Karran Pandey

Curriculum Vitae

Dynamic Graphics Project
University of Toronto
karranpandey.github.io
karran@cs.toronto.edu

Research Interests

My research builds novel creative controls for 3D-aware visual content creation, editing and exploration. Spanning diverse artistic mediums, my work ranges from accelerating traditional workflows in sketch-based design and 3D geometric modeling to building new approaches for controllable photorealistic creation with 3D Gaussian splats and generative image / video models. I aim to make it convenient, intuitive and fun to manifest our visual imagination.

Education

University of Toronto — 2021 - 2025
PhD Computer Science
Advisor: Karan Singh — Toronto, Canada

Birla Institute of Technology and Science Pilani — 2014 - 2019
MSc Mathematics, BE Computer Science
Advisors: Vijay Natarajan, Tathagata Ray, Sharan Gopal — Hyderabad, India

Publications

Painting with 3D Gaussian Splat Brushes — 2025
Karran Pandey, Anita Hu, Or Perel, Clement Fuji-Tsang, Karan Singh, Masha Shugrina
ACM SIGGRAPH North America.

Motions Modes: What Happens Next? — 2025
Karran Pandey, Matheus Gadelha, Yannick Hold-Geoffroy, Karan Singh, Niloy Mitra, Paul Guerrero
CVPR.

Diffusion Handles: Enabling 3D Edits for Diffusion Models by Lifting Activations to 3D — 2024
Karran Pandey, Paul Guerrero, Matheus Gadelha, Yannick Hold-Geoffroy, Karan Singh, Niloy Mitra
CVPR **Highlight**.

Juxtaform: interactive visual summarization for exploratory shape design — 2023
Karran Pandey, Fanny Chevalier, Karan Singh
ACM SIGGRAPH North America.

Face Extrusion Quad meshes — 2022
Karran Pandey, Jakob Andreas Baerentzen, Karan Singh
ACM SIGGRAPH North America.

A GPU Parallel Algorithm for Computing Morse-Smale Complexes — 2022
Varshini Subhash, **Karran Pandey**, Vijay Natarajan
IEEE Transactions on Visualization and Computer Graphics (TVCG).

Morse Theory-based Segmentation and Fabric Quantification of Granular Materials — 2022
Karran Pandey, Talha bin Masood, Saurabh Singh, Ingrid Hotz, Vijay Natarajan, Tejas Murthy
Granular Matter 24, 27.

GPU Parallel Computation of Morse-Smale Complexes 2021
Varshini Subhash, **Karran Pandey**, Vijay Natarajan
IEEE Visualization Conference (VIS) (Short Paper).

An Integrated Geometric and Topological Approach for the Visual Analysis of Rossby Wave Packets 2020
Karran Pandey, Joy Merwin Monteiro, Vijay Natarajan
Monthly Weather Review, 2020, 148 (8): 3139-3155.

Conference Talks

ACM SIGGRAPH North America August 2023
Juxtaform: interactive visual summarization for exploratory shape design Los Angeles, USA

ACM SIGGRAPH North America August 2022
Face Extrusion Quad Meshes Vancouver, Canada

ACM SIGGRAPH North America (Labs Demo) August 2022
Face Extrusion Quad Meshes Vancouver, Canada

Industry Experience

Adobe Research June 2024 - September 2024
Research Scientist Intern
Advisors: Paul Guerrero, Niloy Mitra, Matheus Gadelha, Yannick Hold-Geoffroy

- Image-to-Video Generation with Object-Focused Motion Diversity
  A training-free pipeline for generating diverse object-focused motions with camera control using pretrained image-to-video diffusion models. Paper accepted to CVPR 2025.

NVIDIA Toronto AI Lab February 2024 - June 2024
Research Scientist Intern
Advisor: Masha Shugrina

- Painting with 3D Gaussian Splat Brushes
  A real-time 3D painting approach using brushes created from real-world gaussian splat captures. Paper accepted to ACM SIGGRAPH 2025.

Adobe Research June 2023 - September 2023
Research Scientist Intern
Advisors: Paul Guerrero, Niloy Mitra, Matheus Gadelha, Yannick Hold-Geoffroy

- 3D-aware edit handles for text-to-image diffusion models
  A training-free pipeline for 3D-aware object editing using pretrained text-to-image diffusion models. Paper accepted to CVPR 2024 (Highlight).

Professional Activities

Reviewer
Eurographics 2023, CVPR 2025, SIGGRAPH 2025

Teaching

- Teaching Assistant at University of Toronto Fall 2022, Fall 2023
  Data Visualization, Design of Interactive Computational Media