Project Portfolio Summary

1. Voice-Activated Banking Application

Designed and implemented a secure, scalable voice recognition system enabling natural language processing (NLP) for seamless banking transactions. Integrated Google speech-to-text API. Developed a fault-tolerant microservice architecture ensuring real-time, low-latency responses and end-to-end encryption for sensitive financial data. Demonstrated expertise in deploying high-availability systems with monitoring, logging, and automated recovery mechanisms.

2. Real-Time Analytics Search Tool for Public Opinion Mining

Built a distributed analytics engine capable of aggregating and analyzing millions of social media posts in real time. Engineered high-throughput data ingestion pipelines using Apache Kafka and custom NLP models to extract sentiment, trending topics, and user demographics. Implemented advanced data visualization dashboards with interactive filtering and anomaly detection, optimizing for both performance and user experience. This tool empowered decision-makers with actionable insights, processing over 10,000 queries per second at peak load.

3. Simulated Autonomous Vehicle Driving

Developed a high-fidelity simulation environment for autonomous vehicle navigation using reinforcement learning (RL) and deep neural networks. Trained agents on synthetic and real-world driving scenarios, achieving robust decision-making under uncertainty. Integrated sensor fusion (LIDAR, camera, radar) and real-time path planning algorithms, reducing collision rates by 30% compared to baseline models. Showcased strong proficiency in parallel computing and GPU acceleration for scalable training pipelines.

5. Markov Decision Processes: Strategy Comparison and Hyperparameter Tuning

Conducted a rigorous empirical study comparing various RL strategies (e.g., Q-learning, SARSA, Monte Carlo) in stochastic environments. Automated hyperparameter optimization using Bayesian methods and distributed computing, achieving state-of-the-art performance on benchmark tasks. Demonstrated advanced understanding of theoretical foundations and practical trade-offs in RL algorithm selection.

6. Early-Stage Cancer Screening Using ImageNet Training

Engineered a deep learning pipeline for medical image analysis, leveraging transfer learning with pre-trained ImageNet models. Achieved high sensitivity and specificity in detecting early-stage malignancies from histopathology images. Developed robust data augmentation and preprocessing techniques to address class imbalance and limited annotated datasets. Published findings in a peer-reviewed workshop, highlighting clinical relevance and engineering rigor.

7. NLP Models for Word Prediction and Chatbot Development

Designed and deployed large-scale language models for next-word prediction and conversational AI. Explored transformer architectures (BERT, GPT) and recurrent neural networks (RNNs) for diverse language modeling tasks. Optimized model inference for lowlatency, real-time chatbot interactions, integrating with multi-modal user interfaces. Demonstrated expertise in model compression and deployment on edge devices.

8. Binary Exploitation

Led security research on binary exploitation techniques, including buffer overflow, returnoriented programming (ROP), and heap-based attacks. Developed custom tools for vulnerability discovery and exploit mitigation, contributing to open-source security projects. Demonstrated deep understanding of low-level system internals and defensive programming practices.