Bhagyashri Tushir

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SUMMARY

Accomplished computer engineer with a Ph.D. in Computer Science & Engineering and over 7 years of experience in machine learning and IoT. Expertise in designing and implementing machine learning solutions to address complex research and business challenges effectively. Proficient in advanced machine learning algorithms (LSTMs, XGBoost) and distributed cloud systems (AWS) and relational databases (PostgreSQL). Proven ability to collaborate with cross-functional teams and communicate complex concepts effectively. Dedicated to driving technological advancements and business solutions in cutting-edge environments

TECHNICAL SKILLS

Machine Learning: LSTMs, NLP, Gradient Boosted, Random Forest, Decision Tree, Neural Networks, Deep Learning, T-CNN, K-nearest neighbor, Predictive Modeling, Regression, Bagging and Boosting, Clustering, Time Series Analysis, Anomaly Detection, Support Vector Machine, A/B testing, Hypothesis Testing

Tools: Pytorch, Scikit-Learn, Pandas, NumPy, Matplotlib, MongoDB, Kubernetes, Docker, AWS, Lambda, S3, Git, MySQL, DynamoDB

Languages & Frameworks: Python, C++, C, Java, HTML, CSS, JavaScript, Bootstrap, Flask, Plotly

WORK EXPERIENCE

Applied Researcher - *SIOT Lab, SCU, CA*   **Sep 2017 - May 2024**

- Productionalized light-weight ML models (neural networks, SVM) using feature selection and model compression techniques, achieving device classification latency of 0.0194 ms, thereby improving real-time analytics and user experience
- Designed and developed NLP apps and testbeds to collect and analyze terabytes of streaming network data from IoT devices (Ring Cam, Google Nest)
- Fine-tuned ML models to achieve 97% accuracy in classifying IoT devices (Alexa, Google Home) on home network, leading to better network bandwidth management and reducing the latency by 30%
- Enhanced network security, performance, and customer experience by identifying anomalies 10 times faster than existing methods using Random Forest
- Conducted analytical study revealing $253 million loss due to fraudulent power consumption in IoT devices, highlighting economic risks and prompting increased investment in security measures
- Collaborated and mentored 3 teams of graduate students to run experiments, collect data and publish papers

Machine Learning Research Intern - *Infineon Technologies, San Jose*, CA   **Nov 2021 - March 2022**

- Developed ML based recommendation system for identifying under-performing IoT devices with 99.68% accuracy improving IoT device health and saving $6 million annually
- Collaborated with teams of expert engineers, researchers, and data scientists to innovate and implement solutions

Data Scientist - *Zaclon India Ltd, Delhi, IN*   **Aug 2015 - July 2017**

- Developed ETL pipelines to process sensor data, using clustering models to optimize temperature and air pressure, achieving a 7% cost reduction in sintering operations
- Employed multi-regression to predict pre-sintered product dimensions, reducing the rejection rate by over 45%, thereby boosting product quality and manufacturing profitability

Software Engineer - *Zaclon India Ltd, Delhi, IN*   **June 2012 - July 2013**

- Created basic authentication and backend functionality using Flask REST API framework
- Developed UI functionality for web platform using JavaScript by consuming REST APIs

PROJECTS

- **Anomaly detection**: Optimized ML models (k-nearest-neighbor, Random Forest, Support Vector Machine) for anomaly detection and IoT device classification with 98% accuray, enabling device-specific policies and QoS optimizations. Developed a low-cost and scalable SDN-based framework tailored for smart homes, enhancing network management and safeguarding consumer data across smart devices
- **Device classification**: Utilized tree based ML models (Decision Tree, Random Forest, Light Gradient Boosted Machine, Extreme Gradient Boosting) to classify IoT devices in dynamic smart home settings. Improving classification accuracy from 75% to 97%, enhancing network bandwidth management, device latency and security in IoT devices, hence improving customer experience

- **Feature selection**: Developed a feature selection system utilizing Decision Trees, Random Forests, and LightGBM, achieving a 28% improvement in device classification accuracy. This system leverages device latency and introduces accumulation score features. Performed correlation analysis and recursive feature elimination to rank features
- **Fine-tuned BERT:** Fine-tuned the BERT model using Hugging Face's Transformers library to classify network traffic as malicious or benign, significantly enhancing IoT network security.
- **Automated Testbeds**: Designed and developed automated smart home testbeds to identify vulnerabilities and anomalies in device security and user privacy. The testbed was capable of imitating a smart home setup and collecting terabytes of data. It consists of 8 smart home devices, a programmable power switch, a command and control center, ETL pipelines, programs to sniff data, launch DDOS attacks, restart devices remotely, and notify stakeholders in case of any escalations
- **Home Telecare System**: Developed a web-app and trained TCNN-based model that predicts elderly behavior from sensor data with 97% accuracy. It alerts stakeholders when risky behavior is detected, improving personalized care and safety in smart homes for elderly users

EDUCATION

Ph.D., *Computer Science & Engineering* | *GPA: 3.65/4*   **December 2023**
Santa Clara University, Santa Clara, CA
IoT and Machine Learning ‖ *Publications*: 01 (Journal) | 06 (Conference)

Master of Engineering, *Computer Engineering* | *GPA: 8.3/10*   **July 2015**
Netaji Subhas Institute of Technology, Delhi, IN
Information System ‖ *Publications*: 03 (Conference)

Bachelor of Technology, *Computer Science & Engineering* | *GPA: 7/10*   **June 2012**
Indraprastha University, Delhi, IN

PUBLICATIONS

- Accurate Identification of IoT Devices in the Presence of Wireless Channel Dynamics, *LCN, 2024*
- Detecting Abnormal Activity in Daily Living: A Deep Learning Approach, *under review, International Journal of Human–Computer Interaction, 2024*
- Frame Aggregation Based Method for Low-Rate DDoS Detection in IoT Networks, *Springer NSS 2022*
- Securing Smart Homes via Software-Defined Networking and Low-Cost Traffic Classification, *IEEE COMPSAC 2021*
- An Efficient SDN Architecture for Smart Home Security Accelerated by FPGA, *IEEE LANMAN 2021*
- A Quantitative Study of DDoS and E-DDoS Attacks on WiFi Smart Home Devices, *IEEE IoT Journal, 2020,* | *IF: 11.7*
- The Impact of DoS Attacks on Resource-constrained IoT Devices: A Study on the Mirai Attack, *UBI Media 2018*
- Graph Colouring Technique for Efficient Channel Allocation in Cognitive Radio Networks, *IEEE ICC, 2016*

PROFESSIONAL SERVICES

Journal Reviewer: IEEE IoT Journal, IEEE Consumer Electronics Magazine, International Journal of Communication Systems, Elsevier Physical Communication, Journal of Supercomputing, IEEE Micro, Elsevier Computer Networks, Wiley Security and Privacy, Expert Systems, IEEE Transactions on Green Communications and Networking, Sustainable Cities and Society
Conference Reviewer: ICME, IEEE ICC, IEEE COINS, CITS, COMPSAC, MASCOTS, ICEDEG

ACHIEVEMENTS AND AWARDS

- Dean's Excellence Research Award 2021-2023
- Grad Engineering Fellow Award 2018-2021
- Qualified Graduate Aptitude Test for Engineering (GATE), (98.67 percentile) 2013
- Best Team Award, Zaclon India 2013