Kush Singh

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About Me

Computer Science undergraduate specializing in Machine Learning and Deep Learning. Focused on architecting advanced neural networks for Natural Language Processing and Computer Vision, with expertise in Transformer mechanisms, model fine-tuning, and distilling complex research into accessible technical writing..

Education

Kalinga Institute of Industrial Technology — Bhubaneswar, India
Bachelor of Technology in Computer Science Engineering; CGPA: 9.24 — *2023 – 2027*

DPS Mathura Road — New Delhi, India
Class XII (CBSE) — *2022*

Projects

Transformer Translate | *PyTorch, NLP, Attention Mechanisms* — [Live Demo](#) | [GitHub](#)
End-to-end English-to-Hindi Neural Machine Translation model
- Architected a Transformer from scratch (Attention, Positional Encoding) based on the *Attention Is All You Need* paper.
- Implemented Mixed Precision Training and Gradient Accumulation to optimize convergence on limited GPU resources.
- Achieved a BLEU score of **23.64**, demonstrating competitive translation accuracy.

C++ Inference Engine | *C++, SIMD, Model Optimization* — [GitHub](#)
High-performance CPU-based inference system for Large Language Models
- Engineered an inference engine in C++, implementing **SIMD (AVX2)** for optimized matrix multiplication.
- Integrated **KV-Cache** and custom memory allocators to reduce latency and overhead during token generation.
- Designed support for model quantization to minimize memory footprint without degrading perplexity.

Mental Health ChatBot | *Llama 3, PEFT, Quantization* — [HuggingFace](#)
Fine-tuned LLM optimized for empathetic counseling
- Fine-tuned Llama 3 8B on counseling datasets to enhance empathetic reasoning, utilizing PEFT adapters.
- Compressed the model using **4-bit Quantization (GGUF)** for efficient edge deployment on consumer hardware.

Custom SSG (Static Site Generator) | *Golang* — [Live Demo](#) | [GitHub](#)
High-performance build tool for technical blogging
- Developed a custom SSG in Go featuring incremental builds, custom AST transformations, and on-the-fly image compression.
- Extended the Goldmark Markdown compiler to support **LaTeX mathematical notation** and server-side syntax highlighting, eliminating the need for heavy client-side rendering libraries.
- Implemented a **dependency-aware cache system** that tracks changes in global templates and CSS to intelligently trigger full or partial rebuilds, ensuring site-wide consistency.

Image Caption Generator | *CNN, LSTM, Computer Vision* — [Live Demo](#) | [GitHub](#)
Hybrid architecture combining Computer Vision and Sequence Modeling
- Built an end-to-end pipeline using a ResNet encoder and LSTM decoder to generate descriptive captions for images.
- Trained on MS COCO with regularization techniques like Dropout and Early Stopping to ensure generalization.

Technical Skills

Languages: C++, Python, Go (Golang), C, Java, SQL
Machine Learning: PyTorch, Hugging Face Transformers, NumPy, Pandas, Scikit-learn, OpenCV
Developer Tools: Git, Docker, Kubernetes, Linux (Bash), CI/CD Pipelines