

Aman Kumar

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RESEARCH PROFILE

Undergraduate AI Researcher & Team Lead driven by a passion for solving complex, real-world challenges through Computer Vision, Natural Language Processing, and Edge AI. Published author with a track record of deploying end-to-end deep learning pipelines—spanning hardware-optimized defect detection and cyber-physical systems to large-scale computational linguistics and medical diagnostics. Actively seeking international Master's, Ph.D., or Visiting Researcher opportunities to contribute to high-impact computational research.

EDUCATION

Sikkim Manipal Institute of Technology (SMIT) Sikkim, India
Bachelor of Technology in Computer Science and Engineering (Data Science) Jul. 2023 – Expected: Jul. 2027

EXPERIENCE

Undergraduate AI Researcher & Team Lead Aug. 2024 – Present
Dept. of AI and Data Science, SMIT Sikkim, India

- Directing multi-disciplinary deep learning research spanning medical image segmentation, remote sensing, and NLP-driven document analysis.
- Integrating advanced statistical frameworks (Conformal Prediction, Deep Delta Learning) to establish provable reliability and uncertainty quantification in complex physical and visual systems.

Research Intern – (Computer Vision & Deep Learning) Jun. 2026 – Present
Indian Statistical Institute (ISI), Kolkata Hybrid

- Conducting research in complex spatial analysis and image restoration under the supervision of Prof. Umapada Pal, bypassing traditional segmentation bottlenecks.

Research Intern – (Deep Learning & Sequence Modeling) Jun. 2026 – Present
The University of Salford, UK Remote

- Collaborating internationally on deep learning architectures for text recognition and visual sequence modeling frameworks under the supervision of Dr. Shivakumara Palaiahnakote.

RESEARCH MANUSCRIPTS

- L. Chhetri, **A. Kumar**. “DDV-GNet: High-Throughput Defect Detection for Space Manufacturing via Deep Delta Gated Networks.” *Accepted for Oral Presentation at IEEE SPACE, 2026.*
- R. Das, L. Chhetri, **A. Kumar**, P. Ghosal. “Intrinsic Neural Firewalls for Cyber-Physical Systems: Robust Anomaly Rejection via Deep Delta Residual Overwrites.” *Accepted for Oral Presentation at WIN 6.0, 2026.*
- L. Chhetri, **A. Kumar**, G. Sarma. “Deep Delta Vision Mamba: A Lightweight State Space Architecture with Deep Delta Learning for Efficient Remote Sensing.” *Accepted at IEEE CONECCT, 2026.*
- L. Chhetri, **A. Kumar**. “Optimizing Deep Learning for Brain Tumor Classification: A Comparative Ablation Study of Preprocessing and Augmentation Strategies.” *Accepted at IEEE GCON, 2026.*
- A. Kumar**, L. Chhetri, D. Das. “SPECTRAFORGE: Domain-Equalized Frequency-Spatial Fusion for Synthetic Dermatology Detection.” *Under Review at IEEE DSAA, 2026.*
- L. Chhetri, **A. Kumar**. “Beyond Limited Labels: Safe Semi-Supervised Learning for Malaria Diagnosis.” *Under Review at IEEE DSAA, 2026.*
- A. Mukherjee, **A. Kumar**, SR. Verma, H. Das, L. Chhetri, G. Sarma. “Risk-Controlled Urban Change Detection: Conformal Prediction Wrappers for Provable Reliability in High-Resolution Satellite Imagery.” *Under Review at ICCI, 2026.*

- **A. Kumar**, L. Chhetri. “Ionospheric TEC Forecasting via Deep Delta Learning.” *Under Review at Journal: Advances in Space Research (SCIE Q2)*, 2026.
- **A. Kumar**, SR. Verma, H. Das, L. Chhetri, G. Sarma. “Interpretable Solar Panel Defect Detection via Fuzzy Rule Extraction from Deep Learning Architectures.” *Under Review at ICICI*, 2026.

ACTIVE RESEARCH & PROJECTS

Ionospheric TEC Forecasting (CNN-DDL) *Targeting Journal: Advances in Space Research (SCIE Q2)* *PyTorch, Deep Delta Learning, Conformal Prediction*

- Co-authored a CNN-DDL architecture featuring a dynamic β -gate that conditions real-time solar wind drivers to scale non-linear corrections over physical persistence baselines.
- Evaluated via zero-shot cross-solar-cycle testing (SC25 to SC24), achieving SOTA storm-time error rates (2.30 RMSE) and outperforming deep sequential baselines and IRI-2020.
- Integrated Marginal Split Conformal Prediction to establish distribution-free uncertainty quantification, providing a mathematically reliable 90% empirical coverage bound during extreme geomagnetic superstorms.

Degraded Ancient Ashokan Brahmi Script Recognition (ML/CV Lead) *Targeting ICDAR (2027)* *PyTorch, WGAN-GP, SimCLR, OCR Pipelines*

- Leading a computer vision team alongside L. Chhetri, A. Anand, and G. Sarma to engineer a data generation and ETL pipeline using WGAN-GP to synthesize 20K+ Brahmi characters, applying physically-motivated degradation to construct a 150K sequence dataset.
- Developed an end-to-end OCR architecture integrating SimCLR self-supervised pretraining on a ResNet34 backbone with a BiLSTM-CTC decoder.
- Conducted a synthetic-to-real domain gap study, establishing the first severity-based Character Error Rate (CER) evaluation benchmark for ancient Indic scripts.

Reddit Climate NLP Analysis (2015-2025) (Solo Researcher)

Active Research

BERTopic, SBERT, Python, Stats

- Applying BERTopic and SBERT on 89K+ posts to quantify long-term textual evolution, human emotion modeling, and semantic shifts in online communication.
- Utilizing linguistic approaches, OLS, and Chi-Square regression for large-scale data-driven analysis to prove the rise of meta-political debate and socio-emotional shifts within climate discourse.

HONORS, CERTIFICATIONS & ACADEMIC SERVICE

- **Top 5% Topper & Elite Silver Medalist:** Introduction to Internet of Things, NPTEL (Funded by MoE, Govt. of India). Elite score: 87%.
- **Technical Peer Reviewer:** Invited and served as an official peer reviewer for the **IEEE GCON** conference, evaluating manuscripts in applied deep learning and computer vision.
- **Data Science & AI Certifications:** Natural Language Processing in Python, Data Science & Machine Learning, and Python From Scratch Bootcamp (Udemy).

TECHNICAL SKILLS

AI, Vision & NLP: PyTorch, CNNs, Edge AI, Spatial-Frequency Analysis, BERTopic, Sequence Modeling

Core Programming & Scripting: Python (Advanced), C, Java, OpenCV

Platforms & Version Control: Git, LaTeX, Linux/Ubuntu environments, IoT Frameworks, Report Writing