Seungcheol (Paul) Oh

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Education

George Brown College — Toronto, Ontario, Canada
Mobile Application Development (Co-operative Program) — Dec. 2024

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
- Graduated with Dean's Honour List, Magna Cum Laude and Distinction

Skills

Areas of Knowledge: Machine Learning, Wireless Communications, 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), HuggingFace, MATLAB/Simulink, C/C++, HTML/CSS, Javascript, SQL, Kotlin, Swift, LabVIEW, CVX-Solver, Android Studio, Arduino, LTSpice, MongoDB

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)

Student Researcher, University of Toronto — *August 2022 - May 2023*
- Validated the neural network's capability to learn 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) [1, 2]

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 Beamformer — *June 2023 – Present*
- 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 (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

Publications

Google Scholar Link

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

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

[3] **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 tutorials to apply machine learning in wireless communication — *Spring 2024*
- Held tutorials on LabVIEW to operate USRPs to design beamforming systems — *Fall 2019*