Abdullah Al-Digs

CONTACT INFORMATION

323-2875 Osoyoos Crescent,
Vancouver, BC, Canada, V6T 2G3

Phone: +1(604)518-5354
Email: aldigs@ece.ubc.ca

EDUCATION

The University of British Columbia (UBC) — Vancouver, BC
Ph.D. in Electrical and Computer Engineering — May 2021
Thesis: *Models and Methods for Power System Online Dynamic Contingency Monitoring and Control*
Advisor: Dr. Christine Chen
Cumulative GPA 4.0/4.0

B.A.Sc. in Electrical and Computer Engineering (Power and Energy Systems) — May 2015
Graduated with First Class Honors
Cumulative GPA 3.9/4.0

TEACHING EXPERIENCE

Guest Lecturer
Department of Electrical and Computer Engineering, UBC — Vancouver, BC

EECE 567: Power System Dynamics and Stability — Spring 2019 – 2021
- Delivered three guest lectures on my research topic
- Contributed to teaching materials and lectures for the course

EECE 560: Network Analysis and Simulation — Spring 2020 – 2021
- Delivered guest lecture to help students use programs required to run simulations

Teaching Assistant
Department of Electrical and Computer Engineering, UBC — Vancouver, BC

ELEC 453: Power Systems Analysis I (6 times) — Fall 2015 – 2020
- Delivered three lectures each term on three-phase transmission-line parameters
- Prepared and delivered weekly 2-hour tutorial lectures
- Designed and presented 3-hour review sessions prior to exams with full attendance
- Contributed to teaching materials and lectures for the course
- Conducted weekly office hours

ELEC 454: Power Systems Analysis II (4 times) — Spring 2018 – 2021
- Prepared and delivered weekly 2-hour tutorial lectures
- Designed and presented 3-hour review sessions prior to exams with full attendance
- Contributed to teaching materials and lectures for the course
- Conducted weekly office hours

ELEC 352: Electric Energy Systems (2 times) — Spring 2016 – 2017
- Delivered a guest lecture on the topic of grid-tie inverter control
- Prepared and delivered weekly 2-hour tutorial lectures
- Designed and presented 3-hour review sessions prior to exams with full attendance
- Contributed to teaching materials and lectures for the course
- Conducted weekly office hours

EECE 555: Renewable and Efficient Electric Power Systems — Fall 2017
- Prepared and delivered weekly 2-hour tutorial lectures
- Contributed to teaching materials and lectures for the course
- Conducted weekly office hours

ELEC 553: Power System Operation Decision Support Methods — Spring 2017
- Prepared and delivered weekly 2-hour tutorial lectures
- Contributed to teaching materials and lectures for the course
- Conducted weekly office hours

Research Experience

Graduate Researcher 2015 – 2021
Electric Power and Energy Systems Group, UBC Vancouver, BC

Transmission Systems Monitoring, Operation, and Control

- Re-examined the distributed slack bus power flow formulation to improve the solution accuracy and best match results from dynamic time-domain simulations
- Derived closed-form analytical mapping between complex-power injections to line flows
- Developed sparsity-promoting controller for regulating transmission-line power flows
- Designed and implemented optimization algorithm to detect/estimate load disturbances
- Quantified contributions of nodal active- and reactive-power injections to system loss

Distribution Systems Operation and Control

- Developed a set-theoretic method to estimate feasible nodal power injections
- Derived sensitivities that map the contributions of inverter-interfaced distributed energy resources (DERs) to the feeder-head active and reactive power injections
- Designed and implemented a controller for regulating distribution feeder-head injections by optimally dispatching distributed energy resources

Power Systems Dynamic Contingency Analysis

- Derived reduced-order location-cognizant dynamical model that accounts for locational effects of load disturbances on system frequency dynamics
- Derived analytical expressions to estimate post-disturbance local bus voltage frequency transients and predict them under what-if contingency scenarios
- Derived closed-form analytical mapping between nodal power injections and line flows
- Derived analytical closed-form expressions for dynamic generator participation factors
- Derived analytical closed-form expressions for dynamic distribution factors to predict post-disturbance active-power line flow transients

Power Systems Researcher (NSERC Engage Grant) 2018 – 2019
Enbala Power Networks Inc. North Vancouver, BC

- Conducted literature review of IEEE standards for control and communication of DERs
- Developed system models and design standards compliant DER voltage controller
- Verified the controller using simulations against benchmark system-wide optimization
- Produced full technical report summarizing achievements, results, and future plans

Certifications

Engineers and Geoscientists of British Columbia (EGBC) Burnaby, BC

- Engineer-in-Training (EIT) 2021

UBC Centre of Teaching, Learning, and Technology Vancouver, BC

- Teaching Assistant Institute: Teaching Skills 2019
- Teaching Assistant Institute: Teaching Assistant Wellness 2019
- Teaching Assistant Institute: Experiential Learning 2019
- Teaching Assistant Institute: Teaching with Technology 2019
- Instructional Skills Workshop 2018

UBC Risk Management Services Vancouver, BC

- Privacy and Information Security 2018
- Preventing and Addressing Workplace Bullying and Harassment 2015
- New and Young Worker Safety Orientation 2015
- Floor Warden Training 2015

Skills

Project Management:	Risk Assessment, Cost Allocation, Critical Thinking
Programming:	MATLAB, C, C++, Verilog, VHDL
Applications:	PSCAD, PowerWorld, MicroTran, PSIM, MS Office Suites, LaTeX
Operating Systems:	Microsoft Windows, macOS, Linux
Soft:	Communication, Leadership, Teamwork, Initiative
Teaching:	Classroom Management, Active Learning, Experiential Learning
Languages:	English (fluent), Arabic (native proficiency)

Journal Publications

A. Al-Digs and Y. C. Chen, "Power System Loss Divider," *IEEE Transactions on Power Systems*, vol. 35, no. 4, pp. 3286-3289, July 2020.

S. V. Dhople, Y. C. Chen, A. Al-Digs, and A. Dominiguez-Garcia, "Reexamining the Distributed Slack Bus," *IEEE Transactions on Power Systems*, vol. 35, no. 6, pp. 4870-4879, November 2020.

A. Al-Digs, S. V. Dhople, and Y. C. Chen, "Dynamic Distribution Factors," *IEEE Transactions on Power Systems*, vol. 34, no. 6, pp. 4974-4983, November 2019.

A. Al-Digs, S. V. Dhople, and Y. C. Chen, "Measurement-based Sparsity-promoting Optimal Control of Line Flows," *IEEE Transactions on Power Systems*, vol. 33, no. 5, pp. 5628-5638, September 2018.

Refereed Conference Proceedings

A. Al-Digs, B. Chen, S. V. Dhople, and Y. C. Chen, "A Data-driven Convex-optimization Method for Estimating Load Changes," in Proceedings of *Global Conference on Signal and Information Processing*, Ottawa, ON, November 2019.

A. Al-Digs, V. Purba, S. V. Dhople, and Y. C. Chen, "Tracking Aggregate Active-and Reactive-power Setpoints for a Collection of Dispatchable Inverters," in Proceedings of *Workshop on Control and Modeling for Power Electronics*, Toronto, ON, June 2019.

B. Chen, A. Al-Digs, and Y. C. Chen, "A Network-cognizant Aggregate-frequency Reduced-order Power System Dynamical Model," in Proceedings of *North American Power Symposium*, Fargo, ND, September 2018.

A. Al-Digs, S. V. Dhople, and Y. C. Chen, "Time-varying Injection Shift Factors to Predict Post-contingency Dynamic Line Flows," in Proceedings of *Allerton Conference on Communication, Control, and Computing*, Monticello, IL, October 2017.

A. Al-Digs, S. V. Dhople, and Y. C. Chen, "Linear-quadratic-Gaussian Control of Line Active-power Flow," in Proceedings of *IEEE Power and Energy Society General Meeting*, Chicago, IL, July 2017.

A. Al-Digs and Y. C. Chen, "Generation and Load Balance Using Linear Quadratic Gaussian Control," in Proceedings of *North American Power Symposium*, Denver, CO, September 2016.

A. Al-Digs, S. V. Dhople, and Y. C. Chen, "Estimating Feasible Nodal Power Injections in Distribution Networks," in Proceedings of *IEEE Power Energy Society Innovative Smart Grid Technologies Conference*, Minneapolis, MN, September 2016.

Y. C. Chen, A. Al-Digs, and S. V. Dhople, "Mapping Nodal Power Injections to Branch Flows in Connected LTI Networks," in Proceedings of *IEEE International Symposium on Circuits and Systems*, Montreal, Canada, May 2016.

Manuscripts Under Preparation

A. Al-Digs and Y. C. Chen, "Generalized Frequency Divider and Application in Analytical Dynamic Contingency Analysis".

A. Al-Digs, S. V. Dhople, and Y. C. Chen, "Constant-power Injections and Flows in AC Electrical Networks: Mappings and Sensitivities".

R. Khatami, A. Al-Digs, and Y. C. Chen, "Dynamics-aware Marginal Pricing of Electricity".

R. Khatami, A. Al-Digs, and Y. C. Chen, "Dynamics-aware Optimal Power Flow".

Conference Presentations

"Linear-quadratic-Gaussian Control of Line Active-power Flow," *IEEE Power and Energy Society General Meeting*, Chicago, IL, July 2017.

"Generation and Load Balance Using Linear Quadratic Gaussian Control," *North American Power Symposium*, Denver, CO, September 2016.

Referee Service

IEEE Transactions on Power Systems, *IEEE Transactions on Energy Conversion*, *IEEE Transactions on Smart Grids*, *IEEE Power and Energy Systems Letters*

Major Scholarships & Awards

- Postgraduate Scholarship Doctoral Award, *NSERC* 2018 – 2021
- Four Year Doctoral Fellowship (4YF), *UBC* 2017 – 2021
- Li Tze Fong Memorial Fellowship, *UBC* 2020
- British Columbia Graduate Scholarship, *UBC* 2019
- Killam Graduate Teaching Assistant Award, *UBC* 2019
- John Tiedje Fellowship, *UBC* 2018
- Graduate Scholarship Master's Award (CGS-M), *NSERC* 2016

Other Scholarships & Awards

- Faculty of Applied Science Graduate Award, *UBC* 2015 – 2020
- Northern Telecom Graduate Fellowship, *UBC* 2020
- President's Academic Excellence PhD Award, *UBC* 2020
- Bank of Montreal Graduate Fellowship, *UBC* 2017
- Theodore E. Arnold Fellowship, *UBC* 2017
- TREK Excellence Scholarship, *UBC* 2013 – 2015
- Charles Lindsay Thompson Scholarship, *UBC* 2014
- Charles and Jane Banks Scholarship, *UBC* 2014
- President's Entrance Scholarship, *UBC* 2011

Academic Achievements & Recognitions

- Applied Science Rising Star Award, *UBC* 2021
- Faculty of Applied Science Dean's Honor List, *UBC* 2011 – 2015
- Achievement Award in Engineering, *APEGBC* 2015
- Ranked 1st/216 Students in Electrical and Computer Engineering, *UBC* 2015
- Ranked 4th/315 Students in Electrical and Computer Engineering, *UBC* 2014
- Ranked 8th/250 Students in Electrical and Computer Engineering, *UBC* 2013
- Outstanding Scholastic Excellence, *Golden Key International Honor Society* 2012

Memberships in Professional Organizations

Institute of Electrical and Electronics Engineers (IEEE)
Student Member 2014 – Present

IEEE - UBC Student Branch
Member 2014 – 2021

Extracurricular Activities

Research Lab Ambassador - ECE Department 2021
- Built connections with 8 other labs within ECE department
- Represented our research lab to provided feedback on programs within ECE
- Provided suggestions to the student experience within ECE
- Participated in monthly meetings to discuss creating events and initiatives

World University Service of Canada (WUSC) - UBC Branch 2018 – Present
- Welcomed new refugee students at the airport
- Helped refugee students relocate to their new homes on UBC campus
- Assisted refugee students with their applications to graduate school
- Applied to join WUSC's new mentorship program

IEEE Student International Field Trips - UBC Student Branch 2014 – 2015
- Participated in the IEEE international field trips to Germany, France, and South Korea
- Visited companies, universities, research institutes, and exploring the cultures
- Explored the nature of professional engineering and working environments abroad

Sports and Physical Activities - UBC Recreation 2012 – Present
- Outdoor Soccer Tournament: Champion and 2nd ranked leading scorer (2014)
- REC Indoor Futsal: Reached the semifinals two years in a row (2013–2015)
- REC Outdoor Soccer: Champion and leading scorer (2012–2013)