Saehong Park

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RESEARCH INTERESTS

1. **Control, Estimation, & Learning of Battery Systems in Electrified Transportation**:
   Improving the battery management systems in electric vehicles.

2. **Energy / Transportation Network Management in Smart Cities**:
   Integrating battery energy storage, renewable power generation, and load control in smart cities.

TEACHING INTERESTS

1. **Introduction to Cyber-physical Systems**
   Undergraduate course for prototyping cyber-physical systems via electronic circuits.

2. **Introduction to Energy Systems Engineering**
   Introductory course for modeling, estimation, and controls for energy systems.

3. **Artificial Intelligence & Optimal Control**
   Graduate level course for learning-based controls and model-based controls.

EDUCATION

- **University of California, Berkeley** — Berkeley, USA
  Postdoctoral Research Associate — *Jan. 2021 – Aug. 2021*
  - Associate Director at Energy, Controls, & Applications Lab (eCAL)
  - Advisor : Professor Scott Moura

- **University of California, Berkeley** — Berkeley, USA
  Ph.D. at the Department of Civil and Environmental Engineering — *Aug. 2015 – Dec. 2020*
  - Major: Systems Engineering
  - Advisor : Professor Scott Moura

- **Graduate School of Sogang University** — Seoul, KOREA
  M.S. at the Department of Electronic Engineering — *Mar. 2013 – Feb. 2015*
  - Advisor : Professor Hongseok Kim

- **Sogang University** — Seoul, KOREA
  B.S. at the Department of Electronic Engineering — *Mar. 2007 – Feb. 2013*
  - Graduated with honors (Cum Laude)

PUBLICATIONS: PEER-REVIEWED JOURNALS

* indicates equal contribution.

1. Distributionally Robust Surrogate Optimal Control for High-Dimensional Systems
   Aaron Kandel, **Saehong Park**, Scott Moura
   In Review, IEEE Transactions on Control Systems Technology, Impact Factor: 5.312, 2021

2. A Deep Reinforcement Learning Framework for Fast Charging Strategy of Li-ion Batteries
   Saehong Park, Andrea Pozzi, Michael Whitemeyer, Hector Perez, Aaron Kandel, Geumbee Kim,
   Yohwan Choi, Won Tae Joe, Davide M Raimondo, Scott Moura
   In Review, IEEE Transactions on Transportation Electrification, Impact Factor: 6.370, 2021

3. Faster and safer charge of Li-ion batteries: Feedback control makes the difference
   Luis Couto, Raffaele Romagnoli, **Saehong Park**, Dong Zhang, Scott Moura, Michel Kinnaert, Emanuele Garone
   To Appear, IEEE Transactions on Control Systems Technology, Impact Factor: 5.312, 2021

4. Reinforcement Learning versus PDE Backstepping and PI Control for Congested Freeway Traffic
   Huan Yu*, **Saehong Park***, Alexandre Bayen, Scott Moura, Miroslav Krstic
   IEEE Transactions on Control Systems Technology, Impact Factor: 5.312, 2021

5. A passive interfacial thermal regulator based on shape memory alloy and its application to battery thermal management
   Menglong Hao, Jian Li, **Saehong Park**, Scott Moura, Chris Dames
   Nature Energy, Impact Factor: 54.026, 2018

6. Optimal Experimental Design for Parameterization of an Electrochemical Lithium-Ion Battery Model
   Saehong Park, Dylan Kato, Zach Gima, Reinhardt Klein, Scott Moura
   Journal of the Electrochemical Society, Impact Factor: 3.662, 2018

7. Data-Driven Baseline Estimation of Residential Buildings for Demand Response
   Saehong Park, Seunghyoung Ryu, Yohwan Choi, Jihyo Kim, Hongseok Kim
   Energies Journal, Impact Factor: 2.702, 2015

PUBLICATIONS: REFEREED CONFERENCES PROCEEDINGS

1. Estimation of Cyclable Lithium for Li-ion Battery State-of-Health Monitoring
   Saehong Park, Dong Zhang, Reinhardt Klein, Scott Moura
   IEEE American Control Conference (ACC), 2021

2. Reinforcement Learning vs. Backstepping Control of Stop-and-Go Traffic
   Huan Yu*, **Saehong Park***, Scott Moura, Alexandre Bayen, Miroslav Krstic
   arXiv preprint arXiv:1904.12957

3. Optimal Control of Battery Fast Charging Based-on Pontryagin's Minimum Principle
   Saehong Park, Donggun Lee, Hyoung Jun Ahn, Claire Tomlin, Scott Moura
   IEEE Conference on Decision and Control (CDC), 2020

4. Reinforcement Learning-based Fast Charging Control Strategy for Li-ion Batteries
   Saehong Park, Andrea Pozzi, Michael Whitmeyer, Won Tae Joe, Davide M Raimondo, Scott Moura
   IEEE Conference on Control Technology and Applications (CCTA), 2020

5. Nonlinear State and Parameter Estimation for Lithium-Ion Batteries with ThermalCoupling
   Dong Zhang, Luis D. Couto, **Saehong Park**, Preet Gill, Scott Moura
   International Federation of Automatic Control (IFAC) conference World Congress, 2020

6. Distributionally Robust Surrogate Optimal Control for Large-Scale Dynamical Systems
   Aaron Kandel, **Saehong Park**, Hector E. Perez, Geumbee Kim, Yohwan Choi, Hyoung Jun Ahn, Won Tae Joe, Scott Moura
   IEEE American Control Conference (ACC), 2020

7. Optimal Input Design for Parameter Identification in an Electrochemical Li-ion Battery Model
   Saehong Park, Dylan Kato, Zach Gima, Reinhardt Klein, Scott Moura
   IEEE American Control Conference (ACC), 2018, ***Best Student Paper Finalist***

8. Hybrid Electrochemical Modeling with Recurrent Neural Networks for Li-ion Batteries
Saehong Park, Dong Zhang, Scott Moura
lEEE American Control Conference (ACC), 2017

9. A Framework for Baseline Load Estimation in Demand Response: Data Mining Approach
Saehong Park, Seunghyoung Ryu, Yohwan Choi, Hongseok Kim
IEEE International Conference on Smart Grid Communications, 2014

WORK EXPERIENCE

- **Apple Data Scientist** Cupertino, USA
  Battery Analytics Group *August. 2021 – Present*
  - Perform a design of battery management system using ML/AI data science skills.

- **USRA Intern at NASA Ames Research Center** Mountain view, USA
  Data Science Group Intern *Jun. 2020 – Aug. 2020*
  - Conducted research on system-wide safety assurance using reinforcement learning in Aeronautics .

- **Robert Bosch Research Technology Center** Sunnyvale, USA
  Controls Group Intern *Sep. 2019 – Dec. 2019*
  - Conducted research on parameter estimation / state estimation for Li-ion battery model.

- **Sekisui House Australia (Engineering/Construction Company)** Sydney, AUSTRALIA
  Training Division Intern *Jan. 2012 – Feb. 2012*
  - Conducted smart homes modeling with AUTOCAD

- **Republic Of Korea Navy**
  Radio man (Interpreter) *Mar. 2009 – Mar. 2011*
  - Joined Multinational Task Force 151 in response to piracy attacks in the Gulf of Aden, Middle East
  - Awarded: **Navy Commendation Medal** (presented by captain of the task group)
  - Liaison works in submarine operation in Commander, Republic of Korea Fleet (COMROKFLT), Pusan

AWARDS & HONORS

- Best Student Presentation Award in Korean American Scientists and Engineers Association 2019

- Best Student Paper Award Finalist in American Control Conference 2018

- Hyundai Motors Group Scholarship in 2016

INVITED TALKS

- **Intelligent Transportation Seminar Hosted by HKUST, GZ** Guangzhou, China
  "Fast Charging of Li-ion Batteries using Deep RL in Electrified Transportation" *October 2021*
- **SIAM Conference on Control and Its Applications** Washington, USA
  "Estimation and Control for Batteries" *July 2021*
- **Applied Machine Learning Days(AMLD) Hosted by EPFL** Lausanne, Switzerland
  "AI & Sustainable Energy" *April 2021*
- **NASA Ames Reseacher Center Symposium** Mountain View, USA
  "System-wide Safety Assurance in Aeronautics" *September 2020*

RESEARCH EXPERIENCE

- **Energy Management Research funded by DoE**
  Connected and Learning Based Optimal Freight Management *Oct. 2020 – Jul. 2021*
  - Developing learning-based algorithms for electric truck fleet management.

- – Playing a **LEADING** role in research execution

- **Battery Management Research funded by NSF**
  Advanced Battery Management System Design   *July. 2019 – Present*
  - – Developing algorithms for Parameter Estimation / State Estimation / Optimal Control
  - – Developing closed-loop battery testing based on electrochemical model
  - – Playing a **LEADING** role in research execution

- **Battery Management Research funded by LG Chem**
  Fast Charging: Controls & Learning with Electrochemical Models   *Jan. 2018 – Jun. 2020*
  - – Developing P2D model environment and reinforcement learning algorithms
  - – Played a **LEADING** role in research execution

- **Battery Management Research funded by Bosch RTC**
  Optimal Experiment Design for Lithium-ion Battery   *June. 2016 – Aug. 2017*
  - – Developing optimized experimental designs for electro-chemical Li-ion battery models
  - – Played a **LEADING** role in research execution

- **Battery Management Research funded by Samsung SDI**
  Electro-chemical model based control of batteries   *Aug. 2015 – Aug. 2016*
  - – Developing electro-chemical battery modeling with parameter identification

- **ESS Research funded by National Research Foundation of Korea**
  Korea-Energy-Storage operating system for base station   *May. 2014 – Feb. 2015*
  - – Designed Depth of Discharge control algorithm using optimization technique under the Smart Grid

- **DR Research funded by National IT Industry Promotion Agency**
  Energy ICT platforms   *Aug. 2013 – Nov. 2014*
  - – Played a **LEADING** role in research execution (Research proposal, Management, and Outcomes)
  - – Analyzed fast demand response (DR) in cooperation with smart metering company, Omni System in Korea

- **Korea Micro Energy Grid (K-MEG) R&D**
  Testbeds in K-MEG   *Jun. 2013 – Jun. 2014*
  - – Analyzed technological competitiveness and feasibility of Energy IT platform for overseas markets
  - – Evaluated load impacts of K-MEG testbeds for Demand Response Measurement and Verification

TEACHING EXPERIENCE

- **CE 92A: Design for Future Infrastructure Systems**   UC Berkeley
  Graduate Student Instructor   *Fall 2020*

- **Reinforcement Learning for Energy Systems**   Tsinghua-Berkeley Shenzhen Institute
  Co-instructor   *Summer 2020*

- **CE 186: Design of Cyber-Physical Systems**   UC Berkeley
  Graduate Student Instructor   *Fall 2017*

- **EEE2013: Advanced Engineering Mathematics**   Sogang University
  Teaching Assistant   *Spring 2013*

LEADERSHIP & SERVICE

- **Undergraduate Research Internship in Science & Engineering (URISE)**
  Research Mentor   *Summer 2019*
  - – Mentor an undergraduate to develop research skills

- **Korean Graduate Student Association at UC BERKELEY**   Berkeley, USA
  President   *Jun. 2017 – Jun. 2018*
  - – Organized industrial / social events for Korean graduate students at UC Berkeley

- **Reviewer**
  Academic journals   *Jan. 2016 – Present*
    – IEEE Transactions on Automatic Control
    – IEEE Transactions on Smart Grid
    – IEEE Transactions on Control Systems Technology
    – IEEE Transactions on Transportation Electrification
    – IEEE Transactions on Neural Networks and Learning Systems
    – IEEE Transactions on Industrial Electronics
    – IEEE Transactions on Industrial Informatics
    – IEEE/ASME Transactions of Mechatronics
    – IEEE Vehicular Technology Magazine
    – IEEE Control Systems Letters
    – Journal of Dynamic Systems, Measurement and Control
    – Electrochimica Acta
    – Journal of the Electrochemical Society
    – Journal of Industrial and Engineering Chemistry Research

- **Reviewer**
  Academic conferences   *Jan. 2016 – Present*
    – IEEE American Control Conference
    – IEEE Conference on Decision and Control
    – IEEE Conference on Control Technology and Applications
    – ASME Dynamic Systems and Control Conference

RESEARCH MENTORSHIP

- Jaewoong Lee (UC Berkeley CE Graduate 2021-Present)

- Anvita Nigam (UC Berkeley MSE Undergraduate 2020)

- Dylan Kato (UC Berkeley CEE Undergraduate 2016-2017), Ph.D. student at UC Berkeley.

- Sonia Martin (UC Berkeley ME Undergraduate 2018-2019), Ph.D. student at Stanford.

- Michael Whitmeyer (UC Berkeley CS Undergraduate 2017-2018), MS student at UC Berkeley.

- Vanessa Hernandez-Cruz (UC Berkeley ME Undergraduate 2018-2019), Ford Motors

PATENTS

1. KOR Patent (KOR 10-1581685)
   Apparatus and method for charge and discharge scheduling in energy storage device

2. KOR Patent (KOR 10-1581684)
   Apparatus and method for charge and discharge scheduling using Depth of Discharge control in energy storage device

3. KOR Patent (KOR 10-1708709)
   Method for estimating customer baseline load using data mining and apparatus thereof

References

1. **Scott Moura — relation: Ph.D. advisor**
   Associate Professor at University of California, Berkeley, and Director of Energy, Controls, and Applications Lab (eCAL), Davis Hall 625, University of California, Berkeley, CA, 94720, United States, Email:smoura@berkeley.edu, TEL:+1 510-642-0948

2. **Claire Tomlin — relation: Dissertation committee**
   Professor at University of California, Berkeley, and Director of Hybrid Systems Lab, 721 Sutardja
   Dai Hall, University of California, Berkeley, CA, 94720, United States,
   Email:tomlin@eecs.berkeley.edu, TEL:+1 510-643-6610

3. **Satadru Dey — relation: Lab colleague**
   Assistant Professor at Penn State University, and Director of Smart City Laboratory, 338C Reber
   Building, University Park, PA 16802, United States, Email:skd5685@psu.edu, TEL:+1 864-908-4336