

Ayman Karam

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King Abdullah University of Science and Technology, Jeddah, KSA

Education

- **King Abdullah University of Science and Technology (KAUST)** Thuwal, KSA
Ph.D. Candidate in Electrical Engineering Expected: Oct. 2016
 - **Dissertation Title:** Reduced Order Dynamic Modeling & Optimization of Solar Powered Direct Contact Membrane Distillation.
 - **Advisor:** T. M. Laleg-Kirati, taousmeriem.laleg@kaust.edu.sa
- **King Abdullah University of Science and Technology (KAUST)** Thuwal, KSA
M.S. Mechanical Engineering 2010 - 2012
 - **Thesis Title:** Nonlinear Neural Network Approach for fMRI Data Analysis.
 - **Advisor:** T. M. Laleg-Kirati, taousmeriem.laleg@kaust.edu.sa
- **King Fahd University of Petroleum and Minerals (KFUPM)** Dhahran, KSA
B.S. Control and Instrumentation Systems Engineering 2005 - 2010
 - **Senior Design Project:** System Identification of an RC Helicopter.

Research Experience

King Abdullah University of Science and Technology (KAUST) Thuwal, KSA
Ph.D. Candidate 2012-2016

- Projects:
 - **Dynamic Modeling of Direct Contact Membrane Distillation (DCMD)**
 - Developed and validated a novel dynamic model of DCMD based on lumped-parameter method.
 - Two journal papers [J1], [J2] and one conference proceeding [C2].
 - **Membrane Fouling Detection based on Adaptive Descriptor Observer Design**
 - Developed a new design method of *adaptive descriptor observers* for nonlinear DAE systems.
 - Implemented a method for characterizing the membrane properties and detecting membrane fouling in DCMD based on adaptive observers.
 - One journal paper [U1] and one conference proceeding [U2]
 - Two patents filed [P1][P2]:
 - United States Provisional Patent Application No. 62/318,008
 - United States Provisional Patent Application No.62/218,765
 - **Optimization of Energy Consumption in Solar Powered Membrane Distillation**
 - On going project, developing methods for optimizing the energy efficiency of the solar-powered DCMD process based on *extremum seeking and model predictive control*.
 - One conference proceeding [C1] and one patent filed [P3]:
 - United States Provisional Patent Application No. 62/187,618

□ **Nonlinear Neural Network Approach for fMRI Data Analysis**

- Developed an artificial neural network model for the human brain functional MRI data.
- Estimated unmeasured physiological states and hidden neural activity from real fMRI response data.
- One journal paper published out this project [J3] and one poster presentation.

King Abdullah University of Science and Technology (KAUST)

Thuwal, KSA

Researcher

Fall 2011

• **Project: Automated Characterization Suite of Electro-thermal Micro-actuators**

- Implemented image processing techniques, like *edge detection and pattern matching and tracking*, to measure micro-actuator displacement using LabVIEW.
- Designed a graphical user interface to automate power vs displacement tests.
- Significantly reduced test times and enabled reliable characterization of several micro-actuators designs.
- One journal paper published out of this project [J4].

Texas A&M University at Qatar

Doha, Qatar

Researcher

Summer 2011

- Project: Modeling and Design of Magnetically Levitated Flywheel Energy Storage System
 - Modeled and simulated a magnetic levitated flywheel energy storage system.
 - Designed and selected the required electrical circuits and sensors.

Rose-Hulman Institute of Technology

Terre Haute, IN, USA

Visiting Student

MAR-MAY 2010

3 months coursework in Spring 2010 quarter.

Teaching Experience

King Abdullah University of Science and Technology (KAUST)

Thuwal, KSA

Teaching Assistant

2015-2016

- TA for Control Theory and Applied Numerical Methods courses.
 - Held tutorial sessions for graduate students in MATLAB.
 - Graded assignments and had weekly office hours.

Saudi ARAMCO 2008 & 2009 Summer Programs

Al-Khobar, KSA

Trainer & Curriculum Developer

Summers 2008 & 2009

- Developed material and experimental demonstrations to convey technical concepts of electrical engineering in a summer camp for gifted high school students.
- Taught and coached around 120 student in each camp (20 students per section).

Honours & Awards

- 2012: KAUST Scholarship Ph.D.'s Degree Award.
- 2010: KAUST Discovery Scholarship Master's Degree Award.
- 2009: KAUST Graduate Fellowship.
- 2005-2010: Deans list in systems engineering department.

Selected Courses

- Control of Mobile Robots by Prof. Magnus Egerstedt, online at [Coursera](#).

King Abdullah University of Science and Technology (KAUST)

Thuwal, KSA

- Game Theory by Prof. Jeff Shamma. Spring 2016
- Dynamic Programming by Prof. Jeff Shamma. Spring 2015
- Nonlinear Control Systems by Prof. Taous-Meriem Laleg-Kirati. Spring 2011

European Embedded Control Institute

Supelec, Paris, France

1 week course from the International Graduate School on Control.

- Model Predictive Control (MPC) by Prof. Eduardo F. Camacho. Mar. 2015
- Sliding Mode Control and Observation by Prof. Christopher Edwards. Jan. 2014

Patents

- [P1] Taous Meriem Laleg-Kirati; **Ayman Karam** - "patent pending" -US provisional application, 62/318,008
- [P2] Taous Meriem Laleg-Kirati; **Ayman Karam**; Fadi Eleiwi - "patent pending" - US provisional application 62/218,765
- [P3] Taous Meriem Laleg-Kirati; **Ayman Karam**; Fadi Eleiwi - "patent pending" -US provisional application 62/187,618

Professional Skills

LEADERSHIP

- Lean Six Sigma Yellow belt certified.
- Participated in the Lean Startup Bootcamp at KAUST.
- Participated in the Leadership Challenge Workshop.
- Head of workshops and seminars group in the Systems Engineering Club at KFUPM.
 - Organized a two days intermediate level workshop on PIC micro-controllers for students.

PROGRAMMING & SOFTWARE:

LabVIEW, MATLAB, Simulink, GUI, \LaTeX , Altium Designer, Assembly, C++, AutoCAD.

LANGUAGES:

Fluent in English, native in Arabic, proficient in oral and written communication.

CONFERENCE ORGANIZING EXPERIENCE

- Organized meet and greet events for invited guests for the [Human-Machine Networks and Intelligent Infrastructure conference](#) at KAUST, October 5-7, 2015.
- Reviewed travel itinerary and planned agenda for invited guests to the [Winter Enrichment Program \(WEP\)](#) at KAUST, January 9-22, 2016.

Publications

JOURNAL PAPERS

- [J1] **Ayman Karam** and T. M. Laleg-Kirati, “[Electrical Thermal Network for Direct Contact Membrane Distillation Modeling and Analysis](#)”, *Accepted in the Journal of Process Control*.
- [J2] **Ayman Karam**, A. Alsaadi, N. Ghaffour, and T. M. Laleg-Kirati, “Analysis of Direct Contact Membrane Distillation Based on a Lumped-Parameter Dynamic Predictive Model”, *Accepted in the Desalination Journal*.
- [J3] **Ayman Karam**, T. M. Laleg-Kirati, Chadia Zayane, and N. H. Kashou, “[Nonlinear neural network for hemodynamic model state and input estimation using fMRI data](#)”, *Biomedical Signal Processing and Control*, Vol.14, pp.240-247, Nov. 2014.
- [J4] Ehab Rawashdeh, **Ayman Karam**, and Ian G. Foulds, “[Characterization of Kink Actuators as Compared to Traditional Chevron Shaped Bent-Beam Electrothermal Actuators](#)”, *Micromachines*, Vol.3, no.3, pp.542-549, July 2012.

UNDER PREPARATION

- [U1] **Ayman Karam** and T. M. Laleg-Kirati, “Adaptive Singular Observer for the Joint State and Parameter Estimation: Application to Direct Contact Membrane Distillation”.
- [U2] **Ayman Karam** and T. M. Laleg-Kirati, “Nonlinear Adaptive Descriptor Observer for Joint States and Parameters Estimation”.

CONFERENCE PROCEEDINGS

- [C1] **Ayman Karam** and T. M. Laleg-Kirati, “[Real Time Optimization of Solar Powered Direct Contact Membrane Distillation Based on Multivariable Extremum Seeking](#)”, in *Control Applications (CCA), 2015 IEEE Conference on*, pp.1618-1623, 21-23 Sept. 2015.
- [C2] **Ayman Karam** and T. M. Laleg-Kirati, “[Electrical thermal networks for direct contact membrane distillation modeling](#)”, *Control Applications, 2014 IEEE Conference on*, pp.1563-1569, Oct. 2014.
- [C3] **Ayman Karam** and T. M. Laleg-Kirati, “Dynamical Model for Direct Contact Membrane Distillation based on Electrical Analogues”, *Paper presented at the 10th International Congress on Membranes and Membrane Progresses (ICOM2014)*, China, 2014.
- [C4] **Ayman Karam**, Chadia Zayane, and T. M. Laleg-Kirati, “[Nonlinear Neural Network Approach for the Inversion of fMRI Response](#)”, *Poster session presented at the 34th Annual International IEEE EMBS Conference*, San Diego, USA, July 2012.

ORAL & POSTER PRESENTATIONS

- **Ayman Karam** and T. M. Laleg-Kirati, “[Towards Smart Desalination Systems](#)”, *poster presented at the KAUST-NSF Research Conference on Electronic Materials, Devices, and Systems for a Sustainable Future*, KAUST, Saudi Arabia, Mar. 2016.
- **Ayman Karam** and T. M. Laleg-Kirati, “Sustainable Desalination for Smart Cities”, *poster presented at the Human-Machine Networks and Intelligent Infrastructure Conference*, KAUST, Saudi Arabia, Oct. 2015.
- **Ayman Karam** and T. M. Laleg-Kirati, “[Dynamical Model for Direct Contact Membrane Distillation based on Electrical Analogues](#)”, *Invited Seminar at EE Graduate Seminar at KAUST*, Mar. 2014.

Industrial Experience

Saudi Aramco 2010 Summer Gifted Program

Program Leader

Al-Khobar, KSA

Summer 2010

- Lead a team of 15 persons to deliver a robotics design course.
 - Developed the curriculum of robotics design, topics included electrical circuits analysis, mechanical design, and programming & algorithms.
 - Managed the day-to-day site activities and overcame the challenges.
 - The program was recognized by the senior vice presidents of Saudi ARAMCO and covered in newspapers articles.

National Talent Company

Design Engineer

Al-Khobar, KSA

Summer 2008

- Design an interface circuit to the LEGO Mindstorms NXT.
 - Designed and implemented a digital and analog interface circuit.
 - Expanded the number of inputs and outputs of the NXT micro-controller.
 - Enabled speed and position control of 2 extra DC motors using NI LabVIEW.

References

Dr. Taous-Meriem LALEG-KIRATI, Assistant Professor

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Program Chair of Electrical Engineering
Computer, Electrical and Mathematical Sciences & Engineering Division (CEMSE)
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