KIM, JIWON

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RESEARCH INTERESTS

- **Energy storage management systems**
  Energy storages are utilized in a diverse range of devices, from mobile systems to electric vehicles. My research focuses on intelligent energy storage management systems, including remaining capacity estimation, hybrid energy storage system design, and sensing techniques development based on various machine learning techniques. I have conducted a comprehensive array of research activities, which include battery experiments, hardware design, and software development.
- **On-device machine learning**
  Operating DNN models on mobile devices is critical for mitigating various problems, such as privacy and network issues, in ML-based applications. My research focuses on energy efficient on-device inference with DNN architectures capable of adaptive operation. To optimize inference efficiency, I comprehensively cover multiple layers of Android mobile devices, from the kernel to the framework and application levels, and develop targeted solutions.
- **Battery-less IoT systems**
  IoT sensor nodes are a core technology for future applications such as smart farms. Due to maintenance challenges, battery-free, light energy-harvesting sensor nodes are promising. My research concentrates on energy optimization for both energy-consuming devices and energy-supplying harvesters to ensure stable IoT device operation. I have developed both low-power IoT devices and energy-efficient harvesting mechanisms that adapt various environments based on reinforcement learning.

EDUCATION

Yonsei University, Seoul, Republic of Korea Mar. 2018 – Present
Ph.D. Candidate in Computer Science, Expected Completion: February 2024
Thesis title: Exploiting Energy Storage Characteristics for Application-Optimized Device Operation
Mobile Embedded Systems Lab., Advised by Prof. Hojung Cha

Ewha Womans University, Seoul, Republic of Korea Mar. 2011 – Feb. 2016
B.S. in Electronics Engineering (major), and Computer Science & Engineering (minor)

PUBLICATIONS (SCIE JOURNALS AND INTERNATIONAL CONFERENCES)

NRF list denotes the top CS conference list from National Research Foundation of Korea.
* indicates co-primary authors

1. **DNN-based Temperature Prediction of Large-Scale Battery Pack**,
   Jiwon Kim, and Rhan Ha,
   IET Electronics Letters, Vol. 59, Issue 16, Aug. 2023.
2. **Detecting Structural Anomalies of Quadcopter UAVs based on LSTM Autoencoder**,
   Seunghyeok Jeon, Jaeyun Kang, **Jiwon Kim**, and Hojung Cha,
   Pervasive and Mobile Computing (PMC), Vol. 88, Jan. 2023.
3. **DynLiB: Maximizing Energy Availability of Hybrid Li-Ion Battery Systems**
   Jiwon Kim, Sungwoo Baek, Seunghyeok Jeon, and Hojung Cha,
   IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (TCAD), Vol. 41, Issue 11, Nov. 2022. (Special issue on EMSOFT'22) *(IF: 2, NRF list)*.

4. **PVoT: Reconfigurable Photovoltaic Array for Indoor Light Energy-powered Batteryless Devices**,
Jiwon Kim*, Eunyeong Kim*, Seunghyeok Jeon, Junick Ahn, Hyungchol Jun, and Hojung Cha,
IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (TCAD), Vol. 41, Issue 11, Nov. 2022. (Special issue on CODES+ISSS'22) *(IF: 2, NRF list)*.

5. **Voltage Prediction of Drone Battery Reflecting Internal Temperature**,
Jiwon Kim, Seunghyeok Jeon, Jaehyun Kim, and Hojung Cha,
The 59th Design Automation Conference (DAC'22) *(IF: 3, NRF list)*.

6. **Optrone: Maximizing Performance and Energy Resources of Drone Batteries**,
Jiwon Kim, Yonghun Choi, Seunghyeok Jeon, Jaeyun Kang, and Hojung Cha,
IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (TCAD), Vol. 39, Issue 11, Nov. 2020. (Special issue on EMSOFT'20) *(IF: 2, NRF list)*.

7. **Hydrone: Reconfigurable Energy Storage for UAV Applications**,
Jiwon Kim, Sungwoo Baek, Yonghun Choi, Junick Ahn, and Hojung Cha,
IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (TCAD), Vol. 39, Issue 11, Nov. 2020. (Special issue on CODES+ISSS'20) *(IF: 2, NRF list)*.

8. **Optimizing Discharging Efficiency of Reconfigurable Battery with Deep Reinforcement Learning**
Seunghyeok Jeon, **Jiwon Kim**, Junick Ahn, and Hojung Cha,
IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (TCAD), Vol. 39, Issue 11, Nov. 2020. (Special issue on EMSOFT'20) *(IF: 2, NRF list)*.

ORAL PRESENTATIONS

1. **DynLiB: Maximizing Energy Availability of Hybrid Li-Ion Battery Systems**
The ACM SIGBED International Conference on Embedded Software (EMSOFT 2022), Hybrid-Shanghai, Oct. 07-14, 2022.

2. **PVoT: Reconfigurable Photovoltaic Array for Indoor Light Energy-powered Batteryless Devices**,
The International Conference on Hardware/Software Codesign and System Synthesis (CODES+ISSS 2022), Hybrid-Shanghai, Oct. 07-14, 2022.

3. **Voltage Prediction of Drone Battery Reflecting Internal Temperature**,
The 59th Design Automation Conference (DAC 2022), San Fransisco, USA, July 10-14, 2022.

4. **Optrone: Maximizing Performance and Energy Resources of Drone Batteries**,
The ACM SIGBED International Conference on Embedded Software (EMSOFT 2020), Virtual Conference, Sep. 20-25, 2020.

5. **Hydrone: Reconfigurable Energy Storage for UAV Applications**,
The International Conference on Hardware/Software Codesign and System Synthesis (CODES+ISSS 2020), Virtual Conference, Sep. 20-25, 2020.

PATENTS

1. **J. Kim**, T. Jung, H. Jun, and H. Cha, "Method and Apparatus for Estimating Battery Availability Based on Dynamic Voltage Threshold" KR Patent Application No. 10-2022-0164163, filed November 30, 2022. Patent Pending.

2. **J. Kim**, E. Kim, S. Jeon, J. Ahn, H. Jun, and H. Cha, "Reconfigurable Photovoltaic Array Monitoring Apparatus and Method" KR Patent Application No. 10-2021-0172113, filed December 12, 2021. Patent Pending.

3. **J. Kim**, Y. Choi, J. Ahn, S. Jeon, and H. Cha, "Hybrid Energy Storage Device and Method for Improving Available Capacity of Drone Battery" KR Patent Application No. 10-2020-0140548, filed October 27, 2020. Patent Pending.

4. **J. Kim**, Y. Choi, S. Jeon, J. Kang, and H. Cha "Apparatus and Method for Providing Usable Capacity of a Battery for Drone" KR Patent No. 10-2303478 filed November 21, 2019. and issued September 13, 2021.

5. S. Jeon, **J. Kim**, and H. Cha, "Battery Level Indicator and Method Displaying Battery Level Thereof" KR Patent No. 10-2091340, filed December 11, 2018. and issued March 13, 2020.

ACADEMIC SERVICE

Peer Review
IEEE Transactions on Energy Conversion (TEC)

RESEARCH PROJECT EXPERIENCES

Task Relation Graph Prediction Based on RNN — Mar. 2023 – Feb. 2024
AP S/W Development Team, Samsung Electronics, Republic of Korea

Development of Energy Management Techniques for Batteryless IoT System — Mar. 2019 – Feb. 2022
National Research Foundation of Korea, NRF, Republic of Korea

Development of Energy Optimization Techniques for Multi-cell Battery System — Apr. 2019 – Dec. 2019
Intelligent Machine Center, Samsung Research, Republic of Korea

Development of High-Assurance (≥EAL6) Secure Microkernel — Apr. 2018 – Present
Institute for Information &communications Technology Promotion (IITP), Ministry of Science and ICT, Republic of Korea

AWARDS AND HONORS

Academic Research Fellowship, *BK21 PLUS Yonsei Scholarship* — Fall semester, 2022

Ph.D. Fellowship, *National Research Foundation (NRF) of Korea* — June 2020 – May 2022

Excellence Prize in Capstone Design, *Dept. of Electronic Engineering, Ewha Womans University* — Fall semester, 2015

Academic Excellence Scholarship, *Dept of Electronic Engineering, Ewha Womans University* — Fall semester, 2014

2nd Place in 2014 LES Asia-Pacific Business Plan Competition Award, Licensing Executive Society — Nov. 24, 2014

Gold Medal in 4th International Festival of Innovations, Int. Federation of Inventors' Associations (IFIA) — Apr. 24, 2014

Grand Prize (Prime Minister's Award, 1st place among 3,441 teams),
in National University Invention Competition, Korean Intellectual Property Office — May 5, 2013

TECHNICAL SKILLS

Software Development

- Programming Languages: C, C++, Python, MATLAB

Hardware Development

- Circuit design (PCB schematic design)
- Knowledge of simulation tools: MATLAB Simulink

Languages

- Korean – Native
- English – Advanced