Luay Alawneh, Ph.D.

PERSONAL INFO

- Associate Professor of Software Engineering at Jordan University of Science & Technology
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- Professional profiles: LinkedIn, Google Scholar, ResearchGate

SHORT BIO

Luay Alawneh is an associate professor in the Department of Software Engineering at Jordan University of Science and Technology (JUST), Irbid, Jordan. He earned his master's and PhD degrees from the Electrical and Computer Engineering department at Concordia University in Canada. His research activities focus on the analysis of high-performance computing and parallel systems, and the application of deep learning in human activity recognition. Before joining JUST in 2014, he worked at Nuance Communications Canada as a senior software engineer. Nuance Communications is a world leader (acquired by Microsoft) in voice recognition. Further, before completing his PhD studies, Luay worked as an applications developer at Rockwell Automation.

EDUCATION

- Ph.D., Electrical & Computer Engineering, Concordia University, 2012, Montreal – Canada. Thesis: *"Techniques to Facilitate the Understanding of Inter-Process Communication Traces"*.
- M.A.Sc., Electrical & Computer Engineering, Concordia University, 2006, Montreal – Canada. Thesis: *"Verification & Validation in Systems Engineering Design Models: Applications to UML 2.0 Activity & Class Diagrams"*.
- BSc, Electrical Engineering (Computer Engineering specialization), Jordan University of Science & Technology, 1999, Irbid – Jordan.

ACADEMIC WORK EXPERIENCE

Feb 2014 to present	**Jordan University of Science & Technology, Irbid - Jordan**
Feb 2019 to present	Associate Professor in Software Engineering
Feb 2014 to Feb 2019	Assistant Professor in Software Engineering
Sept 2016 to Sept 2018	Head of Software Engineering Department

- *Head of IET Accreditation Committee (Sept 2016 to present):*
  - Preparing all the requirements for the next accreditation visit in December 2023.
  - Leading the accreditation process and the communication with the IET personnel.
  - Preparation of the documentation for accreditation visits.
  - Following up with the faculty members and seeking help from administrative staff to apply the IET recommendations and standards to maintain the department's accreditation.
  - Performing QA activities on the software engineering courses in terms of validating the course learning outcomes and their mapping to the program learning outcomes.

- *Teaching the following courses:*
  - *Software Engineering for Web Applications*: restructured the course by adding new material to cope with the new technology standards. The course covers topics such as HTTP protocol, Java Servlets, JSP, MVC, SOAP and REST web services, and frameworks such as Spring and Spring-boot.
  - *Software Quality Assurance*: developed this new elective course for teaching best industrial practices in software engineering and quality assurance.
  - *Software Security*.
  - *Software Requirements Engineering*.
  - *Software Modeling*.
  - *Software Analysis & Design*.

- *Software Engineering Lab.*
- *Practical Training.*

- *Undergraduate students' supervision.* Supervising undergraduate students' projects in different topics such as Internet of Things (IoT), Document Management Systems, Social Network applications, Integrated Hospital Management System, Augmented Reality, Modeling tools, and maintenance of open-source systems (OSS).

Research Activities:

- *Graduate students' supervision.* Supervising graduate students from the Faculty of Computing and Information Technology (the *Software Engineering Department* does not have a master's program) in different topics including GPU programming, Deep Learning, IoT, DevOps, Sentiment Analysis, and NLP.

- *Current Graduate Students (computer engineering and electrical engineering students):*
  - *Mohammad Shehab,* PhD student at Concordia University (Software defects prediction).
  - *Ayah Al-Qurashi*, MSc (Classification of software requirements using deep learning).
  - *Maram Al-Sakarneh*, MSc (Forecasting of solar energy using deep learning).
  - *Aseel Abu-Abbas*, MSc (Classification of software requirements using machine learning).
- *Former Graduate Students (Computer science and computer engineering students)*
  - *Ameena Flefil*, MSc (Surveys on DevOps tools).
  - *Asalah Bani-Thiab*, MSc (Contextual emotion detection).
  - *Israa Al-Asem*, MSc (Path planning for vehicles in Internet of Underwater Things).
  - *Tamam Al-Sarhan*, MSc (Human activity recognition using deep learning).
  - *Imad Rawashdeh*, MSc (Speeding up sequence segmentation using GPU programming).

- Leading a research project on human activity recognition using deep learning techniques.
  - Deep learning networks: Recurrent Neural Networks (RNN), LSTM, and GRU
  - Improving the performance of RNN models using data augmentation techniques.
  - Applying statistical tests to check the significance of the proposed solutions.
  - Programming the models using Python on Keras and Tensorflow.

- Conducting research in software engineering and HPC resulting in several publications in reputable international journals and conferences.

- Frequent reviewer in the following journals:
  - Engineering Applications of Artificial Intelligence, Elsevier.
  - Journal of Ambient Intelligence and Humanized Computing, Springer.
  - Cluster Computing, Springer.
  - Soft Computing, Springer.
  - Future Generations Computer Systems, Elsevier.
  - Applied Soft Computing, Elsevier.
  - Expert Systems with Applications, Elsevier.

- Technical program committee member, track chair, and session chair in IEEE International Conference on Information and Communication Systems (ICICS), 2015 to present.

- Technical program committee member in MobiSPC-2021, SDS 2018 and AICCSA2018.

- *Member of the following committees:*
  - Head/member of several search committees for hiring faculty members.
  - Head/member of the study plan committee.
  - Head/member of the scientific research committee.
  - Member of the committee for establishing a graduate program in the SE department.
  - Internal auditor for the International Standards Organization (ISO) process at JUST.
  - Acting as a liaison between the software engineering department and the industry.
  - Participated in the ERASMUS+ 561577 PWs@PhD project in the United Kingdom for developing a PhD program in Software Engineering in Jordanian Universities.

Sept 2020 to Sept 2021   **Concordia University, Montreal – Quebec**
<u>Visiting Researcher in Electrical & Computer Engineering</u>

- Leading a research project on the development of methods and techniques for facilitating the analysis and maintenance of high performance and cloud-based environments.
  - Using information theory approaches.
  - Statistical analysis techniques.
  - Statistical prioritization techniques.
  - Programming using Java.
- Co-supervising a PhD student who is working on Just-In-Time (JIT) Defect Prediction in clustered software projects using machine learning.

Jan. 2004 to May 2006   **Concordia Institute for Information Systems Engineering**
<u>Research Assistant</u>

- Designed and implemented a verification tool to measure the validity of workflow systems modeled using UML 2.0 activity diagrams. NuSMV model checker was used to verify the system properties.
- Designed and implemented a verification tool to measure the correctness of UML 2.0 class diagrams.
- Integration with Artisan Real-time studio database using OLE.
- Teacher assistant at Concordia University:
  - Introduction to programming I.
  - Introduction to programming II.
  - Computer Organization.

RESEARCH INTERESTS

- Dynamic Analysis of High-Performance Computing (HPC) and GPU Programming.
- Program analysis of multithreaded real-time distributed systems.
- Human Activity Recognition (HAR) using deep learning approaches.
- Requirements engineering, Software evolution and maintenance.
- Software processes such as XP and Agile and DevOps.
- Verification and Validation of software systems models.

VOLUNTARY ACTIVITIES

- Organized a field trip to ESKADENIA Software Solutions in Amman for SE students.
- Organized an activity at JUST with the PMP Jordan Chapter Group for SE students.

GRANTS, FELLOWSHIPS, AND AWARDS

- JUST Grant no. 20170396: Improving Genome Sequence Analysis Algorithms using the Capabilities of Graphics Processing Units (GPU).
- JUST Grant no. 20200285: Locating inefficient communication in message passing programs.
- JUST Grant no. 20220450: A Unified Approach for Arabic Dialects Translation to Modern Standard Arabic (ongoing project).
- ERASMUS+ Teaching Mobility Grant at Polytechnic Institute of Cávado and Ave (IPCA), Portugal, 2023.
- ERASMUS+ Teaching Mobility Grant at Romanian-American University, 2019.
- ERASMUS + 561577 PWs@PhD, Capacity building project, UK, 2018.
- National Scientific Research and Support Fund grant no. Bas/2/04/2013.
- Dean Fellowship Award for Doctoral students, Concordia University 2008/2009/2010.

- Teaching Assistant fellowships, Concordia University 2004 -2006.

April 2012 to August 2014   Nuance Communications, Montreal - Quebec
<u>Senior Software Developer Engineer R&D</u>

Duties and Responsibilities:
- Proposing new solutions to optimize the Nuance Speech Server (NSS).
- Analysis of the Nuance Speech Server (NSS).
- Development of new features in NSS.
- Designing of new features by applying design patterns.
- Writing project specifications using the Unified Modeling Language.
- C/C++, Java programming, Multithreading and inter-process communication programming.
- Following up with the QA team on performance related issues.
- Presenting product features to the QA team for deriving the test cases.
- Writing unit tests and functional tests (sanity tests) for new features and feature enhancements.
- Protocols: SIP, MRCP, TCP and HTTP.
- Tools: Clearcase, Subversion (SVN), Jira, ClearQuest and Rally.
- Methodologies: Agile, Scrum, DevOps, continuous integration and delivery.

Main Projects:

- *Embedding libmicrohttpd in NSS:* Improved NSS to work as an HTTP server in order to enable the different components in the framework to send commands to NSS using http protocol.
- *Language Reload:* To apply the minor modifications for the language models, NSS should restart its service. The Language Reload project intends to overcome this issue by responding to http requests to reload the language models at runtime. This project improved NSS by reducing the downtime of NSS when new language updates are available. Client: *Apple*
- *Enrolment From Transcription (EFT):* Users of voice recognition systems should be able to adapt the acoustic models in their user profiles to their voices by reading a transcription. The purpose of this project is to improve the accuracy of the recognition. Client: *Intel*.
- *Caching of user Language Models:* NSS should not rebuild a Language Model from user information for each request. This project aims to cache the Language Model (LM) in the user profile to save the time to rebuild the LM during each request. The LM should only be rebuilt when the user's information change. Client: *Samsung*.

May 2006 to April 2011   TekSystems Canada Corp, Montreal - Quebec
Contractor for Rockwell Automation in USA
<u>Proposals & Estimation Applications Developer/Manager</u>

Duties and Responsibilities:
- Application architecture, development and maintenance including analysis, design, coding, testing, implementation and change management.
- Identifying secondary impacts caused by changes to the existing systems.
- Gathering the requirements directly from the business stakeholders and writing functional requirements.
- Ensure business requirements are identified, documented and met.
- Converting business requirements into technical specifications.
- Preparation of the technical documentation for the change management process which includes pre-implementation test plan, post-implementation test plan, implementation plan and back-out plan.
- Prepared test data and system testing according to the prepared test plans.

- Performed application development following the Agile software development methodology. Worked in a team of six members. Luay was responsible for leading the development of the Frontlog Tracking System and the Approval Request system.

Main Projects:

- *iPE Proposals & Estimating Tools:* Developed a set of modules for the Estimating and Proposals department at Rockwell Automation. The main two modules are the Frontlog Tracking System (FTS) and the Request Approval System.
  - o FTS is a group of Lotus Notes applications used to identify and track predicted revenue for Proposed project Opportunities. Frontlog data is a leading indicator of Rockwell business health and reported monthly to Senior Management.
  - o The Request Approval System is a workflow system that governs the approvals of various request types and is being used by all businesses at Rockwell.
- *Customer Satisfaction Survey:* Responsible for the architecture and development of a standard template for customer satisfaction survey in a web-based survey in a Domino environment.
- *Channel Extranet*: Participated in the development of an enterprise system that consists of many databases distributed for many regions.
- *Demos Online*: Developed a product demo reservation system, which consists of two applications for administration and a web interface used by end users.

May 2002 - December 2003 W.J. TOWELL COMPUTER SERVICES
<p align="center">CRM Application Developer</p>

- Designed and Developed the Document Management System for the Ministry of Housing and Electricity Using Visual Basic & Lotus Notes.
- Designed Developed the Document Management System for the Ministry of Religious Affairs and Endowments using ArabDox Document Management System.
- Developed the Agricultural Census System for the ministry of Agriculture on the Pocket PC using Embedded Visual Basic 6.0 and SQLCE database.
- Designed Developed the Educational System for Muscat College using Visual Basic 6.0 and Oracle Database.

August 2000 - May 2002   LEAPONE EXECUTIVE CONSULTING
<p align="center">Programmer</p>

- Developing and Designing Workflow systems using Lotus Notes R5 (LotusScript & Lotus Formula programming, JavaScript)
- Developing Workflow applications using Lotus Workflow.
- Maintaining and Supporting the Clients' Management Information Systems.

Oct. 1999 – Aug. 2000   JORDAN-UNITED STATES BUSINESS PARTNERSHIP
<p align="center">Software Developer</p>

- Participated in the development of the company's Management Information system using Lotus Notes Database development.

PROFESSIONAL CERTIFICATIONS

- ITIL v3 Foundation
- ISO 9001:2008 Internal Quality Auditor
- IBM Certified Developer

SELECTED PUBLICATIONS

BOOK:

- Mourad Debbabi , Fawzi Hassaine , Yosr Jarraya , Andrei Soeanu , Luay Alawneh, "Verification and Validation in Systems Engineering: Assessing UML/SysML Design Models," Springer, 2010

JOURNAL ARTICLES UNDER REVIEW:

- Ayah Alqurashi, Luay Alawneh, "Stacked ensemble deep learning for the classification of non-functional requirements," submitted to IEEE Transactions on Reliability, November 2023.

REFEREED JOURNALS:

- A. Bani-Thiab, L. Alawneh, M. Alsmadi, "Contextual Emotion Detection Using Ensemble Deep Learning," Computer Speech and Language, Volume 86, Elsevier.

- L. Alawneh, A. Hamou-Lhadj, "Locating and categorizing inefficient communication patterns in HPC systems using inter-process communication traces," Journal of Systems and Software 194, 111494, December 2022.

- L. Alawneh, M. Al-Zinati, M. Al-Ayyoub, "User identification using deep learning and human activity mobile sensor data," International Journal of Information Security, Springer, 2022.

- L. Alawneh, M. Al-Ayyoub, ZA. Al-Sharif, A. Shatnawi, "Personalized human activity recognition using deep learning and edge-cloud architecture," Journal of Ambient Intelligence and Humanized Computing, 1-13, February 2022.

- M. Al-Bzoor, E. Al-assem, L. Alawneh, Y. Jararweh, "Autonomous underwater vehicles support for enhanced performance in the internet of underwater things," Transactions on Emerging Telecommunications Technologies 32 (3), e4225, March 2021.

- M. Malkawi, A. Shatnawi, K. Al-Zoubi, L. Alawneh, "Improving Network Entry Procedure in Broadband Wi-Fi Networks," International Journal on Communications Antenna and Propagation (IRECAP) 11 (5), 2021.

- L. Alawneh, T. Alsarhan, M. Al-Zinati, M. Al-Ayyoub, Y. Jararweh, H. Lu, "Enhancing human activity recognition using deep learning and time series augmented data," Journal of Ambient Intelligence and Humanized Computing, 10.1007/s12652-020-02865-4.

- L. Alawneh, M.A. Shehab, M. Al-Ayyoub, Y. Jararweh, Z.A. Al-Sharif, "A scalable multiple pairwise protein sequence alignment acceleration using hybrid CPU–GPU approach," Cluster Computing, 2020, pp.1-12.

- L. Alawneh, E. Rawashdeh, M. Al-Ayyoub, Y. Jararweh, "GPU Parallelization of Sequence Segmentation Using Information Theoretic Models", Simulation Modelling Practice and Theory, Volume 86, Pages 11–24, August 2018

- J. Hassine, A. Hamou-Lhadj, L. Alawneh, "A framework for the recovery and visualization of system availability scenarios from execution traces," Information and Software Technology, Volume 96, Pages 78-93, 2018

- Y. Jararweh, M. Al-Ayyoub, M. Fakirah, L. Alawneh, B. Gupta, "Improving the performance of the needleman-wunsch algorithm using parallelization and vectorization techniques," Multimedia Tools and Applications, Pages 1-17, 2017

- L Alawneh, A Hamou-Lhadj, J Hassine, "Segmenting large traces of inter-process communication with a focus on high performance computing systems," Journal of Systems and Software, Volume 120 October 2016, pages 1-16.

- H. Pirzadeh, S. Shanian, A. Hamou-Lhadj, L. Alawneh, A. Sharifee, "Stratified Sampling of Execution Traces: Execution Phases Serving as Strata," Journal on Science of Computer Programming, Volume 78 Issue 8, 2013, Pages 1099-1118.

- L. ALawneh and A. Hamou-Lhadj, "An exchange format for representing dynamic information generated from High Performance Computing applications," Future Generation Computer Systems, Volume 27, Issue 4, April 2011, pages 381-394.

REFEREED CONFERENCES:
- M. Al-Harbi, R. Obeidat, M. Al-Ayyoub, L. "Alawneh Question-aware Deep Learning Model for Arabic Machine Reading Comprehension", *to appear* in the proceedings of The Third International Conference on Intelligent Systems and Patterns Recognition (ISPR'2023).

- A. Flefil, L. Alawneh, and F. Albalas. "DevOps Culture in Software Development Companies in Jordan." 2022 13th International Conference on Information and Communication Systems (ICICS). IEEE, 2022.

- M. Shehab, A. Hamou-Lhadj, and L. Alawneh. "ClusterCommit: A Just-in-Time Defect Prediction Approach Using Clusters of Projects." 2022 IEEE International Conference on Software Analysis, Evolution and Reengineering (SANER). IEEE, 2022.

- L. Alawneh, B. Mohsen, M. Al-Zinati, A. Shatnawi, M. Al-Ayyoub, "A Comparison of Unidirectional and Bidirectional LSTM Networks for Human Activity Recognition," 2020 IEEE International Conference on Pervasive Computing and Communications Workshops (PerCom Workshops), 2020.

- Md. S. Islam, K. K. Sabor, W. Hamou-Lhadj, A. Trabelsi, and L. Alawneh, "MASKED: A MapReduce Solution for the Kappa-pruned Ensemble-based Anomaly Detection System," In Proceedings of the 18th IEEE International Conference on Software Quality, Reliability, and Security, July 2018

- H. S. Alkaf, J. Hassine, A. Hamou-Lhadj, L. Alawneh, "An Automated Change Impact Analysis Approach to GRL Models," 18th International SDL Forum, 2017

- L. Alawneh, "Requirements Prioritization Using Hierarchical Dependencies," Information Technology-New Generations, 459-464

- L. Alawneh, A. Hamou-Lhadj, J. Hassine, "Towards a Common Metamodel for Traces of High Performance Computing Systems to Enable Software Analysis Tasks," In Proceedings of 22nd International Conference on Software Analysis, Evolution, and Reengineering, (SANER15).

- L. Alawneh and A. Hamou-Lhadj, "Identifying Computational Phases from Inter-Process Communication Traces of HPC Applications," In Proceedings of the International Conference on Program Comprehension (ICPC 2012), 2012.

- L. Alawneh and A. Hamou-Lhadj, "Pattern Recognition Techniques Applied to the Abstraction of Traces of Inter-Process Communication," In Proceedings of the European Conference on Software Maintenance and Reengineering (CSMR 2011), 2011.

- L. Alawneh, M. Debbabi, Y. Jarraya, A. Soeanu, F. Hassaine: "A Unified Approach for Verification and Validation of Systems and Software Engineering Models," ECBS 2006: 409-418

BOOK CHAPTER:
- L. Alawneh and A. Hamou-Lhadj, "Execution Traces: A New Domain that Requires the Creation of a Standard Metamodel," book chapter in the book series Communications in Computer and Information Science, Springer Berlin Heidelberg, 2009.