Danishjeet Singh

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Education

Indiana University, Bloomington — **Bloomington, IN**
Ph.D. in Computer Science — May 2030
M.S. in Computer Science — May 2026
B.S. in Computer Science — May 2025

Experience

Observatory on Social Media — January 2023 - July 2025
Machine Learning Engineer

- Designed and optimized scalable ETL pipelines on AWS, leveraging S3 for data storage, AWS Lambda for event-driven processing, and AWS Batch with EC2 Spot Instances for parallelized multiprocessing. Utilized Apache Spark on EMR for distributed computing, reducing image similarity analysis for 860 million comparisons from 14 days to 3 minutes
- Developed deep learning models with PyTorch and TensorFlow, leveraging CLIP and open-source Vision-Language Models (VLMs) such as Qwen 2.5 and Llama 3.2 for deepfake detection and reasoning, achieving over 87% accuracy

IU Computer Vision Lab, Indiana University — May 2022 - January 2023
Machine Learning Engineer

- Executed large-scale GPU benchmarking experiments on Lambda servers to evaluate optimal hardware configurations for training diffusion models, improving training efficiency for Stable Diffusion, LoRA fine-tuning, ControlNet, and IPA adapters.
- Built a generative AI pipeline leveraging Image Diffusion Models, GANs, and advanced image conditioning techniques to generate 500+ high-fidelity, diverse synthetic human images, ensuring consistency in style and attributes across samples.
- Applied dimensionality reduction (t-SNE, PCA) and clustering (K-Means, DBSCAN) to analyze generative model latent spaces, optimizing hyperparameters for improved representation learning and classifier robustness.

Rite Clinic Private Limited — March 2021 - April 2022
Software Engineer

- Developed a scalable and secure EMR system using React, Node.js, PostgreSQL, and AWS, focusing on frontend usability, backend efficiency, and cloud deployment to ensure seamless performance and compliance with healthcare regulations.
- Implemented key backend functionalities in Node.js and PostgreSQL, designing efficient API endpoints and optimizing database queries to reduce patient record retrieval time by 40%. Integrated JWT authentication and AWS-based storage for handling patient documents securely.

Projects

Deepfake detection on Twitter(https://doi.org/10.54501/jots.v2i4.197)

- Identified 15,000+ deepfake profiles by building a eye-position based heuristic on top of a CNN-based facial detector model, achieving 99% precision and 95% recall across daily active Twitter users.
- Analyzed 10 million profiles using a custom-built image ranking pipeline to systematically assess AI-generated profile likelihood and uncover deepfake usage patterns at scale.

AI-Image detection with Vision-Language Models(https://arxiv.org/pdf/2506.11031)

- Improved detection 29% by developing from scratch a response prefill methodology that steers vision-language models to focus on subtle synthesis artifacts in AI-generated images.
- Validated across multiple models(LLama, Qwen, OpenAI o3) and datasets (faces, objects, animals), demonstrating universal scalability without requiring additional training or fine-tuning.

Denoising Diffusion models(singhdan.me/diffusion)

- Achieved 15% quality improvement by building unconditional and four conditional diffusion models from ground up, incorporating custom EMA and Classifier-Free Guidance implementations for high-quality landscape generation.
- Reached FID score 16.5 by developing attention-based U-Net architecture from scratch on CIFAR-10, enabling controlled class-conditional sample generation with superior visual coherence.

Skills

Languages: Python, R, JavaScript, TypeScript, Java, C#, Bash, JSON, SQL
Databases and Tools: AWS, GCP, MySQL, PostgreSQL, MongoDB, Supabase, Git, Docker, Excel, Snowflake
Data Analysis/Exploration: Pandas, Statistical Models, Matplotlib, Seaborn, Plotly, Regression, Time Series Analysis, DFA, MFDFA
Machine Learning: PyTorch, TensorFlow, NumPy, Scikit-learn, OpenCV, Generative AI, Hugging Face, XGBoost
NLP: Word Embeddings, NLTK, BERT, GPT, Gemini, LLaMA
Development: HTML5, CSS3, React, Next.js, REST API, FastAPI, Flask, Django, Node.js, Express.js, Cursor
Software Engineering: Design Patterns, System Design, Microservices, CI/CD, Distributed Systems