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Prof. Ibrahim Aljarah, PhD

| Professor | Highly Cited Researcher | Big Data Scientist | AI Technical Consultant |
Professor of Big Data Mining and Computational Intelligence
The University of Jordan
Research Lab: www.evo-ml.com

RESEARCHER INFORMATION

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Google Scholar Information: Citations: 9727 h-index: 47 10-index: 93

Scopus Information: Scopus Author ID: 36766902800 Citations: 6958 h-index: 39

PERSONAL DETAILS

Birth Oct 23, 1981

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Department of Artificial Intelligence
King Abdullah II School of Information Technology
The University of Jordan
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Research Gate https://www.researchgate.net/profile/Ibrahim_Aljarah

SUMMARY

IBRAHIM ALJARAH is a Highly Cited Researcher (Clarivate) / Big Data Scientist and AI Technical Consultant (European Union and UNESCO) and Professor of BIG Data Mining and Computational Intelligence at the University of Jordan. Furthermore, ALJARAH is currently the Head of Department of Artificial Intelligence at the University of Jordan, Jordan (First appointed Head). He obtained his PhD in computer science from the North Dakota State University, USA, in 2014. He also obtained his master degree in computer science and information systems from the Jordan University of Science and Technology - Jordan in 2006. He obtained the bachelor degree in Computer Science from Yarmouk University - Jordan, 2003. In 2017, He has co-founded The Evolutionary and Machine Learning (Evo-ML.com) Research group which counts 7 PhD and master students from the University of Jordan and collaborates with

many well-regarded and ambitious scholars from different countries across the world. In 2021, Aljarah has been selected among the Highly Cited Researchers in the world by Clarivate for his exceptional research influence, demonstrated by the production of multiple highly-cited papers that rank in the top 1% by citations for field and year in the Web of ScienceTM. He won UJ Distinguished Researcher Award in 2022 and won Ali Mango Award for Distinguished Researcher in 2020. In 2019, 2020, and 2021, he was recognized as one of the top researchers publishing in Scopus journals in the University of Jordan with 110+ publications in refereed international conferences and prestigious Q1 and Q2 ISI journals with high impact factor with over 9,700 citations and an H-index of 47. In addition, he has ranked amongst the top 2% scientists in the world and the one of top ten scientists in Jordan in Artificial Intelligence and Image Processing field, as per Stanford University Global Ranking 2020. He participated in many conferences in the field of data mining, machine learning, and Big data such as CEC, GECCO, EVOSTar, ECTA, CSIT, IEEE NABIC, CASON, and BIGDATA Congress. Furthermore, he contributed in many projects in USA such as Vehicle Class Detection System (VCDS), Pavement Analysis Via Vehicle Electronic Telemetry (PAVVET), and Farm Cloud Storage System(CSS) projects. His research focuses on data mining, Machine Learning, Cybersecurity, Information security, Big Data, MapReduce, Hadoop, Swarm intelligence, Evolutionary Computation, Social Network Analysis (SNA), and largescale distributed algorithms.

EDUCATION

PhD in Computer Science

2010-2014

North Dakota State University, Fargo, North Dakota, United States of America

Dissertation Title: MapReduce-Enabled Scalable Nature-Inspired Approaches For Clustering

Adviser: Prof. Simone A. Ludwig

GPA: 3.9

Master in Computer Science, and Information Systems

2003-2007

Jordan University of Science and Technology, Irbid, Jordan

Thesis Title: An Automatic Course Scheduling Approach Using Instructors' Preferences

Adviser: Dr. Ayad Salhie

Cumulative Average: 80.2

Bachelor in Computer Science

1999-2003

Yarmouk University, Irbid, Jordan

Cumulative Average: 78.2

Tawjihi (General Secondary Education Certificate)

1998-1999

Al-Mazar Secondary Boys School, Irbid, Jordan

Average Score: 81.2

WORK EXPERIENCE

Administrative Experiences

Head of Department of Artificial Intelligence (First appointed head)

Sep. 2022 - Present

King Abdullah II School of Information Technology

The University of Jordan, Amman, Jordan

Director of Open Educational Resources & Blended Learning Center

Aug. 2019 - Sep. 2020

The University of Jordan, Amman, Jordan

Assistant to Unit Director for Externally Funded Projects

Mar. 2018 - Aug. 2019

International Affairs Unit

The University of Jordan, Amman, Jordan

Acting Director

*International Affairs Unit
The University of Jordan, Amman, Jordan*

Sept. 2018 - Nov. 2018

Dean Assistant for Laboratory Affairs

*King Abdullah II School of Information Technology
The University of Jordan, Amman, Jordan*

Sep. 2017- Mar. 2018

Director of the University Website Content

The University of Jordan, Amman, Jordan

Sep 2014- Sep. 2015

Online\Automated Exams Administrator and Developer

*King Abdullah II for information and technology Faculty
The University of Jordan, Amman, Jordan*

Nov. 2006 - Dec. 2009

Website Administrator

*Language Center
The University of Jordan, Amman, Jordan*

Nov. 2006 - Dec. 2007

Academic Experiences**Professor**

*Department of Artificial Intelligence
King Abdullah II School of Information Technology
The University of Jordan, Amman, Jordan*

May 2022 - Present

Associate Professor

*Department of Information Technology
King Abdullah II School of Information Technology
The University of Jordan, Amman, Jordan*

May 2018 - May 2022

Assistant Professor

*Department of Information Technology
King Abdullah II School of Information Technology
The University of Jordan, Amman, Jordan*

Sep. 2014- May 2018

Lecturer

*Department of Information Technology
King Abdullah II School of Information Technology
The University of Jordan, Amman, Jordan*

May 2014- Sep. 2014

Teaching\Research Assistant

*Computer Science Department
North Dakota State University, Fargo, ND, USA*

Jan. 2010 - May 2014

Part-time lecturer

Jan. 2007 - Dec. 2009

Teacher

Al-Mazar Secondary Boys School
Ministry of Education, Jordan

2004-2006

Industry Experiences/Other Experiences

Artificial Intelligence Technical Consultant / Expert

European Union

Dec 2021 - Aug 2022

Duties include: Provide an advisory service to the Ministries of ICT for different countries, Reviewing Current policies and legislation, best regional and international practices in Artificial Intelligence Strategies, and AI international reports and Indices. Suggestion of an Artificial Intelligence Strategy based on best practices and local needs. Recommendation of best implementation mechanisms. Implementation Road map with milestones and KPIs to follow implementation progress

Information Communication Technology - ICT Specialist / Expert

UNESCO

Nov 2020 - Dec 2021

Duties include: Serving as the entry point for collecting source data and information for the preparation of the report. Preparing drafts of reports to be consolidated into the ICT Higher Education Insight report. Contribution to online/offline consultations

Computer hardware and software technician

NASA for computer technology center, Irbid, Jordan

2003-2006

Duties include: Computer Maintenance, and software installations.

AWARDS AND HONORS

UJ Distinguished Researcher Award

The University of Jordan

August 2022

UJ Distinguished Researcher Award is granted annually to encourage researchers to continue their efforts in enriching the different fields of science. The awards are granted in three fields: Science, Health, and Arts

The most highly cited researcher in Scopus in 2022

The University of Jordan

June 2022

Honored by The University of Jordan as one of the Top Ten publishing researchers in SCOPUS in the university in the last five years (2016-2021).

Ranked 2 out of 1700 faculty members ([Ranking Link @ JU](#))

Highly Cited Researchers Award

Clarivate Analytics

Nov. 2021

Selected among the Highly Cited Researchers in the world by Clarivate for the exceptional research influence, demonstrated by the production of multiple highly-cited papers that rank in the top 1% by citations for Computer Science field in the Web of Science ([List Link @ Clarivate](#))

Top 2% scientists in the world

Stanford University

October 2021

Ranked amongst the top 2% scientists in the world and the one of top ten scientists in Jordan in the field of Artificial Intelligence and Image Processing as per Stanford University Global Ranking. ([Ranking Link @ Elsevier](#))

The most highly cited researcher in Scopus in 2021

The University of Jordan

Dec. 2021

Honored by The University of Jordan as one of the Top Ten publishing researchers in SCOPUS in the university in the last five years (2014-2019).

Ranked 2 out of 1700 faculty members ([Ranking Link @ JU](#))

Top 2% scientists in the world

October 2020

Stanford University

Ranked amongst the top 2% scientists in the world and the one of top ten scientists in Jordan in the field of Artificial Intelligence and Image Processing as per Stanford University Global Ranking. ([Ranking Link @ PLOS](#))

Ali Mango Award for Distinguished Researcher

June 2020

Hamdi Mango Center for Academic Research, The University of Jordan

Ali Mango Award is granted annually through a generous donation to encourage researchers to continue their efforts in enriching the different fields of science. The awards are granted in three fields: Science, Medicine, and Dentistry, Pharmacy, and Graduate studies.

The most highly cited researcher in Scopus in 2020

June 2020

The University of Jordan

Honored by The University of Jordan as one of the Top Ten publishing researchers in SCOPUS in the university in the last five years (2014-2019).

Ranked 2 out of 1600 faculty members ([Ranking Link @ JU](#))

Top Ten highly Cited Researchers in Scopus in 2018

March 2019

The University of Jordan

Honored by The University of Jordan as one of the Top Ten publishing researchers in SCOPUS in the university in 2018.

Ranked 7 with 19 Scopus indexed publications in 2018

Top highly Cited Researchers in Google Scholar

Sep 2018

The University of Jordan

Honored by The University of Jordan as one of the most publishing researchers in Google Scholar in the university.

Ranked 121 out of 1600 (University level) with more than 60 Google Scholar indexed publications

Top highly Cited Researchers in Scopus

Jul 2018

The University of Jordan

Honored by The University of Jordan as one of the most publishing researchers in SCOPUS in the university

Ranked 56 out 1600 (University level) in the last five years (2013-2018)

PhD Scholarship

2010-2014

The University of Jordan

Granted by The University of Jordan to get the Ph.D degree in Computer Science from North Dakota State University, USA.

FUNDED PROJECTS

Employing data mining methods to improve the quality of the performance of the educational process at the University of Jordan

April, 2019 - August, 2021

The University of Jordan, Amman, Jordan

Summary of the project:Over the last few years, the educational data mining techniques have received considerable attention, where these techniques concerned with developing methods for exploring the unique and hidden information that come from educational data. The hidden information that extracted from the educational data are used then to support the decision makers to enhance the education process. Many data mining and analysis techniques have been proposed to extract hidden information from educational data. The objective of this project is to take advantage of data mining and data analytics to solve some of educational problems such as low student performance which is hinder the development of educational process. In this project, the data will be collected from the Admissions and Registration Unit at the University of Jordan. The data will be related to all aspects of the educational process such as student performance, the academic load of the instructors, the number of the registered courses, and other related data. Once the data collection phase has been completed, the data will be analyzed by applying intelligent methods by taking advantage of data mining techniques.

Funded By: Deanship of Academic Research, The University of Jordan

Budget: 8,000 JD (11,283 \$)

Duration: 2019 - 2021 (18 Months)

Lead Investigator: Hamad Alswalgah

Principal Investigators: Ibrahim Aljarah, Yazan Alshmailah, and Hossam Faris

Intelligent Evolutionary Approach for Hate Speech Detection in Arabic Social Media

Feb, 2019 - Feb, 2021

The University of Jordan, Amman, Jordan

Summary of the project: Recently the social media has become an essential part of our daily life activities , people can post and share their opinion on current world's event . Although of its many useful uses, the hate speech is a common problem in social media. It means that using hate words against group or individuals based on people race , gender or religion with intention of bringing harm and raise violence toward them. It's important that social media should provide a tool to detect hate speech since it has a huge impact on its targets. Detecting hate speech in English has been widely studied and presented by a large number of researchers, however the topic of hate speech detection in Arabic language has attracted little attention .This due the limited resources and NLP (Natural Language Processing) tools in Arabic, thus has drove our interest in proposing a tool for hate speech detection in Arabic social media . In this project, we use different machine learning and evolutionary algorithms to build efficient detectors/ models for hate speech contents.

Funded By: Deanship of Academic Research, The University of Jordan

Budget: 16,500 JD (23,000 \$)

Duration: 2019 - 2021(24 Months)

Lead Investigator: Ibrahim Aljarah

Principal Investigators: Bassam Hammo, Mohammed Abusharia, and Hossam Faris

PUBLICATIONS

Journals

***Corresponding Author**

1. Abdullah Alzaqebah, **Ibrahim Aljarah***, Omar Al-Kadi, and Robertas Damaševičius. A modified grey wolf optimization algorithm for an intrusion detection system. *Mathematics*, 10(6):999, 2022. (**Publisher:** MDPI, **Rank:** Q1)
2. Lakhan Dev Sharma, Vijay Kumar Bohat, Maria Habib, Ala' M. Al-Zoubi, Hossam Faris, and **Ibrahim Aljarah**. Evolutionary inspired approach for mental stress detection using eeg signal. *Expert Systems with Applications*, 197:116634, 2022. (**Publisher:** Elsevier, **Rank:** Q1)
3. Ruba Abu Khurma, **Ibrahim Aljarah***, Ahmad Sharieh, Mohamed Abd Elaziz, Robertas Damaševičius, and Tomas Krilavičius. A review of the modification strategies of the nature inspired algorithms for feature selection problem. *Mathematics*, 10(3):464, 2022. (**Publisher:** MDPI, **Rank:** Q1)
4. Bilal I Al-Ahmad, Al-Zoubi Ala'A, Md Faisal Kabir, Marwan Al-Tawil, and **Ibrahim Aljarah***. Swarm intelligence-based model for improving prediction performance of low-expectation teams in educational software engineering projects. *PeerJ Computer Science*, 8:e857, 2022. (**Publisher:** PeerJ, **Rank:** Q1)
5. Lina Alhmoud, Ruba Abu Khurma, Ala'M Al-Zoubi, and **Ibrahim Aljarah***. A real-time electrical load forecasting in jordan using an enhanced evolutionary feedforward neural network. *Sensors*, 21(18):6240, 2021. (**Publisher:** MDPI, **Rank:** Q1)
6. Issam Alhadid, Sufian Khwaldeh, Mohammad Al Rawajbeh, Evon Abu-Taieh, Ra'ed Masa'deh, and **Ibrahim Aljarah***. An intelligent web service composition and resource-optimization method using k-means clustering and knapsack algorithms. *Mathematics*, 9(17):2023, 2021. (**Publisher:** MDPI, **Rank:** Q2)
7. **Ibrahim Aljarah***, Hossam Faris, Ali Asghar Heidari, Majdi M Mafarja, Al-Zoubi Ala'M, Pedro A Castillo, and Juan J Merelo. A robust multi-objective feature selection model based on local neighborhood multi-verse optimization. *IEEE Access*, 2021. (**Publisher:** IEEE, **Rank:** Q1)

8. Neveen Mohammed Hijazi, Hossam Faris, and **Ibrahim Aljarah***. A parallel metaheuristic approach for ensemble feature selection based on multi-core architectures. *Expert Systems with Applications*, page 115290, 2021. (**Publisher:** Elsevier, **Rank:** Q1)
9. Ruba Abu Khurma, Hamad Alsawalqah, **Ibrahim Aljarah***, Mohamed Abd Elaziz, and Robertas Damaševičius. An enhanced evolutionary software defect prediction method using island moth flame optimization. *Mathematics*, 9(15):1722, 2021. (**Publisher:** MDPI, **Rank:** Q1)
10. Ruba Abu Khurma, Iman Almomani, and **Ibrahim Aljarah***. Iot botnet detection using salp swarm and ant lion hybrid optimization model. *Symmetry*, 13(8):1377, 2021. (**Publisher:** MDPI, **Rank:** Q1)
11. Bilal Abu-Salih, Marwan Al-Tawil, **Ibrahim Aljarah**, Hossam Faris, Pornpit Wongthongtham, Kit Yan Chan, and Amin Beheshti. Relational learning analysis of social politics using knowledge graph embedding. *Data Mining and Knowledge Discovery*, pages 1–40, 2021. (**Publisher:** Springer, **Rank:** Q1)
12. Bilal Al-Ahmad, Ala’M Al-Zoubi, Ruba Abu Khurma, and **Ibrahim Aljarah***. An evolutionary fake news detection method for covid-19 pandemic information. *Symmetry*, 13(6):1091, 2021. (**Publisher:** MDPI, **Rank:** Q1)
13. Lina Alhmoud, Abdul Raouf Al Dairy, Hossam Faris, and **Ibrahim Aljarah***. Prediction of hysteresis loop of barium hexaferrite nanoparticles based on neuroevolutionary models. *Symmetry*, 13(6):1079, 2021. (**Publisher:** MDPI, **Rank:** Q1)
14. Iman Almomani, Raneem Qaddoura, Maria Habib, Samah Alsoghyer, Alaa Al Khayer, **Ibrahim Aljarah***, and Hossam Faris. Android ransomware detection based on a hybrid evolutionary approach in the context of highly imbalanced data. *IEEE Access*, 9:57674–57691, 2021. (**Publisher:** IEEE, **Rank:** Q1)
15. Hai Tao, Maria Habib, **Ibrahim Aljarah**, Hossam Faris, Haitham Abdulmohsin Afan, and Zagher Mundher Yaseen. An intelligent evolutionary extreme gradient boosting algorithm development for modeling scour depths under submerged weir. *Information Sciences*, 2021. (**Publisher:** Elsevier, **Rank:** Q1)
16. Raneem Qaddoura, Hossam Faris, **Ibrahim Aljarah**, and Pedro A Castillo. Evocluster: An open-source nature-inspired optimization clustering framework. *SN Computer Science*, 2(3):1–12, 2021. (**Publisher:** Springer, **Rank:** NA)
17. Arwa Shawabkeh, Hossam Faris, **Ibrahim Aljarah***, Bilal Abu-Salih, Dabiah Alboaneen, and Nouh Alhindawi. An evolutionary-based random weight networks with taguchi method for arabic web pages classification. *Arabian Journal for Science and Engineering*, 46(4):3955–3980, 2021. (**Publisher:** Springer, **Rank:** Q2)
18. Ruba Abu Khurma, **Ibrahim Aljarah***, and Ahmad Sharieh. A simultaneous moth flame optimizer feature selection approach based on levy flight and selection operators for medical diagnosis. *Arabian Journal for Science and Engineering*, pages 1–26, 2021. (**Publisher:** Springer, **Rank:** Q2)
19. Thaer Thaher, Majdi Mafarja, Hamza Turabieh, Pedro A Castillo, Hossam Faris, and **Ibrahim Aljarah**. Teaching learning-based optimization with evolutionary binarization schemes for tackling feature selection problems. *IEEE Access*, 9:41082–41103, 2021. (**Publisher:** IEEE, **Rank:** Q1)
20. Al-Zoubi Ala’M, Mohammad A Hassonah, Ali Asghar Heidari, Hossam Faris, Majdi Mafarja, and **Ibrahim Aljarah**. Evolutionary competitive swarm exploring optimal support vector machines and feature weighting. *Soft Computing*, 25(4):3335–3352, 2021. (**Publisher:** Springer, **Rank:** Q2)

21. Ruba Abu Khurmaa, **Ibrahim Aljarah***, and Ahmad Sharieh. An intelligent feature selection approach based on moth flame optimization for medical diagnosis. *Neural Computing and Applications*, pages 1–40, 2020. (**Publisher:** Springer, **Rank:** Q1)
22. Israa Al-Badarneh, Maria Habib, **Ibrahim Aljarah**, and Hossam Faris. Neuro-evolutionary models for imbalanced classification problems. *Journal of King Saud University-Computer and Information Sciences*, 2020. (**Publisher:** Elsevier, **Rank:** Q1)
23. Sinan Q Salih, Maria Habib, **Ibrahim Aljarah**, Hossam Faris, and Zaher Mundher Yaseen. An evolutionary optimized artificial intelligence model for modeling scouring depth of submerged weir. *Engineering Applications of Artificial Intelligence*, 96:104012, 2020. (**Publisher:** Elsevier, **Rank:** Q1)
24. Raneem Qaddoura, Hossam Faris, and **Ibrahim Aljarah***. An efficient evolutionary algorithm with a nearest neighbor search technique for clustering analysis. *Journal of Ambient Intelligence and Humanized Computing*, pages 1–26, 2020. (**Publisher:** Springer, **Rank:** Q1)
25. Mohammed Eshtay, Hossam Faris, Ali Asghar Heidari, Al-Zoubi Ala’M, and **Ibrahim Aljarah**. Autorwn: automatic construction and training of random weight networks using competitive swarm of agents. *Neural Computing and Applications*, pages 1–18, 2020. (**Publisher:** Springer, **Rank:** Q1)
26. **Ibrahim Aljarah**, Maria Habib, Hossam Faris, Nailah Al-Madi, Ali Asghar Heidari, Majdi Mafarja, Mohamed Abd Elaziz, and Seyedali Mirjalili. A dynamic locality multi-objective salp swarm algorithm for feature selection. *Computers & Industrial Engineering*, page 106628, 2020. (**Publisher:** Elsevier, **Rank:** Q1)
27. **Ibrahim Aljarah**, Maria Habib, Neveen Hijazi, Hossam Faris, Raneem Qaddoura, Bassam Hammo, Mohammad Abushariah, and Mohammad Alfawareh. Intelligent detection of hate speech in arabic social network: A machine learning approach. *Journal of Information Science*, page 1, 2020. (**Publisher:** SAGE, **Rank:** Q2)
28. Hamad Alsawalqah, Neveen Hijazi, Mohammed Eshtay, Hossam Faris, Ahmed Al Radaideh, **Ibrahim Aljarah**, and Yazan Alshamaileh. Software defect prediction using heterogeneous ensemble classification based on segmented patterns. *Applied Sciences*, 10(5):1745, 2020. (**Publisher:** MDPI, **Rank:** Q2)
29. Enas F Rawashdeh, **Ibrahim Aljarah**, and Hossam Faris. A cooperative coevolutionary method for optimizing random weight networks and its application for medical classification problems. *Journal of Ambient Intelligence and Humanized Computing*, 2020. (**Publisher:** Springer, **Rank:** Q2)
30. Majdi Mafarja, Ali Asghar Heidari, Maria Habib, Hossam Faris, Thaer Thaher, and **Ibrahim Aljarah***. Augmented whale feature selection for iot attacks: Structure, analysis and applications. *Future Generation Computer Systems*, 2020. (**Publisher:** Elsevier, **Rank:** Q1)
31. Maria Habib, **Ibrahim Aljarah***, and Hossam Faris. A modified multi-objective particle swarm optimizer-based lévy flight: An approach toward intrusion detection in internet of things. *Arabian Journal for Science and Engineering*, 2020. (**Publisher:** Springer, **Rank:** Q2)
32. Hossam Faris, Maria Habib, Iman Almomani, Mohammed Eshtay, and **Ibrahim Aljarah**. Optimizing extreme learning machines using chains of salps for efficient android ransomware detection. *Applied Sciences*, 10(11):3706, 2020. (**Publisher:** MDPI, **Rank:** Q2)
33. Mohammad A. Hassonah, Rizik Al-Sayyed, Ali Rodan, Ala’ M. Al-Zoubi, **Ibrahim Aljarah***, and Hossam Faris. An efficient hybrid filter and evolutionary wrapper approach for sentiment analysis of various topics on twitter. *Knowledge-Based Systems*, page 105353, 2019. (**Publisher:** Elsevier, **Rank:** Q1)

34. Raneem Qaddoura, Hossam Faris, and **Ibrahim Aljarah***. An efficient clustering algorithm based on the k-nearest neighbors with an indexing ratio. *International Journal of Machine Learning and Cybernetics*, pages 1–40, 2019. (**Publisher:** Springer, **Rank:** Q1)
35. Majdi Mafarja, Asma Qasem, Ali Asghar Heidari, **Ibrahim Aljarah***, Hossam Faris, and Seyedali Mirjalili. Efficient hybrid nature-inspired binary optimizers for feature selection. *Cognitive Computation*, 12(1):150–175, 2020. (**Publisher:** Elsevier, **Rank:** Q1)
36. Hossam Faris, Ali Asghar Heidari, Al-Zoubi Ala’M, Majdi Mafarja, **Ibrahim Aljarah**, Mohammed Eshtay, and Seyedali Mirjalili. Time-varying hierarchical chains of salps with random weight networks for feature selection. *Expert Systems with Applications*, page 112898, 2019. (**Publisher:** Elsevier, **Rank:** Q1)
37. Rizik MH Al-Sayyed, Wadi’A Hijawi, Anwar M Bashiti, **Ibrahim Aljarah**, Nadim Obeid, and Omar Y Adwan. An investigation of microsoft azure and amazon web services from users’ perspectives. *International Journal of Emerging Technologies in Learning*, 14(10), 2019. (**Publisher:** Kassel University Press GmbH, **Rank:** Q2)
38. Hamouda Chantar, Majdi Mafarja, Hamad Alsawalqah, Ali Asghar Heidari, **Ibrahim Aljarah***, and Hossam Faris. Feature selection using binary grey wolf optimizer with elite-based crossover for arabic text classification. *Neural Computing and Applications*, pages 1–20. (**Publisher:** Springer, **Rank:** Q1)
39. Amaal Al Shorman, Hossam Faris, and **Ibrahim Aljarah***. Unsupervised intelligent system based on one class support vector machine and grey wolf optimization for iot botnet detection. *Journal of Ambient Intelligence and Humanized Computing*, pages 1–17, 2019. (**Publisher:** Springer, **Rank:** Q2)
40. Hossam Faris, Ruba Abukhurma, Waref Almanaseer, Mohammed Saadeh, Antonio M Mora, Pedro A Castillo, and **Ibrahim Aljarah***. Improving financial bankruptcy prediction in a highly imbalanced class distribution using oversampling and ensemble learning: a case from the spanish market. *Progress in Artificial Intelligence*, pages 1–23, 2019. (**Publisher:** Springer, **Rank:** Q2)
41. Mohammad Taradeh, Majdi Mafarja, Ali Asghar Heidari, Hossam Faris, **Ibrahim Aljarah**, Seyedali Mirjalili, and Hamido Fujita. An evolutionary gravitational search-based feature selection. *Information Sciences*, 2019. (**Publisher:** Elsevier, **Rank:** Q1)
42. **Ibrahim Aljarah***, Majdi Mafarja, Ali Asghar Heidari, Hossam Faris, and Seyedali Mirjalili. Clustering analysis using a novel locality-informed grey wolf-inspired clustering approach. *Knowledge and Information Systems*, pages 1–33, 2019. (**Publisher:** Springer, **Rank:** Q1)
43. Mohammed Azmi Al-Betar, **Ibrahim Aljarah**, Mohammed A. Awadallah, Hossam Faris, and Seyedali Mirjalili. Adaptive β -hill climbing for optimization. *Soft Computing*, Mar 2019. (**Publisher:** Springer, **Rank:** Q2)
44. Ali Asghar Heidari, Seyedali Mirjalili, Hossam Faris, **Ibrahim Aljarah**, Majdi Mafarja, and Huiling Chen. Harris hawks optimization: Algorithm and applications. *Future Generation Computer Systems*, 2019. (**Publisher:** Elsevier, **Rank:** Q1)
45. **Ibrahim Aljarah***, Hossam Faris, Seyedali Mirjalili, Nailah Al-Madi, Alaa Sheta, and Majdi Mafarja. Evolving neural networks using bird swarm algorithm for data classification and regression applications. *Cluster Computing*, pages 1–29, 2019. (**Publisher:** Springer, **Rank:** Q2)
46. Ali Asghar Heidari, **Ibrahim Aljarah**, Hossam Faris, Huiling Chen, Jie Luo, and Seyedali Mirjalili. An enhanced associative learning-based exploratory whale optimizer for global optimization. *Neural Computing and Applications*, pages 1–27, 2019. (**Publisher:** Springer, **Rank:** Q1)

47. Hossam Faris, Seyedali Mirjalili, and **Ibrahim Aljarah***. Automatic selection of hidden neurons and weights in neural networks using grey wolf optimizer based on a hybrid encoding scheme. *International Journal of Machine Learning and Cybernetics*, pages 1–20, 2019. (**Publisher:** Springer, **Rank:** Q2)
48. Majdi Mafarja, **Ibrahim Aljarah**, Hossam Faris, Abdelaziz I Hammouri, Al-Zoubi Ala'M, and Seyedali Mirjalili. Binary grasshopper optimisation algorithm approaches for feature selection problems. *Expert Systems with Applications*, 117:267–286, 2019. (**Publisher:** Elsevier, **Rank:** Q1)
49. Hossam Faris, Al-Zoubi Ala'M, Ali Asghar Heidari, **Ibrahim Aljarah**, Majdi Mafarja, Mohammad A Hassonah, and Hamido Fujita. An intelligent system for spam detection and identification of the most relevant features based on evolutionary random weight networks. *Information Fusion*, 48:67–83, 2019. (**Publisher:** Elsevier, **Rank:** Q1)
50. Mohammad Tubishat, Mohammad A. M. Abushariah, Norisma Idris, and **Ibrahim Aljarah**. Improved whale optimization algorithm for feature selection in arabic sentiment analysis. *Applied Intelligence*, 2018. (**Publisher:** Springer, **Rank:** Q2)
51. Mo'ath Alrefai, Hossam Faris, and **Ibrahim Aljarah***. Sentiment analysis for arabic language: A brief survey of approaches and techniques. *arXiv preprint arXiv:1809.02782*, 2018. (**Publisher:** arXiv, **Rank:** N/A)
52. Alaa F Sheta, Hossam Faris, and **Ibrahim Aljarah**. Estimating arma model parameters of an industrial process using meta-heuristic search algorithms. *International Journal of Engineering & Technology*, 7(3.10):187–194, 2018. (**Publisher:** SPC, **Rank:** Q4)
53. Majdi Mafarja, **Ibrahim Aljarah**, Ali Asghar Heidari, Hossam Faris, Philippe Fournier-Viger, Xiaodong Li, and Seyedali Mirjalili. Binary dragonfly optimization for feature selection using time-varying transfer functions. *Knowledge-Based Systems*, 161:185–204, 2018. (**Publisher:** Elsevier, **Rank:** Q1)
54. Ali Asghar Heidari, Hossam Faris, **Ibrahim Aljarah***, and Seyedali Mirjalili. An efficient hybrid multilayer perceptron neural network with grasshopper optimization. *Soft Computing*, pages 1–18, 2018. (**Publisher:** Springer, **Rank:** Q1)
55. **Ibrahim Aljarah**, Majdi Mafarja, Ali Asghar Heidari, Hossam Faris, Yong Zhang, and Seyedali Mirjalili. Asynchronous accelerating multi-leader salp chains for feature selection. *Applied Soft Computing*, 71:964–979, 2018. (**Publisher:** Elsevier, **Rank:** Q1)
56. Mohammed Azmi Al-Betar, Mohammed A Awadallah, Hossam Faris, **Ibrahim Aljarah**, and Abdelaziz I Hammouri. Natural selection methods for grey wolf optimizer. *Expert Systems with Applications*, 113:481–498, 2018. (**Publisher:** Elsevier, **Rank:** Q1)
57. Hossam Faris, Majdi M Mafarja, Ali Asghar Heidari, **Ibrahim Aljarah***, Al-Zoubi Ala'M, Seyedali Mirjalili, and Hamido Fujita. An efficient binary salp swarm algorithm with crossover scheme for feature selection problems. *Knowledge-Based Systems*, 154:43–67, 2018. (**Publisher:** Elsevier, **Rank:** Q1)
58. Sarah Shukri, Hossam Faris, **Ibrahim Aljarah***, Seyedali Mirjalili, and Ajith Abraham. Evolutionary static and dynamic clustering algorithms based on multi-verse optimizer. *Engineering Applications of Artificial Intelligence*, 72:54–66, 2018. (**Publisher:** Elsevier, **Rank:** Q1)
59. **Ibrahim Aljarah***, Al-Zoubi Ala'M, Hossam Faris, Mohammad A Hassonah, Seyedali Mirjalili, and Heba Saadeh. Simultaneous feature selection and support vector machine optimization using the grasshopper optimization algorithm. *Cognitive Computation*, pages 1–18, 2018. (**Publisher:** Springer, **Rank:** Q1)

60. Majdi Mafarja, **Ibrahim Aljarah***, Ali Asghar Heidari, Abdelaziz I Hammouri, Hossam Faris, Al-Zoubi Ala'M, and Seyedali Mirjalili. Evolutionary population dynamics and grasshopper optimization approaches for feature selection problems. *Knowledge-Based Systems*, 145:25–45, 2018. (**Publisher:** Elsevier, **Rank:** Q1)
61. Hossam Faris, **Ibrahim Aljarah**, Mohammed Azmi Al-Betar, and Seyedali Mirjalili. Grey wolf optimizer: a review of recent variants and applications. *Neural computing and applications*, pages 1–23, 2018. (**Publisher:** Elsevier, **Rank:** Q1)
62. Wadi' Hijawi, Hossam Faris, Ja'far Alqatawna, **Ibrahim Aljarah***, Ala'M Al-Zoubi, and Maria Habib. Emfet: E-mail features extraction tool. *arXiv preprint arXiv:1711.08521*, 2017. (**Publisher:** arXiv, **Rank:** N/A)
63. Seyedeh Zahra Mirjalili, Seyedali Mirjalili, Shahrzad Saremi, Hossam Faris, and **Ibrahim Aljarah**. Grasshopper optimization algorithm for multi-objective optimization problems. *Applied Intelligence*, 48(4):805–820, 2018. (**Publisher:** Springer, **Rank:** Q2)
64. Hossam Faris, **Ibrahim Aljarah***, and Seyedali Mirjalili. Improved monarch butterfly optimization for unconstrained global search and neural network training. *Applied Intelligence*, 48(2):445–464, 2018. (**Publisher:** Springer, **Rank:** Q2)
65. Hossam Faris, Mohammad A Hassonah, Al-Zoubi Ala'M, Seyedali Mirjalili, and **Ibrahim Aljarah**. A multi-verse optimizer approach for feature selection and optimizing svm parameters based on a robust system architecture. *Neural Computing and Applications*, 30(8):2355–2369, 2018. (**Publisher:** Springer, **Rank:** Q1)
66. **Ibrahim Aljarah**, Hossam Faris, and Seyedali Mirjalili. Optimizing connection weights in neural networks using the whale optimization algorithm. *Soft Computing*, 22(1):1–15, 2018. (**Publisher:** Springer, **Rank:** Q2)
67. Hossam Faris, **Ibrahim Aljarah**, Nailah Al-Madi, and Seyedali Mirjalili. Optimizing the learning process of feedforward neural networks using lightning search algorithm. *International Journal on Artificial Intelligence Tools*, 25(06):1650033, 2016. (**Publisher:** World Scientific, **Rank:** Q4)
68. **Ibrahim Aljarah***, Hossam Faris, Seyedali Mirjalili, and Nailah Al-Madi. Training radial basis function networks using biogeography-based optimizer. *Neural Computing and Applications*, 29(7):529–553, 2018. (**Publisher:** Springer, **Rank:** Q1)
69. Elaf Abu Amrieh, Thair Hamtini, and **Ibrahim Aljarah**. Mining educational data to predict student's academic performance using ensemble methods. *International Journal of Database Theory and Application*, 9(8):119–136, 2016. (**Publisher:** SERSC, **Rank:** Q4)
70. Bashar Awad Al-Shboul, Heba Hakh, Hossam Faris, **Ibrahim Aljarah**, and Hamad Alsawalqah. Voting-based classification for e-mail spam detection. *Journal of ICT Research and Applications*, 10(1):29–42, 2016. (**Publisher:** ITB, **Rank:** Q3)
71. Hossam Faris, **Ibrahim Aljarah**, and Seyedali Mirjalili. Training feedforward neural networks using multi-verse optimizer for binary classification problems. *Applied Intelligence*, 45(2):322–332, 2016. (**Publisher:** Springer, **Rank:** Q2)
72. Loai M Alnemer, Lama Rajab, and **Ibrahim Aljarah**. Conformal prediction technique to predict breast cancer survivability. *International Journal of Advanced Science and Technology*, 96:1–10, 2016. (**Publisher:** SERSC, **Rank:** N/A)
73. **Ibrahim Aljarah*** and Simone A Ludwig. A scalable mapreduce-enabled glowworm swarm optimization approach for high dimensional multimodal functions. *International Journal of Swarm Intelligence Research (IJSIR)*, 7(1):32–54, 2016. (**Publisher:** IGI Global, **Rank:** N/A)

74. Nazeeh Ghatasheh, Hossam Faris, **Ibrahim Aljarah**, and Rizik MH Al-Sayyed. Optimizing software effort estimation models using firefly algorithm. *Journal of Software Engineering and Applications*, 8(03):133, 2015. (**Publisher:** Scientific Research Publishing, **Rank:** Q4)
75. **Ibrahim Aljarah**, Ayiad Salhie, and Hossam Faris. An automatic course scheduling approach using instructors' preferences. *International Journal of Emerging Technologies in Learning (iJET)*, 7(1), 2012. (**Publisher:** IAOE, **Rank:** Q3)
76. Saeed Salem, Rami Alroobi, Shadi Banitaan, Loqmane Seridi, **Ibrahim Aljarah**, and James Brewer. Improving functional modules discovery by enriching interaction networks with gene profiles. *Current Bioinformatics*, 7(4), 2012. (**Publisher:** IAOE, **Rank:** Q3)

Conferences

1. Ruba Abu Khurma, **Ibrahim Aljarah**, Pedro A Castillo, and Khair Eddin Sabri. An enhanced opposition-based evolutionary feature selection approach. In *International Conference on the Applications of Evolutionary Computation (Part of EvoStar)*, pages 3–14. Springer, 2022
2. Ruba Abu Khurma, Mohammed A Awadallah, and **Ibrahim Aljarah***. Binary harris hawks optimisation filter based approach for feature selection. In *2021 Palestinian International Conference on Information and Communication Technology (PICICT)*, pages 59–64. IEEE, 2021
3. Ruba Abu Khurma, Khair Eddin Sabri, Pedro A Castillo, and **Ibrahim Aljarah**. Salp swarm optimization search based feature selection for enhanced phishing websites detection. In *Applications of Evolutionary Computation: 24th International Conference, EvoApplications 2021, Held as Part of EvoStar 2021, Virtual Event, April 7–9, 2021, Proceedings*, volume 12694, page 146. Springer Nature, 2021
4. Raneem Qaddoura., Hossam Faris., **Ibrahim Aljarah.**, J. J. Merelo., and Pedro A. Castillo. Empirical evaluation of distance measures for nearest point with indexing ratio clustering algorithm. In *Proceedings of the 12th International Joint Conference on Computational Intelligence - Volume 1: NCTA.*, pages 430–438. INSTICC, SciTePress, 2020
5. Ruba Abu Khurma., Pedro A. Castillo., Ahmad Sharieh., and **Ibrahim Aljarah**. New fitness functions in binary harris hawks optimization for gene selection in microarray datasets. In *Proceedings of the 12th International Joint Conference on Computational Intelligence - Volume 1: ECTA.*, pages 139–146. INSTICC, SciTePress, 2020
6. Ruba Abu Khurma., Pedro A. Castillo., Ahmad Sharieh., and **Ibrahim Aljarah**. Feature selection using binary moth flame optimization with time varying flames strategies. In *Proceedings of the 12th International Joint Conference on Computational Intelligence - Volume 1: ECTA.*, pages 17–27. INSTICC, SciTePress, 2020
7. Yazn Alshamaila, Maria Habib, **Ibrahim Aljarah**, Hamad Alsawalqah, Hossam Faris, and Anas AlSoud. An intelligent approach for the effect of social media on undergraduate students performance: A case study in the university of jordan. In *Proceedings of the 2020 6th International Conference on Computer and Technology Applications*, pages 102–108, 2020
8. Raneem Qaddoura, Hossam Faris, **Ibrahim Aljarah**, and Pedro A Castillo. Evocluster: An open-source nature-inspired optimization clustering framework in python. In *International Conference on the Applications of Evolutionary Computation (Part of EvoStar)*, pages 20–36. Springer, 2020
9. Ruba Abu Khurma, **Ibrahim Aljarah***, and Ahmad Sharieh. Rank based moth flame optimisation for feature selection in the medical application. In *2020 IEEE Congress on Evolutionary Computation (CEC)*, pages 1–8. IEEE, 2020

10. Maria Habib Hossam Faris, **Ibrahim Aljarah** and Pedro A. Castillo. Hate speech detection using word embedding and deep learning in the arabic language context. In *Proceedings of The International Conference on Pattern Recognition Applications and Methods*, 2020
11. Ruba AbuKhurma, **Ibrahim Aljarah*** and Ahmad Sharieh. An efficient moth flame optimization algorithm using chaotic maps for feature selection in the medical applications. In *Proceedings of The International Conference on Pattern Recognition Applications and Methods*, 2020
12. Reham. Barham and **Ibrahim Aljarah***. Link prediction based on whale optimization algorithm. In *2017 International Conference on New Trends in Computing Sciences (ICTCS)*, pages 55–60, Oct. 2018
13. Heba Hakh, **Ibrahim Aljarah***, and Bashar Al-Shboul. Online social media-based sentiment analysis for us airline companies. In *Proceedings of the New Trends in Information Technology (NTIT-2017), Amman, Jordan*, April 2017
14. Hamad Alsawalqah, Bashar Al-Shboul, Yazan Alshamaileh, Hossam Faris, **Ibrahim Aljarah**, and Ahmad Abadleh. A proposed index for evaluating component commonality for software product family. In *Proceedings of the New Trends in Information Technology (NTIT-2017), Amman, Jordan*, April 2017
15. Ghadeer AL-Sukkar, **Ibrahim Aljarah***, and Hamad Alsawalqah. Enhancing the arabic sentiment analysis using different preprocessing operators. In *Proceedings of the New Trends in Information Technology (NTIT-2017), Amman, Jordan*, April 2017
16. Hossam Faris, **Ibrahim Aljarah**, Sayedali Mirjalili, Pedro Castillo, and J.J Merele. Evolopy: An open-source nature-inspired optimization framework in python. In *In Proceedings of the 8th International Joint Conference on Computational Intelligence ECTA, Portugal*, volume 3, pages 171–177, April 2016
17. Laila. M. Qaisi and **Ibrahim Aljarah***. A twitter sentiment analysis for cloud providers: A case study of azure vs. aws. In *2016 7th International Conference on Computer Science and Information Technology (CSIT)*, pages 1–6, July 2016
18. Hossam Faris, **Ibrahim Aljarah***, and Ja’far Alqatawna. Optimizing feedforward neural networks using krill herd algorithm for e-mail spam detection. In *2015 IEEE Jordan Conference on Applied Electrical Engineering and Computing Technologies (AEECT)*, pages 1–5, Nov 2015
19. Sarah. E. Shukri, Rawan. I. Yaghi, **Ibrahim Aljarah***, and Hamad Alsawalqah. Twitter sentiment analysis: A case study in the automotive industry. In *2015 IEEE Jordan Conference on Applied Electrical Engineering and Computing Technologies (AEECT)*, pages 1–5, Nov 2015
20. Elaf A. Amrieh, Thair Hamtini, and **Ibrahim Aljarah**. Preprocessing and analyzing educational data set using x-api for improving student’s performance. In *2015 IEEE Jordan Conference on Applied Electrical Engineering and Computing Technologies (AEECT)*, pages 1–5, Nov 2015
21. Nailah. Al-Madi, **Ibrahim Aljarah**, and Simone A. Ludwig. Parallel glowworm swarm optimization clustering algorithm based on mapreduce. In *2014 IEEE Symposium on Swarm Intelligence*, pages 1–8, Dec 2014
22. **Ibrahim Aljarah*** and Simone A. Ludwig. A new clustering approach based on glowworm swarm optimization. In *2013 IEEE Congress on Evolutionary Computation*, pages 2642–2649, June 2013. Cancun, Mexico
23. **Ibrahim Aljarah*** and Simone A. Ludwig. Mapreduce intrusion detection system based on a particle swarm optimization clustering algorithm. In *2013 IEEE Congress on Evolutionary Computation*, pages 955–962, June 2013. Cancun, Mexico

24. **Ibrahim Aljarah*** and Simone A. Ludwig. Towards a scalable intrusion detection system based on parallel pso clustering using mapreduce. In *Proceedings of the 15th Annual Conference Companion on Genetic and Evolutionary Computation, GECCO '13 Companion*, pages 169–170, New York, NY, USA, 2013. ACM
25. **Ibrahim Aljarah*** and Simone A. Ludwig. A mapreduce based glowworm swarm optimization approach for multimodal functions. In *2013 IEEE Symposium on Swarm Intelligence (SIS)*, pages 22–31, April 2013
26. **Ibrahim Aljarah*** and Simone A. Ludwig. Parallel particle swarm optimization clustering algorithm based on mapreduce methodology. In *2012 Fourth World Congress on Nature and Biologically Inspired Computing (NaBIC)*, pages 104–111, Nov 2012
27. Saeed Salem, Shadi Banitaan, **Ibrahim Aljarah**, and Rami Alroobi. Mining maximal-homogeneous subnetworks using protein interaction networks and gene profiles. In *in proceeding of the 4th international conference on Bioinformatics and Computational Biology (BICoB)*, pages 203–210, Las Vegas, Nevada, USA, Oct 2012
28. **Ibrahim Aljarah***, Shadi Banitaan, Sameer Abufardeh, Wei Jin, and Saeed Salem. Selecting discriminating terms for bug assignment: A formal analysis. In *Proceedings of the 7th International Conference on Predictive Models in Software Engineering*, Promise '11, pages 12:1–12:7, New York, NY, USA, 2011. ACM
29. Saeed Salem, Shadi Banitaan, **Ibrahim Aljarah**, James Brewer, and Rami Alroobi. Discovering communities in social networks using topology and attributes. In *2011 10th International Conference on Machine Learning and Applications and Workshops*, volume 1, pages 40–43, Dec 2011
30. Saeed Salem, Rami Alroobi, Shadi Banitaan, Loqmane Seridi, James Brewer, and **Ibrahim Aljarah**. Clarm: An integrative approach for functional modules discovery. In *Proceedings of the 2Nd ACM Conference on Bioinformatics, Computational Biology and Biomedicine, BCB '11*, pages 646–650, New York, NY, USA, 2011. ACM
31. Shadi Banitaan, Saeed Salem, Wei Jin, and **Ibrahim Aljarah**. A formal study of classification techniques on entity discovery and their application to opinion mining. In *Proceedings of the 2Nd International Workshop on Search and Mining User-generated Contents, SMUC '10*, pages 29–36, New York, NY, USA, 2010. ACM

Book Chapters

1. **Ibrahim Aljarah***, Maria Habib, Hossam Faris, and Seyedali Mirjalili. Introduction to evolutionary data clustering and its applications. *Evolutionary Data Clustering: Algorithms and Applications*, page 1
2. **Ibrahim Aljarah***, Maria Habib, Razan Nujoom, Hossam Faris, and Seyedali Mirjalili. A comprehensive review of evaluation and fitness measures for evolutionary data clustering. *Evolutionary Data Clustering: Algorithms and Applications*, page 23
3. Ruba Abu Khurma and **Ibrahim Aljarah***. A review of multiobjective evolutionary algorithms for data clustering problems. *Evolutionary Data Clustering: Algorithms and Applications*, page 177
4. Raneem Qaddoura, **Ibrahim Aljarah***, Hossam Faris, and Iman Almomani. A classification approach based on evolutionary clustering and its application for ransomware detection. *Evol. Data Clust. Algorithms Appl*, pages 237–248, 2021
5. Raneem Qaddoura, **Ibrahim Aljarah***, Hossam Faris, and Seyedali Mirjalili. A grey wolf-based clustering algorithm for medical diagnosis problems. *Evolutionary data clustering: algorithms and applications. Algorithms for intelligent systems. Springer, Singapore*, pages 73–87, 2021

6. Seyedali Mirjalili, Hossam Faris, and **Ibrahim Aljarah**. Introduction to evolutionary machine learning techniques. In *Evolutionary Machine Learning Techniques*, pages 1–7. Springer, 2020
7. Ruba Abu Khurma, **Ibrahim Aljarah**, Ahmad Sharieh, and Seyedali Mirjalili. Evolopy-fs: An open-source nature-inspired optimization framework in python for feature selection. In *Evolutionary Machine Learning Techniques*, pages 131–173. Springer, 2020
8. Rawan I Yaghi, Hossam Faris, **Ibrahim Aljarah**, Al-Zoubi Ala’M, Ali Asghar Heidari, and Seyedali Mirjalili. Link prediction using evolutionary neural network models. In *Evolutionary Machine Learning Techniques*, pages 85–111. Springer, 2020
9. Maria Habib, **Ibrahim Aljarah**, Hossam Faris, and Seyedali Mirjalili. Multi-objective particle swarm optimization for botnet detection in internet of things. In *Evolutionary Machine Learning Techniques*, pages 203–229. Springer, 2020
10. Al-Zoubi Ala’M, Ali Asghar Heidari, Maria Habib, Hossam Faris, **Ibrahim Aljarah**, and Mohammad A Hassonah. Salp chain-based optimization of support vector machines and feature weighting for medical diagnostic information systems. In *Evolutionary Machine Learning Techniques*, pages 11–34. Springer, 2020
11. Maria Habib, **Ibrahim Aljarah**, Hossam Faris, and Seyedali Mirjalili. Multi-objective particle swarm optimization: Theory, literature review, and application in feature selection for medical diagnosis. In *Evolutionary Machine Learning Techniques*, pages 175–201. Springer, 2020
12. **Ibrahim Aljarah**, Majdi Mafarja, Ali Asghar Heidari, Hossam Faris, and Seyedali Mirjalili. Multi-verse optimizer: Theory, literature review, and application in a data clustering. In *Nature-Inspired Optimizers: Theories, Literature Reviews and Applications*, pages 123–141. Springer International Publishing, Cham, 2020
13. Hossam Faris, Seyedali Mirjalili, **Ibrahim Aljarah**, Majdi Mafarja, and Ali Asghar Heidari. Salp swarm algorithm: Theory, literature review, and application in extreme learning machines. In *Nature-Inspired Optimizers: Theories, Literature Reviews and Applications*, pages 185–199. Springer International Publishing, Cham, 2020
14. Majdi Mafarja, Ali Asghar Heidari, Hossam Faris, Seyedali Mirjalili, and **Ibrahim Aljarah**. Dragonfly algorithm: Theory, literature review, and application in feature selection. In *Nature-Inspired Optimizers: Theories, Literature Reviews and Applications*, pages 47–67. Springer International Publishing, Cham, 2020
15. Ali Asghar Heidari, Hossam Faris, Seyedali Mirjalili, **Ibrahim Aljarah**, and Majdi Mafarja. Ant lion optimizer: Theory, literature review, and application in multi-layer perceptron neural networks. In *Nature-Inspired Optimizers: Theories, Literature Reviews and Applications*, pages 23–46. Springer International Publishing, Cham, 2020
16. Seyedali Mirjalili, **Ibrahim Aljarah**, Majdi Mafarja, Ali Asghar Heidari, and Hossam Faris. Grey wolf optimizer: Theory, literature review, and application in computational fluid dynamics problems. In *Nature-Inspired Optimizers: Theories, Literature Reviews and Applications*, pages 87–105. Springer International Publishing, Cham, 2020
17. Hossam Faris, **Ibrahim Aljarah**, and Seyedali Mirjalili. Chapter 28 - evolving radial basis function networks using moth–flame optimizer. In Pijush Samui, Sanjiban Sekhar, and Valentina E. Balas, editors, *Handbook of Neural Computation*, pages 537 – 550. Academic Press, Elsevier, 2017
18. Hossam Faris, **Ibrahim Aljarah***, and Bashar Al-Shboul. A hybrid approach based on particle swarm optimization and random forests for e-mail spam filtering. In Lecture Notes in Computer Science, editor, *Computational Collective Intelligence*, pages 498–508, Cham, 2016. Springer International Publishing

19. Hamad Alsawalqah, Hossam Faris, **Ibrahim Aljarah***, Loai Alnemer, and Nouh Alhindawi. Hybrid smote-ensemble approach for software defect prediction. In Radek Silhavy, Petr Silhavy, Zdenka Prokopova, Roman Senkerik, and Zuzana Kominkova Oplatkova, editors, *Software Engineering Trends and Techniques in Intelligent Systems*, pages 355–366, Cham, 2017. Springer International Publishing

Edited Books

1. **Ibrahim Aljarah***, Seyedali Mirjalili and Hossam Faris. Evolutionary data clustering: Algorithms and applications. Springer, 2021
2. Seyedali Mirjalili, Hossam Faris, and **Ibrahim Aljarah**. Evolutionary machine learning techniques. Springer, 2020

PROJECTS

Vehicle Class Detection System

Dec. 2013–April. 2014

North Dakota State University, USA.

Project Description: This project is developed for Upper Great Plains Transportation Institute (UGPTI), which is a research and education center at North Dakota State University. This project aims to design a traffic monitoring system by extracting vehicle images from video acquisition using OpenCV library (pattern recognition functions). Then, we used a rule-based system to classify the vehicles according to their axle's properties.

Technologies used in this project: C++ language and OpenCV library.

Farm Cloud Storage System

Sept. 2013–Dec. 2013

North Dakota State University, USA.

Project Description: This project was developed for John Deere/RDO Equipment companies and was supported by NDSU Computer Science Industry/University Consortium Program which was dedicated to strengthening ties between NDSU and regional industry. The aim of this project was to automate the collection of data from farmers and the storage of this data in a cloud-based file system. The stored data was used for analysis in order to contribute towards specialized software tools for farm support.

Technologies used in this project: Cloud Operating System (OpenStack), FTP, ASP.NET, C#, IIS7, and MYSQL 5.0

PAVVET App– Pavement Analysis Via Vehicle Electronic Telemetry

Jan. 2013–Sep. 2013

North Dakota State University, USA.

Project Description: This project was developed for the Upper Great Plains Transportation Institute (UGPTI), which was a research and education center at North Dakota State University. This project aims to design a smart phone app under iPhone platform to collect information to monitor the road conditions using the iPhone embedded sensors (Motion sensor/accelerometer, Gyroscope and GPS).

Technologies used in this project: iOS operating system and Objective-C.

Air Academy Associates: Online Testing System (OTS)

Aug. 2010–Jan. 2011

North Dakota State University, USA.

Project Description: This a team capstone project, which was developed for Software Design course at North Dakota State University.

Air Academy Associates provides training courses in many areas (Statistics, Six Sigma, etc.). Once a course is completed, the trainers have to take exams, which have been in paper format in the past. The online testing system, which is a web-based application that supposed to help in automation that process. OTS automates the process of creating, evaluating, and taking examinations by Air Academy Associates.

Technologies used in this project: HTML, Java, and Java Servlet.

Automated Exams System

Jan. 2007–Dec. 2009

University Of Jordan, Jordan.

Project Description: This system was designed using Microsoft Visual Basic and MySQL 2007 Database.

PRESENTATIONS, SEMINARS, LECTURES AND TALKS

- A keynote speaker at the workshop on the importance of artificial intelligence and its basics, which was held at the Ministry of Digital Economy, and the aim of the workshop was to come up with a charter of ethics for artificial intelligence in Jordan (2021)
- Giving an introductory lecture to students on data science and artificial intelligence, organized by ACM (2021)
- Participation as a feature speaker in the Fourth Revolution Conference, which was organized in the Sultanate of Oman at the Applied University in Abra (2021)
- Specialized seminar for faculty members and postgraduate students entitled by :”Data driven optimization” (2021)
- Specialized seminar on the new data science program for the student community, especially new students (2021)
- Participation in the Artificial Intelligence Journalism Conference as a panel discussion coordinator (2020)
- Paper Presentation: Optimizing Feedforward Neural Networks Using Krill Herd Algorithm for E-mail Spam Detection”, IEEE Jordan Conference on Applied Electrical Engineering and Computing Technologies (AEECT), Amman, Jordan, November 2015.
- Paper Presentation: A New Clustering Approach based on Glowworm Swarm Optimization, In Proceedings of 2013 IEEE Congress on Evolutionary Computation Conference (IEEE CEC’13), Cancun, Mexico, June 2013.
- Paper Presentation: MapReduce Intrusion Detection System based on a Particle Swarm Optimization Clustering Algorithm, In Proceedings of 2013 IEEE Congress on Evolutionary Computation Conference (IEEE CEC’13), Cancun, Mexico, June 2013.
- Paper Presentation: Parallel Particle Swarm Optimization Clustering Algorithm based on MapReduce Methodology, Fourth World Congress on Nature and Biologically Inspired Computing (IEEE NaBIC’12), Mexico City, Mexico, November 2012.
- Paper Presentation: Selecting Discriminating Terms for Bug Assignment: A Formal Analysis, 7th International Conference on Predictive Models in Software Engineering (ACM Promise’11), Banff, Alberta, Canada, September 2011.

INVOLVEMENT IN: CONFERENCES, WORKSHOPS, AND EVENTS

Conferences

2021

- *Applications of Evolutionary Computation: 24th International Conference, Evo Applications 2021, Virtual Event, April 7–9.*

2020

- *12th International Joint Conference on Computational Intelligence by INSTICC, and SciTePress.*
- *International Conference on Pattern Recognition Applications and Methods, Valletta, Malta, February.*

2017

- *Phi’s Research and Innovation Summit (PRIS17), Amman, Jordan, August.*
- *New Trends in Information Technology (NTIT-2017) conference, Amman, Jordan, April.*

2015

- *The third 2015 IEEE Jordan Conference on Applied Electrical Engineering and Computing Technologies (AEECT), 3-5 November, Amman, Jordan.*

2013

- *The 2013 IEEE International Conference on Big Data (BigData'13), October 6-9, Silicon Valley – Santa Clara, California, USA.*
- *The Fifth 2013 IEEE World Congress on Nature and Biologically Inspired Computing (NaBIC2013), August 12-14, Fargo, North Dakota, USA.*
- *The 2013 IEEE Congress on Evolutionary Computation Conference (IEEE CEC'13), June 20-23, Cancun, Mexico.*

2012

- *The Forth 2012 IEEE World Congress on Nature and Biologically Inspired Computing (NaBIC2012), November 5-9, Mexico City, Mexico.*

2011

- *The Seventh ACM International Conference on Predictive Models in Software Engineering (Promise'11), Banff, Canada, September 20-21 (Co-located with ESEM'11).*

Workshops

2019

- *Attending a workshop specialized in building electronic educational courses, which was organized by the Ministry of Higher Education and the United Nations High Commissioner.*
- *Attending a workshop entitled Writing and Managing European Projects, which aims to develop the skills of a faculty member to submit projects to the European Union, which was held by the Accreditation and Quality Center at the University of Jordan*

2018

- *Training workshop of HEAL+” about Data science, Machine Learning, and Curriculum Development of a master program in Health informatics, which is funded by Erasmus+ program of the European Union. Sweden, Stockholm, April 7-April 17, 2018.*
- *”Open Knowledge Night” workshop with Katherine Maher - Executive Director of Wikimedia Foundation By Jordan Open Source Association. Zain Innovation Campus (ZINC), King Hussein Business Park, Amman, Jordan. October 2018.*
- *A workshop entitled ”I update my data myself”, which aims to develop the website for the faculty member, which was held by the Accreditation and Quality Center at the University of Jordan*

2016

- *Learn what Cloud Computing can do for you and your business” workshop by Oracle, PST, and Techaccess companies, Sheraton Amman Hotel, Amman, Jordan. December 2016.*
- *How technology helps forecast the weather workshop by Arabia Weather and Jordan Open Source Association”. Zain Innovation Campus (ZINC), King Hussein Business Park Amman, Jordan. March 2016.*

2015

- *A workshop entitled Instructional Design and Educational Media Production - 15 credit hours, which aims to develop educational courses, which were held by the Accreditation and Quality Center at the University of Jordan*
- *”Machine Learning” workshop by Jordan Open Source Association. Zain Innovation Campus (ZINC), King Hussein Business Park, Amman, Jordan. August 2015.*

- *International Staff Training Week IV: Re-Thinking Internationalization at Middle East Technical University (METU). Turkey, Ankara. June 17-21, 2019. The staff week includes the following themes: Institutional Structures for Internationalization, Challenges and Crises in Internationalization and Mobility Programs, and Internationalization at Home.*

PROFESSIONAL ACTIVITIES (2013-PRESENT)

University/Faculty/Department Professional Committees

At The University Level:

- Member of the Comprehensive Evaluation Committee for E-Learning at the University of Jordan
- Member of the Committee to increase citations of the faculty members at the University of Jordan.
- Member of the Higher Committee for the Follow-up of E-Learning and Online Learning
- Member of the distinguished online learning use cases committee
- Participation in the design of the website of the University of Jordan and its content
- Member of the Committee to enhance the University of Jordan website
- Member of the Quality Assurance and International Accreditation Committee at the University
- Member of the E-Learning and Blended Learning Committee at the University
- Member of the Committee to prepare for the Distinguished Official University Award in Jordan

At The Faculty Level:

- Member of the committee to establish the Department of Artificial Intelligence and Data Science
- Member of the study plans committee
- Member of the Quality Assurance and International Accreditation Committee at the college level
- Member of the committee of the automated examination software
- Member of the ISO quality Committee
- Head of the e-learning and blended learning committee
- Member of the students affairs Committee

At The Department Level:

- Head of the Quality Control and Assurance Committee in the department
- Head of the Accreditation Board for Engineering and Technology (ABET) Committee in the Information Technology Department
- Head of the Scientific Research, Conferences and Library Committee in the department
- A member of the study plan committee in the department at the bachelor's and master's levels.
- Member of the e-learning committee in the department

- Member of the Learning Outcomes Committee in the department
- Member of the Accreditation Board for Engineering and Technology (ABET), Quality Assurance, and Accreditation Committee in the department
- Member of the Graduate Studies Committee in the department
- Member of the Student and Project Training Committee in the department
- Member of the Supervising Committee for Student Elections in the department.
- Head of the Committee (Focus Group) for Intelligent Systems track
- Member of the committee for developing a data science program in the department
- Member of the Comprehensive Exam Writing Committee

General Professional Committees

- Representing the University of Jordan in a specialized committee in the Ministry of Digital Economy to review the National Charter and its legislation for artificial intelligence (2021)
- Member of the E-Learning Evaluation Committee at the Ministry of Higher Education and Scientific Research during the Corona pandemic (2020)
- Representing the University of Jordan in a specialized committee for e-learning that was formed by UNESCO to work out specialized instructions and standards for e-learning at the level of the Arab world (2020).
- Member of the committee to establish the National Center for E-Learning in the Ministry of Higher Education and Scientific Research (2020)
- Member of the Committee in the Ministry of Education for the preparation of the general and private frameworks, standards and key performance indicators of computer courses from kindergarten to grade 12 (2019)

Conference Committees

- Technical Committee: 13th International Conference on Neural Computation Theory and Applications” - NCTA 2021.
- Technical Committee: Third Palestinian International Conference on Information and Communication Technology 2021 (PICICT 2021).
- Technical Committee: The 13th International Joint Conference on Computational Intelligence, ECTA 2021
- Organizing Committee: New Trends in Information Technology (NTIT-2017) conference, Amman, Jordan, April, 2017
- Technical Committee: International Conference on New Trends in Computing Sciences, Amman, Jordan, October 2017
- Technical Committee: The International Conference on Computer Science and Information Technology (CSIT 2016), Amman, Jordan
- Organizing Committee: Fifth World Congress on Nature and Biologically Inspired Computing (IEEE NaBIC’13), USA
- Organizing Committee: Fifth International Conference on Computational Aspects of Social Networks (CASoN 2013), USA.

Journals/Conferences Reviewer:

- Applied Soft Computing, Elsevier.
- Neurocomputing, Elsevier.
- Journal of Computer and System Sciences, Elsevier.
- Neural Computing and Applications, Springer.
- Journal of the American Society for Information Science and Technology
- Modern Physics Letters B (MPLB)
- Kuwait Journal of Science (KJS)
- IEEE Jordan Conference on Applied Electrical Engineering and Computing Technologies (AEECT)

PROFESSIONAL AFFILIATIONS AND CERTIFICATES

Affiliations

- Institute of Electrical and Electronics Engineers (IEEE) Society
- Extreme Science and Engineering Discovery Environment (XSEDE)
- Jordan Computer Society (JCS)
- Association for the Advancement of Artificial Intelligence (AAAI)

Certificates

- Title: Big Data 101. Certification authority: IBM Cognitive Class. License: BD0101EN. Jun 2017.
- Title: Hadoop 101. Certification authority: IBM Cognitive Class. License: BD0111EN. Jun 2017.
- Title: International Computer Driving Licence. Certification authority: Ministry of Education, Amman, Jordan. 2004.

STUDENT ADVISING AND COMMITTEES

Advising

Current students

1. Hala Alshoubki, "Modelling customer churn prediction using an enhanced machine learning approach", In Progress, Expected: January 2023.

Alumni students

1. Abdullah I. Al- Zagebah, "An enhanced population-based nature-inspired technique for anomaly detection applications, PhD Dissertation. The University of Jordan. May 2022.
2. Amal Alshorman, "Evolutionary Intelligent Detection System for Internet of Things Botnet based on Support Vector Machine", PhD Dissertation. The University of Jordan. May 2022.
3. Najeeb Haddad, "Predicting Student Academic Achievement Using Evolutionary Machine Learning Models", M.Sc. Thesis. The University of Jordan. May 2022.
4. Ahamd Alraei, "Intelligent automated approach to forecast foreign exchange", M.Sc. Thesis. The University of Jordan. December 2021.
5. May Mahmoud Alsaidi, "Using Machine Learning to Predict Autism Spectrum Disorder", M.Sc. Thesis. The University of Jordan. August 2021.

6. Eman Ahmad Nasser, "Optimized Feature Selection for Phishing Websites Detection", M.Sc. Thesis. The University of Jordan. August 2021.
7. Neveen Hijazi, "Ensemble Feature Selection based on Parallel Evolutionary Algorithms: Homogeneous and Heterogeneous approaches", PhD Dissertation. The University of Jordan. August 2021.
8. Razan Nujoom, "Multi-Aspect based Sentiment Analysis for Telecommunication Companies in Jordan: A Multi-label Multi-class Approach", M.Sc. Thesis. The University of Jordan. July 2021.
9. Ruba Abu Khurma, "An Enhanced Meta-heuristic Optimization Algorithm for Feature Selection Problem and Its Applications for Disease Diagnosis", PhD Dissertation. The University of Jordan. December 2020.
10. Enas Faisal, "Coevolutionary Framework for Feature Selection and Optimization of Neural Networks", PhD Dissertation. The University of Jordan. August 2020.
11. Raneem Qaddoura, "A Design and Implementation of a Clustering Algorithm based on the Nearest Point", PhD Dissertation. The University of Jordan. December 2019.
12. Maria Habib, "Multi-objective Intelligent Computational Algorithms: An Approach toward Intrusion Detection in Internet of Things Era", M.Sc. Thesis. The University of Jordan. June 2019.
13. Haifa Ghanem, "Detecting Android Malware Using Multi Dynamic Analysis Method ", M.Sc. Thesis. The University of Jordan. July 2018
14. Moath Alrefai, "Building a Hybrid Sentiment Analysis System for Arabic Language", M.Sc. Thesis. The University of Jordan. Dec 2017
15. Rawan Yaghi, "Link Prediction Using Evolutionary Learning Models", M.Sc. Thesis. The University of Jordan. May 2017.
16. Sarah Shukri, "Web Log Clustering Based on Evolutionary Optimization Algorithm", M.Sc. Thesis. The University of Jordan. Dec 2016.
17. Elaf Abu Amrieh, "A Recommender System for Predicting and Improving Student's Performance Using Educational Data Mining", M.Sc. Thesis. The University of Jordan. May 2016

Examination Committees

1. Ayat Mohammed Abd Almorat, "Vehicle Routing Problems Based on Salp Swarm Optimization Algorithm". M.Sc. Thesis. Al-Balqa Applied University. May 2022.
2. Fatima shannag, "Cyberbullying Detection in Arabic Tweets: Corpus Construction and System Development". PhD Dissertation. The University of Jordan. May 2022.
3. Rama Alkhasawneh, "AI-Based Hybrid Model for Detecting Covid-19". M.Sc. Thesis. Yarmouk University. May 2022.
4. Inas Abuqaddom, "Anti-Vanishing Gradient Descent Optimization Algorithm For Very Deep Neural Networks". PhD Dissertation. The University of Jordan. November 2021.
5. Mohammad Bashabsheh, "Big Data Analysis using Hybrid Harris Hawks Optimizer and MapReduce Framework". M.Sc. Thesis. Amman Arab University. June 2021.
6. Sahar Alhayajneh, "Continuous Intention to Use BI Tools: Integrating the Expectation Confirmation Model (ECM), Flow Theory, and Information System (IS) Success Model". M.Sc. Thesis. Yarmouk University. June 2021.
7. Mohammed Al-Hadith, "Predicting The Coronavirus Infection Using Machine Learning". M.Sc. Thesis. Philadelphia University, June 2021.
8. Nabaa Fawzi, "Deep Learning Method for Analyzing the Features Extracted from Speech". M.Sc. Thesis. Philadelphia University, June 2021.
9. Zahia Assoli, "Using Accelerated Particle Swarm Optimization (Accelerated PSO) Algorithm for Arabic Query Expansion". M.Sc. Thesis. Yarmouk University. May 2021.

10. Ali Abedalaziz Alsarhan, "Multi-Tier Cloud-Based Intrusion Detection System Using Deep-Learning Classifier". M.Sc. Thesis. The University of Jordan. May 2021.
11. Masoud Mahmoud Alkhraisat, "Sentiment Analysis for Arabic Language Using Machine Learning Algorithms". M.Sc. Thesis. Al-Balqa' Applied University, May 2021.
12. Feda Bolus Al baqain, "Histopathological Web Diagnosis System for Prostate Cancer". M.Sc. Thesis. The University of Jordan. August 2020.
13. Rana Husni, "A modified bond energy algorithm with fuzzy merging and its application to arabic text document clustering". PhD Dissertation. The University of Jordan. July 2020.
14. Shadi Masa'adeh, "Feature Selection Problems based on Emperor Penguins Colony". M.Sc. Thesis. Al-Balqa' Applied University, June 2020.
15. Aya Monther Taleb, "JKRW Link Prediction: A New Ensemble Technique Based On Merging Other Known Techniques In The Social Network Analysis". M.Sc. Thesis. The University of Jordan. May 2020.
16. Hebatullah Khattab, "Parallel Chemical Reaction Optimization for Graph Vertex Cover Problem". PhD Dissertation. The University of Jordan. December 2019.
17. Lana Obeidat, "Feature Location Enhancement Based On Source Code Augmentation With Synonyms Of Terms", M.Sc. Thesis. Yarmouk University. July 2019.
18. Osama Al-Qasem, "Software Fault Prediction Using Deep Learning Algorithms", M.Sc. Thesis. Yarmouk University. December 2018.
19. Feras Namous, "Continuous Smartphone Authentication Based on user Bahviour", M.Sc. Thesis. The University of Jordan. December 2018.
20. Wedyan Alswiti, "Age prediction for online web filtering using data mining techniques", M.Sc. Thesis. The University of Jordan. July 2018.
21. Mohammad Eshtay, "Metaheuristic design for extreme learning machine", PhD Dissertation. The University of Jordan. June 2018.
22. Nazek Hassounch, "Deep learning for predicting survivability for leukemia patients on seer data", M.Sc. Thesis. The University of Jordan. April 2018.
23. Hebah Aldomi, "Query Expansion Using Bat-Inspired Algorithm For Arabic Information Retrieval", M.Sc. Thesis. Yarmouk University. April 2018.
24. Laila Al-Qaisi, "A meta-heuristic approach for offloading in mobile cloud computing", M.Sc. Thesis. The University of Jordan. November 2017.
25. Mohammad Hassonah, "Sentiment analysis using hybrid machine learning method", M.Sc. Thesis. The University of Jordan. July 2017.
26. AlMonther Al-Khalafat, "Violence detection over online social networks: an arabic sentiment analysis approach", M.Sc. Thesis. The University of Jordan. March 2017.
27. Bara'a Alhammad, "Pattern recognition tracking of gene functionalities in plants natural evolution", M.Sc. Thesis. The University of Jordan. July 2015.

TEACHING EXPERIENCE

- **Undergraduate Level's Courses:** Computer Skills, Visual Basic Programming, C++ Programming, Object Oriented Programming, Decision Support Systems, Operations Researches, Web Application Development, Computer Fundamentals, Social Media, Advance topics (Data Science, Python).
- **Graduate Level's Courses:** Social Network Analysis

RELATIVE COMPUTER SKILLS

- Operating Systems: Linux (Ubuntu), Windows 10, 7, and Vista
- Programming Languages: Oracle 8i/9i, C++, Visual basic, Pascal, HTM 5L, CSS 3, Java, Java Script, C# ,Python, Perl, and Others
- Software Packages: Matlab 2018, LATEX R, MS-Office 2013
- Machines: IBM PC's and Compatibles.
- Knowledge In: Big Data Analytics, Hadoop/MpReduce , Hive, Pig, Spark, Mahout Framework, Software Engineering life cycle, Database Management Systems, Relational Databases, Assembly Programming, Hardware and Software Maintenance, and Windows 8 Security, and familiar with NTFS file system, Networks Management With Windows 2013 Server, and Windows7.

LANGUAGES

<i>Languages</i>	Arabic (mother tongue) English (Medium)
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REFERENCES

- Dr. Jamal Alsakran, The University of Jordan, Jordan, Amman. Email: j.alsakran@ju.edu.jo.
- Prof. Simone Ludwig, North Dakota State University, USA. Email: simone.ludwig@ndsu.edu
- Prof. Hossam Faris , The University of Jordan, Jordan. Email: hossam.faris@ju.edu.jo

*References available upon request

Research Statement

Ibrahim Aljarah, PhD

My research interests are in supervised and unsupervised machine learning and data mining algorithms and their combination with several dimensionality reduction, and feature selection methods based on nature-inspired based optimization. In addition, I am very interested in Big Data Era, MapReduce, Hadoop, Swarm intelligence, Evolutionary Computation, Social Network Analysis (SNA), and large scale distributed algorithms.

Previous Research

In my Master's thesis I proposed a solution model to tackle the timetabling problems using data mining and optimization methodologies. The solution proposed was a new representation of the timetabling problem by mining instructor preferences from previous schedules to avoid undesirable time slots for instructors. This work is published in International Journal of Emerging Technologies in Learning (iJET), Vol 7(1), pp. 24-32, (2012). My PhD research was concentrated on developing parallel scalable nature-inspired data mining algorithms. PhD research was aimed to benefit from the MapReduce methodology, which is a parallelization platform to reformulate the data mining algorithms in order to become more efficient and scalable for big data. Most state-of-the-art nature-inspired algorithms do not work well when applied on large datasets. Some of the algorithms need restructuring and rebuilding to become computationally efficient to deal with growing data. I proposed three related methods to tackle the large scale data set problems. Firstly, we introduced Parallel Particle Swarm Optimization Clustering Algorithm based on MapReduce Methodology, which allows us to adapt the MapReduce framework to prove that MapReduce is successful as a parallelization methodology for data clustering. This work was published in Proceedings of the Fourth World Congress on Nature and Biologically Inspired Computing (IEEE NaBIC'12), November 2012, Mexico City, Mexico. Secondly, we extended this work by developing a large scale intrusion detection system to deal with the large-scale network traffic. This work was accepted in Proceedings of the Genetic Evolutionary Computation Conference (GECCO'13), July 2013, Amsterdam, Netherlands. Thirdly, we proposed a MapReduce Glowworm Swarm Optimization (GSO) algorithm to solve the multimodal functions. We demonstrated that MapReduce GSO is appropriate for optimizing difficult evaluation functions, and we showed that high function peak capture rates were achieved. This work was accepted in the IEEE Symposium Series on Computational Intelligence - SSCI 2013, April 2013, Singapore. As part of separate projects through my graduate study, I have also worked on Bug Assignment (Bug Triage) project, which is considered one of the challenging problems in software development. In this project, the bug assignment problem was formulated as a classification task, and then examines the impact of several term selection approaches on the classification effectiveness. This work was published in the Proceedings of the 7th International Conference on Predictive Models in Software Engineering (Promise'11 -ACM), September 2011, Banff, Canada.

Current Research

My recent research work covers three distinct areas of machine learning, data mining, and optimization: neural network optimization, feature selection, and sentiment analysis. Since May 2014, I have co-authored in more than 25 articles in top journals in machine learning, and data mining: Expert Systems with Applications (Elsevier) (2 articles), Information Fusion, (Elsevier) (one article), Knowledge-Based Systems, (Elsevier) (3 articles), Soft Computing, (Springer) (2 articles), Applied Soft Computing, (Elsevier) (one article), Engineering Applications of Artificial Intelligence, (Elsevier) (one article), Cognitive Computation, (Springer) (one article), Neural Computing and Applications, (Springer) (3 articles), Applied Intelligence, (Springer) (4 articles), and many more. More details about my current research are given in the following paragraphs:

Spam Identification and Detection

With the incremental use of emails as an essential and popular communication mean over the Internet, there comes a serious threat that impacts the Internet and the society. This problem is known as spam. By receiving spam messages, Internet users are exposed to security issues, and minors are exposed to inappropriate contents. Moreover, spam messages waste resources in terms of storage, bandwidth, and productivity. What makes the problem worse is that spammers keep inventing new techniques to dodge spam filters. On the other side, the massive data flow of hundreds of millions of individuals, and the large number of attributes make the problem more cumbersome and complex. Therefore, proposing evolutionary and adaptable spam detection models becomes a necessity. In this paper, an intelligent detection system that is based on Genetic Algorithm (GA) and Random Weight Network (RWN) is proposed to deal with email spam detection tasks. In addition, an automatic identification capability is also embedded in the proposed system to detect the most relevant features during the detection process. The proposed system is intensively evaluated through a series of extensive experiments based on three email corpora. The experimental results confirm that the proposed system can achieve remarkable results in terms of accuracy, precision, and recall. Furthermore, the proposed detection system can automatically identify the most relevant features of the spam emails.

Evolutionary Clustering Algorithms

Clustering based on nature-inspired algorithms is considered as one of the fast growing areas that aims to benefit from such algorithms to formulate a clustering problem as an optimization problem. In this work, the search capabilities of a recent nature-inspired algorithm called Multi-verse Optimizer (MVO) is utilized to optimize clustering problems in two different approaches. The first one is a static clustering approach that works on a predefined number of clusters. The main objective of this approach is to maximize the distances between different clusters and to minimize the distances between the members in each cluster. In an attempt to overcome one of the major drawbacks of the traditional clustering algorithms, the second proposed approach is a dynamic clustering algorithm, in which the number of clusters is automatically detected without any prior information. The proposed approaches are tested using 12 real and artificial datasets and compared with several traditional and nature-inspired based clustering algorithms. The results show that static and dynamic MVO algorithms outperform the other clustering techniques on the majority of datasets

Feature selection and dimensionality reduction

Feature selection is an imperative preprocessing step that can positively affect the performance of machine learning techniques. Searching for the optimal feature subset amongst an unabridged dataset is a challenging problem, especially for large-scale datasets. In this research, nature-inspired algorithms such as Salp Swarm Algorithm, Grasshopper Optimization Algorithm are formulated and modified to be search strategies to design a wrapper-based feature selection methods. The proposed algorithms are tested and validated on well-known datasets. The results and comparisons verify that utilizing nature-inspired based algorithms as feature selection methods improve the performance in terms of accuracy metric.

Sentiment analysis

To help individuals or companies make a systematic and more accurate decisions, sentiment analysis (SA) is used to evaluate the polarity of reviews. In SA, feature selection phase is an important phase for machine learning classifiers specifically when the datasets used in training is huge. Whale Optimization Algorithm (WOA) is one of the recent metaheuristic optimization algorithm that mimics the whale hunting mechanism. However, WOA suffers from the same problem faced by many other optimization algorithms and tend to fall in local optima. To overcome these problems, two improvements for WOA algorithm are proposed in this research work. The first improvement includes using Elite Opposition-Based Learning (EOBL) at initialization phase of WOA. The second improvement involves the incorporation of evolutionary operators from Differential Evolution algorithm at the end of each WOA iteration including mutation, crossover, and selection operators. In addition, we also used Information Gain (IG) as a filter features selection technique with WOA using Support Vector Machine (SVM) classifier to reduce the search space explored by WOA. To verify our proposed approach, four Arabic benchmark datasets for sentiment analysis are used since there are only a few studies in sentiment analysis conducted for Arabic language as compared to English. The proposed algorithm is compared with six well-known optimization

algorithms and two deep learning algorithms. The comprehensive experiments results show that the proposed algorithm outperforms all other algorithms in terms of sentiment analysis classification accuracy through finding the best solutions, while its also minimizes the number of selected features.

Vision for the Future

For future research, I am open to all problems related to machine learning and optimization. I am particularly interested in working on distributed and parallel future selection methods to handle the big data, and large dimensional datasets. Another future interest, is to use the multi-objective optimization to solve some challenging.

Teaching Statement

Ibrahim Aljarah, PhD

One of the important merits and valuable experiences of an academic life is the opportunity to work with young and bright students with clear minds. It gives me a chance to be a part of their initial stages of learning journey. This experience is not only reflected on the students to learn new things, but also reflected on me for improving my own skills to invent new teaching methods. I believe that knowledge if not passed from generation to generation will die, we must be very careful to transfer this knowledge in easy and smooth ways to preserve it. Teaching is one of the most effective ways to pass on our knowledge, thus ensuring that our field grows and prospers.

Teaching Experience

My primary teaching experience comes from four semesters as a teaching assistant (TA), of Computer Science at the introductory, upper-division undergraduate, and graduate levels. My first exposure to teaching came as a first year, graduate student, when I served as a TA for introductory Computer Science course, running a weekly discussion, assisting students during office hours, and grading assignments and exams. Helping a group of students with largely no prior experience in our field achieve basic proficiency and the ability to use Java programming. More recently, I have served as a TA/RA for, respectively, NDSU's undergraduate and graduate data mining and bioinformatics courses. In the former, I ran two weekly discussion sections, prepared and graded exams, and designed some R-language-based hands-on labs. Furthermore, as a senior graduate student at North Dakota State University, USA, I had the opportunity to advise some younger graduate students. Having experienced myself many of the difficulties of a graduate student, for example, the switching from a problem solving to a problem understanding mind set, the pursuit of individual research, and the articulation of results for my dissertation, I've helped many graduate students in overcoming these difficulties. One of the results of my tutoring of younger students was the work on Davei's thesis. In this project, I helped her in framing her research to understand the global optimization problem and in designing a parallel algorithms to further evaluate her master thesis work.

As a faculty member, I would be qualified and excited to teach courses in web development, decision support systems, operation research, computer fundamentals, data analytics, and social network analysis at both the graduate and undergraduate level. I would also be happy to teach courses in data science, data mining, cloud computing, and programming languages. I would enjoy giving seminars on large scale "Big Data" systems, MapReduce (HADOOP Frameworks), distributed computing in theory and in practice, and emerging topics in internet of things and Cybersecurity.

A big part of my current research is done in cooperation with graduate students. Currently, I am advising 2 M.Sc. students, and two PhD students. I find that the most important skill an advisor has to develop is the ability to strike the right balance between helping students to make optimal choices in their work and at the same time providing them with enough freedom and encouragement to conduct research on their own. I try to promote active research dialog and open interaction with the students. To achieve this I have regular meetings with students and maintain an open door policy. I enjoy the stimulation team research provides and expect to have a strong group of research students in the future. I also believe in the benefits of cooperation with other faculty members. I think co-advising students widens the research scope of each individual researcher and is beneficial to faculty as well as students. Finally, I believe that the best way to learn about research is to do high-quality, novel research and participate meaningfully as a collaborator. I believe to give students meaningful projects that engage their curiosity and work with them as valued contributors.

Teaching Philosophy

I aim to keep courses attractive through my passion for teaching and by covering the material in an engaging manner. In many areas, computer science is a practical subject—and, as a result, some of those courses are seen as less interesting—but with the proper instruction, all aspects of our field can be

engaging and inspiring. Lectures should be grounded in realistic case examples and students should be given opportunities to apply the lessons through in-class active learning activities. Students should work in groups to develop an understanding of the human aspects of software development and to encourage collaborative learning.

Teaching Methods

I am interested in teaching a variety of courses at the graduate and undergraduate levels using new teaching methods, such as blended learning, learning by projects, and virtual learning