Shubham Patel

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Education

New York University, Courant Institute of Mathematical Sciences — New York, NY
Master of Science in Computer Science, GPA: 3.9/4.0 — *Sep 2024 – May 2026*

- Relevant Courses: Deep Learning, Fundamental Algorithms, Programming Languages, Computer Vision, Natural Language Processing, Large Language and Vision Models

Indian Institute of Technology (IIT), Gandhinagar — Gujarat, India
Bachelor of Technology in Mechanical and Computer Science Engineering, GPA: 3.27/4 — *Aug 2020 – May 2024*

- Relevant Courses: Operating Systems, Data Structures and Algorithm, Discrete Mathematics

Experience

Stanford University — Stanford, CA(Hybrid)
Deep Learning Intern under Professor Fuller and Doctor Vinny Suja View. — *Sep. 2023 – Jun. 2025*

- Specialized in Large Language Models, overseeing computational tasks and optimizing model performance.
- Developed a RoBERTa-based Model for surface tension prediction, achieving over 98% accuracy during pre-training on 70 million SMILES strings using masked language modeling. The fine-tuned model demonstrated strong predictive performance with an r2value of 0.9126.
- Demonstrated the model's ability to capture intermolecular relationships, ensuring physically grounded predictions. Enabled drug scientists to predict surface tension accurately, aiding drug design and formulation.

Massachusetts Institute of Technology(MIT) — Cambridge, MA(Hybrid)
Deep learning Intern under Professor Ju Ni, View. — *Aug. 2024 - Present*

- Tech lead for multiscale synthetic image generation using GANs to achieve high-fidelity materials microstructure analysis across micrometer to nanometer scales.
- Creation of synthetic multiscale data via Fourier domain techniques and inverse Fast Fourier Transform (FFT) to enhance texture realism. Development of a scalable deepfake model that integrates super-resolution techniques for innovative materials science applications.
- Manipulation of k-space power spectrum for controlling frequency components, enabling simulation of texture variance based on magnification.

UC Berkeley | Google DeepMind — Berkeley, CA(Hybrid)
Research Intern under Professor Laurent El Ghaoui and Doctor Alicia, View. — *Sep. 2024 – Present*

- Conducted research on Deep Equilibrium Models (DEQs) for time series prediction, achieving a superior r2 of 0.82 with four times fewer parameters compared to LSTMs (r2: 0.74), showcasing their efficiency and scalability.
- Designed and implemented a novel framework combining implicit deep learning models with attention mechanisms for multivariate time series forecasting, improving predictive accuracy and reducing computational costs.
- Demonstrated superior performance over Microsoft's SeqSNN in financial data applications; conducted ablation studies to validate architecture.

University Of Pennsylvania — Philadelphia, PA(Hybrid)
Deep Learning Intern under Professor Christos Davatzikos, View. — *Jan. 2024 – March 2025*

- Developed a foundational large language model (LLM) to predict multi-organ imaging-derived phenotypes (IDPs), integrating genetic variations (SNPs) with imaging data from the UK Biobank, like brain and heart MRI
- Integrated GWAS data to enhance SNP-IDP association modeling for improved predictions.
- Enabled insights into genetics and organ traits to support personalized medicine and genetic research.

Indian Institute of Technology, Gandhinagar — Gujarat, India
Research Intern under Prof. Mondal — *Jun. 2022 – Jan. 2023*

- Investigated vulnerabilities in Large Language Models (LLMs) and conducted poisoning attacks to analyze security gaps.
- Developed defense mechanisms to enhance model resilience against poisoning attacks, improving robustness of NLP models.

Projects

Joint embedding prediction architecture | Self supervised learning, View — Sep'24 – Nov'24

- Implemented a Joint Embedding Predictive Architecture (JEPA) world model to learn latent state representations and predict agent trajectories in a multi-room environment, achieving robust generalization to novel room layouts
- Engineered a representation learning system preventing embedding collapse through variance regularization, while maintaining high-fidelity predictions over extended horizons
- Developed a recurrent state predictor capturing physical constraints from visual input, demonstrating strong transfer to out-of-distribution scenarios

VisionTransformer | CIFAR-100 dataset, View — Sep'24 – Nov'24

- Implemented a custom Vision Transformer (ViT) for image classification, incorporating Patch Embedding, Multi-Head Self-Attention, and Transformer Blocks.
- Optimized training on CIFAR-100 using advanced techniques like label smoothing, AutoAugment, and Cosine Annealing Warm Restarts.

DeepDream | VGG13 neural network, View — Oct'23 – Nov'23

- Implemented a DeepDream-inspired image generation technique using a pre-trained VGG13 neural network, leveraging gradient ascent to iteratively enhance features associated with target class activations.
- Optimized visualization of neural activations by transforming random noise images into class-specific outputs, enabling deeper insights into model interpretability and feature representation.

Question Answering System | BERT, SQuAD 1.1, Dataset, View — Sep'22 – Dec'22

- Implemented a model to find precise answers from given paragraphs using BERT, focusing on improving accuracy and efficiency.
- Integrated contextual word embeddings and a dense layer for enhanced answer identification capabilities.

Salon Booking Ecosystem | Node.js, Flutter, Firebase, MongoDB, View — May'22 – June'23

- Led the development of a full-featured salon booking system, implementing both user and salon owner interfaces.
- Utilized Flutter for frontend development and Node.js for backend services, deployed on Firebase and using MongoDB for data management.
- Innovated dynamic time slot management, adopted widely by salon owners, providing a unique solution in the local market.

Activities

Teaching Assistant, NYU Courant | Introduction to Machine Learning — Sep'24 – Dec'24

- Developed teaching skills to explain complex concepts in intuitive way with practical examples
- Assisted in grading assignments and providing feedback to enhance student comprehension.

Nyasa, IIT Gandhinagar | NPO — Feb'23 – Jan'24

- Volunteered with Nyasa, teaching and supporting education for construction workers' children
- Organized health drives and community programs to enhance living conditions for laborers.

16 Pixels | Photography Club at IITGN — Aug'22 – May'23

- Managed a team of 159 members capturing tech events and student festivals throughout the year
- Raised more than 3000 dollars through various sources to purchase inventory

Swmainarayan temple | NPO — May'22 – June'23

- Dedicated over two years to food packing for 1,000+ individuals and intensive temple chores, including cleaning, with a 3-month daily summer commitment.
- Played a key role in organizing festivals and supporting temple operations through hands-on efforts.

Technical Skills

Languages: Java, Python, C/C++, JavaScript, SQL, TypeScript, Dart, R
Frameworks: React, Node.js, TensorFlow, Django, Vue.js, Flask, FastAPI, Pytorch
Tools: Git, Docker, Kubernetes, AWS, Google Cloud Platform, VS Code, IntelliJ, Eclipse
Libraries: Pandas, NumPy, Matplotlib, scikit-learn, OpenCV, NLTK, SpaCy
Project Management: Managed AI and ML projects, focusing on performance optimization and deployment strategies