Brajesh Kumar

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Skills

- **Programming Languages:** **Python**, Bash
- **Development:** **FastAPI**, **PostgreSQL**, HTML, CSS, JavaScript,
- **Frameworks/Libraries:** **Keras**, **scikit-learn**, **OpenCV**, NLTK, spaCy, **TensorFlow**, **Fuzzy Logic**, pickle
- **Tools/Platforms:** Git, GitHub, Docker, Jenkins, **DevOps**, **AWS**, **ETL Tools**
- **Data Analysis:** **Power BI**, **Pandas**, **NumPy**, Matplotlib, Seaborn, Plotly

Projects

- **Named Entity Recognition (NER) System** LINK *Mar 2025*
  - Developed supervised sequence labeling model using **Conditional Random Fields (CRF)** with **L2-SGD optimization algorithm**, achieving 87% F1-score and 82% sequence accuracy on multi-class NER task.
  - Engineered 25+ contextual features including **n-gram patterns**, **POS tags**, **morphological attributes**, and **bidirectional word context windows** to capture sequential dependencies in text data.
  - Implemented **BIO tagging scheme** for sequence annotation and applied forward-fill imputation for missing data, processing 47,000+ labeled tokens across 8 entity classes (**PER**, **ORG**, **GEO**, **GPE**, **TIM**, **ART**, **EVE**, **NAT**).
  - Applied feature extraction pipeline combining linguistic preprocessing (**tokenization**, **POS tagging via NLTK**) with custom feature engineering including **word capitalization patterns**, **suffix/prefix analysis**, and **positional encoding**.
  - Built interactive **Streamlit** web application with real-time text analysis, color-coded entity visualization using Streamlit's markdown rendering, and user-friendly interface with emoji-based entity labels.
  - Integrated complete ML workflow from model training in Jupyter notebooks to web app with **pickle model serialization**, automated **NLTK downloads**, and dynamic result display with detailed table views.

  Tech: **sklearn-crfsuite**, **NLTK**, **spaCy**, **Streamlit**, **Pandas**, **CRF Models**, **Sequence Labeling**, **Feature Engineering**, **Machine Learning**

- **Real-Time Face Mask Detector Software** LINK *Mar–Apr 2024*
  - **Developed real-time face mask detection system** using **OpenCV DNN** for face detection and transfer learning with **MobileNetV2 CNN**, achieving 95%+ accuracy on binary classification task with confidence threshold filtering greater than 50%.
  - **Implemented dual-model architecture** integrating pre-trained **Caffe face detection model** with custom fine-tuned **MobileNetV2 classifier**, processing real-time video streams with threaded video capture using imutils `VideoStream`.
  - **Applied transfer learning methodology** by freezing MobileNetV2 base layers and training custom head (AveragePooling2D + Dense + Dropout), reducing training time from weeks to 30 epochs while maintaining high performance.
  - **Engineered comprehensive data preprocessing pipeline** with image augmentation (rotation, zoom, shift, flip) using `ImageDataGenerator`, label encoding with `scikit-learn`, and MobileNetV2-specific preprocessing for optimal model performance.
  - **Built end-to-end inference pipeline** featuring blob creation with **OpenCV DNN**, batch prediction processing, bounding box coordinate normalization, and real-time visualization with color-coded confidence scoring and percentage display.
  - **Optimized for production deployment** with HDF5 model serialization, efficient memory management through batch processing (32 samples), aspect-ratio preserving image resizing (width=400), and proper resource cleanup for continuous operation.

  Tech: **TensorFlow/Keras**, **OpenCV**, **MobileNetV2**, **Deep Learning**, **Transfer Learning**, **Computer Vision**

- **Maze Runner Game — Interactive Web Application** LINK *Mar 2024*
  - **Containerized microservices architecture** using Docker with multi-stage builds, Python 3.10-slim base images, and Docker Compose orchestration for scalable deployment, enabling environment-agnostic development and production deployment with optimized container performance.
  - **Implemented comprehensive CI/CD pipeline with Jenkins**, featuring declarative pipeline syntax, automated testing workflows, Docker image building with version tagging, and multi-environment deployment automation, reducing deployment time by 80% and ensuring consistent application delivery.
  - **Developed interactive maze game** using Python/Streamlit with advanced pathfinding algorithms (Depth-First Search for maze validation), dynamic maze generation across 4 difficulty levels, real-time collision detection, and session state management for a persistent user experience.
  - **Built comprehensive user management system**, featuring user registration/authentication, persistent leaderboard with difficulty-based filtering, personal statistics tracking, multi-theme UI support (Default/Dark/Ocean/Forest), and responsive design with custom CSS styling embedded in Streamlit components.

  Tech: **Python**, **Streamlit**, **Docker**, **Jenkins**, **Flask**, **Git**, **CI/CD**

Experience

AI Instructor – READ India NGO *Apr–Jun 2023*

- Delivered AI and ML workshops to 100+ students, guiding hands-on coding sessions and project development.
- Enhanced student understanding of machine learning concepts and engagement

Achievements

- **Research Paper Accepted for Publication** — *NER using CRFs* (Sep 2024) Link
- **Top 10% Dean's List, LPU** (Aug 2024) Link
- **Achieved 100 WPM typing speed** Link

Certifications

- **IBM DevOps and Software Engineering** Link
- **Mastering Data Structures Algorithms using C and C++** Link
- **NPTEL Cloud Computing** Link
- **Python Bootcamp: Zero to Hero** Link

Education

- **Lovely Professional University, Punjab, India** *2022 – 2026*
  Bachelor of Technology - Computer Science and Engineering *CGPA: 7.6*