Taha ValizadehAslani, Ph.D.

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Summary

Machine Learning Engineer with Ph.D. in Electrical Engineering and experience at Comcast and academia. Expertise in large language models, optimization algorithms, and information theory. Skilled in building scalable ML pipelines, developing domain-specific NLP models, and applying metaheuristic and information-theoretic approaches to network design and data analysis. Passionate about bridging theoretical innovation and practical deployment.

Experience

- **Comcast**   Philadelphia, PA
  Software Engineer   *Sept 2023 – Present*
    - Developed metaheuristic optimization pipelines (PSO, GA, ACO, DE) for designing Layer-3 fiber network topology, improving resiliency and reducing implementation cost.
    - Applied Monte Carlo simulation to assess network capacity overload risks under different stochastic traffic scenarios.
    - Designed time-series forecasting pipeline (ARIMA, ETS, exponential smoothing, etc.) to predict traffic utilization at national, regional, and site levels.
    - Built Spark/Databricks pipelines to monitor network utilization and ensure data quality.
    - Modeled network link latency estimation as a linear programming optimization problem.

- **Drexel University**   Philadelphia, PA
  Graduate Researcher, Machine Learning (Dissertation)   *Sept 2018 – Mar 2024*
    - Developed **PharmBERT**, a domain-specific LLM for FDA, surpassing baseline models in classification and extraction tasks.
    - Created **Two-Stage Fine-Tuning**, a novel deep learning training strategy for learning class-imbalanced data.
    - Proposed parameter-efficient fine-tuning of **LayerNorm**, reducing computational complexity by 99%.
    - Predicted antimicrobial resistance using the novel amino-acid k-mer features, achieving performance and interpretability.

Selected Projects

- **PharmBERT (Developed for FDA)** – A pre-trained domain-specific large language model for pharmacological text mining, outperforming SOTA models on different pharmaceutical tasks, such as detecting adverse drug reactions, identifying drug–drug interactions, and classifying drug-label text.

- **Two-Stage Fine-Tuning** – A novel deep learning training strategy for improving the model performance on under-represented classes and generalizability on out-of-distribution samples.

- **Amino-Acid k-mer** – A new feature for predicting antibiotic resistance from the genome. The proposed method outperformed SOTA techniques and provided new insights into resistance mechanisms, including changing our understanding of the *tet(D)* gene.

- **Efficient Fine-Tuning for LLMs** – Proposed a novel LayerNorm-based parameter-efficient tuning strategy for the transformer-based deep learning models, which reduces the computational complexity by 99%.

- **Mathematical Analysis and Improvement of IS-LDPC Code** – Proved four mathematical theorems that explain performance degradation of IS-LDPC codes, then proposed a method that improves the error-control performance based on the theorems.

Technical Skills

Languages: Python, SQL, R, MATLAB, Bash, C, C++, Scala
ML Frameworks: PyTorch, TensorFlow, Keras, XGBoost, Random Forest, SVM, scikit-learn, statsmodels
NLP: Hugging Face Transformers, BERT, GPT, LLaMA, Mistral, Instructor, fast.ai, NLTK
Optimization: Particle Swarm Optimization, Genetic Algorithms, Ant Colony Optimization, Differential Evolution
Theory: Information Theory, Probability Theory, Graph Theory
Data science tools: Spark, Hadoop, Databricks, KNIME, t-SNE, PCA, Tableau, Matplotlib, seaborn, ggplot2
High-performance computing: Slurm Workload Manager, SGE, AWS, Microsoft Azure, Cerebras (CS-2), Google Colab
Bioinformatic packages: Biopython, BLAST, SAMtools, MAFFT, Ray assembly, MetaBAT 2, Bowtie
Miscellaneous: pandas, NumPy, SciPy, Git, Docker, Conda, HTML, Linux, LaTeX, Microsoft Office

Education

- **Drexel University**   Philadelphia, PA
  Ph.D. Electrical Engineering   *Sept 2018 – Mar 2024*

- **Iran University of Science and Technology**   Tehran, Iran
  M.Sc. Electrical Engineering – Communication Systems   *Sept 2014 – Jan 2017*

- **Lorestan University**   Khorramabad, Iran
  B.Sc. Electrical Engineering – Power   *Feb 2009 – May 2013*