TUSHAR PARMANAND BUDHWANI

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EDUCATION

University of Massachusetts Amherst   **May 2025**
Master of Science in Computer Science   *GPA:* **3.93/4.0**
- Teaching Assistant for the graduate course "Algorithms for Data Science" under Prof. Andrew McGregor (Spring 2025).

University of Mumbai   **May 2023**
Bachelor of Engineering in Computer Engineering   *GPA:* **3.8/4.0**
- Patent Granted: Proposed a faster alternative to the AES algorithm for secure communication between IoT devices.
- Community Service: Led 250 volunteers for over 80 events including Blood Donation Drives, Cleanup Drives, etc.

EXPERIENCE

Graduate Researcher - GenAI   **Jan 2025 - May 2025**
Adobe Inc. (with University of Massachusetts Amherst)
- Developing a hybrid evaluation approach that integrates LLM-generated critiques with regression models to overcome LLM miscalibration and improve human alignment by 9%.
- Extracted token embeddings from the last hidden-layer of a transformer, capturing semantic features of LLM-generated critiques for accurate human feedback prediction.
- Applied PCA to reduce critique embeddings from 512 to 50 dimensions and trained regressors to efficiently map embeddings to target scores, ensuring computational efficiency and scalability.

Full Stack Development Intern   **Aug 2021 - Jan 2022**
Infovue Solutions Inc.
- Integrated REST APIs with external payroll services and benefits providers in an HR automation project, significantly improving data synchronization and reducing the time required for manual administrative tasks by 15 hours.
- Developed a MERN-based internal employee portal with an adaptive dashboard for HR and payroll data visualization.
- Migrated a legacy monolithic system to a containerized microservices architecture using Docker.
- Crafted an advanced permission and role-based access control (RBAC) module, ensuring secure handling of sensitive employee data.

PROJECTS

Optimizing Self-written Machine Learning Algorithms for Real-World Data Applications | *Python, ML*   **May 2024**
- Conducted a comparative analysis of self-written models (Neural Networks, Random Forests, and KNN) on 4 diverse datasets.
- Modeled multi-layer architectures with custom back propagation, activation functions (ReLU, Sigmoid), and weight initialization, achieving up to 98.14% test accuracy on the Handwritten Digits dataset.
- Executed k-fold cross-validation with 10 folds, ensuring robust generalization, reduced overfitting, and high accuracy and F1 scores.

Personalizing LLMs based on User Profile | *Python, LLM, NLP, Deep Learning*   **Dec 2023**
- Created a Retrieval-Augmented Generation (RAG) pipeline to personalize LLM outputs by integrating user profile data.
- Engineered enhanced prompts by combining input queries, retrieved articles, and lexical augmentation techniques, improving the LLM's contextual understanding and alignment with user preferences by 14%.
- Implemented a BM25 retriever to extract top-k (1,2,3) relevant articles from a user's profile.
- Fine-tuned Google's FLAN-T5 model to predict article categories, boosting accuracy by 23%.

ML-Based Web Platform for Early Detection of Fatal Diseases | *Python, Scikit-learn*   **Feb 2023**
- Trained and evaluated eight ML models (SVM, Random Forest, XGBoost, AdaBoost), using hyperparameter tuning and k-fold cross-validation to identify the best-performing model for six diseases.
- Performed preprocessing techniques such as feature engineering, SMOTE, and standardization, improving robustness and boosting prediction accuracy by up to 4%.
- Assembled a Stacking Ensemble model combining Logistic Regression, KNN, and Decision Trees, attaining 91.3% accuracy for heart disease detection, outperforming individual models.

TECHNICAL SKILLS

Programming Languages: Python, Java, C, C++, SQL, JavaScript, R, Git

Python Libraries: NumPy, Pandas, Scikit-learn, NLTK, Matplotlib, TensorFlow, Keras, PyTorch, Seaborn

Databases & Visualization Tools: PostgreSQL, MySQL, SQLite, MongoDB, PowerBI, Tableau

Full Stack Development: Express.js, React.js, Node.js, HTML/CSS, AJAX, Bootstrap, Tailwind.css, JQuery, PHP, Laravel

Cloud Platforms & DevOps: AWS (EC2, S3, Lambda, RDS, Elastic Beanstalk), Docker, Kubernetes