Hussein Abdeltawab

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HIGHLIGHTS OF SKILLS

- Currently, assistant professor of electrical engineering at Penn State University, The Behrend College.
- Ph.D. in electrical engineering with research experience in energy systems, control, optimization, and machine learning.
- 30 top-tier publications related to power systems, machine learning, and control systems.
- 12 years of postgraduate teaching experience of automation, power systems, and electronics courses
- A licensed professional engineer in Saskatchewan, Canada, with 3 years of Industrial experience in electrical system design and automation.
- Senior Member-IEEE, Associate Editor of the IET Generation, Transmission & Distribution Journal.
- Lawful permenant resident of the United States.

EDUCATION

Ph.D., Electrical Engineering	2012-2017
University of Alberta, Edmonton, Canada	
• Thesis Topic: Planning and Energy Management of Energy Storage Systems in Active Distribution Networks, GPA: 3.98/4.0	
MSc, Electrical Engineering with distinction Cairo University, Cairo, Egypt	2009-2012
 Focus: control systems, GPA: 4.0/4.0 Thesis topic: Designing Robust Pitch Controller for Large Wind Turbines 	
BSc, Electrical Engineering with distinction Cairo University, Cairo, Egypt	2004-2009
 Coursework score (88.55%), Ranked 3rd among a class of 400 students Capstone Project: designing an automated system for a pre-casted concrete factory via a programmable logic controller (PLC) with supervisory control and data acquisition (SCADA). 	
DEI EVANT EVDEDIENCE	

RELEVANT EXPERIENCE

Assistant Professor

Penn State University, Behrend College, Erie

- Teaching courses for both electrical engineering and technology majors, including Advanced control and Automation using PLCs (CMPEN 497), Circuits and Devices (EE 210), Applied Feedback Systems (EET-440), Electric Machines (EET-214), Electrical Circuits (EET-101), Digital Electronics (CMPET-120), Introduction to PLC (EET-275), with labs.
- Coordinating the Senior Project course (EET-490)
- Advising undergraduate students and tracking their academic progress.
- Completing required courses evaluations for the ABET accreditation.
- Advising capstone projects: Robotic Arm control via computer vision and image processing, Freight configuration via image processing, Robot Arm control with a camera, and PLC, Voice and Alarm Controller design for Mines.
- Conducting research on power and energy management, optimization, and machine learning applications.

July 2020- Present

• Co-supervising graduate Students remotely to develop research on deep learning energy management, power and energy applications.

Assistant Teaching Professor

Penn State University, Altoona College, Altoona

- Teaching both technology and engineering majors: Digital logic Design course and lab (CMPEN-271, CMPEN-275), Electric Drives (EMET-325), Automatic Control Systems (EMET-410).
- Publishing course contents online on Canvas, lion path, and using starfish for Students' advising.
- Completing courses evaluation for the ABET accreditation.
- Participating in undergraduate research projects;
 - Cooperation with Dominion Energy© in a capstone project related to power system protection,
 - Advising undergraduate research project on robotics optimization, Funded by the multi-campus-research-experience - Penn State College of Engineering.
 - Advising undergraduate research project related to 3D printing (Infill Optimization for Additive Manufacturing), multi-campus-researchexperience, multi-campus-research-experience - Penn State College of Engineering
 - Prime investigator, research project related to EV charging, funded by Research development grant, Penn State College of Engineering.

Design Engineer

SMP engineering, Edmonton, AB

- Conducting power system studies for the Edmonton Medical Lab Hub Center, including; distribution system design, co-generation, protection coordination studies, and working on the arc flash reduction solutions.
- Designing Emergency generator for the City of Edmonton, Pound-maker firefighters training center, Edmonton, Canada.
- Creating a Distribution power system and Home automation design for Home Sense South common, TJX-Canada.
- Participating in the planning of the distribution system modernization for the Arts convocation hall, University of Alberta, Edmonton, Canada.
- Designing a Solar photovoltaic system for new schools in Fort McMurtry, Alberta, Canada (including state of the art sun-tracking systems installation such as Solar Flower©).
- Assisting in various Power quality studies and harmonics mitigation solutions for Oil and gas projects.
- Assembling Engineering specifications (both technical and front-end specs.).
- Writing different proposals and requests for quotation (RFQ).
- Reviewing different Project tasks scheduling, and project progress reports.
- Assisting in the construction administration, including site instructions, site review, and change orders.

Design Engineer

Maskell Plenzik & partners engineering, Edmonton, AB

- Participating in more than 50 power and automation projects in the commercial and industrial sectors
- Designing lighting control systems, building management systems, and HVAC (heat, ventilation, and Air conditioning) Control and electrification.

June 2016-July 2018

Aug. 2018-Jan. 2019

Jan. 2019- July 2020

- Assisting in Power quality studies and harmonics mitigation solutions.
- Writing projects Engineering specifications (both technical and front-end specs.).
- Participating in technical proposals' writing, project tasks' scheduling, and project management.
- Validating the design on construction sites, conducting site reviews, and initiating change orders.

Research, Teaching Assistant

Electrical & Computer Engineering, University of Alberta, Edmonton, AB

- Investigating cutting-edge technologies in smart grid, energy management, and power system optimization.
- Studying the economic dispatch of hybrid systems (renewable and storage) while boosting the storage life and maximizing the owner's profit.
- Improving the performance of flywheel application for wind smoothing using smart robust predictive control solution that reduces its losses and compensates for process uncertainties.
- Developing a power-flow-based controller that defines robust and safe charge and discharge limits for dispersed distributed storage systems with high penetration of renewables.
- Designing a novel controller for mobile storage systems to provide power and ancillary services at different distribution system locations.
- Investigating a multiagent energy trading framework for independent storage and renewable owners.
- Sizing and Allocation of bulk energy storage resources in the power system.
- Demonstrating Labs for the following courses:
 - ECE-210- *Introduction to Digital Logic Design*: the course includes design logic gate circuits, decoding, and encoding mechanisms, VHDL simulations, and FPGA programming.
 - ECE-433- *power system transient stability*: The course includes power system design, Transit stability, small-signal stability, Voltage stability, and electromagnetic transits in power systems.
 - ECE-432- *variable speed Drives*: programming industrial drives, Pulse width modulation, sensorless vector control, flux-oriented control, drive control design, and space vector control.
 - ECE-303- *Analogue Electronics*: designing and implementing analog circuits like PID control circuits using operational amplifiers.

Research Engineer (part-time)

Science and Technology Development Fund (STDF), Cairo, Egypt.

- Working with five other researchers in this \$1,000,000 wind power research project to design wind turbine controllers.
- Developing a model for the wind light detection and ranging sensor (LIDAR) and using it in wind turbine pitch angle control.
- Enhancing the harvested power by measuring the future wind speed using LIDAR. The measurements help a predictive controller to improve power regulation and reduce turbine fatigue load.
- Developing an adaptive pitch controller for the turbine's fatigue loads mitigation.

Control Systems Engineer (part-time)

Schneider Electric, Cairo, Egypt.

- Designing process control systems for various industrial industries including; steel factories, sugar factories, Airport automation systems, pre-casted concrete factories.
- Conducting Programmable logic controller (PLC) coding, simulations, and installation.

Sept. 2012- June 2017

2010-2011

2011-2012

- performing control systems commissioning; site acceptance test and factory acceptance test (SAT and FAT) for control panels, cabinets, PLCs, Sensors, and actuators.
- Programming supervisory control and data acquisition (SCADA) systems and HMIs; including; process variables monitoring, Alarms, Trends graphs, and process reports generation.
- Programming different Schneider Electric equipment using software such as Twido, Zelio, unity pro, and Vijeo CITECT.

Teaching Assistant (full-time)

Cairo University, Cairo, Egypt.

- Assisting in teaching four undergraduate courses for six semesters to 300 students:
 - *Signals and Systems*: the course includes signals Convolution, Systems modeling, Fourier transform, Laplace transform, Z-transform, and bode plot.
 - *Digital electronics and microcontrollers*: logic gates, logic design, micro-processors operation, micro-controller programming.
 - *Analog control systems*: System stability, transit response of linear systems, designing controllers for a single input single output continuous system using Root-locus and bode plot, and for multi-input-multi-output using pole placement.
 - *Digital control systems*: stability and control design for discrete systems.
- Lab instructor for control system laboratory (microcontroller programming using micro-c, analog and digital stabilizing controller design for servo-mechanism, and tank-level PID control system, Programmable logic controller programming, and SCADA system screens designing, Distributed control systems (DCS) programming).

AWARDS, HONORS

- Outstanding paper award, NAMRC 50 Conference, Purdue University (2022).
- Awarded 10 undergraduate research projects at Penn State (2020-2021).
- Alberta Innovates graduate student's award, Edmonton, Canada (2014-2016), Value 31,000 \$/year for two years.
- ECE Research/teaching Scholarship u of Alberta (2012-2014), value: 24,000 \$/year for two years.
- International Society of Automation Educational Foundation award, USA (2015)
- Shell enhanced learning fund, Edmonton, Canada (2014)
- The Pharaonic village award and Ministry of Energy and Electricity award, Cairo, Egypt (2011)
- Cairo University Undergraduate Distinguished Students' Award, Egypt (2005-2009).

PROFESSIONAL DEVELOPMENT

- Teaching development
 - Completed the following training/webinars during my tenure with Penn State: "Advancing Engineering Education with Virtual Labs", "Teaching Electric Power Systems with MATLAB and Simulink", "Integrating AI into Model-Based Design", "Teaching on Zoom: Lessons Learned", "Exam Strategies for Remote Delivery", "Organizing Course Content in Canvas", "Building a Safe Penn State: Reporting Child Abuse", "Understanding Title IX at Penn State", "Tips, Tools, and Techniques of Educational Technology", "Looking forward: Using ERT hands-on lessons learned in your future instruction", "Engaging Students Through Multimedia Assignments", "Using EquatIO to Read and Write Math in a Digital Classroom" "Information Security Awareness", "Resources for Faculty: Affirmative Action, Information Technology, Student Affairs, and University Libraries", "2019-2022 Annual Compliance Training", "FERPA Tutorial & Quiz", "PowerPoint: Creating a Self-Running, Interactive Presentation", "Canvas: An Introduction", and "Clery Act Training".
 - Attended Six professional development sessions with the Faculty of graduate studies and Research, University of Alberta, Canada: "Graduate Student Perspectives on Teaching", "Who is in Your

Class? The Mental Wellness of Your Students"," Smart Classroom Technology", "Developing your Teaching Philosophy", "Teaching Effectively in the Lab", "TA Teaching in Engineering", "Teaching in the Canadian Classroom".

- Attended Six teaching workshops with the Faculty and leadership Development Center, Cairo University, Cairo, Egypt (2011-2012), the workshops include effective learning, syllabus designing, Moodle website designing courses.
- Research development
 - Completed the following training/webinars during my tenure with Penn State: "The EV Revolution is Here!", "Grant Academy 4 Sessions for NSF grant proposals", "Responsible Conduct of Research", "Hardware-in-the-Loop Testing of Control Algorithms for Modular Multi-Level Converters", "Deep Learning Demystified, Advances in Renewable Energy: Enabling Our Decarbonized Energy Future with Technology Innovations and Smart Operations, A Future with Self-Driving Vehicles", "NSF proposal development Webinar, Battery State Estimation Using Deep Learning", "Comparative trends in utility-scale wind and solar markets in the United States", "Writing a Successful Personal Narrative – Panel Discussion".
 - Completed/audited the following Online courses: "Artificial Intelligence Fundamentals of Reinforcement Learning", "Deep Learning and Reinforcement Learning", "Predictive Modeling and Machine Learning with MATLAB".
- Undergraduate Summer Intern;
 - o Drives and automation training, ABB©, Cairo, Egypt (2008).
 - Oil and gas maintenance engineer training, Petro jet©, Cairo, Egypt, (2007).
 - Distribution Engineer training, South Cairo utility company, Cairo, Egypt, (2006).

COMPUTER SKILLS

- MATLAB, Simulink, Control systems toolboxes (SISOTOOL, MPC, robust control, system identification).
- Python; including IDE such as PyCharm- familiar with Keras, Tensor Flow, and Jupyter Notebook
- Optimization tools (MATLAB solvers, GUROBI, YALMIP, and CPLEX).
- Hardware-in-the-loop (OPAL-RT, DSpace programming using control desk// Matlab).
- FPGA programming using VHDL via Xilinx- Vivado, Multisim
- Automation software (PLCs and SCADA programming for Rockwell Automation ©: Studio5000 and Connected-Components, Schneider Electric©, Siemens©, and ABB©)
- Electrical drawing using AutoCAD, Microsoft-Visio
- Power system studies using ETAP, Power-World, PSCAD
- Lighting design using AGI-32 and Dialux.
- Micro-controller programming Python, C, C#, and C++
- Microsoft Office Suite: Word, Excel, and PowerPoint, Pdf Drawer
- Websites Design Using Word Press

VOLUNTEER ACTIVITIES/AFFILIATIONS

- Professional Engineer, Association of Professional Engineers and Geoscientists of Saskatchewan-Canada (March, 2020-present).
- Professional Engineer, Association of Professional Engineers and Geoscientists of Alberta-Canada (2019-2020).
- Senior Member, IEEE (Feb. 2022-present).
- Member, International Society of Automation-ISA (2013).
- Member, Egyptian Engineering Syndicate (2011).

Volunteer Activities/ University Service:

• IET Generation, Transmission & Distribution, Associate Editor (2021 - present).

- *Electronics*, Topic Editor (2021)
- Awards & Scholarship Committee, Penn State Behrend, Chairperson, (2020-present)
- School of Engineering Safety Committee Penn State Behrend, member, (2020-present)
- Electrical Motor lab Coordinator, Penn State Behrend, (2020-present)
- Electrical Engineering Technology Curriculum Committee, Penn State, Secretary, (2021-present)
- SEAL high school robots competition, Penn State, Judge, (2019-2020)
- Schreyer Scholar Selection Committee, Penn State, Reader (2019-present)
- Penn State Altoona Outdoor Club, Trip chaperone (2019-2020)
- Bredin center for Hiring, Edmonton, Canada, Mentor and career couch (2017-2019)
- Catholic Social Services, Edmonton, Canada, New immigrants' settlement mentor (2018-2019)
- Toastmasters, Edmonton, Canada, and State College, USA, member (2015-present)
 - Practicing public speaking and body language skills.
 - Improving listening skills during table discussions.
- IEEE-reviewer (2012-present)
 - A reviewer of many conferences and journal papers, including IEEE transaction on Power Systems, IEEE transaction on Industrial Electronics, IEEE transaction on Smart grid, IEEE transaction on Sustainable technologies, and IEEE Transaction Energy Conversion. American Control Conference.
- VP-internal-International Society of Automation (ISA), (2013-2017).
 - Responsible for advertising to current members.
 - Working with the President and VP External for planning ISA events.
 - Executive, Engineers without borders- U of Alberta Chapter, Canada, (2013-2014).
 - Involving in the global engineering program for enhancing ethical and global thinking for engineers and increasing industry interaction.
 - Discussing African agriculture problems and helping in the water crisis in Africa.
 - Promoting fair trade of coffee and tea.
- Member, Energy club U of Alberta, Canada (2012-2017).
 - Hosting sessions for Professionals in Oil and gas industry.
 - Discussing the environmental impacts of different energy resources.
 - Making field trips to various sustainable energy sites.
- Volunteer, "Resala" Charity Organization, Egypt (2009-2012).
 - Providing and maintaining regular food services to impoverished villages in Egypt.

SELECTED PUBLICATIONS

Journal Papers:

- J1. H. H. Abdeltawab, AL ElShafei, WA Farag, MS Saad., "A robust LMI-based pitch controller for large wind turbines," *Renewable Energy*, Vol. 44, P 63–71, August 2012,
- J2. H. H. Abdeltawab, Y. A. I. Mohamed, "Market-Oriented Energy Management of a Hybrid Wind-Battery Energy Storage System via Model Predictive Control with Constraints Optimizer", *IEEE Transactions on Industrial Electronics*, Vol. 62., no. 11, Pages 6658 - 6670, Nov. 2015.
- J3. H. H. Abdeltawab, Y. A. I. Mohamed, "Robust Energy Management of a Hybrid Wind and Flywheel Energy Storage System Considering Flywheel Power Losses Minimization and Grid-Code Constraints", *IEEE Transactions on Industrial Electronics*, 4242-4254, Vol. 63, Issue 7, July 2016.
- J4. H. H. Abdeltawab, Y. A. I. Mohamed, "Robust operating zones identification for energy storage dayahead operation," *Sustainable Energy, Grids and Networks*, Vol. 10, June 2017
- J5. H. H. Abdeltawab, Y. A. I. Mohamed, "Mobile Energy Storage Scheduling and Operation in Active Distribution Systems," *IEEE Transactions on Industrial Electronics*, Vol. 64, p 6828-6840, Sept. 2017.
- J6. M Taha, **H. H. Abdeltawab**, Y. A. I. Mohamed, "An Online Energy Management System for a Grid-Connected Hybrid Energy Source," *IEEE Transactions on Emerging Topics in Power Electronics*, Vol. 6, Issue 4, p 2015-2030, April 2018.
- J7. H. H. Abdeltawab, Y. A. I. Mohamed, "Mobile Energy Storage Sizing and Allocation for Multi-Services in Power Distribution Systems," *IEEE Access*, Vol. 7, p 176613-176623, Nov. 2019.

- J8. H. H. Abdeltawab, Y. A. I. Mohamed, "Distributed Battery Energy Storage Co-Operation for Renewable Energy Sources Integration," *Energies*, Vol. 13, p 5517-5530, Oct. 2020.
- J9. A Dolatabadi, **H. H. Abdeltawab**, Y. A. I. Mohamed, "Hybrid Deep Learning-Based Model for Wind Speed Forecasting Based on DWPT and Bidirectional LSTM Network," *IEEE Access*, Vol. 8, p 229219-229232, Dec. 2020.
- J10. **H.H. Abdeltawab**, Y. A. I. Mohamed, "Energy Storage Planning for Profitability Maximizing by Power Trading and Ancillary Services Participation," *IEEE Systems Journal*, April 2021.
- J11. A Dolatabadi, **H. H. Abdeltawab**, Y. A. I. Mohamed, "Deep Spatial-Temporal 2-D CNN-BLSTM Model for Ultra-Short-Term LiDAR-Assisted Wind Turbine's Power and Fatigue load Forecasting", *IEEE Transactions on Industrial informatics*, April 2022.
- J12. A Dolatabadi, **H. H. Abdeltawab**, Y. A. I. Mohamed, "Deep Reinforcement Learning-Based Self-scheduling Strategy for a CAES-PV System Using Accurate Sky Images-based Forecasting", IEEE Transactions on Power Systems, May 2022.
- J13. Ihab Ragai, Abdallah S. Abdalla, **Hussein Abdeltawab**, Feng Qian, J. Ma, "Toward smart manufacturing: Analysis and classification of cutting parameters and energy consumption patterns in turning processes", Journal of Manufacturing Systems, May 2022.
- J14. A Dolatabadi, **H. H. Abdeltawab**, Y. A. I. Mohamed, "A Novel Model Free Deep Reinforcement Learning Framework for Energy Management of a PV Integrated Energy Hub", IEEE Transactions on Power Systems, early-access, Sept. 2022.
- J.15 Andrew Sherren, Kyle Fink, Joshua Eshelman, Luay Yassin Taha, Sohail Anwar, Craig Brennecke, Hussein M Abdeltawab, Shihui Shen, Faeze Ghofrani, and Cheng Zhang, "Experimental and simulation validation of Piezoelectric Road Energy Harvesting", Open Journal of Energy Efficiency, Sept. 2022.

International Conferences

- C1. **H.M. Hassan**, WA Farag, M Shawkey, AL ElShafei, "Designing Pitch Controller for Large Wind Turbines via LMI Techniques", International Conference on Smart Grid and Clean Energy Technologies (ICSGCE 2011), pp. 503:509, Sep. 2011, China.
- C2. H.M. Hassan, WA Farag, MS Saad, Abdel Latif Elshafei, "Design of Multi-Objective Robust Pitch Control for Large Wind Turbines", IEEE World Congress on Sustainable Technologies (WCST-2011) pp. 95:100 Nov. 2011, UK.
- C3. H.M. Hassan, WA Farag, MS Saad, Abdel Latif Elshafei, Robust dynamic output feedback pitch control for flexible wind turbines, 2012 IEEE Energytech, PP 1-6, May 2012- Cleveland, USA.
 C4. H.M. Hassan, WA Farag, MS Saad, AL Elshafei, Adaptive Look-Ahead Feedforward Wind Turbine Pitch Control using LIDAR Technology, World Academy of Science, Engineering, and Technology 65 2012, PP 675-681, May-2012, Netherlands.
- C5. H.M. Hassan, Y.A.I. Mohamed, Market-oriented energy management of a hybrid power system via model predictive control with constraints optimizer, IEEE PES General Meeting, July 2014- National Harbor, MD, USA.
- C6. **H. H. Abdeltawab**, Y .A.I. Mohamed, Operating Zones Identification for Independent-Energy-Storage, Energy, Utility & Environmental Conference (EUEC), Feb. 2015, San Diego, CA, USA.
- C7. H. H. Abdeltawab, Y .A.I. Mohamed, "Independent Energy Storage Power Limitations for Secured Power System Operation", Doctoral Conference on Computing, Electrical and Industrial Systems, April 2016, Portugal.
- C8 W Farag, **H Hassan**, M Saad, AL Elshafei, "A LiDAR-based pitch control strategy for ultra-large wind turbines", IEEE MEPCON, 2017, Cairo, Egypt.
- C9 H. H. Abdeltawab, Y.A.I. Mohamed, "The Potential of Mobile Energy Storage in Microgrids". MIPRO 2019 - 42nd International Convention, Nov. 2020, Croatia.
- C10 K Knowles, B Faye, A Orrson, **H Abdeltawab**, M Bayrakci-Boz, S Anwar, "Optimal EV Charger Level Specification for Residential Buildings with Renewable Energy", IEEE EUROCON 2021-19th International Conference on Smart Technologies, 426-431, July 2021, Ukraine.

- C11 **H** Abdeltawab, A Radwan, "Area Control Error Forecasting using Deep learning for an Interconnected Power System", Power and Energy Conference at Illinois March, 2022.
- C12 K Rall, **H Abdeltawab**, M Bayrakci-Boz, S Anwar, "Developing MATLAB Data Acquisition and Control Functions for the LABVOLT Electromechanical Training System", IEEE Integrated STEM Education Conference (ISEC 22), Princeton, NJ, March 2022.
- C13 I Ragaia, A S. Abdallah, **H Abdeltawab**, F Qiana, and J. Ma "Toward Smart Industrial Internet of Things (IIoT): Classification of Cutting Parameters and Energy Consumption Patterns in the Turning Process", North American Manufacturing Research Conference, July 2022.
- C14 **H** Abdeltawab," Optimal Stochastic Dispatch of Combined Heat Power System with Guaranteed Heat Trading", IEEE JAC-ECC 2022, Dec. 2022.
- C15 C Murzynski, **H Abdeltawab**, O Ashour, "Affordable industrial Robot Arm Setup for Educational Labratories", ASEE annual meeting 2023, 5-pages, Submitted.

References

1. Dr. Yasser Abdel-Rady I. Mohamed Professor, Electrical & Computer Engineering, U of Alberta Donadeo ICE 11-215, 9211-116 Street NW, Edmonton, Alberta, Canada T6G 1H9 Telephone: +1 (780) 492-7287 Cell: (780)868-3956 Email: <u>yasser2@ualberta.ca</u>

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PROFESSIONAL PROFILES

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- Google-Scholar: <u>https://scholar.google.ca/citations?user=0ds9rKYAAAAJ&hl=en&authuser=1</u>
- Ph.D. Thesis: https://era.library.ualberta.ca/files/crn301154b/Abdeltawab_Hussein_MH_201701_PhD.pdf
- Penn State website: https://behrend.psu.edu/person/hussein-abdeltawab