Wafa' H. AlAlaween

Curriculum Vitae

Address

Associate Professor
Department of Industrial Engineering
The University of Jordan
Amman, 11942
Jordan

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Qualifications

Ph.D. Automatic Control and Systems Engineering
The University of Sheffield, UK (2018)

Dissertation Title: "A New Framework for Right-First-Time Production of Granules and Tablets: A Systems Engineering Approach to Modelling and Optimization"

M.Sc. Industrial Engineering
The University of Jordan, Jordan (2013)

Dissertation Title: "Solving Dynamic systems with Multi-responses in Robust Design by Integrating Desirability Function and Data Envelopment Analysis"

B.Sc. Industrial Engineering
The University of Jordan, Jordan (2010)

Graduation Project Title: "New Product Development: Orange Juice"

Experience

Associate Professor

Jul. 2022 – Present

Department of Industrial Engineering
The University of Jordan, Amman, Jordan

Teaching various courses related to artificial intelligence and deterministic and stochastic optimization, and supervising undergraduate and postgraduate students.
Working on various projects funded by different international and national organizations.
Leading or being a team member in various committees and activities that support The University of Jordan at different levels and in many aspects (e.g., defining and prioritizing the national research priorities).

Assistant Professor   Feb. 2018 – Jul. 2022

Department of Industrial Engineering
The University of Jordan, Amman, Jordan

Teaching various courses related to artificial intelligence and deterministic and stochastic optimization, and supervising undergraduate and postgraduate students.
Teaching all the courses online during the university closure due to COVID-19.
Working on various projects funded by different international and national organizations.
Leading or being a team member in various committees and activities at The University of Jordan and The Higher Council of Science and Technology to support the university's activities and to evaluate the current state of scientific research in Jordan and its impact on the national economy.

Graduate Teaching Assistant   Mar. 2016 – Jan. 2018

Department of Automatic Control and Systems Engineering
The University of Sheffield, UK

Demonstrating and supporting learning activities in different laboratories related to modelling and control of different processes and applications for four different departments.

Teaching and Research Assistant   Feb. 2011 – Jun. 2014

Department of Industrial Engineering
The University of Jordan, Amman, Jordan

Teaching various laboratories and courses related to manufacturing and advanced optimization.

Research Grants and Contracts

- **W.H. AlAlaween** and M. Alabdallat, The Effects of Ionizing Radiation on the In-Vivo Biocompatibility of Polymer Medical Implants Produced by 3D Printing, December, 2023. Abdul Hameed Shoman Foundation (JOD 20k).

    The idea of this project stems from the fact that ionizing radiation, as a sterilization technique, can affect the biocompatibility of implants produced using the fused deposition 3D printing process. Therefore, such a project aimed to investigate the effects of ionizing radiation on the biocompatibility of these implants.

    In this project, The University of Jordan will collaborate with The Jordan Atomic Energy Commission.

- **W.H. AlAlaween**, A Fuzzy Based Predictive Framework for Modelling the Fused Deposition Process, December, 2023. The Jordan Design and Development Bureau and King Abdallah II Fund for Development (JOD 4,150, Undergraduate Project- For Students).

    This project aims to develop a fuzzy-based predictive model that maps the parameters of the fused deposition 3D printing process to the mechanical properties of 3D printed specimens. Such a model can be used to predict these mechanical properties in a way that facilitate the process of producing 3D printed parts with the required mechanical properties.

- B. Gharaibeh, **W.H. AlAlaween** and Ju Li, Radiation Effects On Medical Devices Made By 3d Printing, April, 2021. The MIT-Jordan Abdul Hameed Shoman Foundation Seed Fund ($30k).

    The idea of this project stems from the fact that thorough sterilization of medical devices is more than ever important given the spread of viruses and diseases. Therefore, such a project aimed to investigate the effects of ionizing radiation on the mechanical, physical and chemical properties. This project is the first of its kind as it investigated these effects for devices produced using functional materials by the additive manufacturing techniques in healthcare. In addition, the radiation parameters were investigated and mapped to the changes in the devices' properties by exploiting the wealth of digital data allied to Artificial Intelligence. The Right-First-Time strategy was then employed to identify the optimal set of radiation parameters that can lead to the required/optimal medical devices' properties.

    In this project, The University of Jordan collaborated with The Massachusetts Institute of Technology.

- **W.H. AlAlaween**, B. Gharaibeh, M. Mahfouf and A. Al Soussi, Right-First-Time Fused Deposition for Healthcare Manufacturing, October, 2020. The Royal Academy of Engineering (UK) and Industrial Scientific Research and Development Fund-The Higher Council for Science and Technology (Jordan) (£80k).

    The idea of this project stems from the fact that Industry-4.0 concepts can be ascertained by the systematic and profitable integration between cyber and physical systems to construct intelligent plants. Therefore, this project proposed the right-first-time production concept for products produced by Additive Manufacturing. Such a concept was ascertained by developing novel Systems-Engineering paradigms that were then exploited in a reverse-engineering fashion to identify the optimal set of parameters used to manufacture 3D printed products with predefined properties. In this project, medical implants were systematically designed then 3D printed right from the first time utilizing these paradigms. To validate the paradigms proposed, various

implants were produced for patients suffering from Hemifacial Microsomia and skull laceration. All implantation operations, which were carried in Jordan under strict medical and ethical supervisions, proved very successful, and as a result, other similar patient-specific implants will be produced in the near future. The cost of producing these implants was less than 10% of the cost of the implants produced by other leading manufacturers based in Europe, leading therefore, to treatment costs being reduced significantly. Finally, it was also found that the mechanical properties of these 3D printed implants, were better than those properties pertaining to off-the-shelf implants, in terms of strength and micro-hardness. It is worth mentioning that this project is the first of its kind in Jordan.

In this project, The University of Jordan collaborated with The University of Sheffield and Printie 3D.

- **W.H. AlAlaween**, A Predictive Modelling Paradigm Based on The Artificial Neural Network for COVID-19 Expansion in Jordan, December, 2020. King Abdallah II Design and Development Bureau and King Abdallah II Fund for Development (JOD 3,830, Undergraduate Project- For Students).

  Due to the rapid spread of COVID-19 globally and its extremely infectious nature, there was a strong need to predict the spread of the disease to take the best courses of actions to minimize its spread and its negative impacts on the national economy and key sectors (e.g., health, pharmaceutical and industrial sectors). Therefore, this project aimed to develop a nonlinear autoregressive exogenous model (NARX) to predict the spread of COVID-19 in Jordan by mapping the related factors (i.e. sociodemographic characteristics and government actions) to the number of confirmed COVID-19 cases in the twelve governorates in Jordan. It was shown that the developed NARX model predicted the number of confirmed cases successfully which led to efficient management of the available resources, and helped decision-makers in selecting the best courses of actions to minimize the spread of COVID-19.

  In this project, The University of Jordan collaborated with The National Centre for Security and Crisis Management (NCSCM) in Jordan.

- **W.H. AlAlaween**, M. Mahfouf, Abdallah Alalawin and Mahmoud Mustafa, Developing An International Warehouses Assessment Scheme, April, 2019. The Royal Academy of Engineering (UK) and Industrial Scientific Research and Development Fund-The Higher Council for Science and Technology (Jordan) (£50k).

  In order to focus on their core businesses, enterprises often tend to outsource their logistic activities to third-party logistics providers (3PLPs). Therefore, assessing the various 3PLPs available is an indispensable process that precedes eliciting the best one, where warehouse logistics and facilities are considered to be the main resources that can determine the performance of a 3PLP. Therefore,

this project aimed to develop an international warehouse assessment scheme through several stages including defining the evaluation criteria, developing different schemes based on different algorithms, and eliciting the best scheme based on the validated results that included the results of 55 warehouses. Three schemes based on three different novel algorithms were developed successfully. The elicited scheme was registered in The Jordan standards and metrology organization (JSMO), as the standardization body in Jordan.

In this project, The University of Jordan collaborated with The Conformity Assessment Centre, The Hashemite University and The University of Sheffield.

Research Visits

Visiting Scholar   Jan. 2023

Department of Automatic Control and Systems Engineering
The University of Sheffield, UK

Visiting Scholar   Aug. 2022

Department of Industrial Engineering
Massachusetts Institute of Technology, Cambridge,
Massachusetts, USA

Visiting Scholar   Feb. 2022

Department of Automatic Control and Systems Engineering
The University of Sheffield, UK

Research Interests

- Computational intelligence and artificial intelligence.
- Data mining and information fusion.
- Biologically inspired computing and optimization.
- Systems engineering approaches for modelling and optimization.
- Fuzzy and neural fuzzy systems for modelling and control.

Professional Activates and Recognition

- Strategic Management and Academic Leadership, The University Leadership and Management Training Course (UNILEAD), The University of Oldenburg .
- Project Management, The University Leadership and Management Training Course (UNILEAD), The University of Oldenburg.
- Member of the organization committee of The 10th International Granulation Workshop (2023).

- DIES ProGRANT Proposal Writing for Research Grants (three-section course).
- The IIER Excellent Paper Award.
- Member of the Editorial Board of the Journal of Medicines Development Sciences.
- Associate Fellow of Higher Education Academy (AFHEA).
- Member of the organization committee of The 8th International Granulation Workshop (2017).
- Member of the organization committee of The 7th International Granulation Workshop (2015).
- Referee for a number of international journals and conferences.
- Member of Jordan Engineers Association.

Recent Key Publications

Journal Papers

[1] M.A. Shbool, F. Altarazi, **W.H. Alalaween,** A Dynamic nonlinear autoregressive exogenous model to analyze the impact of mobility during COVID-19 pandemic on the electricity consumption prediction in Jordan, Journal of Scientific & Industrial Research, 2024.

[2] **W.H. AlAlaween**, M. Mahfouf, C. Omar, R.B Al-Asady, D. Monaco, A.D. Salman, Serial artificial neural networks characterized by Gaussian mixture for the modelling of the Consigma25 continuous manufacturing line, Powder Technology, 2023.

[3] **W.H. AlAlaween**, A.H. AlAlawin, S.O. AbuHamour, BM. Gharaibeh, M. Mahfouf, A. Alsoussi, A.E. AbuKaraky, Fuzzy particle swarm for the right-first-time of fused deposition, Journal of Intelligent & Fuzzy Systems, 2023.

[4] M.A. Shbool, A. Al-Bazi, A. Kokash, **W.H AlAlaween**, N.T. Albashabsheh and R. Al-Taher, The economy of motion for laparoscopic ball clamping surgery: a feedback educational tool, MethodsX, 2023.

[5] **W.H. AlAlaween**, O.A. Abueed, B.M.Y. Gharaibeh, A.H. AlAlawin, M. Mahfouf, A. Alsoussi and N.T. Albashabsheh, The development of a radial based integrated network for the modelling of 3D fused deposition, Rapid Prototyping Journal, 2023.

[6] A.H. Alalawin, A.M. Qamar, **W.H. AlAlaween**, Y. Bentahar, T. Al-Halaybeh, S. Al-Jundi and Moayad Tanash, Aligning key performance indicators with lean management in the service sector: A case study for a Jordanian telecommunication company, Cogent Engineering, 2022.

[7] **W.H. AlAlaween**, O.A. Abueed, A.H. AlAlawin, O.H. Abdallah, N.T. Albashabsheh, E.S. AbdelAll and Y.A. Al-Abdallat, Artificial neural networks for predicting the demand and price of the hybrid electric vehicle spare parts, Cogent Engineering, 2022.

[8] A.H. AlAlawin, **W.H. AlAlaween**, M.A. Shbool, O.H. AlAlaween and L. Al-Qatawneh, An interpretable predictive modelling framework for the turning process by the use of a compensated fuzzy logic system, Production & Manufacturing Research, 2022.

[9] A.H. AlAlawin, **W.H. AlAlaween**, M.A. Salem, M. Mahfouf, N.T. Albashabsheh and C. He, A fuzzy logic based assessment algorithm for

developing a warehouse assessment scheme, Computers & Industrial Engineering, 2022.

[10] **W.H. AlAlaween**, N.M. Fa'ouri, S.H. Al-Omar, E.M. Hendaileh, A.S. Almousa, A.H. AlAlawin, O.H. Abdallah, N.T. Albashabsheh, B. Khorsheed, and O.A. Abueed, A Dynamic Nonlinear Autoregressive Exogenous Model for the Prediction of COVID-19 Cases in Jordan, Cogent Engineering, 2022.

[11] L.M. Al-Durgham, **W.H. AlAlaween** and N.T. Albashabsheh, Optimizing the Turning Operation via Using the Grey Relational Grade, International Journal of Mechanical Engineering and Robotics Research, 2022.

[12] **W.H. AlAlaween**, A.H. AlAlawin, M. Mahfouf, O.H. Abdallah, M.A. Shbool and M.F. Mustafa, A New Framework for Warehouse Assessment Using a Genetic-Algorithm Driven Analytic Network Process, PLOS ONE, 2021.

[13] **W.H. AlAlaween**, A.H. AlAlawin, L. Al-Durgham and N.T. Albashabsheh, A New Integrated Modelling Architecture Based on the Concept of the Fuzzy Logic for the Turning Process, Journal of Intelligent & Fuzzy Systems, 2021.

[14] M. Shbool, A. AlBazi and **W.H. AlAlaween**, An Integrated Multi-Criteria Decision-Making Framework for a Medical Device Selection in the Healthcare Industry, Cogent Engineering, 2021.

[15] **W.H. AlAlaween**, A.H. Alalawin, Mahdi Mahfouf and Omar H. Abdallah, A Dynamic Type-1 Fuzzy Logic System for the Development of a New Warehouse Assessment Scheme, IEEE Access, 2021.

[16] **W.H. AlAlaween**, M. Mahfouf and A.D. Salman, When swarm meets fuzzy logic: Batch optimisation for the production of pharmaceuticals, Powder Technology, 2021.

[17] A. Alalawin, L. Arabiyat, **W.H. AlAlaween**, A. Qamar and A. Mukattash, Forecasting vehicle's spare parts price and demand, Journal of Quality in Maintenance Engineering, 2020.

[18] **W.H. AlAlaween**, B. Khorsheed, M. Mahfouf, G.K. Reynolds and A.D. Salman, An interpretable fuzzy logic based data-driven model for the twin screw granulation process, Powder Technology, 2020.

[19] M. Alshafiee, **W.H. AlAlaween**, D. Markl, M. Soundaranathan, A. Almajaan, K. Walton, L. Blunt and K. Asare-Addo, A predictive integrated framework based on the radial basis function for the modelling of the flow of pharmaceutical powders, International Journal of Pharmaceutics, 2019.

[20] **W.H. AlAlaween**, B. Khorsheed, M. Mahfouf, I. Gabbott, G.K. Reynolds and A.D. Salman, Transparent predictive modelling of the twin screw granulation process using a compensated interval type-2 fuzzy system, European Journal of Pharmaceutics and Biopharmaceutics, 2018.

[21] **W.H. AlAlaween**, M. Mahfouf and A. Salman, Integrating the physics with data analytics for the hybrid modelling of the Granulation Process, AIChE Journal, 2017.

[22] **W.H. AlAlaween**, M. Mahfouf and A. Salman, Predictive modelling of the granulation process using a systems engineering approach, Powder Technology, 2016.

[23] A. Al-Refaie, E. Sy, I. Rawabdeh and **W.H. AlAlaween**, Integration of SWOT and ANP for effective strategic planning in the cosmetic industry, Advances in Production Engineering & Management, 2016.

[24] A. Al-Refaie, **W.H. AlAlaween**, A. Diabat and M. Li, Solving dynamic systems with multi-responses by integrating desirability function and data envelopment analysis, Journal of Intelligent Manufacturing, 2014.

Conferences

[1] **W.H. AlAlaween**, M. Mahfouf, C. Omar, R.B Al-Asady, D. Monaco and A.D. Salman, A modelling framework based on serial artificial neural networks for the modelling of a continuous tabletting line, The 10th International Granulation Workshop, Sheffield, UK, 2023.

[2] **W.H. AlAlaween**, A. Alalawin, B.M.Y. Gharaibeh, M. Mahfouf and A. Alsoussi, An interval type-2 fuzzy logic system for the simulation of fused deposition, International Conference on Electrical, Computer, Communications and Mechatronics Engineering (ICECCME), Maldives, 2022.

[3] B.M.Y. Gharaibeh, A.A. Salaimeh, M.W. Jararweh, A. Al-Omari, **W.H. AlAlaween** and M. Mahfouf, Correlation of optical properties to mechanical degradation of 3D printed thermoplastic polyurethane polymers subjected to gamma irradiation, International Conference on Electrical, Computer, Communications and Mechatronics Engineering (ICECCME), Maldives, 2022.

[4] **W.H. AlAlaween**, A. Alalawin, B.M.Y. Gharaibeh, M. Mahfouf and A. Alsoussi, A type-1 fuzzy logic system for the modelling of fused deposition, International Conference on Research in Science, Engineering and Technology (ICRSET), Barcelona, Spain, 2022.

[5] **W.H. AlAlaween**, O.A. Abueed, A.H. AlAlawin and M. Mahfouf, A grey-relational-based type-1 fuzzy logic analysis for the development of a warehouse assessment scheme, The 2nd International Conference on Advanced Research in Management, Economics, and Accounting (ARMEACONF), Milan, Italy, February, 2022.

[6] **W.H. AlAlaween**, A.H. AlAlawin, M. Mahfouf, O.H. Abdallah, M. Mustafa, Integrating the genetic algorithm and analytic hierarchy process for the development of a warehouse assessment scheme, INFORMS Virtual 2020 Annual Meeting, November, 2020.

[7] **W.H. AlAlaween**, A. Baraka, A. AlAlawin, O. Obajemu and T. Walker, Predictive modelling of the hot rolling process using an integrated based network, Kuala Lumpur, Malaysia, 2018.

[8] **W.H. AlAlaween**, M. Mahfouf and A.D. Salman, Development of a predictive framework for a high shear granulation process, AIChE Annual Meeting, Minneapolis, USA, 2017.

[9] **W.H. AlAlaween**, M. Mahfouf and A.D. Salman, Data-driven deterministic and stochastic modelling of the wet granulation process, Joint IFPRI Robert Pfeffer Symposium & UK Particle Technology Forum, Guilford, UK, 2016.

[10] **W.H. AlAlaween**, M. Mahfouf and A.D. Salman, 'Right-first time' production of granules- a systems modelling and optimization approach, The 7th International Granulation Workshop, Sheffield, UK, 2015.

[11] **W.H. AlAlaween**, M. Mahfouf and A.D. Salman, Towards the systems modelling of the granulation process, Automatic Control and Systems Engineering Symposium, Sheffield, UK, 2015.