

Latchan Chhetri

latchanchhetri19@gmail.com | [Halo Mind Research Group Portfolio](#)

[Personal Portfolio](#) | [LinkedIn](#) | [GitHub](#)

Profile & Research Focus

AI Researcher specializing in efficient deep sequence modeling, space-time architectures, and algorithmic robustness. My research focuses on engineering hardware-efficient neural mechanisms, specifically sub-quadratic State Space Models (Mamba) and Deep Delta Learning (DDL) to process high-throughput, volatile data streams. By bridging continuous physical dynamics with discrete neural computation, I design self-contained, uncertainty-aware frameworks capable of autonomous anomaly rejection, real-time distribution shift adaptation, and trustworthy medical image analysis. Driven by a methodology of rigorous ablation and reproducibility, I aim to build resource-efficient, mathematically bounded AI systems for mission-critical edge deployments.

Education

Sikkim Manipal Institute of Technology (SMIT)

Bachelor of Technology in Computer Science and Engineering (AI & Data Science)

Sikkim, India

July 2023 – June 2027

Experience

Founder & Lead Research Architect

Halo Mind Research Group

Jan 2026 – Present

Independent Research Organization

- Architectural Direction: Direct the fundamental scientific trajectory of an independent research group focused on hardware-efficient sub-quadratic mechanisms (DDL, Vision Mamba).
- Research Leadership: Manage a distributed team of ML Systems Engineers, Applied Vision Researchers, and Data Engineering Interns to execute end-to-end experimental designs.
- Open-Source Development: Oversee the deployment and rigorous evaluation of robust PyTorch frameworks for space AI, solar-weather forecasting, medical imaging, and conformal prediction's.

Research Assistant (AI & Computer Vision)

The ALIEN Lab (Aston University, UK)

May 2026 – Present

Remote

- Medical Vision Architectures: Engineer foundational AI representations and low-level vision architectures under the supervision of Dr. Ziyang Wang.
- Spatial & Sequential Modeling: Design, implement, and rigorously evaluate deep learning pipelines optimized for complex spatial and sequential tasks within bio-medical domains.

Research Intern - (Computer Vision, OCR & Document Analytics)

Indian Statistical Institute, Kolkata

Jun 2026 – Present

Hybrid

- Degraded Document Analysis: Spearhead research in computer vision and Optical Character Recognition (OCR) under the supervision of Prof. Umapada Pal, focusing on the restoration of highly degraded and unstructured texts.
- Architectural Engineering: Formulate and evaluate novel deep learning architectures for text and image restoration, explicitly designed to bypass traditional segmentation bottlenecks and improve feature extraction.

Research Intern - (Computer Vision, OCR & Document Analytics)

The University of Salford, UK

Jun 2026 – Present

Remote

- Scene Text Recognition: Drive international research initiatives in complex scene text recognition under the supervision of Prof. Shivakumara Palaiahnakote.
- Deep Sequence Frameworks: Engineer advanced sequence modeling frameworks designed to process complex visual structures, optimizing architectures for high-fidelity text extraction in unstructured environments.

Research Assistant & Team Lead

Sikkim Manipal Institute of Technology (SMIT)

Sept 2025 – Present

Onsite

- Medical Vision & Attention Mechanisms: Architected attention-enhanced Swin Transformer pipelines for complex medical diagnostics. Delivered robust brain tumor classification capabilities and generalized feature extraction under rigorous patient-level data splitting protocols (Accepted, IEEE GCON).
- Fuzzy Logic & Medical Image Segmentation: Engineered *AHF-RBF Net* by replacing traditional Gaussian fuzzy membership with learnable Radial Basis Function (RBF) kernels. This architecture provides numerically stable, boundary-aware spatial attention for complex lesion segmentation, achieving a superior 84.55% IoU on the ISIC 2016 benchmark.
- Cyber-Physical Security & Anomaly Rejection: Engineered *Intrinsic Neural Firewalls* utilizing Deep Delta Residual Overwrites for edge-deployed cyber-physical systems. Achieved high-performance, zero-shot anomaly rejection against False Data Injection Attacks (Accepted for **Oral Presentation**, WIN 6.0).
- Research Leadership & Pipeline Engineering: Directed and mentored student research teams, training junior researchers in core deep learning methodologies and guiding end-to-end experimental design from conceptualization to multiple first author and co-authored acceptances in IEEE and Springer venues.

AI & Data Science Intern

Soft Nexis Technology

Jul 2025 – Aug 2025

Remote

- Predictive Analytics Pipeline: Engineered and deployed **RealVisor**, an end-to-end AI real estate platform. Developed robust predictive pipelines utilizing XGBoost and Random Forest Regressors to estimate property valuations based on complex spatial features.

- **Model Evaluation & Deployment:** Conducted rigorous evaluation across curated real-world datasets, strictly outperforming baseline models, and designed a production-ready Streamlit dashboard featuring interactive market trend visualizations and automated investment analysis.

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.*
- **L. Chhetri**, A. Datta, P. Ghosal. “Attention-Enhanced Swin Transformers for Robust Brain Tumor Classification Under Patient-Level Data Splitting.” *Accepted at IEEE GCON, 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**. “Risk-Controlled Urban Change Detection: Conformal Prediction Wrappers for Provable Reliability in High-Resolution Satellite Imagery.” *Under Review at ICCI, 2026.*
- SR. Verma, A. Kumar, H. Das, **L. Chhetri**. “Interpretable Solar Panel Defect Detection via Fuzzy Rule Extraction from Deep Learning Architectures.” *Under Review at ICCI, 2026.*

Active Research & Projects

Ionospheric TEC Forecasting

Under Review at 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.

DDL-Mamba – Geometric Residual Learning for 3D Medical Image Segmentation

Targeting Journal of Biomedical and Health Informatics (Q1) | PyTorch, U-Mamba, DDL, 3D Medical Imaging

- Developing a novel **Delta-Mamba** framework integrating **Deep Delta Learning (DDL)** blocks into a U-Mamba backbone for 3D volumetric medical image segmentation, targeting concentric cardiac structures on the **ACDC** and **Synapse** benchmarks.
- Engineered a **DDL** block with **L2-normalized, Softplus-constrained** weights to enforce strictly non-negative global slot amplitudes, stabilizing the geometric manifold across deep encoder layers and resolving the representation drift inherent in dense 3D State Space Models.
- Implemented β -gate visualization providing a geometrically interpretable, layer-wise explainability mechanism for segmentation decisions — structurally impossible in standard Transformer or prior Mamba-based architectures.
- Experiments currently in progress; architecture validated on ACDC cardiac and Synapse datasets.

Degraded Ancient Ashokan Brahmi Script Recognition (ML/CV Lead)

Targeting ICDAR (2027) | PyTorch, WGAN-GP, SimCLR, OCR Pipelines

- Leading a computer vision team alongside A. Anand, A. Kumar, 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.

AHF-RBFNet – Medical Image Segmentation

Targeting Expert Systems with Applications (Q1) | PyTorch, AHF-Net, Fuzzy Logic

- Collaborating under the supervision of Dr. Swalpa Kumar Roy and Prof. Palash Ghoshal to engineer AHF-RBFNet by integrating a learnable Radial Basis Function (RBF) fuzzy membership kernel into an Attention-Guided Hierarchical Fusion U-Net to dynamically filter semantic uncertainty.
- Achieved SOTA performance on the ISIC 2016 dataset (84.55% IoU, 91.97% Dice), strictly outperforming 11 baselines including the original AHF-U-Net architecture.
- Orchestrated massive hyperparameter optimization via Optuna and executed rigorous multi-dataset evaluations (ISIC, BUSI, PH2).

Reddit Climate NLP Analysis (2015-2025)

Large-Scale Data-Driven Analysis | BERTopic, SBERT, Python, Statistical Modeling

- Collaborated with the research team to execute a large-scale NLP analysis on 89K+ textual posts, quantifying long-term narrative evolution within global climate discourse.
- Advised on the integration of transformer-based architectures, specifically suggesting and deploying BERTopic and SBERT for advanced semantic feature extraction.
- Assisted in the application of statistical modeling (OLS, Chi-Square regression) to map socio-political shifts and human emotion in online communication.

Honors, Certifications & Academic Service

- **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.
- **Top 1% Topper & Gold Medalist:** Introduction to Internet of Things, NPTEL (Funded by MoE, Govt. of India). Elite score: 91%.
- **Deep Learning & AI Certifications:** NLP with DL, PyTorch for Medical Imaging (Udemy); GenAI for Data Scientists (Coursera); Applied Machine Learning (AMII).

Technical Skills

Languages & Frameworks: Python, C, Java, PyTorch, TensorFlow, Keras, Streamlit, LaTeX, Git, GitHub

Computer Vision: Vision Transformers, Mamba, SSMS, U-Net, Deep Delta Learning, Diffusion Models, GANs, YOLO, CNN's

Signal Processing & Time Series: 1D CNNs, Signal Analysis, Spacy, NLTK, Text Mining, OCR Pipelines

Data Engineering & Tools: Pandas, NumPy, SciPy, Scikit-learn, ETL Workflows, Hadoop, Spark, Computational Workflows, High-Throughput Image Processing