

Prabhat Kumar

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SUMMARY

Machine Learning Researcher with 7+ years of experience across Computer Vision, Multi-modal Foundation Models, and Temporal Sequence Modeling. Expert in model architecture design, self-supervised representation learning, and multi-task optimization. Proven track record of advancing state-of-the-art vision and multimodal systems from theoretical algorithmic formulation and custom loss design to robust, large-scale experimental validation.

EXPERIENCE

Software Engineer, Machine Learning

Dec 2025 – Present

Roku Bengaluru, India

- Researched multi-modal Scene Break Detection, scaling temporal sequence modeling by benchmarking linear-complexity *State-Space Models (Mamba)* and *Graph Convolutional Networks (GCNs)* against standard Transformers.
- Formulated self-supervised proxy tasks to align asynchronous cross-modal representations from visual (*DINO*), textual (*Sentence Transformers*), and acoustic foundation models for precise boundary localization.
- Scaled distributed feature extraction and experimental validation across ultra-long-form video datasets using *Ray*, enabling high-throughput parallel processing and localized structural reasoning.

Researcher / Tech Lead

Jul 2025 – Nov 2025

R&D Specialist

Oct 2022 – Jun 2025

Bosch Research / BGSW

Bengaluru, India

- Developed unsupervised cross-camera optical flow estimation by coupling a *UNIT-GAN* translation network with a *FlowFormer* backbone, enabling zero-shot model and label transfer across heterogeneous sensors.
- Formulated dual-level domain adaptation objectives using predicted dense flow fields to warp visual representations at both pixel and latent feature levels, maximizing cross-domain geometric consistency.
- Leveraged flow-based feature alignment to jointly regularize and improve representation capacity across source and target camera perception networks, resulting in multiple filed US patents.

Research Engineer I

Jul 2021 – Sep 2022

Ola Electric Technologies Pvt Ltd

Bengaluru, India

- Developed a unified multi-task network for joint Semantic Segmentation and Depth Estimation tailored for unstructured road environments using hybrid supervised and self-supervised training.
- Implemented domain adaptation pipelines and novel geometric and photometric data augmentations to minimize feature degradation against severe out-of-distribution driving conditions.
- Evaluated model efficiency and real-world inference constraints by adapting neural architectures for low-latency execution via *TensorRT* within an onboard *ROS* robotics environment.

Student Researcher

Aug 2018 – Jun 2021

Indian Institute of Science & IIT Jodhpur

Bengaluru & Delhi, India

- *Indian Institute of Science*: Formulated a self-supervised representation learning framework (*SISL*) to decouple content-independent camera signatures from image patches, training an anomaly localization network to identify splicing boundaries without pixel-level ground truth.
- *IIT Jodhpur*: Developed a multi-stream deep neural network to isolate regional artifacts and spatial-temporal texture distortions from facial reenactment pipelines, mapping model robustness across progressive video compression codecs.

PUBLICATIONS & PATENTS

- **Prabhat Kumar**, et al. "[SISL: Self-Supervised Image Signature Learning for Splicing Detection](#)". *CVPR Workshops, 2022*.
- **Prabhat Kumar**, Mayank Vatsa, Richa Singh. "[Detecting Face2Face Facial Reenactment in Videos](#)". *WACV, 2020*.
- **Patents**: "[System for Translation of Images Between Two Distinct Heterogeneous Cameras...](#)", US Patent (Published, 2025). *Two additional patents currently filed and awaiting review.*

EDUCATION

Graduate Studies, Computer Vision & Deep Learning | *Indian Institute of Science (IISc)*

2019 – 2021

M.Tech, Computer Science & Engineering | *IIIT-Delhi*

2017 – 2019

B.Tech, Computer Science & Engineering | *University of Delhi*

2013 – 2017

TECHNICAL SKILLS

Core Research: Model Architecture Design, Generative AI, Foundation Models, Optical Flow, Multi-modal Feature Alignment, Temporal Sequence Modeling, Self-Supervised Learning, Unsupervised Domain Adaptation, Multi-Task Learning, Loss Formulation, Graph Neural Networks (GNNs)

Languages & Frameworks: Python, C++, PyTorch, TensorFlow, OpenCV, Ray, TensorRT, ROS, SQL, Git, Distributed Training