STATEMENT OF PURPOSE

B.TECH THESIS *(July - Dec. '25 | On-site, Full-Time | Self-Funded)*

I am Nirvan Patil, a third-year Electronics & Communication Engineering undergraduate at BITS Pilani, driven by a strong passion for machine-learning research. Over the past year, I have contributed to industrial leaders (Renishaw), rising start-ups (Vizuara and DeepTek), and top on-campus labs (DaSH and APPCAIR), gaining breadth in both Natural-Language Processing and Computer Vision. Driven by a strong passion for Machine Learning research, I am eager to contribute to Precog not only for its impactful work but also for the closely knit, supportive student community it fosters. I hope to channel this passion through an on-site, full-time and self-funded Undergraduate Thesis from July to December 2025. *I apologise for applying late; a planned thesis at Harvard fell through because of the recent U.S. visa restrictions.*

In my recent NLP Research at Vizuara, I extended Microsoft's TinyStories work to demonstrate that carefully trained Small Language Models (SLMs) can serve as efficient surrogates for Larger Models when benchmarking Indic tokenizers, evaluating machine translation versus synthetic-text pipelines, and comparing the intrinsic "learnability"/complexity of languages for LLMs. I developed and open-sourced datasets of more than 10 million short stories across Hindi, Marathi, and Bangla to train said SLMs whilst aiming to accelerate Indic-NLP research. My Computer Vision research is highlighted through my engineering of high-precision segmentation pipelines for Industrial Metrology at Renishaw by blending EdgeSAM (Knowledge Distillation) and perSAM-f (zero-shot personalised segmentation). While at DeepTek, a global medical imaging leader, I designed Grad-CAM (CNN interpretability) driven self-refinement loops for Pneumonia localisation and classification. My current work at APPCAIR (leading AI lab at BITS Pilani) employs VAE-based latent representations to improve Out-Of-Distribution (OOD) X-ray diagnosis, thereby rounding out a portfolio that spans foundational NLP and dataset curation through computer-vision interpretability to real-world deployment.

These experiences map naturally onto research at Precog. My SLM and Indic-NLP expertise aid me in advancing projects such as "Small Language Models as a Transformative Interface" and the "Counter Turing Test for Hindi," while my familiarity with interpretability methods equips me to contribute to "Interpreting OCR" and "Atomics". Conversations with Precog Undergraduate students Ameya Rathod and Hemang Jain underscored additional synergies with ongoing research, particularly Interpretability for Multimodal Models, whilst alternative research into knowledge conflicts in agent memory and safety in multi-agent LLM environments piques my interest. A strong work ethic shaped by startup experience, quick thinking, and a proven track record of delivering results under time constraints, showcased by multiple large hackathon wins, reinforces my ability to meaningfully contribute to Precog.

Regularly reading Prof. Ponnurangam Kumaraguru's LinkedIn has offered a clear view of Precog's culture—one that couples ambitious, cutting-edge research with genuine mentorship and a supportive community, especially among its undergraduate scholars. This rare blend of intellectual rigour and supportive community is exactly what I seek for my thesis semester, where I remain keen to not only sharpen my technical skills but also to contribute meaningfully to Precog's projects, learning from and growing with its members as I shape and draw clarity on my path toward pursuing research.

Nirvan Patil