RYAN TSAI

Machine Learning Engineer

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SUMMARY

Machine learning engineer with 10 years of experience in signal processing and systems engineering for cellular chipsets at Qualcomm and Zeku. Successfully transitioned across RF hardware, RF systems, modem systems, and machine learning through self-study and hands-on projects. Experienced in training machine learning models in PyTorch for computer vision and natural language processing, building ML pipelines for retrieval-augmented generation, and deploying applications on AWS.

SKILLS

- **Programming Languages:** Python, MATLAB
- **ML Libraries:** PyTorch, Hugging Face, Scikit-learn, TorchMetrics, NumPy, pandas, Matplotlib
- **Development and Deployment:** FastAPI, Streamlit, Docker, AWS (EC2, ECR, Lambda), Qdrant, Milvus, OpenAI, Haystack
- **Tools:** Git, Conda, Jupyter, VSCode, Spyder, Ubuntu

PROFESSIONAL EXPERIENCE

BEAM DATA   **Toronto, ON**
Data Science Consultant   **Feb 2025-Present**
- Building machine learning pipelines for content tagging and indexing university teaching materials (presentations, notebooks, lecture transcripts) to support a teaching assistant powered by retrieval-augmented generation.

QUALCOMM   **Santa Clara, CA**
Staff Modem Systems Engineer   **May 2022-Dec 2023**
Owned the commercialization of new features on Qualcomm's cellular chipset.
- Owned the design and commercialization of a novel APT PA calibration algorithm, achieving 20% reduction in power consumption at lower operating powers and 10% decrease in calibration time. Used Python to analyze the calibration data, which facilitated algorithm and software debugging.
- Owned the development and commercialization of a new software feature to adjust FBRx capture timing based on Tx group delay, eliminating all capture-related bugs. Used Python to generate the software lookup tables.

ZEKU   **Palo Alto, CA**
Senior Staff Modem Systems Engineer   **May 2020-May 2022**
Designed efficient digital filters and led end-to-end simulation effort for cellular chipset startup funded by Oppo.
- Designed a hardware-efficient notch filter in Matlab to suppress CW spurs and recover degraded SNR, necessary for meeting receiver performance standards. Tuned filter hyperparameters to optimize SNR across channel configurations and spur levels.
- Designed hardware-efficient rational upsampling and downsampling filter chains in Matlab, necessary for competitive power consumption and performance. Tuned filter hyperparameters to meet transmitter and receiver performance requirements across sampling rates.
- Led the team in integrating the digital transmitter filters and RF transmitter models into an end-to-end simulation in Matlab. Created 3GPP-compliant signal quality and emissions calculators in Matlab and delivered simulation results to show compliance with internal and 3GPP requirements across transmitter configurations.

QUALCOMM   San Diego, CA
Senior RF Systems Engineer   Nov 2017-May 2020
Senior RF Hardware Engineer   Apr 2013-Nov 2017

Key contributor to the commercialization of multiple cellular chipsets.

- Owned the commercialization of a novel TxIIP2 calibration algorithm, necessary for meeting receiver performance standards in self-blocking scenarios. Used Python to analyze the calibration data, which facilitated software and hardware debugging and identified similar signal paths. Reduced calibration time by 50% by reusing calibration settings across similar paths.
- Owned the development of a Python library to analyze baseband harmonic emissions, significantly reducing budgeting time and increasing test coverage and accuracy compared to manual spreadsheets. The library parsed specifications, calculated the link budgets, simulated the power spectral density of the harmonics to improve budget accuracy, and exported the budgets to Excel.
- Delivered comprehensive transmitter specifications for 4G/5G RF transceivers. Calculated link budgets for each new and updated specification, collaborating with RFIC and PA systems teams to relax specifications while maintaining acceptable performance.
- Debugged and resolved all customer RMAs related to 4G RF transmitter.
- Delivered 2G/3G/4G phone-level test data necessary for commercializing Qualcomm's cellular chipsets. Optimized PA impedance matching and hardware settings to achieve competitive Tx performance. Debugged and resolved all transmitter and receiver performance failures.

MACHINE LEARNING PROJECTS

Book Recommendation Chatbot with Retrieval-Augmented Generation   Dec 2024
- Indexed Goodreads book summaries into Qdrant vector database with OpenAI for text embedding
- Developed FastAPI chatbot application with Qdrant vector search and OpenAI chat completion
- Deployed containerized application to AWS EC2

Clinical Dialogue Text Summarization   Oct 2024
- Fine-tuned BART model, using low-rank adaptation, to summarize clinical dialogues, achieving 97% ROUGE-L on the training data but only 47% on the validation data.
- Analyzed the dataset by embedding the dialogues and proved that the dataset is too small and noisy for generalization.

Histopathology Image Classification   Aug 2024
- Employed image augmentation, class balancing, and transfer learning to achieve an AUC of 94.2% with ResNet-18 and 94.8% with ViT-Base on the test dataset, outperforming the research paper's AUC of 92.7%.

EDUCATION

WECLOUDDATA   Toronto, ON
Machine Learning Engineering Program   2024

UNIVERSITY OF CALIFORNIA, LOS ANGELES   Los Angeles, CA
Master of Science, Electrical Engineering   2011-2013

UNIVERSITY OF CALIFORNIA, BERKELEY   Berkeley, CA
Bachelor of Science, Electrical Engineering and Computer Sciences   2007-2011