Joohan Lee

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LinkedIn **Personal Website** **Google Scholar** **GitHub**

Research interests

AI Agents, AI Security, Machine Learning, Deep Learning, LLM, AI, Computer Networking, Full-stack Development, Wireless Communication

Education

University of Southern California Los Angeles, California
MS in Computer Science Jan 2022 – Dec 2023
Mentors: Professor Andreas Molisch, Doctor Juhyung Lee. *GPA: 3.71/4.0*

Yonsei University Wonju, South Korea
BE in Computer Engineering Mar 2015 – Feb 2021
Mentors: Professor Tae-Eung Sung. *GPA: 3.97/4.3*

Honors and scholarships

1st rank award (ICASSP 2023 Pathloss Radio Map Prediction Challenge) 2023
3rd rank award (USC IMSC SW Pioneer Hackathon) 2022
Academic scholarships for all 8 semesters (Yonsei University) 2021
3rd rank award (Yonsei University Capstone Design Competition) 2020
Honors (Yonsei University) 2019
Commendation (Gyeongnam Provincial Police, Republic of Korea) 2018

Publications

Integrating Pre-Trained Language Model with Physical Layer Communications
Ju-Hyung Lee, Dong-Ho Lee, Joohan Lee, Jay Pujara.
IEEE Transactions on Wireless Communications, vol. 23, no. 11, November 2024.

PMNet: Large-Scale Channel Prediction System for ICASSP 2023 First Pathloss Radio Map Prediction Challenge
Ju-Hyung Lee, Joohan Lee, Seon-Ho Lee, Andreas F. Molisch.
IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), 2023.

Generative vs. Predictive Models in Massive MIMO Channel Prediction
Ju-Hyung Lee, Joohan Lee, Andreas F. Molisch.
2024 58th Asilomar Conference on Signals, Systems, and Computers.

Software Entity Recognition with Noise-Robust Learning
Tai Nguyen, Yifeng Di, Joohan Lee, Muhao Chen, Tianyi Zhang.

38th IEEE/ACM International Conference on Automated Software Engineering (ASE '23), 2023.

Research experience

On-device AI Communications [GitHub]
Under prof. Andreas Molisch, Dr. Juhyung Lee (USC) May 2023 – Dec 2023
• Built on-device AI communication framework by incorporating a language model (BART) into TensorFlow-based library for simulating the physical layer of communication systems (NVIDIA Sionna).
• Applied vector quantizing knowledge into the AI communication system resulting in 10% noise-robustness and 50% compression for transmission size.

Building own Internet [GitHub]
Under prof. Ramesh Govindan (USC) Sep 2023 – Dec 2023
• Developed a functional router with static routing, incorporating ARP packet handling, IP forwarding, and ICMP replies for ping and traceroute, showcasing an understanding of Ethernet frame and processing skills.
• Configured OSPF for intra-domain and iBGP/eBGP for inter-domain routing in layer-3 networks.
• Implemented cTCP with BBR congestion control protocol.

PMNet: Large-Scale Channel Prediction System [GitHub]
Under prof. Andreas Molisch, Dr. Juhyung Lee (USC) Jan 2023 – May 2023
• Developed a PyTorch-based channel (pathloss) prediction framework to efficiently train deep learning models and improved model accuracy by 18% through model optimization, fine-tuning, and data augmentation

Meeting scheduling process(UNIX Socket programming) [GitHub]
Under prof. Ali Zahid (USC) Feb 2023 – May 2023
• Developed a high-performance meeting scheduling system using C and socket programming, streamlining the process of finding suitable meeting times for groups of participants.
• Conducted intersection calculations on the availability data retrieved from the backend servers to identify time slots that work for all participants, minimizing scheduling conflicts.

Named Entity Recognition for Software Engineering [GitHub]
Under prof. Tianyi Zhang (Purdue), Muhao Chen (USC) Jun 2022 – Apr 2023
• Established WikiSER: a high-quality dataset of 1.7M sentences with 79K labeled software entities, boasting an 8.62% lower error rate than the previous benchmark.
• Suggested self-regularization, a noise-robust learning approach for training SER models, and achieved a 7.1% F1 score improvement over a state-of-the-art model in noisy conditions.

Multimedia Compression and Video Player [GitHub]
Under prof. Parag Havaldar (USC) Jan 2023 – May 2023
• Constructed a sophisticated video player capable of extracting precise video indexes, enabling interactive exploration by discriminating distinct shots and scenes.
• Implemented a program to sample video frames, prevent spatial and temporal aliasing, and compress images.

Multilingual Cryptocurrency Chatbot [GitHub]
Under prof. Mohammad Rostami (USC) Sep 2022 – Dec 2022
• Implemented a cryptocurrency chatbot application utilizing Word2Vec, TF-IDF, and BERT embedding models.
• Developed a translating module that automatically recognizes the language type and translates the contents.

Stock price prediction using RNN, LSTM
Under prof. Tae-Eung Sung (Yonsei) Sep 2019 – Jan 2020
• Researched stock price prediction and improved prediction accuracy by utilizing not only stock prices but also environmental auxiliary indicators such as exchange rate, interest rate, etc. as inputs of RNN, LSTM models using Python, TensorFlow, Pandas, NumPy, and matplotlib.

Industry experience

Samsung SDS America Ridgefield Park, New Jersey
Gen AI Software Engineer Oct 2024 - Present

- Deployed and operated a self-hosted enterprise LLM chat platform adopted company-wide, significantly improving employee productivity across the organization, and contributed merged fixes upstream to the open-source project in the process.
- Designed and implemented a multimodal retrieval-augmented generation (RAG) pipeline enhancing domain-specific information retrieval and generation performance using LangChain, HuggingFace, Milvus, and AWS Bedrock.
- Developed an LLM-powered sales data analyzer using Pandas and LangChain with prompt engineering and agentic tools, improving response accuracy by 20%.
- Built full-stack AI applications with authentication, chatbot, document processing, and user management using Flask, React, and Electron.
- Identified and resolved 15+ security vulnerabilities in production AI application.
- Deployed production applications using AWS EC2, EBS, Application Load Balancer, Route53, S3, VPC, CloudWatch, Nginx, and Gunicorn.

USP Management, Inc Fort Lee, New Jersey
Full-Stack Developer Apr 2024 - Sep 2024

- Designed and implemented RESTful APIs for ERP system improving operational excellence for logistics data management.
- Implemented ERP UI pages for logistic data management, resulting in streamlined user interactions and improved data accessibility.
- Built end-to-end solutions using Node.js, Express.js, TypeScript, MySQL, Next.js, and React.

CyClean Inc. Buffalo Grove, Illinois
Software Engineer Intern May 2023 - Aug 2023

- Conducted the conceptualization, design, and implementation of a dynamic website utilizing React and TypeScript and integrating AWS Lambda, Amplify, CloudFront, Route 53, and S3 for deployment.
- Developed a user-centric platform for IoT device information while empowering customers to submit quotations.

BSG One Co., Ltd. Seoul, Republic of Korea
RPA Software Engineer Jul 2020 - Aug 2021

- Developed and maintained automation of business processes that use digital systems such as CRM, WMS, ERP.
- Developed a JSON standard interface for BrityRPA, increasing development productivity by up to 30%.
- Integrated OCR into RPA for document verification, reducing verification time by 80%.
- Led 6 projects end-to-end by designing digital transformation and excelled in communicating with clients to ensure alignment and satisfaction.

Teaching experience

Teaching assistant (University of Southern California) Summer 2022
Introduction to Artificial Intelligence
Hosted lab sessions and taught students how to implement basic data structures, A* search, and kNN algorithms and use scikit-learn for Naïve Bayes classifier and MLPRegressor model.

Undergraduate Teaching assistant (Yonsei University) Spring 2020
Fall 2019

YHL 1026: Internet Use
Plan and lead weekly make-up classes for students to deepen their understanding of web deveelopment.

Skills

AI/ML & Deep Learning
PyTorch, TensorFlow, LangChain, HuggingFace, AWS Bedrock, Milvus, Deep Learning, NLP, RAG

Programming Languages
Python, JavaScript/TypeScript, C/C++, Java, SQL, HTML/CSS

Backend & Cloud
Node.js, Express.js, Flask, RESTful APIs, MySQL, Prisma, AWS (EC2, Lambda, Amplify, S3, CloudFront, Route53), Docker, Linux, Nginx, Gunicorn, Git, JSP, Apache Tomcat

Frontend
React, Next.js, Angular, Electron, Bootstrap

Networking & Simulation
TCP/IP, OSPF, BGP, Quagga Routing, Sionna (link-level simulations)