

Žiga Kovačič

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EDUCATION

Cornell University

B.A. in Computer Science, Mathematics, and Physical Simulation (Honors)

Ithaca, NY

Aug 2022 - May 2026

▷ **GPA:** 4.14/4.0

▷ **Relevant Courses:** (Grad) Physically Based Animations (A+), (Grad) Program Synthesis (A+), (Grad) 3D Computer Vision (A+), Reinforcement learning (A), (Grad) Computation for Content Creation (A), (Grad) Computational Imaging (A), Graphics (A+), Machine Learning (A+), Algorithms (A+), Honors Real Analysis II (A+), Numerical Analysis (A),

RESEARCH EXPERIENCE

Cornell Recursion and Learning Lab | Research Assistant

Ithaca, NY

Advisor: Prof. Kevin Ellis

Mar 2025 - Present

▷ **Program Synthesis for Physical Simulation**

Probed the causal reasoning limits of Vision-Language Models (VLMs) by creating a large-scale, multi-modal dataset linking physical simulation videos to their underlying code. Used this benchmark to identify key challenges in inverse simulation and explore how far Supervised Fine-Tuning (SFT) and Reinforcement Learning (RL) can push model performance.

▷ **Refactoring Codebases through Library Design**

Designed Librarian, an agent that automatically refactors codebases into reusable libraries, reducing code duplication by 32%. I established Minimum Description Length (MDL) as the optimal refactoring objective through user studies and asymptotic analysis, showing it best aligns with human preferences. To validate this, I built a novel benchmark on real-world repositories (Transformers, Diffusers), with the resulting work currently *under review at ICLR 2026*.

Cornell Material Simulation Group | Research Assistant

Ithaca, NY

Advisor: Prof. Steve Marschner

May 2025 - Present

▷ **Multi-scaled Yarn Simulation** (Mar 2025 - Present)

Implemented anisotropic elastoplasticity for yarn simulation in an MPM framework, inspired by *Anisotropic Elastoplasticity for Cloth, Knit and Hair Contact*. Exploring learning-based methods to efficiently simulate yarns with hundreds of fibers.

Cornell Graphics and HCI Lab | Research Assistant

Ithaca, NY

Advisor: Prof. Abe Davis

May 2023 - Feb 2025

▷ **Interactive Image-Space Modal Re-simulation** (May 2024 - Feb 2025)

Reimplemented ISMB for **real-time** video-based re-simulation using image-space modal analysis; extended the method with **modal warping** to address artifacts of linear modal analysis.

▷ **Pocket Timelapse, [SIGGRAPH 2025]** (May 2023 - Jan 2025)

Developed a framework for creating time lapses from sparse hand-captured data using 2D Gaussian splatting with change-aware sampling. Enabled user control over time and seasonal variation in synthesized time lapses.

PUBLICATIONS

- ▷ **Refactoring Codebases through Library Design.** Žiga Kovačič, Celine Lee, Justin Chiu, Wenting Zhao, Kevin Ellis. [DL4C @ NeurIPS 2025]. *Extension submitted to ICLR 2026*.
- ▷ **Pocket Time-Lapse.** Eric Chen, Žiga Kovačič, Madhav Aggarwal, Abe Davis. [SIGGRAPH 2025].
- ▷ **Physics-Based Simulation.** M. Li, C. Jiang, Z. Luo, W. Du, C. Yu, Ž. Kovačič, T. Xie. [Book 2025].

PROJECTS

Pen-2-Graph

October 2024 - Feb 2025

- ▷ Developed a novel pipeline using Vision-Language Models, Differential Evolution, and mathematical constraints on graph structure to automatically synthesize node-edge graph programs from hand-drawn sketches.

Material Point Method and CPIC

Mar 2025 - May 2025

- ▷ Engineered a **real-time** 2D/3D MLS-MPM solver with CPIC enhancement using **Taichi Python**, achieving **100+ FPS** across elastic, fluid, and plastic materials on **GPU-backed kernels**.
- ▷ Connected simulation output to **Blender** for lighting/rendering workflows, enabling end-to-end high-quality renders from physics simulation pipelines via Taichi-Blender integration.

SliceSplatting - Obstruction Removal from 3D reconstructions

October 2024 - Feb 2025

- ▷ Modified Gaussian Splatting to remove obstructions (e.g. fences) in 3D reconstructions using depth-aware particle slicing.
- ▷ Removed $\approx 90\%$ of obstructions in 3D reconstructions, improving final rendering quality and scene understanding by $\approx 35\%$.

Deep Learning Autograder

Nov 2024 - May 2025

- ▷ Implementation automated grading system for deep learning projects and assignments using PyTorch and Python.
- ▷ Designed to handle **200+ students**, providing **real-time feedback** on ML model performance and grading for assignments.

RELEVANT TEACHING EXPERIENCE

Cornell University, Teaching Assistant

- ▷ **CS 4787: (Head TA)** Large Scale Machine Learning (Fall 2025), **CS 4782: (Head TA)** Introduction to Deep Learning (Spring 2025), **CS 4620:** Introduction to Computer Graphics (Fall 2024), **CS 4780:** Introduction to Machine Learning (Spring 2024)

TECHNICAL SKILLS

Languages: Python, JavaScript, TypeScript, C/C++, HTML/CSS , **Libraries:** PyTorch, Taichi, Numpy, open-cv, WebGL, THREE.js