

# Žiga Kovacić

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## EDUCATION

### Cornell University

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

Ithaca, NY

Aug 2022 – May 2026

- ▷ **GPA:** 3.99/4.0 (4.13/4.3 on Cornell scale)
- ▷ **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),

## PUBLICATIONS

### ▷ Refactoring Codebases through Library Design.

Ž. Kovacić\*, C. Lee\*, J. Chiu, W. Zhao, K. Ellis. [DL4C @ NeurIPS 2025](#). *Extension under review at ICLR 2026*.

### ▷ Pocket Time-Lapse.

E. Chen, Ž. Kovacić, M. Aggarwal, A. Davis. [SIGGRAPH 2025](#).

### ▷ Physics-Based Simulation.

M. Li, C. Jiang, Z. Luo, Ž. Kovacić, W. Du, C. Yu, T. Xie. [Open-source book](#), 2025.

## RESEARCH EXPERIENCE

### Cornell Recursion and Learning Lab | Advisor: Prof. Kevin Ellis

#### ▷ Program Synthesis as Inverse Physical Simulation

Spring 2025 – Present

Probed whether VLMs can act as inverse simulators by inferring executable physics programs from short video trajectories. Built a controlled 2D MPM dataset to test causal reasoning and found that current models fail at geometric perception and physical parameter inference, revealing fundamental limits in their ability to recover simulation mechanisms from visual input alone.

#### ▷ Refactoring Codebases through Library Design

Spring 2025 – Present

Designed Librarian, a library-learning system that discovers reusable abstractions across multi-file codebases using an MDL-guided objective. Demonstrated that MDL aligns best with human judgments of software quality, outperforming classic metrics, and applied the method to real repositories to achieve scalable, model-driven refactoring. [Preliminary results at DL4C @ NeurIPS 2025](#) and full paper submitted to ICLR 2026.

### Cornell Material Simulation Group | Advisor: Prof. Steve Marschner

#### ▷ Multi-scaled Yarn Simulation

Summer 2025 – Present

Implemented an MPM-based yarn model to study multi-scale fiber interactions and evaluated reduced-order methods (e.g., CROM) for accelerating simulation. Explored how hybrid data-driven simulators can generalize across yarn geometries and fiber configurations.

### Cornell Graphics and HCI Lab | Advisor: Prof. Abe Davis

#### ▷ Interactive Image-Space Modal Re-simulation

Spring 2024 – Jan 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]

Summer 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.

## PROJECTS

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### 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 method for rigid-deformable object interactions using **Taichi**, simulating elastic, fluid, plastic, sand, and visco-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 automatically remove obstructions (e.g. fences) in 3D reconstructions using depth-aware particle slicing. Able to remove multi-layers of obstructions, improving upon previous NeRF-based methods.

### Deep Learning Autograder

Nov 2024 – May 2025

- ▷ Implementation automated grading system for deep learning projects and assignments using PyTorch and Python.
- ▷ Designed to handle **500+ students**, providing feedback on model implementation and grading for assignments.

## RELEVANT TEACHING EXPERIENCE

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### 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)

## LEADERSHIP & MENTORSHIP

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### Cornell University Artificial Intelligence (CUAI)

Fall 2024 – Spring 2025

#### President

- ▷ Responsible for leading and mentoring a team of 17 undergraduate researchers. Fostering an environment for undergrad-led research. Organizing a weekly reading group on recent papers for undergrads.

## HONORS

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- ▷ Dean's List, Cornell University (Fall 2022, Fall 2023, Spring 2024, Spring 2025).
- ▷ Nominated by Cornell for the CRA Outstanding Undergraduate Researcher Award (2025-2026 academic year).
- ▷ TA Award for Computer Science Department (Spring 2024).

## TECHNICAL SKILLS

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