

# Akash Kumar Thakur

Machine Learning Enthusiast — Competitive Programmer

Jharkhand, India — 2023is.akashhumarthakur.a@nie.ac.in — +91 6299380681

## Objective

Aspiring Machine Learning Engineer with strong foundations in ML algorithms and Data Structures, seeking opportunities to apply data-driven solutions while continuously learning. Interested in advancing towards Deep Learning and MLOps.

## Education

**Second-Year College Student**

**CGPA/SGPA:** 8.4 (1st Sem), 9.05 (2nd Sem), 8.95 (3rd Sem), **8.58 (4th Sem)**

## Technical Skills

**Programming Languages:** Python, C++, Java

**Libraries & Tools:** NumPy, Pandas, Matplotlib, Seaborn, Scikit-learn, XGBoost, TensorFlow/Keras, PyTorch, Streamlit, Plotly, BeautifulSoup, Selenium, Playwright, spaCy, Transformers (Hugging Face), FastAPI, Librosa, FAISS, ONNX Runtime

**ML Algorithms:** Linear & Logistic Regression, KNN, Naive Bayes, PCA, SVM, Decision Trees, Random Forest, Gradient Boosting, XGBoost, BERT, SBERT, MPNet, LLaMA, Clustering (K-Means, HDBSCAN)

## Projects

### FIND-TUNES: Real-Time Audio Recognition System

*Python, DSP, Siamese Networks, PyTorch, ONNX Runtime, FastAPI, WebSockets, Librosa, FAISS*

- Architected and deployed a high-speed, three-branch hybrid audio retrieval system combining classical Digital Signal Processing (DSP) with specialized Machine Learning models for robustness against real-world noise and tempo variations.
- Engineered two specialized Siamese Networks (Spectrogram/Timbre and Pitch/Melody), trained using Triplet Margin Loss to learn key-invariant embeddings, enabling accurate Query-by-Humming (QBH) functionality.
- Implemented a rigorous data augmentation pipeline (pitch shifting, time warping) to simulate real-world vocal variations and improve model invariance.
- **Two-Stage Scoring Mechanism:**
  - **DSP Priority:** Performed fast DSP-based matching as the first stage; ambiguity or failure automatically triggered deferral to the ML ensemble.
  - **Time Coherence & Late Fusion:** Verified temporal alignment for all candidate matches (DSP and ML), then fused final rankings using a weighted score (**60% Timbre, 40% Melody**) for decisive identification.
- Built an end-to-end, low-latency real-time audio streaming pipeline using FastAPI and WebSockets, handling buffering and chunking from a browser-based frontend.
- Optimized the system for production by converting PyTorch models to ONNX Runtime, achieving a **3x–5x reduction in inference latency** and meeting strict real-time constraints.

### Large Language Model from Scratch

*PyTorch, Python, Deep Learning*

- Built a GPT-2 style Transformer from scratch, implementing tokenizer, transformer blocks, multi-head self-attention, GELU activation, and top-k sampling.
- Trained a 124M-parameter language model on a cleaned Alpaca-formatted dataset, managing the complete training and inference pipeline.
- Implemented positional encodings, weight tying, learning-rate scheduling, gradient clipping, and checkpointing for stable training.

## Courses Completed

- Physics Wallah Decode 2.0
- Harvard CS50
- Probability for Stanford CS109
- Currently pursuing CampusX DSMP

## Achievements

- Solved **300+** **LeetCode** problems (including SQL), with strong command of Dynamic Programming, Graphs, and Backtracking

LinkedIn — LeetCode