Tushar Kumar Singh

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Education

Guru Gobind Singh Indraprastha University (GGSIPU), EDC **Aug. 2025 – Jul. 2029**

B.Tech. in Artificial Intelligence and Machine Learning *CGPA: 8.86/10*

Coursework: Data Structures, Algorithms, Computer Networks, Operating System, Database Management System.

Technical Skills

Languages: Python, C, C++, Java, Bash, HTML, CSS, JavaScript, TypeScript
ML & AI: Deep Learning, Computer Vision, RAG, Agentic AI, LangChain, LangGraph,
ML Libraries: PyTorch, TensorFlow, Scikit-learn, OpenCV, MediaPipe, NumPy, Pandas, Matplotlib
Web, Backend & Databases: FastAPI, React, Node.js, Express.js, REST APIs, PostgreSQL, MySQL, MongoDB
Cloud & DevOps: Git, GitHub, Linux, AWS, Docker, GitHub Actions (CI/CD), Kubernetes

Experience

Fiverr **Remote**

Freelance Software Developer (Unreal Engine, C++)

- Delivered **9 end-to-end projects** for **7 international clients** within tight deadlines, owning requirements, implementation in **C++ and Blueprints**, and handoff.
- Debugged and resolved **crashes, logic errors, and performance bottlenecks** across **3 production projects**, improving stability across devices.

Projects

3D Brain Tumor Segmentation | *Python, TensorFlow, 3D U-Net, Swin-UNETR, FastAPI* **Jul. 2026 – Aug. 2026**

- Built an end-to-end **3D segmentation pipeline** on **BraTS 2019** multi-modal MRI (T1, T1ce, T2, FLAIR), benchmarking a **3D U-Net** baseline against a transformer-based **Swin-UNETR** using 128×128×128 patch training and **sliding-window inference**.
- Designed a class-weighted **Dice + Cross-Entropy loss** to counter severe tumor/background imbalance; the 3D U-Net reached a **0.85 Whole Tumor Dice** (vs. 0.74 for Swin-UNETR), with per-class Dice of **0.77 / 0.84 / 0.80** on necrotic core, edema, and enhancing tumor.
- Deployed both models behind a **FastAPI REST API** (per-request model selection, weights pulled from **Hugging Face Hub**) with a **Streamlit** UI for MRI upload, slice-wise overlays, and downloadable segmentation masks, and added one-command orchestration of training and serving.

Neural Flow Dynamics | *Python, FastAPI, PostGIS, Docker Compose, React, TypeScript* **Nov. 2026 – Present**

- Designed a research platform for **weather forecasting and disaster decision support** with a six-stage pipeline (acquire, validate, forecast, assess hazards, plan, approval) built on versioned interfaces and full data provenance.
- Implemented a source-independent **data ingestion core** with idempotent, provenance-tracked manifests, **Alembic** migrations for PostgreSQL, and a source-feasibility checker auditing access and licensing for ERA5 and NOAA GFS.
- Containerized the **FastAPI + React/TypeScript + PostgreSQL + Redis** stack with **Docker Compose** and a dependency health endpoint, and enforced code quality with **pytest, Ruff, mypy, and ESLint**. Designed a ClimODE-inspired neural-ODE forecasting architecture, with planned evaluation against GFS and ECMWF AIFS.

Agentic-GameAI | *Python, LLM APIs, Gymnasium, ALE, gym-sokoban, Pygame* **Oct. 2026 – Nov. 2026**

- Built a modular framework for **LLM agents that play five games** of rising difficulty (FrozenLake, Snake, Sokoban, Atari Breakout, and a four-snake Arena), reusing a shared core (retrying LLM client, per-step **JSONL** logging, Pygame viewer) across all tiers.
- Implemented **planning and recovery** for Sokoban with multi-move plans, deadlock detection, retries using lessons from failed attempts, and an optional **BFS** solver hint; added switchable prompt hints to measure their effect.
- Built a **hybrid real-time Breakout agent** with pixel-to-state extraction, a per-frame reflex layer, and a background thread LLM for strategy, and a **multi-agent Snake Arena** where LLM snakes compete against algorithmic opponents.

Achievements & Activities

- **i7 Lead, IoSC GGSIPU-EDC:** Lead a team that builds **AI/ML and game projects** and mentors its members.
- **Hackathons:** Ranked **Top 10 out of 2,000+ teams** at **Fintechstico (NSUT)**, **Top 50 out of 2,700+ teams** at **Brainwave (GGSIPU)**, and **Top 50 out of 1,500+ teams** at **AzinHack (GGSIPU)**.
- Solved **300+ problems on LeetCode** across data structures and algorithms; hold a **contest rating of 1400+**.