Intae Moon

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Personal website : https://itmoon7.github.io/

EDUCATION

MASSACHUSETTS INSTITUTE OF TECHNOLOGY | PhD in Electrical Engineering and Computer Science
Sep 2019 - May 2024| Cambridge, MA · Machine learning research for improving healthcare

MASSACHUSETTS INSTITUTE OF TECHNOLOGY | SM in Electrical Engineering and Computer Science
Sep 2016 - Sep 2018 | Cambridge, MA · Electrical Energy Conversion and Control

SM Thesis Title : Design and implementation of a converter with wide operating range using a variable-inverter-rectifier-transformer structure

UNIVERSITY OF ILLINOIS | BS in Electrical and Computer Engineering
May 2016 | Urbana-Champaign, IL · Highest Honors at graduation

Relevant Coursework (MIT) • Machine Learning for Healthcare • Machine Learning in Genomics • Inference and Information • Statistical Learning Theory and Applications • Inference on Causal and Structural Parameters Using ML and AI • Bayesian Modelling and Inference • Biomedical Signal and Image Processing • Fundamentals of Probability • Real Analysis

RESEARCH

HEALTHY ML LAB | PhD Research Assistant for Prof. Marzyeh Ghassemi
Aug 2022 – present| Cambridge, MA
- Conduct research on deployable and trustworthy AI models robust to real-world challenges, with a focus on ensuring fairness and quantifying uncertainty.

GOOGLE RESEARCH | Student Researcher at Genomics Team in Health AI
June 2022 – Dec 2022| Cambridge, MA
- Developed a multi-modal machine learning framework which learns semantically meaningful representations from cardiac MRI imaging-genetics data

GUSEV LAB | PhD Research Assistant for Prof. Alexander Gusev (Harvard Medical School)
May 2019 – present | Boston, MA
- Utilized routinely collected panel sequencing data to develop a machine learning classifier which reliably predicts primary cancer types of malignant tumors, and developed clinical decision support tool for patients with Cancer with Unknown Primary (CUP)
- Developed Neural-ODE based time-to-event prediction model for irregularly sampled data with competing risks and provided the model-based risk scores for deep venous thrombosis (DVT) among patients with cancer, which outperforms current clinical standards
- Hosted a reading group for causal inference across research labs in the Longwood medical area. Covered contents are available in this **link**

POWER ELECTRONICS RESEARCH GROUP | Research Assistant for Prof. David Perreault
Sep 2016 – Jan 2019 | Cambridge, MA
- Designed and built a high-performance USB Type-C ac-dc power conversion system with wide output voltage range, incorporating an innovative system architecture, "Variable Inverter-Rectifier-Transformer" (US patent: US11716030B2), we developed to optimizes magnetic components in a high-frequency power conversion system

PILAWA RESEARCH GROUP | Undergrad. Research Assistant for Prof. Robert Pilawa-Podgurski
May 2015 – Aug 2016 | Champaign, IL
- Designed and built a high performance 1.3 kW power conversion system for data center power delivery applications and led the undergraduate team to win the Best Innovation Award in IEEE International Future Energy Challenge 2016

TEACHING

6.871 MACHINE LEARNING WITH HEALTHCARE TEACHING STAFF | Graduate Teaching Assistant
working with Prof. David Sontag
Jan 2022 – June 2022 | Cambridge, MA
- Created weekly recitation content and developed Python-based problem sets, in order to improve students' understanding of real-world healthcare applications of machine learning. Course contents including newly developed problem sets are available in this **link**.
- Coordinated collaborations between clinical researchers from MIT and Harvard, and students for course projects, and provided mentorship on student projects, leading to notable publications.
- Awarded **Carlton E. Tucker Award for teaching excellence** (overall instructor rating 6.8/7.0)

6.004 COMPUTATION STRUCTURES TEACHING STAFF | Graduate Teaching Assistant
Sep 2018 – May 2019 | Cambridge, MA
- Helped design and built new laboratory assignments and course materials in a RISC-V assembly and high-level hardware description language Bluespec
- Helped students with understanding various computer architecture concepts from a simple digital system to virtual memory and process synchronization and guided them to build a pipelined multi-stage processor in Bluespec

SELECTED PUBLICATIONS

- **I. Moon**, H. Jeong, M. Ghassemi, and A. Gusev, "Robust and fair time-to-event framework for predicting cancer-associated Venous Thromboembolism (VTE) using routinely-collected clinical and panel-sequencing data.": American Society of Human Genetics (ASHG), Washington, D.C., 2023 (Full paper in preparation)
- G. Lee, A. Li, **I. Moon**, D. Katritsis, Y Pantos, F. Stingo, D. Fabbrico, R. Molinaro, F. Taraballi, W. Tao, and C. Corbo, "Protein Corona Sensor Array Nanosystem for Detection of Coronary Artery Disease.": Small. 2023
- **I. Moon**, J. LoPiccolo, S. Baca, K. Kehl, M. Hassett, D. Liu, D. Schrag, and A. Gusev, "Machine learning for genetics-based classification and treatment response prediction in cancer of unknown primary.": Nature Medicine, 2023 **[Featured on MIT News, DFCI news, and Nature portfolio genetics research.]**
- A. Ayed, C. Saillard, J. Onofrey, **I. Moon**, S. Chang, A. Feldman, and M. Nayan, "Machine learning to predict future PSA in patients with prostate cancer managed with active surveillance.": Journal of Clinical Oncology, 2023
- **I. Moon**, J. LoPiccolo, S. Baca, K. Kehl, and A. Gusev, "Utilizing Electronic Health Records (EHR) and tumor panel sequencing to demystify prognosis of Cancer of Unknown Primary (CUP) patients.": **[Top 10% Reviewers' Choice Abstracts at American Society of Human Genetics (ASHG), Los Angeles, CA, 2022]**
- **I. Moon**, S. Groha and A. Gusev, "SurvLatent ODE : A Neural ODE based time-to-event model with competing risks for longitudinal data improves cancer-associated Venous Thromboembolism (VTE) prediction.": Proceedings of Machine Learning Research (PMLR), Machine Learning for Healthcare 2022.

- **I. Moon**, S. Chakraborty and D. J. Perreault, "A High-performance 65 W Universal ac-dc Converter Using a Variable-Inverter-Rectifier-Transformer with Improved Step-down Capability.": 2019 IEEE Energy Conversion Congress and Exposition (ECCE), Baltimore, MD, 2019.

- **I. Moon**, M. K. Ranjram, S. Chakraborty and D. J. Perreault, "A Wide Operating Range Converter Using a Variable-Inverter-Rectifier-Transformer with Improved Step-Down Capability.": 2019 IEEE Applied Power Electronics Conference and Exposition (APEC), Anaheim, CA, 2019.

- M. K. Ranjram, **I. Moon** and D. J. Perreault, "Variable-Inverter-Rectifier-Transformer: A Hybrid Electronic and Magnetic Structure Enabling Adjustable High Step-Down Conversion Ratios," in IEEE Transactions on Power Electronics, vol. 33, no. 8, pp. 6509-6525, Aug. 2018. **[Chosen as the highlighted paper of the issue]**

- Y. Lei, C. Barth, S. Qin, W. Liu, **I. Moon**, A. Stillwell, D. Chou, T. Foulkes, Z. Ye, Z. Liao and R. C. N. Pilawa- Podgurski, "A 2-kW Single-Phase Seven-Level Flying Capacitor Multilevel Inverter With an Active Energy Buffer," in IEEE Transactions on Power Electronics, vol. 32, no. 11, pp. 8570-8581, Nov. 2017.

- **I. Moon**, C. F. Haken, E. K. Saathoff, E. Bian, Y. Lei, S. Qin, D. Chou, S. Sedig, W. Chung, and R. C. N. Pilawa- Podgurski, "Design and implementation of a 1.3 kW, 7-level flying capacitor multilevel AC-DC converter with power factor correction.": 2017 IEEE Applied Power Electronics Conference and Exposition (APEC), Tampa, FL, 2017, pp. 67-73.

- S. Qin, Y. Lei, **I. Moon**, C. Haken, E. Bian, E. Saathoff, W. Chung, D. Chou, and R. C. N. Pilawa-Podgurski, "A high power density power factor correction front end based on a 7-level flying capacitor multilevel converter.": 2016 IEEE 2nd Annual Southern Power Electronics Conference (SPEC), Auckland, 2016, pp. 1-6.

- C. B. Barth, **I. Moon**, Y. Lei, S. Qin, and R. C. N. Pilawa-Podgurski, "Experimental evaluation of capacitors for power buffering in single-phase power converters.": 2015 IEEE Energy Conversion Congress and Exposition (ECCE), Montreal, QC, 2015, pp. 6269-6276.

INVITED TALKS

- "Machine learning for genetics-based classification and treatment response prediction in cancer of unknown primary", Molecular tumor board at Dana-Farber Cancer Institute, Boston, MA, 2023.

- "Time-to-event model with competing events for irregularly sampled time-series", Cipherome, Inc., San Jose, CA, 2022.

- "A Wide Operating Range Power Converter Using a Variable-Inverter-Rectifier-Transformer with Improved Step-Down Capability", Center for Integrated Circuits and Systems (CICS) Review, Massachusetts Institute of Technology, 2018.

- "Miniaturized Grid–tied ac-dc Power Converters with Wide Output Voltage Ranges", Texas Instruments, Manchester, NH, 2018.

- "A 1.3 kW, 7-level Flying Capacitor Multilevel AC-DC converter for a Data Center Power Delivery", IEEE International Future Energy Challenge, National Taiwan University, 2016.

AWARDS

CHARLES J. EPSTEIN TRAINEE AWARDS FOR EXCELLENCE IN HUMAN GENETICS RESEARCH | PREDOCTORAL SEMIFINALIST

Aug 2022 | American Society of Human Genetics (ASHG), Los Angeles, CA
- 60 semi-finalists were chosen out of over 700 applicants.

CARLTON E. TUCKER AWARD FOR TEACHING EXCELLENCE | ANNUAL DEPARTMENT TEACHING AWARD AT MIT ELECTRICAL ENGINEERING AND COMPUTER SCIENCE

Jun 2022 | Cambridge, MA
- I held a weekly recitation session, mentored students' class projects, and developed Python-based problem sets (overall instructor rating 6.8/7.0).

BEST INNOVATION AWARD | IEEE INTERNATIONAL FUTURE ENERGY CHALLENGE 2016 (TEAM LEADER)

Jul 2016 | National Taiwan University, Taipei, Taiwan
- I led the team of undergraduate students to design and build successful prototype of 1.3 kW power converter for an efficient data center power delivery architecture and won the Best Innovation Award.

RUSSELL E. BERTHOLD SCHOLARSHIP | POWER AND ENERGY SYSTEMS SCHOLARSHIP

Nov 2015 | Champaign, IL
- I was awarded this scholarship for an extraordinary undergraduate research in power and energy systems.

GOOGLE LITTLE BOX CHALLENGE | FINALIST

Oct 2015 | Champaign, IL
- Our team was selected as one of eighteen finalists out of more than hundred teams worldwide. The challenge was to build a power inverter for solar panel applications, that was about one tenth the size of the state-of-the-art at that time.

SKILLS

PROGRAMMING & DESIGN
- Python • R • MATLAB • LaTeX
- C\C++ • SystemVerilog • Bluespec • RISC-V assembly
- Cadence Tools (IC design) • High-frequency PCB design

LANGUAGES
Native fluency:
English, Korean
Basic fluency:
German