Hisham ElMoaqet, PhD

Curriculum Vitae

Associate Professor and Department Chair Mechatronics Engineering Department School of Applied Technical Sciences German Jordanian University Amman 11180, Jordan Email: <u>Hisham.ElMoaqet@gju.edu.jo</u>

Education

2011-2105 **PhD in Mechanical Engineering**, University of Michigan, Ann Arbor, MI. **Specialization: Mechatronics-[GPA:3.9/4]**

Dissertation Title: "A Framework for Evaluation and Identification of Time Series Models for Multi-step Ahead Prediction of Physiological Signals".

Area of Study: Artificial Intelligence, Dynamic System Identification, Predictive Models, Machine Learning, Model Optimization, Mechatronic Systems, Stochastic Processes.

Adviser: Prof. Dawn M. Tilbury.

Main Courses: Probability and Random Processes, Linear Systems Theory, Time Series Analysis & Forecasting, Machine Learning, Mechatronic Systems Design, Robot Modeling and Control, Mechanical Vibrations, Data Science, Statistical Signal Processing, System Identification, Digital Control, Discrete Optimization, Spring Doctoral School on Identification of Nonlinear Dynamic Systems (at Vrije Universiteit Brussel, Brussels, Belgium).

2004 – 2006 MS in Mechanical Engineering, Jordan Uni. of Science & Technology, Jordan. Major: Mechatronics.

Graduated first class honors.

1997 – 2002 BS in Mechanical Engineering, Jordan Uni. of Science & Technology, Jordan.
Major: Mechatronics.

Graduated honored student.

Publications

Published/Accepted Peer-reviewed Journal Papers

O. Alswailem, B. K. Horanieh, A. AlAbbad, S. AlMuhaideb, A. AlMuhanna, M. AlQuaid, **H. ElMoaqet**, N. Abuzied, A. AbuSalah. "COVID-19 Intelligence-Driven Operational Response Platform: Experience of a Large

Tertiary Multihospital System in the Middle East". Diagnostics, 11(12), 2021, 2283. <u>https://doi.org/10.3390/diagnostics11122283</u>

H. ElMoaqet, J. Kim, D. M. Tilbury, S. K. Ramachandran, M. Ryalat, C. H. Chu. "Gaussian Mixture Models for Detecting Sleep Apnea Events Using Single Oronasal Airflow Record". Applied Sciences, 10(21), 2020, 7889. https://doi.org/10.3390/app10217889

H. ElMoaqet, M. Glos, M. Ryalat, and T. Penzel. "Deep Recurrent Neural Networks for Automatic Detection of Sleep Apnea from Single Channel Respiration Signals. Sensors, 20(18), 2020, 5037. https://doi.org/10.3390/s20185037

M. Ryalat, H. S. Damiri, and **H. ElMoaqet**. "Particle Swarm Optimization of a Passivity-Based Controller for Dynamic Positioning of Ships". Applied Sciences, 10(20), 2020, 7314. <u>https://doi.org/10.3390/app10207314</u>

M. Ryalat, D. S. Laila, & **H. ElMoaqet**. "Adaptive Interconnection and Damping Assignment Passivity Based Control for Underactuated Mechanical Systems". Int. J. Control Autom. Syst. 2020. <u>https://doi.org/10.1007/s12555-019-1019-z</u>

M. Ryalat, H. S. Damiri, and **H. ElMoaqet**, I. AlRabadi, Imad. "An Improved Passivity-based Control of Electrostatic MEMS Device." *Micromachines*, Vol. 11, No.7, 2020. <u>https://doi.org/10.3390/mi11070688</u>

M. Ryalat, D. S. Laila, **H. ElMoaqet**, and N. Almtireen. "Dynamic IDA-PBC control for weakly-coupled electromechanical systems." *Automatica* 115, 2020, 108880. https://doi.org/10.1016/j.automatica.2020.108880

M. Ibrahim, A. Alsheikh, Q. Al-Hindawi, S. Al-Dahidi, and H. ElMoaqet. "Short-Time Wind Speed Forecast Using Artificial Learning-Based Algorithms". Computational Intelligence and Neuroscience, 2020. https://doi.org/10.1155/2020/8439719

J. Kim, **H. ElMoaqet**, D. M. Tilbury, S. K. Ramachandran, and T. Penzel. "Time domain characterization for sleep apnea in oronasal airflow signal: a dynamic threshold classification approach". *Physiological measurement*, 40(5), 2019, 054007. <u>https://doi.org/10.1088/1361-6579/aaf4a9</u>

N. Almtireen, **H. ElMoaqet**, and M. Ryalat. "Linearized Modelling and Control for a Twin Rotor System". *Automatic Control and Computer Sciences*, 52(6), 2018, pp. 539-551. <u>https://doi.org/10.3103/S0146411618060020</u>

H. ElMoaqet, D. M. Tilbury, and S.K. Ramachandran: "Multi-Step Ahead Predictions of Critical Levels in Physiological Time Series", *IEEE Transactions on Cybernetics*, Volume 46 (7), 2016, pp. 1704-1714. https://doi.org/10.1109/TCYB.2016.2561974

H. ElMoaqet, D. M. Tilbury, and S. K. Ramachandran: "Effect of Concurrent Oxygen Therapy on Accuracy of Forecasting Imminent Postoperative Desaturations", *Journal of Clinical Monitoring & Computing*, (2014), pp. 1-11. <u>https://doi.org/10.1007/s10877-014-9629-8</u>

H. ElMoaqet, D. M. Tilbury, and S. K. Ramachandran: "Evaluating Predictions of Critical Desaturation Events", *Physiological Measurement*, Volume 35, 2014, pp. 639-655. <u>https://doi.org/10.1088/0967-3334/35/4/639</u>

M. Alata, **H. ElMoaqet**: "Adaptive Neuro-Fuzzy Inference System with Second Order Sugeno Consequents", Journal of Neural Network World, Vol. 3, pp. 171-187, 2007

Published/Accepted Peer-reviewed Conference Papers

H. Muhsen, A. Alkhraibat, and **H. ElMoaqet**. (2021, November). "*Competencies of Fault Ride Through in Microgrid Modeling: A Case Study*". In IEEE Jordan International Joint Conference on Electrical Engineering and Information Technology (JEEIT) (pp. 170-175). 2021, IEEE. https:// 10.1109/JEEIT53412.2021.9634152

M. Ryalat, M. Alsherqatli, and **H. ElMoaqet**. "*IoT-aided Smart Lawnmower*." Proceedings of the 3rd International Symposium on Computer Science and Intelligent Control, 2019. pp. 1-8. <u>https://doi.org/10.1145/3386164.3387298</u>

H. ElMoaqet, I. Ismael, F. Patzolt. "CPSI4.0: "*Design and Integration of an IoT Device for Training Purposes of Industry 4.0*". Proceedings of the 2nd International Symposium on Computer Science and Intelligent Control, 2018, pp. 1-5. <u>https://doi.org/10.1145/3284557.3284740</u>

S. Al-Dahidi, **H. ElMoaqet**. "Direct and Recursive Strategies for Multi-Step Ahead Wind Speed Forecasting". International conference on Time Series and Forecasting (ITISE), Granada, Spain, 2018

C. Maclellan, **H. ElMoaqet**, B. Porr, and K. Moeller. "*Time Series Predictions of Surgical Progress Using Logistic Regression Modelling*." AUTOMED-Automation Techniques for Medicine (2018), Villingen-Schwenningen, Germany, pp. 80-83. ISBN: 9783958533844

H. ElMoaqet, D. M. Tilbury, and S. K. Ramachandran Moeller. "*A Novel Time Series Model to Predict Critical Desaturation Events in the Blood.*" AUTOMED-Automation Techniques for Medicine (2018), Villingen-Schwenningen, Germany, pp. 87-90. ISBN: 9783958533844

M. Ryalat, D. S. Laila, N. Almtireen and **H. ElMoaqet**. "A Novel Dynamic IDA-PBC Controller for Electrostatic MEMS Devices", American Control Conference, IEEE, 2018. <u>https://doi.org/10.23919/ACC.2018.8431845</u>

H. ElMoaqet, Z. Almuwaqqat, and M. Saeed. "*A new algorithm for predicting the progression from paroxysmal to persistent atrial fibrillation*." Proceedings of the 9th International Conference on Bioinformatics and Biomedical Technology. ACM, 2017. <u>https://doi.org/10.1145/3093293.3093311</u>

H. ElMoaqet, Z. Almuwaqat, M. Ryalat, and N. Almtireen. "*A new algorithm for short term prediction of persistent atrial fibrillation*." In Applied Electrical Engineering and Computing Technologies (AEECT), 2017 IEEE Jordan Conference on. IEEE, 2017. <u>https://doi.org/10.1109/AEECT.2017.8257740</u>

H. ElMoaqet, D. M. Tilbury, and S. K. Ramachandran: "*A Probabilistic Approach for Evaluating Predictions of Critical Levels in Physiological Time Series*", Proceedings of the American Control Conference, IEEE, 2016. <u>https://doi.org/10.1109/ACC.2016.7526720</u>

J. Kim, **H. ElMoaqet**, D. M. Tilbury, and S. K. Ramachandran: "*A New Algorithm for the Detection of Sleep Apnea Events in Respiration Signals*", In Engineering in Medicine and Biology Society (EMBC), 2016 IEEE 38th Annual International Conference of the (pp. 3199-3202). IEEE. https://doi.org/10.1109/EMBC.2016.7591409

H. ElMoaqet, D. M. Tilbury, and S. K. Ramachandran: "A Novel Dynamic Model to Predict Abnormal Oxygen Desaturations in Blood", Proceedings of the IEEE International Symposium on Medical Measurements and Applications- MeMeA, 2014. <u>https://doi.org/10.1109/MeMeA.2014.6860062</u>

H. ElMoaqet, D. M. Tilbury, and S. K. Ramachandran: "*Predicting Oxygen Saturation Levels in Blood Using Autoregressive Models: A Threshold Metric for Evaluating Predictive Models*," Proceedings of the IEEE-American Control Conference, 2013. <u>https://10.0.4.85/ACC.2013.6579923</u>

Professional Background

Academia

- 12/2020 Now Associate Professor, Mechatronics Engineering Department, School of Applied Technical Sciences, German Jordanian University, Amman, Jordan
- 10/2020 Now Head of the Mechatronics Engineering Department, School of Applied Technical Sciences (SATS), German Jordanian University, Amman, Jordan

9/2017- 3/2019

Assistant Dean for Industrial Links and Training, School of Applied Technical Sciences (SATS), German Jordanian University, Amman, Jordan

- Coordinated academia-Industry relationship with school industry partners
- Coordinated applied research projects with industry
- Developed structured field training programs for students
- Participated in establishing Dual Study Program in IE Department.

3/2016 - 12/2020

Assistant Professor, Mechatronics Engineering Department, School of Applied Technical Sciences, German Jordanian University, Amman, Jordan

- **Research Themes**: Artificial Intelligence, Systems & Control, Physiological Systems, Internet of Things (IOT) & Industry 4.0
- Major Funded Research Projects:
 - Deep learning for Signal and Image Processing in Healthcare (Funded by the Deanship of Scientific Research at GJU 10/2018-6/2021, 26000 JOD).
 - Data Driven Predictive Models for Physiological Signals (Funded by the German Research Foundation- DFG, 11010 Euros).
 - Artificial Intelligence and Data Fusion in Modern Operating Rooms (*Funded by DAAD- Train the Trainer Program, 1500 Euros*)
- Teaching Experience:
 - ME223 Thermo-fluids (SP-16)

- ME343 Automatic Control Systems (SU-19, 20)
- ME344 Control Systems I (FA- /SP-16, 17, 18, 19, 20)
- ME522- Hydraulic and Pneumatic Systems (SP-20)
- ME555- Machine Intelligence (SP-19, 20)
- ME347 Instrumentation and Measurement Lab (FA- /SP-16, 17)
- ME3430- Automatic Control Systems Lab (FA-/SP-17,18,19, 20)
- ME5220 Hydraulics and Pneumatics Lab (SP-20)
- Committee Service:
 - SATS Executive Council (Member, 9/2020 Now)
 - GJU Industrial Relations (Member, 9/2016 -9/2020)
 - IE Dual Study Committee (Member, 7/2019 9/2020)
 - SATS Industrial Links (Head, 9/2016 -9/2020)
 - MSD Lab Purchase (Head, 6/2020 -9/2020)
 - Selection for ME Assistant Prof. & Lecturer (Member, 6/2020-8/2020)
 - Creativity Committee (Member, 11/2018 -9/2020)
 - SATS Scientific Research Committee (Member, 10/2019 9/2020)
 - ME TA / RA Selection Committee (Member, 9/2018 -12/2018)
 - Selection for the Best Industrial Professor (Head, 6/2017 8/2017)
 - ME Study Plan (Head, 5/2017 9/2019)
 - NTP Organizing Committee (Member, 1/2017 5/2017)
 - SATS Graduate Studies (Member, 11/2016 9/2018)
 - SATS Executive Council (Member, 9/2016 9/2017)
- 9/2017 3/2019 Visiting Research Scientist, Non-Linear Dynamics Research Group, Humboldt University, Berlin, Germany
 - Develop novel modeling methods and interventional control systems for sleep breathing disorders
 - Develop data-driven models for prediction for sleep apnea and automated treatment
 - Analyzed time series using non-linear dynamical approaches for characterizing coordination and synchronization between different signals

9/2017 -10/2017

Visiting Professor, *Institute of Technical Medicine (ITeM)*, Furtwangen University of Applied Science (HFU), Villingen-Schwenningen, Germany

- Developed machine-learning models to predict surgical progress and surgery total lengths to improve scheduling in operating room.
- Developed data fusion algorithms to detect surgery phases using recurrent and convolutional deep neural networks

2015 - 2016

Postdoctoral Research Fellow, *Department of Mechanical Engineering,* University of Michigan, Ann Arbor, MI.

- Investigated Heart Rate Variability metrics for predicting postoperative respiratory loss.
- Developed a probabilistic approach for evaluating multi-step ahead predictions of critical levels in physiological time series.
- Developed an algorithm for detecting sleep apnea using respiration signals
- Investigated multi-step ahead predictions of sleep apneic events.
- 2011 2015 Graduate Student Research Assistant, Controls Group, University of Michigan, Ann Arbor, MI. Advisor: Prof. Dawn M. Tilbury.
 - Developed predictive models to capture the dynamics of blood oxygenation and pulse rate signals.
 - Used dynamic systems models built from physiological signals to predict postoperative and respiratory complications.
 - Developed new performance metrics for evaluating predictions of critical events within blood oxygenation signals.
 - Identified novel modeling methodologies for predicting abnormal changes of oxygen saturation in the blood.
 - Developed computational heart rate variability (HRV) markers for predicting respiratory loss in surgical obstructive sleep apnea patients.
 - Developed a novel modeling framework for short term predictions of critical levels in physiological signals.
- 5/2014 7/2014 Visiting PhD Student, Department of Fundamental Electricity and Instrumentation, Vrije Universiteit Brussel, Brussels, Belgium. Research Mentor: Prof. Kurt Barbe.
 - Frequency domain identification of predictive models using high frequency resolution data.
 - Developing predictive models over specific frequency bands.
 - Improving likelihood properties of auto-regressive models constructed from short data records.
 - Developing predictive dynamic models with guaranteed confidence bounds on short term predictions of critical level in physiological signals.
- 1/2013 5/2013 **Graduate Student Instructor**, *ME-395 Lab-I*, University of Michigan, Ann Arbor, MI.

- Instructor for mechanical engineering laboratory for ME undergrads.
- Responsible for teaching theoretical aspects for lab experiments.
- Directed students when performing experiments during lab sessions
- Trained students on the skills needed for experimental work including data analysis and interpretation of experimental uncertainty.
- 10/2010 7/2011 **Research and Teaching Assistant**, *Department of Mechatronics Engineering*, German-Jordanian University, Amman, Jordan
 - Instructed Control and Instrumentation Lab.
 - Instructed Industrial Automation Lab.
 - Supervised Computer Aided Design Lab (CAD).

Industry

- 2006 -2010 **Control and Instrumentation Engineer**, *JBC Plant*, Albemarle Corporation, Baton Rouge, LA.
 - Full responsibility for management of Control and Instrumentation
 - Participated in the team of bromine plant expansion
 - Improved process control performance in the plant.
 - Configured and commissioned Distributed Control Systems (DCS) and Programmable Logic Controllers (PLC) for new control equipment and projects.
 - Configured Emergency Shut-down Control Loops (ESD) in the plant.
 - Actively participated in root cause failure analysis (RCFA) and Process Hazardous Analysis (PHA) sessions for Controllers and Instrumentation Systems in the plant.
 - Participated in Implementing ISO-9000 and ISO-14000 in the plant.
- 2002-2006 **Controls Engineer**, *Electrical and Instrumentation Department*, Jordan Petroleum Refinery Company, Zarqa, Jordan.
 - Configured new field instrumentation and control systems in the refinery process units, Lube Oil Plant and Liquid Petroleum Gas Filling units.
 - Participated in commissioning new electromechanical equipment in refinery.
 - Participated in upgrading instrumentation and control systems and updating devices' specifications.

Training Courses and Workshops

May 2015 NextPorf: Changing the Face of Academia, University of Michigan, Ann Arbor,

- May 2013 ELEC Spring Doctoral School on Advanced System Identification, Vrije Universiteit Brussel (VUB), Brussels, Belgium.
- Oct 2009 IRCA Internal QMS Auditor ISO 9001:2008, Lloyds Register, UK.
- Mar 2009 Allen-Bradley PLC's (Micrologix & SLC500), Rockwell, Jordan.
- Sep 2008 Delta-V Emerson DCS Advanced Programming Skills, Emerson, Jordan.
- Apr 2008 Practical Problem Solving and Decision Making Tools, Reference Co. for Consultation and Business Development, Jordan.
- Feb 2007 Certified Delta-V (Emerson DCS) Implementation II, Emerson, Dubai, UAE
- Feb 2007 Certified Delta-V (Emerson DCS) Hardware and Troubleshooting, Emerson, Dubai, UAE
- May 2006 Delta-V (Emerson DCS) Implementation I, Emerson, Jordan.
- Apr 2006 ABB Near East Seminar for Control Systems, ABB, Jordan.
- Mar 2006 ABB Variable Frequency Drivers, ABB, Egypt.
- Mar 2006 JIEEEC, Jordan Institute for Electrical and Electronics Engineering Conference, *IEEE*, Jordan.
- Sep 2005 ABB Near East Seminar for Automation and Drives, ABB, Jordan.
- May 2005 Certified Training course on SIMATIC HMI WINCC (SCADA), Siemens, Jordan.
- Oct 2004 Certified Training Course on S7 PLCS, Siemens, Jordan.
- Jun 2004 Effective Communications Skills, Jopetrol, Jordan.
- Jun 2003 Supervision Techniques, *Jopetrol*, Jordan.
- Apr 2002 HVAC systems, Jordan Engineers Association, Jordan.
- Sep 2001 **PLCs implementation and configuration**, *Jordan Engineers Association*, Jordan.
 - Awards and Honors

- **Postdoc-NeT-AI Fellowship** (awarded by DAAD for a selection of outstanding scientists to visit the German hotspots in AI and industry 4.0)
- 2017 First Prize in 19th Arab Forum for Entrepreneurship (awarded by ACTSAU & AGYA for the best project in the track of information systems)
- **2018** Distinguished Researcher Award (*awarded by GJU*)
- **2017** Train the Trainer Award (awarded By DAAD)
- Summer Research Stay at the ELEC Dep. at VUB, Brussels, Belgium (awarded by UMICH)
- 2013, 2014 Conference Travel Grants to attend International Conferences (awarded by UMICH)
 - 2013 Fellowship to join the ELEC Doctorl School on (Non)linear System Indetification (awarded by VUB, Brussles, Belgium)
 - 2013 American Control Conference (ACC) Student Travel Grant (awarded by ACC-2013)
 - **Full PhD Scholarship at the University of Michigan, Ann Arbor, USA** (awarded by GJU)
 - **Distinguished Academic Performance** in Graduate Studies, (*awarded by Jordanian Government*).
 - **Dean's honor list** during undergraduate studies for multiple years. (*awarded by JUST*)

Summary of Skills

Interpersonal Skills

Strong oral and written communication skills. Enjoy interacting with people, flexible, self-motivating, result oriented.

Computer

Languages MATLAB, Python, C, C++. Platforms Windows, UNIX, DOS. Packages CPLEX, Mathematica, Scipy/Numpy, Scikit-learn Office Tools Microsoft Office, LATEX.

Languages

Arabic Fluent (Native language).English Fluent (Speaking, reading, and writing).French Basic (Speaking, reading, and writing).

Professional Service, and Leadership

IEEE

- 2020- Now Chair, IEEE Jordan Section Engineering in Medicine and Biology Society (EMBS) Chapter.
- 2018-2020 Vice Chair, Jordan IEEE EMB Chapter
- 2011- Now Member of Control Systems Society.
 - Member of Engineering in Medicine and Biology
- 2017- Now Editorial Board Member
 - Insight Automatic Control
 - Information Engineering and Applied Computing
 - Progress in Human Computer Interaction
 - Analytical & Bioanalytical Techniques (SMABT)
 - SM Journal of Family Medicine
 - Immunology Research And Therapy Journal
 - EC Orthopaedics
 - Annals Of Orthopaedics, Trauma And Rehabilitation

2017-Now Conference Organizing/Scientific Committee Member

- 2020 Jordan International Joint Conference of Electrical Engineering and Information Technology (JEEIT-2020)
- Scientific Track Chair for Mechatronics, Robotic and Controls in JEEIT-2020
- 2017 2nd International Conference on Biomedical Imaging, Signal Processing (ICBSP 2017), New Jersey, USA, Oct 18-20, 2017
- 10th International Conference of Bioinformatics and Biomedical Technology, Netherlands, May 16-17,2018

- 2018 International Conference on Bioinformatics and Neurosciences (ICoBN 2018), Las Vegas, USA, 2018 on August 27-29, 2018.
- 9th Jordanian International Mechanical Engineering Conference (JIMEC 2018), Jordan

2013-Now Reviewer

- American Control Conference
- IEEE-Transactions on Instrumentation & Measurements
- IEEE-Transactions on Cybernetics
- IEEE-Access
- IEEE-Transactions on Biomedical Engineering
- IEEE-Transactions on Biomedical and Health Informatics
- ASME -Dynamic Systems and Control Conference
- IEEE-Transactions on Instrumentation and Measurements
- IEEE- Conference on Decision and Control
- PLOS ONE
- International Journal of Intelligent Robotics and Applications
- BMJ Open