



AraFinNLP 2024:

The First Arabic Financial NLP Shared Task



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- | | |
|--|---|
| + Arabic Ontology | الأنطولوجيا العربية |
| + Lexicographic Databases (Qabas) | حوسبة المعاجم (قبس و150 معجم) |
| + Dialect Corpora (Currasat) | مدونة اللهجات العامية (كراسات) |
| + SinaTools | أدوات سينا |
| + Morphology Tagger (Alma) | المحلل الصرفي (ألمى) |
| + Word Sense Disambiguation (Salma) | المحلل الدلالي (سلمى) |
| + Named Entity Recognition (Wojood) | استخراج أسماء الاعلام (وجود) |
| + Relation Extraction | استخراج العلاقات |
| + Social Computing (Fada) | الإنسانيات الحاسوبية والتواصل الاجتماعي (فضا) |
| + Synonyms | استخراج المترادفات |
| + Chatbots and intent detection (AraBanking77) | المساعدات الآلية |

AraFinNLP 2024: The First Arabic Financial NLP Shared Task

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Abstract

The expanding financial markets of the Arab world require sophisticated Arabic NLP tools. To address this need within the banking domain, the Arabic Financial NLP (AraFinNLP) shared task proposes two subtasks: (i) Multi-dialect Intent Detection and (ii) Cross-dialect Translation and Intent Preservation. This shared task uses the updated ArBanking77 dataset, which includes about 39k parallel queries in MSA and four dialects. Each query is labeled with one or more of a common 77 intents in the banking domain. These resources aim to foster the development of robust financial Arabic NLP, particularly in the areas of machine translation and banking chat-bots. A total of 45 unique teams registered for this shared task, with 11 of them actively participated in the test phase. Specifically, 11 teams participated in Subtask 1, while only 1 team participated in Subtask 2. The winning team of Subtask 1 achieved F_1 score of 0.8773, and the only team submitted in Subtask 2 achieved a 1.667 BLEU score.

1 Introduction

Financial Natural Language Processing (FinNLP) is revolutionising the financial sector, offering unmatched potential to enhance decision-making, manage risks, and drive operational efficiency (Zavitsanos et al., 2023). By leveraging advanced linguistic analysis (Malaysha et al., 2024) and NLP algorithms (Barbon Junior et al., 2024), FinNLP optimises processes and streamlines workflows, delivering a myriad of benefits (Darwish et al., 2021). FinNLP enables the extraction of key information, including events (Aljabari et al., 2024), relationships (Jarrar, 2021), and named entities (Liqreina et al., 2023), from diverse sources such as financial reports, news articles, invoices, and social media posts.

Practical applications of Financial NLP include textual analysis in accounting and finance (Loughran and McDonald, 2016; El-Haj et al.,

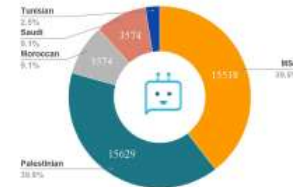


Figure 1: AraBanking2024 Datasets for Intent Detection

2019, 2020), analysis of financial transactions (Jørgensen and Igel, 2021), customer complaints (Jarrar, 2008), and text classification (Arslan et al., 2021; El-Haj et al., 2014). Nevertheless, as recently highlighted by Jørgensen et al. (2023); El-Haj et al. (2021), the majority of financial NLP research is conducted in English.

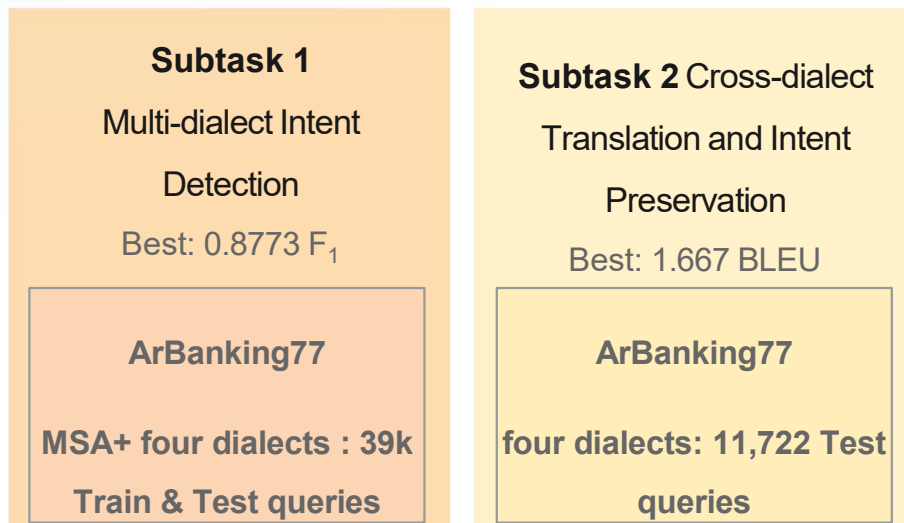
On the other hand, the Arab world's financial landscape is experiencing robust growth, attracting global attention and investment across diverse sectors. This expansion underscores the critical role of Financial NLP in understanding and interpreting the intricacies of Arabic financial communications. As highlighted by Zmandar et al. (2021, 2023), the dynamic nature of Middle Eastern stock markets reflects the region's evolving financial environment, necessitating advanced NLP tools tailored to local linguistic nuances.

In this paper, we provide an overview of the AraFinNLP-2024 Shared Task¹, which represents a significant step forward in advancing the development of Arabic NLP capabilities within the finance domain. We propose two subtasks aimed at addressing key challenges in the banking sector: (i) Multi-dialect Intent Detection and (ii) Cross-dialect Translation and Intent Preservation. For this shared task, we provided participants access

¹Task: <https://sna.birzeit.edu/arbanking77/ara/finlp/>

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AraFinNLP2024 Shared Task



- **Subtask-1 Multi-dialect Intent Detection:**

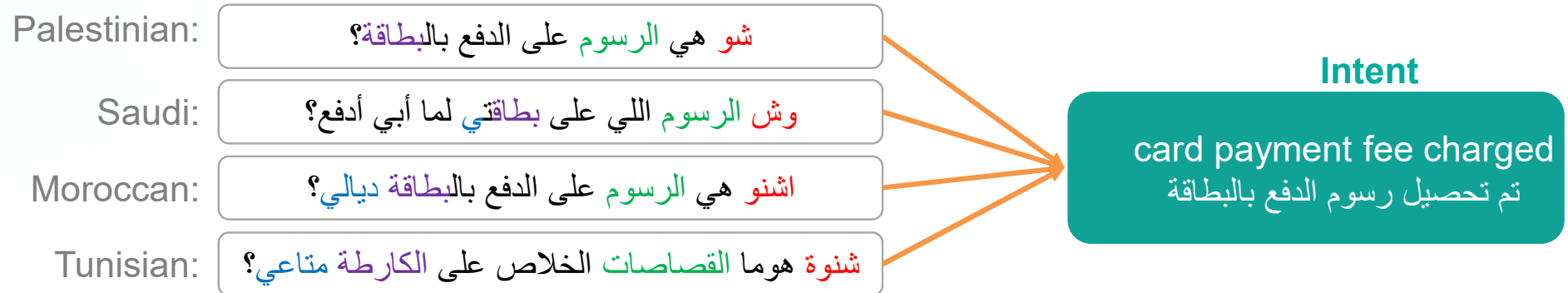
Participants receive customer queries from a diverse Arabic dialects in the banking domain and classify them into a 77 common intents in the banking domain.

- **Subtask-2 Cross-dialect Translation and Intent**

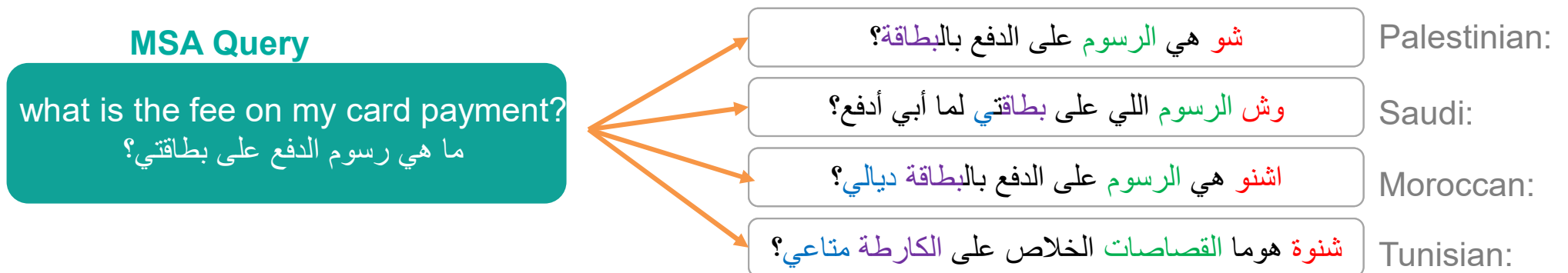
Preservation: participants translate queries from MSA language to various Arabic dialects, ensuring the preservation of the original intent.

Task Description

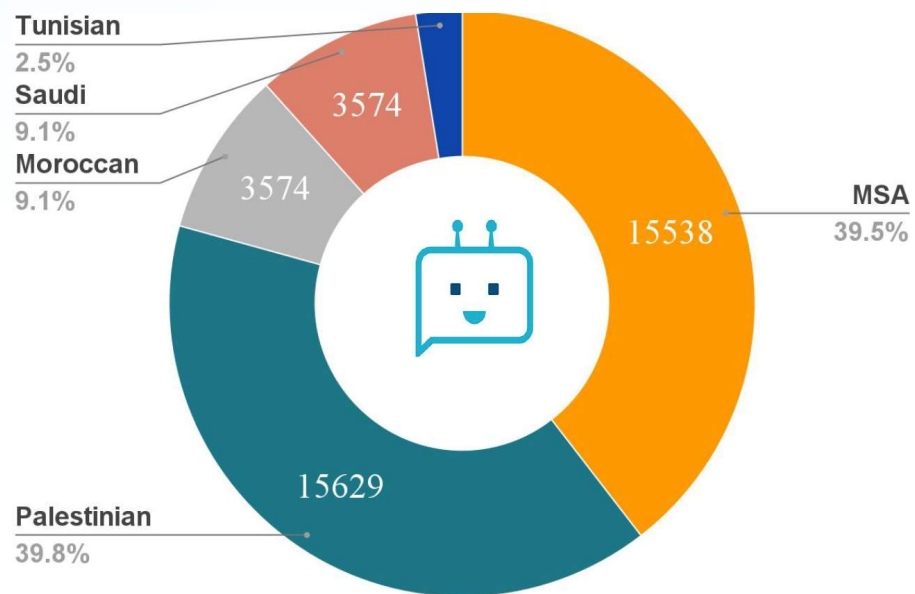
Subtask1: Multi-dialect Intent Detection



Subtask2: Query Translation (MSA to dialects) and intent Preservation

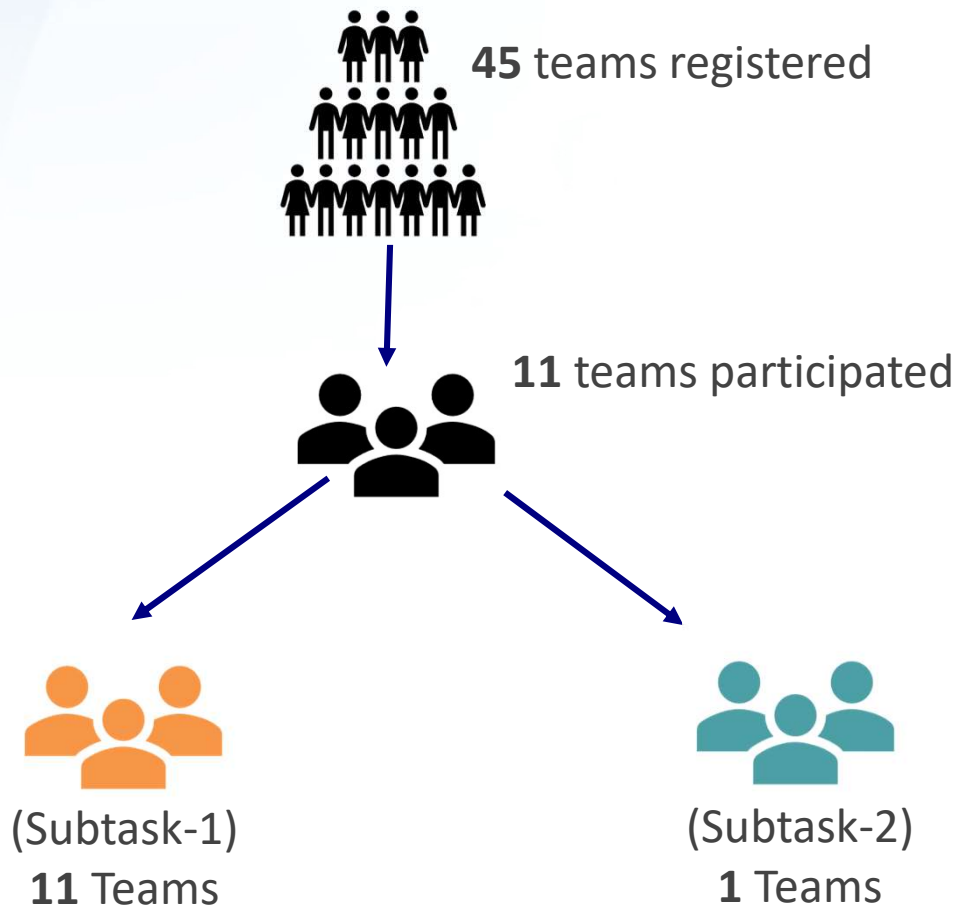


Shared Task Dataset (ArBanking77)



Dialect	Train	Development	Test
MSA	10,733	1,231	3,574
Palestinian	10,821	1,234	3,574
Saudi	--	--	3,574
Moroccan	--	--	3,574
Tunisian	--	--	1,000
Sum	21,554	2,465	15,296
Total	39,315 Queries		

Shared Task Teams & Results



Subtask1 Rank	Team	F ₁ score
1	MA	0.8773
2	AlexuNLP24	0.8762
3	BabelBot	0.8709
4	Sultan (no paper submission)	0.8342
5	SemanticCUETSync	0.8208
6	SENIT	0.8204
7	Fired_from_NLP	0.8014
8	Haithem (no paper submission)	0.7894
9	SMASH	0.7866
10	dzFinNlp	0.6721
11	BFCI	0.4907

Subtask2 Rank	Team	BLEU
1	AlexuNLP24	1.667

Participating Systems

- **Subtask-1:**
 - **Top team** used an ensemble of fine-tuned BERT-based models and augmented ArBanking77 dataset
 - **2nd team** made direct fine-tuning for QARiB and MARBERTv2 models
 - **3rd team** employed an encoder-only T5 model fine-tuned for the task
 - **4th team** has no paper submission
 - **5th team** implemented models using LSTM variants
 - **6th team** employed an ensemble technique combining MARBERTv2 and CAMeLBERT
 - **7th team** leveraged both machine learning and deep learning approaches
 - **8th team** has no paper submission
 - **9th team** utilized several BERT and BART-based models showing best for MARBERTv2
 - **10th team** explored machine learning (LinearSVC with TF-IDF) and deep learning models (BiLSTM)
 - **11th team** used Multi-layer Perceptron, Stochastic Gradient Descent, and SVM achieved best
- **Subtask-2:** **Top team** tackled the task using various BERT and BART-based models.

Open Challenges

- **More data needed** to capture a wider range of Arabic dialectal variations.
- **Dedicated pre-trained models** for the Arabic banking domain are crucial to improve NLP accuracy.
- More **innovative techniques** are needed.

Thank You

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References

1. Tymaa Hammouda, Mustafa Jarrar, Mohammed Khalilia: SinaTools: Open Source Toolkit for Arabic Natural Language Understanding. In Proceedings of the 2024 AI in Computational Linguistics (ACLING 2024), Procedia Computer Science, Dubai. ELSEVIER.
2. Mustafa Jarrar, Diyam Akra, Tymaa Hammouda: ALMA: Fast Lemmatizer and POS Tagger for Arabic. In Proceedings of the 2024 AI in Computational Linguistics (ACLING 2024), Procedia Computer Science, Dubai. ELSEVIER.
3. Lina Duaibes, Areej Jaber, Mustafa Jarrar, Ahmad Qadi, Mais Qandeel: Sina at FigNews 2024: Multilingual Datasets Annotated with Bias and Propaganda. In Proceedings of the Second Arabic Natural Language Processing Conference (ArabicNLP 2024), Bangkok.
4. Wajdi Zaghouni, Mustafa Jarrar, Nizar Habash, Houda Bouamor, Imed Zitouni, Mona Diab, Samhaa El-Beltagy, Muhammed AbuOdeh: The FIGNEWS Shared Task on News Media Narratives. In Proceedings of the Second Arabic Natural Language Processing Conference (ArabicNLP 2024), Bangkok.
5. Sanad Malaysha, Mo El-Haj, Saad Ezzini, Mohammed Khalilia, Mustafa Jarrar, Sultan Nasser, Ismail Berrada, Houda Bouamor: AraFinNLP 2024: The First Arabic Financial NLP Shared Task. In Proceedings of the Second Arabic Natural Language Processing Conference (ArabicNLP 2024), Bangkok.
6. Mustafa Jarrar, Nagham Hamad, Mohammed Khalilia, Bashar Talafha, AbdelRahim Elmoady, Muhammad Abdul-Mageed: WojooodNER 2024: The Second Arabic Named Entity Recognition Shared Task. In Proceedings of the Second Arabic Natural Language Processing Conference (ArabicNLP 2024), Bangkok.
7. Mohammed Khalilia, Sanad Malaysha, Reem Suwaileh, Mustafa Jarrar, Alaa Aljabari, Tamer Elsayed, Imed Zitouni: ArabicNLU 2024: The First Arabic Natural Language Understanding Shared Task. In Proceedings of the Second Arabic Natural Language Processing Conference (ArabicNLP 2024), Bangkok.
8. Alaa Aljabari, Lina Duaibes, Mustafa Jarrar, Mohammed Khalilia: Event-Arguments Extraction Corpus and Modeling using BERT for Arabic. In Proceedings of the Second Arabic Natural Language Processing Conference (ArabicNLP 2024), Bangkok, Thailand. Association for Computational Linguistics.
9. Mustafa Jarrar, Tymaa Hammouda: Qabas: An Open-Source Arabic Lexicographic Database. In Proceedings of the 2024 Joint International Conference on Computational Linguistics, Language Resources and Evaluation (LREC-COLING 2024), pages 13363–13370. Association for Computational Linguistics.
10. Sanad Malaysha, Mustafa Jarrar, Mohammed Khalilia: NLU-STR at SemEval-2024 Task 1: Generative-based Augmentation and Encoder-based Scoring for Semantic Textual Relatedness In Proceedings of the SemEval 2024 Shared Task 1 (Semantic Relatedness) (SemEval 2024), Bangkok.
11. Sylvio Barbon Junior, Paolo Ceravolo, Sven Groppe, Mustafa Jarrar, Samira Maghool, Florence Sèdes, Soror Sahri, and Maurice Van Keulen: Are Large Language Models the New Interface for Data Pipelines? In Proceedings of the International Workshop on Big Data Analytics in Natural Language Processing (BigDLN 2023), Bangkok.
12. Mustafa Jarrar, Sanad Malaysha, Tymaa Hammouda, Mohammed Khalilia: SALMA: Arabic Sense-Annotated Corpus and WSD Benchmarks. In Proceedings of the 1st Arabic Natural Language Processing Conference (ArabicNLP), Part of the EMNLP 2023. ACL.
13. Amal Nayouf, Tymaa Hammouda, Mustafa Jarrar, Fadi Zaraket, Mohamad-Bassam Kurdy: Nàbra: Syrian Arabic Dialects with Morphological Annotations. In Proceedings of the 1st Arabic Natural Language Processing Conference (ArabicNLP), Part of the EMNLP 2023. ACL.
14. Mustafa Jarrar, Ahmet Birim, Mohammed Khalilia, Mustafa Erden, and Sana Ghanem: ArBanking77: Intent Detection Neural Model and a New Dataset in Modern and Dialectal Arabic. In Proceedings of the 1st Arabic Natural Language Processing Conference (ArabicNLP), Part of the EMNLP 2023. ACL.
15. Haneen Liqreina, Mustafa Jarrar, Mohammed Khalilia, Ahmed Oumar El-Shangiti, Muhammad AbdulMaged: Arabic Fine-Grained Entity Recognition. In Proceedings of the 1st Arabic Natural Language Processing Conference (ArabicNLP), Part of the EMNLP 2023. ACL.
16. Mustafa Jarrar, Muhammad Abdul-Mageed, Mohammed Khalilia, Bashar Talafha, AbdelRahim El-madany, Nagham Hamad, Alaa' Omar: WojooodNER 2023: The First Arabic Named Entity Recognition Shared Task. In Proceedings of the 1st Arabic Natural Language Processing Conference (ArabicNLP), Part of the EMNLP 2023. ACL.
17. Nouran Khallaf, Elin Arfon, Mo El-Haj, Jon Morris, Dawn Knight, Paul Rayson, Tymaa Hammouda, Mustafa Jarrar: Open-source thesaurus development for under-resourced languages: a Welsh case study. The 4th LDK Conference on Language, Data and Knowledge (LDK 2023), London.
18. Nagham Hamad, Mustafa Jarrar, Mohammed Khalilia, Nadim Nashif: Offensive Hebrew Corpus and Detection using BERT. The 20th ACS/IEEE International Conference on Computer Systems and Applications (AICCSA). IEEE. Egypt. 2023
19. Sana Ghanem, Mustafa Jarrar, Radi Jarrar, Ibrahim Bounhas: A Benchmark and Scoring Algorithm for Enriching Arabic Synonyms. The 12th International Global Wordnet Conference (GWC2023), Global Wordnet Association. (pp.274-283). San Sebastian, Spain, 2023
20. Sanad Malaysha, Mustafa Jarrar, Mohammed Khalilia: Context-Gloss Augmentation for Improving Arabic Target Sense Verification. The 12th International Global Wordnet Conference (GWC2023), Global Wordnet Association. (pp. 254-262). San Sebastian, Spain, 2023
21. Mustafa Jarrar, Mohammed Khalilia, Sana Ghanem: Wojoood: Nested Arabic Named Entity Corpus and Recognition using BERT. In Proceedings of the International Conference on Language Resources and Evaluation (LREC 2022), Marseille, France. 2022
22. Mustafa Jarrar, Fadi Zaraket, Tymaa Hammouda, Daanish Masood, Martin Waehlich: Lisan: Yemeni, Iraqi, Libyan, and Sudanese Arabic Dialect Corpora with Morphological Annotations. The 20th ACS/IEEE International Conference on Computer Systems and Applications (AICCSA). IEEE. Egypt. 2023
23. Karim El Haff, Mustafa Jarrar, Tymaa Hammouda, Fadi Zaraket: Curras + Baladi: Towards a Levantine Corpus. In Proceedings of the International Conference on Language Resources and Evaluation (LREC 2022), Marseille, France. 2022
24. Mustafa Jarrar: The Arabic Ontology - An Arabic Wordnet with Ontologically Clean Content. Applied Ontology Journal, 16:1, 1-26. IOS Press. 2021
25. Moustafa Al-Hajj, Mustafa Jarrar: ArabGlossBERT: Fine-Tuning BERT on Context-Gloss Pairs for WSD. In Proceedings of the International Conference on Recent Advances in Natural Language Processing (RANLP 2021). PP 40–48, 2021
26. Moustafa Al-Hajj, Mustafa Jarrar: LU-BZU at SemEval-2021 Task 2: Word2Vec and Lemma2Vec performance in Arabic Word-in-Context disambiguation. In Proceedings of the Fifteenth Workshop on Semantic Evaluation (SemEval2021) Task 2: Multilingual and Cross-Lingual Word-in-Context Disambiguation. Association for Computational Linguistics.
27. Eman Naser-Karajah, Nabil Arman, Mustafa Jarrar: Current Trends and Approaches in Synonyms Extraction: Potential Adaptation to Arabic. In Proceedings of the 2021 International Conference on Information Technology (ICIT). PP 748–755, Association for Computational Linguistics.
28. Mustafa Jarrar, Eman Karajah, Muhammad Khalifa, Khaled Shaalan: Extracting Synonyms from Bilingual Dictionaries. The 11th International Global Wordnet Conference (GWC2021), Global Wordnet Association. (pp. 215-222). Pretoria, South Africa, 2021
29. Kareem Darwish, Nizar Habash, Mourad Abbas, Hend Al-Khalifa, Husein T. Al-Natshah, Houda Bouamor, Karim Bouzoubaa, Violetta Cavalli-Sforza, Samhaa R. El-Beltagy, Wassim El-Hajj, Mustafa Jarrar, Hamdy Mubarak: A Panoramic Survey of Natural Language Processing in Arabic. In Proceedings of the 1st Arabic Natural Language Processing Conference (ArabicNLP), Part of the EMNLP 2023. ACL.
30. Mustafa Jarrar: Digitization of Arabic Lexicons. Arabic Language Status Report. UAE Ministry of Culture and Youth. Pages 214-2017. Dec 2020
31. Mustafa Jarrar, Hamzeh Amayreh: An Arabic-Multilingual Database with a Lexicographic Search Engine. The 24th International Conference on Applications of Natural Language to Information Systems (NLDB 2019). Pages(234-246). LNCS 11608, Springer. 2019
32. Mustafa Jarrar, Hamzeh Amayreh, John P. McCrae: Representing Arabic Lexicons in Lemon - a Preliminary Study. The 2nd Conference on Language, Data and Knowledge (LDK 2019). Pages(29-33). CEUR, Volume 2402. ISSN:1613-0073. Leipzig, Germany. 2019
33. Diana Alhafi, Anton Deik, Mustafa Jarrar: Usability Evaluation of Lexicographic e-Services. The 16th IEEE/ACS International Conference on Computer Systems and Applications (AICCSA). Pages(1-7). IEEE. Abu Dhabi, UAE. 2019
34. Mustafa Jarrar, Fadi Zaraket, Rami Asia, Hamzeh Amayreh: Diacritic-Based Matching of Arabic Words. ACM Asian and Low-Resource Language Information Processing. Volume 18, No 2, Pages(10:1-10:21), ACM, ISSN:2375-4699. December, 2018
35. Paolo Ceravolo, Antonia Azzini, Marco Angelini, Tiziana Catarci, Philippe Cudre-Mauroux, Ernesto Damiani, Alexandra Mazak, Maurice Van Keulen, Mustafa Jarrar, Giuseppe Santucci, Kai-Uwe Sattler, Monica Scannapieco, Manuel Wimmer, Robert Wrembel, Fadi Zaraket: Arabic Lexicons: A Survey. In Proceedings of the 1st Arabic Natural Language Processing Conference (ArabicNLP), Part of the EMNLP 2023. ACL.
36. Mustafa Jarrar: Search Engine for Arabic Lexicons. The 5th Conference on Translation and the Problematics of Cross-cultural Understanding. The Forum for Arab and International Relations. Doha, Qatar. December, 2018
37. Mustafa Jarrar, Werner Ceusters: Classifying Processes and Basic Formal Ontology. The 8th International Conference on Biomedical Ontology (ICBO), Newcastle, UK. September, 2017
38. Diab Abuaiadah, Dileep Rajendran, Mustafa Jarrar: Clustering Arabic Tweets for Sentiment Analysis. The 2017 IEEE/ACS 14th International Conference on Computer Systems and Applications. Pages(499-506). IEEE Computer Society. ISBN:9781538635810. (doi.org/10.1109/ICCSA.2017.8262222)
39. Mustafa Jarrar, Nizar Habash, Faeq Alrimawi, Diyam Akra, Nasser Zalmout: Curras: An Annotated Corpus for the Palestinian Arabic Dialect. Journal Language Resources and Evaluation. Pages(745-775). Volume(51), Issue(3). Springer (doi.org/10.1007/s10579-017-9579-0)
40. Mamoun Abu Helou, Matteo Palmorani, Mustafa Jarrar: Effectiveness of Automatic Translations for Cross-Lingual Ontology Mapping. Journal of Artificial Intelligence Research, Special Track on Cross-language Algorithms and Applications. Pages(165-208). Volume 67, Number 1, C. J. C. Burdick, Ed., AAAI Press, 2018
41. Mustafa Jarrar, Anton Deik: The Graph Signature: A Scalable Query Optimization Index for RDF Graph Databases Using Bisimulation and Trace Equivalence Summarization. International Journal on Semantic Web and Information Systems, 11(2), Pages(36-65). IGI Global, 2018
42. Mustafa Jarrar, Nizar Habash, Diyam Akra, Nasser Zalmout: Building a Corpus for Palestinian Arabic: a Preliminary Study. Arabic Natural Language Processing Workshop, at the Conference on Empirical Methods in Natural Language Processing (EMNLP 2014). Pages(100-109). Association for Computational Linguistics.
43. Mamoun Abu Helou, Matteo Palmorani, Mustafa Jarrar, Christiane Fellbaum: Towards Building Lexical Ontology via Cross-Language Matching. The 7th Conference on Global WordNet. Pages(346-354). Global WordNet Association. ISBN:7492329949978. Tartu, Estonia. 2014
44. Antonio Lucas Soares, Carla Sofia Pereira, Mustafa Jarrar (eds): Proceedings of the International Workshop on Ontology Content and Evaluation (OnToContent 2014). In OTM 2014 Workshops. Page 575. LNCS 8842, Springer. ISBN:9783662455494. October, 2014
45. Mustafa Jarrar and Marios D. Dikaiakos: A Query Formulation Language for the Data Web. The IEEE Transactions on Knowledge and Data Engineering. Volume 24, Number 4, Pages(783-798). IEEE Computer Society. April, 2012
46. Gianluca Elia, Mustafa Jarrar: Guest Editorial: Knowledge Management and e-Human Resources Practices for Innovation. The International Journal of Knowledge and Learning (IJKL). Pages(1-5). Volume (8), Number(1/2). Inderscience Publishers. 2012
47. Mustafa Jarrar, Amanda Hicks, Matteo Palmorani (eds): Proceedings of the International Workshop on Ontology Content and Evaluation (OnToContent 2012). In OTM 2012 Workshops. Page 419. LNCS 7567, Springer. ISBN:97836624336171. September, 2012
48. Mustafa Jarrar: Proceedings of the 1st Palestinian Conference on e-Governance and e-Services. Sina Institute at Birzeit University. June, 2012
49. Mustafa Jarrar: Building a Formal Arabic Ontology (Invited Paper). Proceedings of the Experts Meeting on Arabic Ontologies and Semantic Networks. ALECSO, Arab League. Tunisia. July, 2011
50. Mustafa Jarrar, Anton Deik, Bilal Faraj: Ontology-Based Data and Process Governance Framework -The Case of e-Government Interoperability in Palestine. The IFIP International Symposium on Data-Driven Process Discovery and Analysis (SIMPDA). Pages(83-90). Springer. 2019
51. Paolo Ceravolo, Chengfei Liu, Mustafa Jarrar, Kai-Uwe Sattler: Special Issue on Querying the Data Web -Novel techniques for querying structured data on the web. The World Wide Web Journal. Volume(14), Issue (5-6). Springer. ISSN:1573-1413. August, 2011