Research Newsletter
(Jan 2019 – Apr 2020)
Department of Information and Computer Science
King Fahd University of Petroleum & Minerals
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Table 1. Summary of Research profile of ICS department

Total ISI journals published (from Jan 2019 to Apr 2020)	53
Total conference paper published (from Jan 2019 to Apr 2020)	25
Total patent publication/applied (from Jan 2019 to Apr 2020)	12
University Subject Rankings 2020 - Computer Science and Information Systems (QS ranking)	151-200

The list of journals published by ICS faculty members in the time duration Jan 2019 to Apr 2020

1. Zhou N., et. al (2019). The CAFA challenge reports improved protein function prediction and new functional annotations for hundreds of genes through experimental screens. Genome Biology, 244. https://doi.org/10.1186/s13059-019-1835-8
2. Ibraheem Al-Hejri and Sultan Almuhammadi, "Constructing New NLFSR Functions of with Optimal Periods", International Journal of Interdisciplinary Telecommunications and Networking (IJITN), Vol 12(4), pp. 71-80, 2020.
3. Saeed Albukhitan, Ahmed Al-Nazer, Tarek Helmy, (2020). Semantic Web Annotation using Deep Learning with Arabic Morphology. Elsevier open-access Procedia Computer Science Journal, Volume 170, pp. 989-994. https://www.sciencedirect.com/science/article/pii/S1877050920305342?via%3Dihub
4. Al-Shaaby, A., Aljamaan, H. & Alshayeb, M. "Bad Smell Detection Using Machine Learning Techniques: A Systematic Literature Review". Arab J Sci Eng 45, 2341-2369 (2020). https://doi.org/10.1007/s13369-019-04311-w
5. Sheghdara, M.*, Hassine, J. "Automatic Retrieval and Analysis of High Availability Scenarios from System Execution Traces: A Case Study on Hot Standby Router Protocol." To appear in Journal of Systems and Software, ISI Impact Factor (2018): 2.559 (Q1)
6. Hassine, J., Alshayeb, M. "Measuring Goal-Oriented Requirements Language Actor Stability." In e-Informatica Software Engineering Journal, vol. 13, no. 1, pp. 203-226, 2019. DOI: 10.5277/e-Inf190106.
7. Alkaf, H.*, Hassine J., Binalialhag T.*, Amyot D. "An Automated Change Impact Analysis Approach for User Requirements Notation Models." Journal of Systems and Software, 110397, 2019, ISSN 0164-1212, https://doi.org/10.1016/j.jss.2019.110397. ISI Impact Factor (2018): 2.559 (Q1)
8. Ali, N., Cai, H., Hamou-Lhadj, A., Hassine, J. (2019). Exploiting parts-of-speech for effective automated requirements traceability. Information and Software Technology, 106, 126-141, 2019. doi:10.1016/j.infsof.2018.09.009. ISI Impact Factor (2018): 2.921 (Q1)
9. Binalialhag, T.*, Hassine, J., Amyot, D. (2019). Static slicing of Use Case Maps requirements models. Software & Systems Modeling, 18(4), pp.2465-2505, 2019. ISI Impact Factor (2018): 2.660 (Q1)

10. Ahmad Abdellatif, Mohammad Alshayeb, Sami Zahran and Mahmood Niazi, "A Measurement Framework for Software Product Maturity Assessment", Journal of Software: Evolution and Process, Volume 31, Issue 4, April 2019.

11. M. Misbhauddin and Mohammad Alshayeb, "An Integrated Metamodel Based Approach to Software Model Refactoring", Software and Systems Modeling, Volume 18, Issue 3, pp 2013-2050, June 2019.

12. Mohammed Alqmase, Mohammad Alshayeb and Lahouari Ghouti, "Threshold Extraction Framework for Software Metrics", Journal of Computer Science and Technology, Vol. 34, issue 5, pp. 1063-1078, September 2019.

13. M. Alshayeb, "An Empirical Study on Using Class Stability as an Indicator of Class Similarity", Arabian Journal for Science and Engineering, Vol. 44, Issue 11, pp 9413-9426, Nov. 2019.

14. Jawad Javed Akbar Baig, Sajjad Mahmood, Mohammad Alshayeb, and Mahmood Niazi, "Package-Level stability evaluation of object-oriented systems", Information and Software Technology Journal, Vol. 116, December 2019.

15. Mamoona Humayun, Mahmood Niazi, NZ Jhanjhi, Mohammad Alshayeb and Sajjad Mahmood, "Cyber Security Threats and Vulnerabilities: A Systematic Mapping Study", Arabian Journal for Science and Engineering, Vol. 45, Issue 4, pp.3171-3189, April 2020

16. Mahmoud Alfadel, Khalid Aljasser and Mohammad Alshayeb, "Empirical Study of the Relationship between Design Patterns and Code Smells", PLOS One, accepted April 2020

17. Abdulrahman Baqais and Mohammad Alshayeb, "Automatic Software Refactoring: A Systematic Literature Review", Software Quality Journal, accepted Oct. 2019.

18. Ismail Keshta, Mahmood Niazi and Mohammad Alshayeb, "Towards Implementation of Requirements Management Specific Practices (SP1.1 and SP1.2) for Small and Medium Sized Software Development Organizations", IET Software, accepted January 2020.

19. Mohammad Alshayeb, Haris Mumtaz, Sajjad Mahmood, Mahmood Niazi, "Improving the Security of UML Sequence Diagram Using Genetic Algorithm" IEEE Access, accepted March 2020.

20. Haris Mumtaz, Mohammad Alshayeb, Sajjad Mahmood and Mahmood Niazi, "Improving the Security Quality of Use Case Models through the Application of Software Refactoring Using Genetic Algorithm", International Journal of Security and Its Applications, accepted March 2020.

21. Farag A., Salahadin M., Mustafa G., Jaweed Y., Adel A. (2020). Systematic Partitioning and Labeling XML Subtrees for Efficient Processing of XML Queries in IoT Environments. IEEE Access, vol. 8, pp. 61817-61833

22. Farag A., Mustafa G., Salahadin M., Jaweed Y., (2019). Framework for Disease Outbreak Notification Systems with an Optimized Federation Layer. International Journal of Advanced Computer Science and Applications(IJACSA), 10(2). http://dx.doi.org/10.14569/IJACSA.2019.0100268

23. Elarian, Y., Ahmad, I., Zidouri, A., & Al-Khatib, W. G. (2019), "LUCIDAH: Ligative and Unligative Characters in a Dataset for Arabic Handwriting", (IJACSA) International Journal of Advanced Computer Science and Applications, Vol. 10, No.8, 2019.

24. Ahmad, I., & Fink, G. A. (2019), "Handwritten Arabic text recognition using multi-stage sub-core-shape HMMs", International Journal on Document Analysis and Recognition (IJDAR), 22(3), 329-349.

25. Ahmad, I., Awaida, S., & Mahmoud, S. A. (to appear) "Arabic Literal Amount Sub-Word Recognition using Multiple Features and Classifiers", International Journal of Applied Pattern Recognition (IJAPR). to-appear

26. Al Otaibi, M., Farahat, A., Tawabini, B., Omar, M., Ramadan, E., Abuelgasim, A., Singh, R. (2019). Long-Term Aerosol Trends and Variability over Central Saudi Arabia Using Optical Characteristics from Solar Village AERONET Measurements. Atmosphere, 10, 752; doi:10.3390/atmos10120752

27. F Azzedin, M Ghaleb. Internet-of-Things and Information Fusion: Trust Perspective Survey Sensors 19 (8), 2019

28. F Azzedin, M Ghaleb. Towards an Architecture for Handling Big Data in Oil and Gas Industries: Service-Oriented Approach. (IJACSA) International Journal of Advanced Computer Science and Applications, 2019

29. El-Alfy, E.-S. M., Salahadin Mohammed, S. "A review of Machine learning techniques for big data analytics: Bibliometric approach", Technology Analysis & Strategic Management, Feb. 2020. DOI: https://doi.org/10.1080/09537325.2020.1732912 [Web of Science Impact Factor: 1.739; IF5: 1.895; Q3]

30. Al-Obeidat, F. and El-Alfy, E.-S. M., "Hybrid Multicriteria Fuzzy Classification of Network Traffic Patterns, Anomalies, and Protocols," Personal and Ubiquitous Computing, vol. 23, no. 5â€"6, pp 777-791, Nov. 2019. https://doi.org/10.1007/s00779-017-1096-z [Web of Science Impact Factor: 1.735; IF5: 2.061; Q3 CS/IS]

31. Qureshi, M. A. El-Alfy, E.-S. M., "Bibliography of digital image anti-forensics and anti-anti-forensics techniques," IET Image Processing, vol. 13, no. 11, Sept 2019, p. 1811 â€" 1823. http://dx.doi.org/10.1049/iet-ipr.2018.6587 [Web of Science Impact Factor: 2.004; IF5: 1. 2.074; Q3 CS; ESI: Q2]

32. El-Alfy, E.-S. M., and Binsaadoon, A. G. "Automated Gait-Based Gender Identification Using Fuzzy Local Binary Patterns with Tuned Parameters," Journal of Ambient Intelligence and Humanized Computing, Springer, vol. 10, no. 7, pp. 2495-2504, July 2019. (First Online 26 Feb. 2018) http://dx.doi.org/10.1007/s12652-018-0728-0 [Web of Science Impact Factor: 1.91; IF5: 1.598; Q3 CS/AI]

33. Al-Azani, S., El-Alfy, E.-S. M. "Multimodal Age Group Recognition for Video Logs Using Ensemble of Neural Networks," International Journal of Advanced Computer Science and Applications (IJACSA) - Volume 10, No 4, pp. 371-378, Apr 2019. http://dx.doi.org/10.14569/IJACSA.2019.0100445 [Web of Science Emerging List]

34. Naser, H., Awad, W.S., and El-Alfy, E.-S. M., "A Multi-Matching Approximation Algorithm for Symmetric Traveling Salesman Problem," Journal of Intelligent & Fuzzy Systems, vol. 36, no. 3, pp. 2285-2295, March 2019. http://dx.doi.org/10.3233/JIFS169939   [Web of Science Impact Factor: 1.637; IF5: 1.782; Q3 CS/AI (ESI/CS: Q1)]

35. E. Al-Wajih and M. Ahmed, "A New Application for Gabor Filters in Face-Based Gender Classification," International Arab Journal of Information Technology (IAJIT), available online; scheduled to be published in vol. 17, no. 2, Mar. 2020.

36. M. Faisal and M. Ahmed, "An Analysis Framework for Fuzzy Time Series Forecasting Models," International Journal of Computer Science and Network Security (IJCSNS), vol.19, no. 4, pp. 201-210, Nov. 2019.

37. S. Ebad and M. Ahmed, "Investigating the Effect of Software Packaging on Modular Structure Stability," International Journal of Computer Systems Science and Engineering, vol. 34, no. 5, pp. 283-296, Sep, 2019.

38. H. Al-Jamimi and M. Ahmed, "Learning Model Transformation Rules from Examples: The GAILP System," International Journal of Computer Science and Network Security (IJCSNS), vol.19, no. 4, pp. 201-210, Apr. 2019.

39. S. Abudalfa and M. Ahmed, "Semi-Supervised Target-Dependent Sentiment Classification for Micro-Blogs," The Journal of Computer Science and Technology (JCS&T); vol. 19, no. 1, Apr. 2019, https://doi.org/10.24215/16666038.19.e06.

40. Luqman, H., & Mahmoud, S. A. (2019). A machine translation system from Arabic sign language to Arabic. Universal Access in the Information Society, 1-14.

41. Sidig, A. A. I., Luqman, H., & Mahmoud, S. A. (2019). Arabic sign language recognition using vision and hand tracking features with HMM. International Journal of Intelligent Systems Technologies and Applications, 18(5), 430-447.

42. Luqman, H., & Mahmoud, S. A. (2019). Automatic translation of Arabic text-to-Arabic sign language. Universal Access in the Information Society, 18(4), 939-951.

43. M.A. Akbar, J. Sang, Nasrullah, A.A. Khan, Sajjad Mahmood, S.F. Qadri, H. Hu and H. Xiang "Success Factors Influencing Requirements Change Management Process in Global Software Development", Journal of Computer Languages (formelly, Journal of Visual Languages and Computing), vol. 51, pp. 112-130, 2019.

44. Haris Mumtaz, Mohammad Alshayeb, Sajjad Mahmood and Mahmood Niazi, "A Survey on UML Model Smells Detection Techniques for Software Refactoring", Journal of Software: Evolution and Process, Vol. 31, no. 3,pp. 1-17, 2019.

45. Sajid Anwer, Lian Wen, Zhe Wang and Sajjad Mahmood "Comparative Analysis of Requirement Change Management Challenges Between In-house and Global Software Development: Finding of Literature and Industry Survey", IEEE Acess, Vol. 7, pp. 116565-11611, 2019.

46. M.A. Akbar, A.A. Khan, A.W. Khan and Sajjad Mahmood, "Requirement Change Management Challenges in GSD: An Analytical Hierarchy Process Approach", Journal of Software: Evolution and Process, In Press.

47. M. A. Akbar, Sajjad Mahmood, A. Alsanad, A. A. Alsanad, A. Gumaei and S.F. Qadri, "A Multivocal Study to Improve the Implementation of Global Requirements Change Management Process: A Client-Vendor Respective", Journal of Software: Evolution and Process, In Press.

48. M.A.Akbar, A. Alsanad, Sajjad Mahmood, A. A. Alsanad and A. Gumaei, "A Systematic Study to Improve the Requirements Engineering Process in the Domain of Global Software Development", IEEE Access, In Press.

49. Li, X., Bao, L., Giles, L., Al-Zaidy, R., Baral, S., and Rao, A. (2020). Automating Document Classification with Distant Supervision to Increase the Efficiency of Systematic Reviews. Submitted to AIDS 2020.

50. Hassan M R, Haque M S M , Hossain M I , Hassan M M, Alelaiwi A, "A novel cascaded deep neural network for analyzing smart phone data for indoor localization", Future Generation Computer Systems, Vol. 101, Pages 760-769. Current ISI Impact Factor: 4.639; Rank: Q1

51. Gumaei A, Hassan M M, and Hassan M R,"A Hybrid Feature Extraction Method with Regularized Extreme Learning Machine for Brain Tumor Classification", IEEE Access, Vol. 7, Pages 36266-36273. Current ISI Impact Factor: 3.557; Rank: Q1

52. AA Khan, J Keung, M Niazi, S Hussain, M Shameem, GSEPIM: A roadmap for software process assessment and improvement in the domain of global software development, Journal of software: Evolution and Process 31 (1), e1988

53. M. Deriche, S. Arafat, S. A-Insaif, and M. Siddiqui, "Eigenspace Time Frequency Based Features for Accurate Seizure Detection from EEG Data," Innovation and Research in BioMedical Engineering, Elsevier publications, v. 40, Issue 2, pp. 122-132, March 2019. https://doi.org/10.1016/j.irbm.2019.02.002

The list of conference papers published by ICS faculty members in the time duration Jan 2019 to Apr 2020

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1. Sultan Almuhammadi and Omar Bawazeer, "Performance and Security Analysis of Hash Functions", Wireless Telecommunications Symposium (WTS), USA, 2019.

2. Sabor, K., Hamou-Lhadj, A., Trabelsi, A., Hassine, J. (2019): Predicting bug report fields using stack traces and categorical attributes. In Proceedings of the 29th Annual International Conference on Computer Science and Software Engineering (CASCON '19), Tima Pakfetrat, Guy-Vincent Jourdan, Kostas Kontogiannis, and Robert Enenkel (Eds.). IBM Corp., Riverton, NJ, USA, 224-233.

3. Ahmad, I. (2019). Performance of Classifiers on Noisy-Labeled Training Data: An Empirical Study on Handwritten Digit Classification Task. In International Work-Conference on Artificial Neural Networks (pp. 414-425). Springer

4. Elmoselhy, A., Ramadan, E. (2020). Utilizing Graph Database for Inferring Domain-Disease Associations. IEEE International Conference on Advances in the Emerging Computing Technologies (AECT).

5. Al-Thelaya, K., Al-Nethary, T., Ramadan, E. (2020). Social Networks Spam Detection Using Graph-Based Features Analysis and Sequence of Interactions Between Users. IEEE International Conference on Informatics, IoT, and Enabling Technologies.

6. A Kobilica, MI Al Fikri, FA Azzedin, TR Sheltami, LM Alhems. The Perspectives of the Integrated IoT Devices in the Improvement of the Industrial Lab Experience. 2019 International Conference on Innovation and Intelligence for Informatics, 2019

7. Al-Asiri, M, El-Alfy, E.-S. M., "Using Physical Metrics for Intrusion detection in SCADA Systems," Procedia Computer Science, vol. 170C, April 2020, pp. 34-42. Presented at 11th International Conference on Ambient Systems, Networks and Technologies, Poland, 2020. https://doi.org/10.1016/j.procs.2020.03.007

8. Alasow, M. A., Mohammed, S. A., El-Alfy, E.-S. M., "Parallel Association Rules Pruning Algorithm on Hadoop MapReduce," International Conference on Applied Soft Computing and Communication Networks (ACN'19), India, December 2019. Also published as book chapter in Applied Soft Computing and Communication Networks, Chapter 8, 2020. DOI: https://doi.org/10.1007/978-981-15-3852-0_8

9. Althelaya, K., El-Alfy, E.-S. M. "Android Malware Detector Based on Sequences of System Calls and Bidirectional Recurrent Networks," Proc. Seventh International Symposium on Security in Computing and Communications (SSCC19), India, December 2019. Published

by Springer in Communications in Computer and Information Science Series (CCIS), ISSN: 1865:0929. To be available at Springer web-site.

10. Samara, M., and El-Alfy, E.-S. M., 'Benchmarking Open-Source Android Malware Detection Tools," IEEE Middle East & North Africa Communications Conference (MENACOMM 2019), Kingdom of Bahrain, 19-21 November 2019. To be available at http://ieeexplore.ieee.org/

11. Nurnoby, M. F., and El-Alfy, E.-S. M., "Overview and Case Study for Ransomware Classification Using Deep Neural Network," IEEE Middle East & North Africa Communications Conference (MENACOMM 2019), Kingdom of Bahrain, 19-21 November 2019. To be available at http://ieeexplore.ieee.org/

12. Alhubaiti, O. R., El-Alfy, E.-S. M. "Impact of Spectre/Meltdown Kernel Patches on Crypto-Algorithms on Windows Platforms," International Conference on Innovation and Intelligence for Informatics, Computing, and Technologies (3ICT'19), September 2019. Available at IEEExplore DOI: https://doi.org.extoljp.kfupm.edu.sa/10.1109/3ICT.2019.8910282

13. Bin Makhashen, G.M., Luqman, H.A., El-Alfy, E.-S. M., "Using Gabor Filter Bank with Downsam-pling and SVM for Visual Sign Language Alphabet Recognition," Smart Cities Symposium (SCS 2019), 24-26 March 2019, Kingdom of Bahrain, Proceedings Published by IET. DOI: 10.1049/cp.2018.1402

14. Al-Azani, S., El-Alfy, E.-S. M., "Human Ethnicity Recognition using HOG Features," Smart Cities Symposium (SCS 2019), 24-26 March 2019, Kingdom of Bahrain, Proceedings Published by IET. DOI: 10.1049/cp.2019.0176

15. Al-Azani, S., El-Alfy, E.-S. M. "Multimodal Sentiment and Gender Detection for Video Logs," Proceedings of the 11th International Conference on Agents and Artificial Intelligence (ICAART), Prague, Czech Republic, Feb. 2019. http://www.insticc.org/node/TechnicalProgram/icaart/presentationDetails/77114

16. Al-Azani, S., El-Alfy, E.-S. M. "Using Feature-Level Fusion for Multimodal Gender Recognition for Opinion Mining Videos," 8th International Conference on Modeling, Simulation and Applied Optimization (ICMSAO'2019), 2019. Available at IEEExplore DOI: https://doi.org.extoljp.kfupm.edu.sa/10.1109/ICMSAO.2019.8902177

17. Althelaya, K., El-Alfy, E.-S. M., and Mohammed, S. "Forecasting of Bahrain Stock Market with Deep Learning: Methodology and Case Study," 8th International Conference on Modeling, Simulation and Applied Optimization (ICMSAO'2019), 2019. DOI: http://ieeexplore.ieee.org/document/8880382/

18. Shah, A. and El-Alfy, E.-S. M., "Multi-scale LPQ-DCT for Image Forgery Detection," 8th International Conference on Modeling, Simulation and Applied Optimization (ICMSAO'2019), 2019. Available at http://ieeexplore.ieee.org/document/08880273/

19. El-Alfy, E.-S. M., Al-Azani, S., "Statistical Comparison of Opinion Spam Detectors in Social Media with Imbalanced Datasets," Proc. Sixth International Symposium on Security in Computing and Communications (SSCC18), Bangalore, India, September 2018. Published by Springer in Communications in Computer and Information Science Series (CCIS), Volume 969, January 2019, ISSN: 1865:0929. https://link.springer.com/chapter/10.1007/978-981-13-5826-5_12

20. S. Abudalfa and M. Ahmed (2019), "Open Domain Context-Based Targeted Sentiment Analysis System" the 2019 IEEE 7th Palestinian International Conference on Electrical and Computer Engineering (PICECE), the Islamic University of Gaza, Mar. 26-27, 2019.
21. Galal M. BinMakhashen, Hamzah Luqman, and M. Ahmed (2019), "Experimental Evaluation of Salt Dome Detection in Seismic Images using Texture Analysis" 2nd Smart Cities Symposium 2019 (SCS'19), Bahrain, 24-26 Mar. 2019, IET INSPEC DIGITAL LIBRARY.
22. Al-Herz, A., & Pothen, A. (2020). A Parallel 2/3-Approximation Algorithm for Vertex-Weighted Matching. In 2020 Proceedings of the SIAM Workshop on Combinatorial Scientific Computing (pp. 12-21). Society for Industrial and Applied Mathematics.
23. Alyami, R. and Al-Zaidy, R. (2020) Arabic Dialect Identification in Social Media. International Conference on Computer Applications & Information Security, ICCAIS20.
24. Haque M S M, Hassan M R, Sulaiman M, Onoruoiza S, Kamruzzaman J, Arifuzzaman M, "Enhancing Branch Predictors using Genetic Algorithm", I8th International Conference on Modeling Simulation and Applied Optimization 2019, Pages 1-5
25. Dear Asif Gill, Ghassan Beydoun, Mahmood Niazi and Habib Ullah Khan, Adaptive Architecture and Principles for Securing the IoT Systems, The 14th International Conference on Innovative Mobile and Internet Services in Ubiquitous Computing (IMIS-2020)

The list of US patents granted/filed by ICS faculty members in the time duration Jan 2019 to Apr 2020

1. Selective information extraction from network traffic traces both encrypted and non-encrypted. A Ahmad, SA Almuhammadi - US Patent App. 15/981,431, 2019
2. Mohammad Alshayeb, Mahmood Niazi, Haris Mumtaz and Sajjad Mahmood, "Refactoring to improve the security quality of use case models", US Patent No. 10,481,906, November 19, 2019.
3. Luqman, H. A., El-Alfy, E.-S. M., and BinMakhashen, G. Spectral-Spatial Deep Interpreter of Hand Sign Language Alphabets, KFUPM Ref: 2019-234-TM, Oblon Ref: 527312US [Filed]
4. Amer G. A. Binsaadoon and El-Sayed M. El-Alfy, METHOD FOR IDENTIFYING A SUBJECT USING GAIT ANALYSIS, USPTO Patent, Application Number: 16/542,345, Filed: Aug 16, 2019, Publication Number: US 2019-0370535 A1, Publication Date: December 5, 2019, Grant Patent No. US10540544, Grant Date: January 21, 2020.
5. Amer G. A. Binsaadoon and El-Sayed M. El-Alfy, GAIT RECOGNITION SYSTEM TO IDENTIFY WALKING SUBJECT, USPTO Patent, Application Number: 16/542,351, Filed: Aug 16, 2019, Publica-tion Number: 20190370536, Publication Date: December 5, 2019, https://patents.justia.com/patent/20190370536
6. El-Sayed M. El-Alfy and Sadam Al-Azani, "Multi-Modal detection Engine of Sentiment and Demo-graphic Characteristics for Social Media Videos", Filed USPTO Patent, KFUPM Reference #:2018-185, December 26, 2018. Application Number 16/590856, Filed: October 2 ,2019.
7. Amer G. A. Binsaadoon and El-Sayed M. El-Alfy, Multi-Kernel Fuzzy Local Gabor Feature Extraction Method for Automatic Gait Recognition, USPTO Patent, Filed Application No.

15/821121, Nov. 22, 2017, Publication No. 20190156113, Publication Date: May 23, 2019, Grant Patent No. US10552671, Grant Date: February 4, 2020.

8. Methods, computer readable media, and systems for compiling concise expressive design pattern source code. USPT Patent number: 10437572; Type: Grant; Date of Patent: October 8, 2019. Inventors: Taher Ahmed Ghaleb, Khalid Abdullah Aljasser, Musab A. Alturki

9. S. Abudalfa and M. Ahmed, "Dynamic Semi-Supervised Feature Generation for Open Domain Targeted Sentiment," filed on May 2, 2019 (Application No. 62/841,956).

10. Sabri A. Mahmoud and Wasfi G. Al-Khatib and Tamim Alnethary, "Novel Arabic spell checking error model" US Patent #10515148, December 24, 2019.

11. Hassan M R, Hossain M I, and Abdulraheem A,"Apparatuses, systems, and methodologies for permeability prediction", US Patent Office, Patent Number: US App. 15/210,301.

12. Hassan M R and Hossain M I, "Hidden Markov Model based Data Ranking for Enhancement of Classifier Performance to Classify Imbalanced Dataset", Oblon Ref: 525982US. (Under processing by the Attorney).

13. Luqman, H. A, and Mahmoud, S. A., Methods, Computer readable media, and systems for machine translation between arabic and arabic sign language, Oblon Ref: 514956US [Filed]