Gayoung Park

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Research Interests

- Data Center Power Electronics
- Power Electronics for Transportation Electrification
- Renewable Energy Integration
- Application of Optimization Theory

Education

Seoul National University, Seoul, South Korea — Mar. 2023 — Present
M.S. student in Electrical and Computer Engineering — GPA: 3.98/4.3

École Polytechnique Fédérale de Lausanne (EPFL), Lausanne, Switzerland — Feb. 2022 — Jun. 2022
Exchange student in Electrical Engineering

Seoul National University, Seoul, South Korea — Mar. 2018 — Feb. 2023
B.S. in Electrical and Computer Engineering (Honors: *Summa cum laude*) — GPA: 3.93/4.3

Research Experiences

40 kW Isolated DC-DC Converter Development for Bidirectional EV Fast Charger
Graduate Student Researcher — Sep. 2023 — Present
Advisor: Prof. Shenghui Cui — *Seoul, South Korea*

- Designed a high-density SiC-based dual-active bridge converter for a fast DC charger in collaboration with LG Innotek.
- Optimized the physical design of a high-frequency transformer through experimental iteration to enhance efficiency.
- Developed an optimization process to determine the optimal leakage inductance and turns ratio of the transformer.
- Proposed an optimal modulation scheme for the DAB converter, maximizing ZVS capability and minimizing rms current.
- Analyzed the soft-switching characteristics of the DAB converter to reduce switching and conduction losses.

Analysis of Grid-Forming Control for Inverter-Based Resources and Control System Design
Graduate Student Researcher — Jan. 2023 — Present
Advisor: Prof. Shenghui Cui — *Seoul, South Korea*

- Developed an experimental setup for hardware-in-the-loop simulation of GFM control, in collaboration with Korea Electric Power Corporation Research Institute.
- Designed a versatile control system based on the TMS320F28379D MCU, incorporating peripherals–ADC, ePWM, etc.
- Investigated FRT strategies and current limitation techniques for GFM control in 3-level voltage source converters.
- Proposed a stable and fast power-voltage control method for IBRs in weak grids using online nonlinear optimization.
- Conducted research on the integration of supercapacitor-based ESSs to provide active inertia power in GFM control.

Development of Core Technology for High-Temperature Superconducting Magnets
Graduate Student Researcher — Jan. 2023 — Mar. 2023
Advisors: Prof. Shenghui Cui, Prof. Seungyong Hahn — *Seoul, South Korea*

- Assisted in setting up experiments to investigate superconducting magnet operation under a half-bridge inverter, in collaboration with the SNU Applied Superconductivity Laboratory.

3.2 kW Titanium Plus Power Supply Development for Data Center Power Delivery
Undergraduate Student Researcher — Sep. 2022 — Feb. 2023
Advisor: Prof. Shenghui Cui — *Seoul, South Korea*

- Supported the design of a high-efficiency totem-pole bridgeless PFC using SiC and GaN devices for data center power supplies, in collaboration with LG Innotek.
- Conducted research on modulation schemes for totem-pole bridgeless PFC and analyzed efficiency measurement data.

Development of Gate Driver Circuit for 3-Phase 2-Level Voltage Source Converter
Exchange Undergraduate Student Researcher — Feb. 2022 — Jun. 2022
Advisor: Prof. Drazen Dujić — *Lausanne, Switzerland*

- Designed and tested a gate driver circuit for voltage sensing and interfacing with a 3-phase 2-level VSC.

Publications

Journal Articles

1. G. Park, H. Kim, B.-K. Cho and S. Cui, "ZVS-Enhanced and RMS-Current-Minimized Optimal Modulation Scheme of Dual-Active Bridge Converter with Comprehensive ZVS Current Analysis," *Submitted*.
2. C. Im, J. Ham, J. Maeng, G. Kim, S. H. Park, J. Kim, J. Lee, G. Park, J. T. Lee, K. Choi, U. Bong, S. Cui, S. Hahn and S. Lee, "Nonlinear Characteristics of Metal-Insulated REBCO Magnet Under Various Switching Frequencies of Half-Bridge Inverter Circuit," in IEEE Transactions on Applied Superconductivity, vol. 34, no. 5, pp. 1-6, Aug. 2024, Art no. 4604906, doi: 10.1109/TASC.2024.3370092.

Conference Papers

1. G. Park, H. Kim and S. Cui, "Optimization of Transformer Design Parameters of a 20 kW SiC-Based Dual-Active Bridge Converter for Enhanced Efficiency," *2024 IEEE Energy Conversion Congress and Exposition (ECCE)*, Phoenix, AZ, USA, 2024, *Accepted*.
2. G. Park, J. Park, S. Cui and S. -K. Sul, "Nonlinear Optimization-Based Power-Voltage Control of Grid-Connected Converter in Weak Grid," *2024 IEEE Applied Power Electronics Conference and Exposition (APEC)*, Long Beach, CA, USA, 2024, pp. 228-233, doi: 10.1109/APEC48139.2024.10509166.

Honors & Awards

Ph.D. Study-Abroad Scholarship, Korea Foundation for Advanced Studies (KFAS) Fall 2024 — Present
Annual research grant supporting Ph.D. studies (up to 5 years)
(Selected as one of 4 recipients in Electrical Engineering in 2024)

Domestic Graduate Scholarship, SBS Cultural Foundation Fall 2023 — Present
Full tuition and monthly research grant for promising graduate students
(Selected as one of 9 recipients in 2023)

SNU Tomorrow's Engineers Membership (STEM) Spring 2021 — Spring 2022
Honor society for engineering students demonstrating excellence in academic achievements

Yangyoung Foundation Scholarship Spring 2020 — Fall 2021
Full tuition support for undergraduate students with outstanding academic performance

Basic Circuit Theory Project Excellence Award Spring 2019
1st place out of 21 teams, *Topic: DIY electronic music box*

Academic Excellence Scholarship Spring 2018
Full-ride scholarship awarded for academic excellence

Hanseong Son Jae-han Scholarship 2016 — 2017
Research grant for high school students with exceptional potential in scientific research

Korean Physical Society's Physics Camp for High School Girls Summer 2015
2nd place, *Topic: Piezoelectric energy harvesting soccer ball*
Poster presentation at the 2015 KPS Fall Meeting

Selected Course Projects

Temperature Estimation of SiC MOSFETs based on Temperature-Sensitive Optical Parameters Fall 2022
Course: Power Semiconductor Devices

- Designed a light-receiving circuit considering the luminescence intensity profile of SiC MOSFETs.
- Assisted with experimental measurements of luminescence intensity and temperature under different operating currents.

1 kW BLDC Motor Control for Driving an Electric Scooter Fall 2021
Course: Design Project for Electrical Devices and Systems

- Designed a control system using the TMS320F28379D MCU and a 3-phase 2-level voltage source inverter for driving an 1 kW BLDC motor powered by a 48 V battery.

Presentations

Lab Visit Presentation, UC Berkeley Winter 2024
Berkeley Power Electronics Center, University of California, Berkeley

- Presented research on development of 20 kW SiC-based dual-active bridge converter for EV charger, as a representative of the SNU Power Electronics Center, Seoul National University.

Other Experiences

Teaching Assistant, Seoul National University

- Selected Research Topics in Power Electronics — Fall 2024
- Seminar on Electric Energy Conversion and Circuits for M.S. Students — Spring 2024
- Design Project for Electrical Devices and Systems: Motor Drive for Electric Scooters — Spring 2023, Fall 2023
- Introduction to Circuit Theory and Laboratory — Spring 2023

Volunteer Experience, Seoul National University

- **Mentor for STEM Vision Mentoring Program** — Summer 2021
  — *Guidance and roadmap exploration for high school students*
- **Mentor for AI Tech Play** — Spring 2021
  — *AI education program for middle school students*
- **Service Award** — Summer 2019
  — *Recognized for outstanding dedication and contributions to the E&CE student council*
- **Volunteer at Summer Engineering Camp** — Summer 2019
  — *Engineering workshops for elementary school students*
- **Mentor for Dream Camp** — Winter 2018
  — *Roadmap exploration mentoring for high school students in underprivileged areas*

Languages

Korean (Native), **English** (Professional working proficiency, iBT TOEFL Score: 108/120)

Additional Skills

- **Programming:** C/C++, Python, MATLAB Simulink, LaTeX
- **Software:** PLECS, LTspice, Altium, KiCAD, Fusion 360, Code Composer Studio, Typhoon HIL