SEUNGCHEOL (PAUL) OH

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EDUCATION

California State University Long Beach — Long Beach, CA, USA
Master of Science in Electrical Engineering - _Advisor: Prof. Sean Kwon_ — May 2022
  - Thesis: Enhancement of Multiple Input Multiple Output (MIMO) Communication System with Polarization
  - Graduated with graduate Dean's List of University Scholars and Artists

Bachelor of Science in Electrical Engineering — Dec. 2019
  - Graudated with Dean's Honour List and Magna Cum Laude

SKILLS

Areas of Knowledge: Machine Learning, Wireless Communication, Optimization, Signal Processing, Software Dev.
Specialty: LLM, NLP, GPT, Decision-Transformer, LSTM, GRU, Massive-MIMO, Phased Array Antenna, Polarization
Languages & Tools: Python (PyTorch, NumPy, Matplotlib, re), HuggingFace, MATLAB/Simulink, C/C++,
HTML/CSS, Javascript, SQL, Kotlin, Swift, LabVIEW, CVX-Solver, Android Studio, Arduino, LTSpice, MongoDB
Certificate: Korean History Proficiency Test, Level 1 (Nationally Accredited, Highest Level)

WORK EXPERIENCE

Visiting Researcher, WiSE Lab — _June 2023 – Present_
  - Developing data driven, end-to-end machine learning based solutions to optimization problems in wireless
    communication systems by leveraging DNN, GRU, LSTM and Decision-Transformer (GPT) [1]

Graduate Student Researcher, University of Toronto — _August 2022 - May 2023_
  - Produced a dataset to validate the neural network's capability to learn the channel statistics from accurately
    ray-traced reconfigurable intelligent surface (RIS) enabled wireless channels

Graduate & Undergraduate Student Researcher, WiSE Lab — _Jan 2018 – Dec 2022_
  - Developed novel wireless communication systems that leverage polarization to enhance the systems with significant
    improvements in error rate or/and signal to noise ratio (co-op project with Prof. Andreas Molisch) [2, 3, 4]

RESEARCH PROJECTS

Parameter Designs with Sequential Learning in PR-MIMO Communication System — _Jan 2024 – Present_
  - Developing an RNN (LSTM) and decision-transformer (GPT) based sequential learning framework in polarized-MIMO
    communication system that abstracts essential temporal correlation in the channel to maximize system objective

Learning to Map Pilots to Optimal Polarization and Beamforming Vectors — _June 2023 – Sep 2024_
  - Developing a framework utilizing DNNs to directly map pilots to optimal parameters in polarized massive-MISO
    system, resulting in superior performance compared to traditional methods with substantially reduced pilot length

Hymn Generation with GPT — _March 2024 – April 2024_
  - Implemented, trained and fine-tuned a decoder-only transformer (GPT) to generate hymn-like texts in Korean

Convex-Optimization for Antenna Selection in PR-MIMO System — _Sep. 2022 – Dec. 2022_
  - Enhanced polarized antenna selection system via convex-optimization techniques (constraint relaxation, interior point
    method, newton step, CVX-Solver) which significantly reduced the time complexity from $O(M^5)$ to $O(M^{3.5})$

Beamforming Implementation — _August. 2019 – Dec. 2019_
  - Prototyped analog beamforming in MIMO communication system with USRP device
    First Place Award for Senior Capstone Design Competition

SELECTED PUBLICATIONS — GOOGLE SCHOLAR LINK

[1] **Oh, Seungcheol**, Han Han, Joongheon Kim, and Sean Kwon. Double-side polarization and beamforming alignment
    in polarization reconfigurable miso system with deep neural networks. IEEE Wireless Communications Letter
    (submitted), 2024.

[2] **Oh, Paul** and Sean Kwon. Multipolarization superposition beamforming: Novel scheme of transmit power allocation
    and subcarrier assignment. IEEE Transactions on Wireless Communications, 22, 2023.

[3] **Paul S. Oh**, Sean Seok-Chul Kwon, and Andreas F. Molisch. Antenna selection in polarization reconfigurable MIMO
    (PR-MIMO) communication systems. arXiv, 2021.

[4] **Oh, Seungcheol Paul** and Seok-Chul Sean Kwon. Capacity of polarized-mimo (p-mimo) system in different wireless
    channels. In 2018 IEEE Green Energy and Smart Systems Conference (IGESSC), 2018.
    2018 IGESSC Best Paper Award.

INVITED TALKS

EE 488: Communication Capstone Design Class, _Visiting Lecturer_
  - Conducted a tutorial for machine learning applied wireless communications — _Spring 2024_
  - Presented a tutorial on operating USRPs to design beamforming systems with LabVIEW — _Fall 2019_