Csit 2013-Proceedings*,
- Katalnikova, S., Novickis, L.
Choice of knowledge representation model for development of knowledge base: Possible solutions
(2018) *Int. J. Adv. Comput. Sci. Appl*,
- Wani, S., Wahiddin, M.R., Sembok, T.M.T.
Logico-linguistic semantic representation of documents
(2016) *Proc.-2016 IEEE 14th Int. Conf. Dependable, Auton. Secur. Comput. Dasc 2016, 2016 IEEE 14th Int. Conf. Pervasive Intell. Comput. PICom 2016, 2016 IEEE 2nd Int. Conf. Big Data*, pp. 773-780.
- Sakharov, A.
Hierarchical rules for knowledge representation and learning
(2019) *Proc.- IEEE 2nd Int. Conf. Artif. Intell. Knowl. Eng. Aike 2019*, pp. 167-171.
- Corcoglioni, F., Rospocher, M., Aproso, A.P.
A 2-phase frame-based knowledge extraction framework
(2016) *Proc. AcM Symp. Appl. Comput*, pp. 354-361.
04-08-April
- Crouch, R., Kalouli, A.-L.
(2018) *Named Graphs for Semantic Representation*,
- Perera, V., Chung, T., Kollar, T., Strubell, E.
Multi-task learning for parsing the alexa meaning representation language

(2018) *32nd Aaai Conference on Artificial Intelligence, Aaai 2018*,

- Rospocher, M.
Building event-centric knowledge graphs from news
(2016) *J. Web Semant*,
- Fernandes, D., Bernardino, J.
Graph databases comparison: Allegrograph, arangodb, infinitedb, neo4j, and orientdb
(2018) *Data 2018-Proceedings of the 7th International Conference on Data Science, Technology and Applications*,
- Saad, S., Salim, N., Zainal, H., Noah, S.A.M.
A framework for islamic knowledge via ontology representation
(2010) *Proceedings-2010 International Conference on Information Retrieval and Knowledge Management: Exploring the Invisible World, CAMP'10*,
- Harrag, F., Al-Nasser, A., Al-Musnad, A., Al-Shaya, R., Al-Salman, A.S.
(2020) *Quran Intelligent Ontology Construction Approach Using Association Rules Mining*, arXiv
- Gruber, T.R.
Toward principles for the design of ontologies used for knowledge sharing bt-formal ontology in conceptual analysis and knowledge representation
(1993) *Form. Ontol. Concept. Anal. Knowl. Represent*,
- McCray, A.T.
An upper-level ontology for the biomedical domain
(2003) *Comparative and Functional Genomics*,
- Ameen, A., Khan, K.U.R., Rani, B.P.
Creation of ontology in education domain
(2012) *Proceedings-2012 IEEE 4th International Conference on Technology for Education, T4E 2012*,
- Alqahtani, M.M., Atwell, E.
Developing bilingual arabic-english ontologies of al-quran
(2018) *2nd IEEE International Workshop on Arabic and Derived Script Analysis and Recognition, Asar 2018*,
- Kadir, R.A.
(2007) *Question Answering for Reading Comprehension Using Logical Inference Model*, Universiti Kebangsaan Malaysia
- Charniak, E.
(2000) *Reading Comprehension Programs in a Statistical language-processing Class*,
- Riloff, E., Thelen, M.
(2000) *A Rule-based Question Answering System for Reading Comprehension Tests*,
- Yauri, A.R., Kadir, R.A., Azman, A., Murad, M.A.A.
Ontology semantic approach to extraction of knowledge from holy quran
(2013) *2013 5th Int. Conf. Comput. Sci. Inf. Technol. Csit 2013-Proc*, pp. 19-23.
- Safee, M.A.M.
Hybrid search approach for retrieving medical and health science knowledge from quran
(2018) *Int. J. Eng. Technol*,
- Gusmita, R.H., Durachman, Y., Harun, S., Firmansyah, A.F., Sukmana, H.T., Suhaimi, A.
A rule-based question answering system on relevant documents of indonesian

quran translation

(2014) *2014 International Conference on Cyber and It Service Management, Citsm 2014*,

- Alqahtani, M., Atwell, E.
Arabic quranic search tool based on ontology
 (2016) *Lecture Notes in Computer Science (Including Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*,
- Shmeisani, H., Tartir, S., Al-Na'ssaan, A., Naji, M.
Semantically answering questions from the holy quran
 (2014) *International Conference on Islamic Applications in Computer Science and Technology*,
- Alromima, W., Elgohary, R., Moawad, I.F., Aref, M.
Applying ontological engineering approach for arabic quran corpus: A comprehensive survey
 (2016) *2015 Ieee 7th International Conference on Intelligent Computing and Information Systems, Iicis 2015*,
- Hamed, S.K., Aziz, M.J.A.
A question answering system on holy quran translation based on question expansion technique and neural network classification
 (2016) *J. Comput. Sci*,
- Yusuf, N., Yunus, M.A.M., Wahid, N., Naw, N.M., Samsudin, N.A., Arbaiy, N.
Query expansion method for quran search using semantic search and lucene ranking
 (2020) *J. Eng. Sci. Technol*,
- Hakkoum, A., Raghay, S.
Advanced search in the qur'an using semantic modeling
 (2016) *Proceedings of IEEE/ACS International Conference on Computer Systems and Applications, Aiccsa*,
- Putra, S.J., Gusmita, R.H., Hullyyah, K., Sukmana, H.T.
A semantic-based question answering system for indonesian translation of quran
 (2016) *Acm International Conference Proceeding Series*,
- Utomo, F.S., Suryana, N., Azmi, M.S.
Question answering systems on holy quran: A review of existing frameworks, approaches, algorithms and research issues
 (2020) *Journal of Physics: Conference Series*,
- Stanojevic, S., Vranes, M.
A natural language processing for semantic web services
 (2005) *Eurocon 2005-The International Conference on "Computer As a Tool*, pp. 229-232.
- Rusli, A.S.M., Ridzuan, F., Zaki, Z.M., Sayuti, M.N.S.M., Salam, R.A.
A systematic review on semantic-based ontology for quranic knowledge
 (2018) *Int. J. Eng. Technol*,
- Wani, S.
Al-qur'an: Knowledge representation and question answering
 (2015) *International Islamic University Malaysia*,
- Ahmad, N.D., Bennett, B., Atwell, E.
Semantic-based ontology for malay qur'an reader
 (2016) *IMAN'2016 4th Int. Conf. Islam. Appl. Comput. Sci. Technol*,
- Adany, M.A.H., Atwell, E., Hamdelsayed, M.A., Atwell, E.
Islamic applications of automatic question-answering

(2015) *Sust J. Eng. Comput. Sci*,

- Liu, Z., Yang, L., Atwell, E.
The semantic annotation of the quran corpus based on hierarchical network of concepts theory
(2019) *Proc. 2018 Int. Conf. Asian Lang. Process. Ialp 2018*, pp. 318-321.
- Noordin, M.F., Sembok, T.M.T., Othman, R., Gusmita, R.H.
Constructing an ontology-based and graph-based knowledge representation of english quran
(2016) *J. Teknol*,
- Guia, J., Soares, V.G., Bernardino, J.
Graph databases: Neo4j analysis
(2017) *Iceis 2017-Proc. 19th Int. Conf. Enterp. Inf. Syst*, 1, pp. 351-356.
Iceis

Editors: Abd Rahman N., Mohd F., Yusoff R.C.M., Mansor H., Nordin S., Abu Bakar Z., Sembok T.M.T., Ahmad F., Yusof F.H.

Publisher: Institute of Electrical and Electronics Engineers Inc.

Conference name: 5th International Conference on Information Retrieval and Knowledge Management, CAMP 2021

Conference date: 15 June 2021 through 16 June 2021

Conference code: 171213

ISBN: 9781665412377

Language of Original Document: English

Abbreviated Source Title: Proc. - CAMP: Int. Conf. Inf. Retr. Knowl. Manag.: Digit. Technol. IR 4.0 Beyond
2-s2.0-85114964107

Document Type: Conference Paper

Publication Stage: Final

Source: Scopus

ELSEVIER

Copyright © 2025 Elsevier B.V. All rights reserved. Scopus® is a registered trademark of Elsevier B.V.

 **RELX Group™**