Danush Kumar Venkatesh

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▬ Profile

AI research scientist working on generative image and video models, with experience in diffusion-based methods, controllable synthesis, and hands-on model training and evaluation.

▬ Work Experience

- **PhD Researcher**, *NCT Dresden*, Germany
  Topic: Generation of training data for surgical applications
  - Owned end-to-end Sim2Real pipelines for large-scale synthetic data generation (images, videos, masks) using diffusion models.
  - Built controllable video diffusion models targeting rare and edge-case surgical scenarios.
  - Implemented training pipelines, focusing on stability, convergence, and memory efficiency.
  - Designed reproducible experimentation workflows including ablations, metrics, and downstream task evaluations.

- **PhD AI Research Intern**, *Intuitive Surgical*, California, USA
  Topic: Scalable & controllable video generation
  - Developed a resource-efficient video diffusion framework for surgical robotics under limited label supervision.
  - Ran scaling studies across different data regimes, identifying quality–cost trade-offs.
  - Distilled empirical findings into practical guidelines for controllable data generation.

- **Machine Learning Student Intern**, *Helmholtz Zentrum Dresden*, Germany
  - Evaluated GAN-generated and adversarial samples using model-agnostic geometric metrics.

- **Research Assistant**, *Indian Institute of Science*, India
  - Worked in a team of five on microscopy image analysis and feature extraction pipelines.

▬ Education

- **Doctorate**, *Applications of Generative Modeling*, TU Dresden, Germany

- **Master of Science**, *Computational Science*, TU Bergakademie Freiberg
  Grade – 1.4 (German grading system)
  Specialization: Deep learning, image classification & segmentation

▬ Publications

- **Mitigating Surgical Data Imbalance with Dual-Prediction Video Diffusion Models**
  Sparse controllable video diffusion for rare-class generation, improving downstream performance by 10–20%. Under review, `https://arxiv.org/abs/2510.07345`

- **Towards Application-Aligned Synthetic Surgical Image Synthesis**
  Diffusion model alignement with downstream application showing improvied performance across three tasks. GenAI4Health Workshop (*NeurIPS* 2025), `https://arxiv.org/abs/2509.18796`

- **Mission Balance: Generating Under-represented Class Samples with Video Diffusion Models**, Top 9%
  Text-controlled video diffusion for under-represented classes with a lightweight $\sim$400M-parameter model. *MICCAI* 2025, `https://arxiv.org/abs/2505.09858`

- **Data Augmentation for Surgical Scene Segmentation with Anatomy-Aware Diffusion Models**
  Anatomy-aware diffusion for controllable augmentation, enabling per-object control in $\leq$10 steps and training with <100 samples.*WACV* 2025, `https://arxiv.org/abs/2410.07753`

- **One-step Unpaired Image Translation with Consistency Diffusion Models**
  One-step unpaired image translation via consistency diffusion, achieving high visual fidelity and 82% classification accuracy. ECCV Workshop 2024, `https://arxiv.org/abs/2408.09822`

- **Exploring Semantic Consistency in Unpaired Image Translation**, Top 10%
  Contrastive learning for semantic-consistent image-to-image translation, improving performance by >20% over baselines.
  IJCARS, `https://link.springer.com/article/10.1007/s11548-024-03079-1`

- **Detection of Adversarial Samples – A Geometrical Approach**
  Efficient nearest-neighbor search for adversarial-sample detection, delivering 100% search speedup.
  `https://arxiv.org/abs/2206.08738`

▬▬ Professional Engagements

- **Workshops & Invited Talks**
  - Co-organized and delivered a hands-on workshop on **surgical image synthesis with generative models**, engaging 25 researchers and practitioners.
  - Invited speaker on **equivariant neural networks for image segmentation** at the Swiss Equivariant Learning Workshop (100+ participants).

- **Conference Posters & Schools**
  - Poster presentation on **spatially controllable image generation**, ranked top 8%, at East European Summer School (200 participants).
  - Poster presentation on **texture-consistent Sim2Real translation**, ranked top 12%, at Generative Modeling Summer School (120 participants).

- **Research Leadership & Mentorship**
  - Supervised 10+ bachelor's and master's students on research projects in medical image synthesis and generative modeling.
  - Secured **€5,000 in competitive research funding** from SECAI, TU Dresden, to support student-led research projects.

▬▬ Awards

- 2nd Place, Zeiss Foresight Challenge (Robotics & Synthetic Data)
- Best Poster Award, EEML Summer School (out of 150 submissions)
- SECAI Master Fellowship (€2000)
- Best Personal Programming Project, TU Freiberg

▬▬ Reviewer

- International Conference on Information Processing in Computer-Assisted Interventions (IPCAI) 2025, 2026
- IEEE/CVF Winter Conference on Applications of Computer Vision (WACV) 2025
- International Conference on Learning Representations (ICLR) 2025, 2026
- IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR) 2024