PRANAV JAIN

University of Southern California
pranavj@usc.edu

RESEARCH INTERESTS

Geometry Processing, Smooth & Discrete Differential Geometry, Numerical Analysis of Partial Differential Equations, Physical Simulations, Computer Graphics

EDUCATION

University of Southern California — August 2023 - Present
Doctor of Philosophy, Computer Science — *California, USA*

New York University — September 2021 - May 2023
Master of Science (MS), Scientific Computing — *New York, USA*

Indraprastha Institute of Information & Technology Delhi (IIITD) — August 2016 - August 2020
Bachelor of Technology with Honors (B-Tech Hons), — *New Delhi, India*
Computer Science and Applied Mathematics

PUBLICATIONS

Liam Martin, **Pranav Jain**, Zachary Ferguson, Torkan Gholamalizadeh, Faezeh Moshfeghifar, Kenny Erleben, Daniele Panozzo, Steven Abramowitch, Teseo Schneider. A systematic comparison between FEBio and PolyFEM for biomechanical systems. In Computer Methods and Programs in Biomedicine, 2023.

Zachary Ferguson, **Pranav Jain**, Denis Zorin, Teseo Schneider, and Daniele Panozzo. High-Order Incremental Potential Contact for Elastodynamic Simulation on Curved Meshes. In ACM SIGGRAPH 2023 Conference Proceedings (SIGGRAPH '23).

Pranav Jain, Munawar Hasan, Donghoon Chang. Spy based analysis of selfish mining attack on multi-stage blockchain. In Cryptology ePrint Archive, 2019

RESEARCH EXPERIENCE

University of Southern California — August 2023 - Present
PhD Student — *California, USA*
Advisor: Dr. Oded Stein

- Research on Using Implicit Neural Spatial Representations for Fluid Simulations

New York University — September 2021 - May 2023
Research Assistant — *New York, USA*
Advisor: Dr. Daniele Panozzo, Dr. Denis Zorin

- High-order meshes provide a more accurate geometrical approximation of an object's boundary than linear elements, for a negligible additional cost when used in a finite element simulation.
- Introduced a high-order finite element formulation (high-order basis) for elastodynamic simulation on high-order (curved) meshes with contact handling based on the recently proposed Incremental Potential Contact model.
- Compared and highlighted a comparison between FEBio and PolyFEM for biomechanical simulations

nTopology — June 2022 - August 2022
Software Engineer Intern in Geometry Team — *New York, USA*
Advisor: Suraj Musuvathy, Ranjeeth Mahankali

- Given an original CAD, once it is converted to an implicit in performing operations like Boolean operations, topology optimization, etc, the information of the original CAD surface is lost. In other words, once the implicit is converted back to CAD, the original faces/edges of the CAD body aren't preserved.
- Formulated and implemented a new algorithm from scratch that could preserve the analytical faces.

Freie Universität Berlin September 2020 - August 2021
Research Intern *(Virtual) Berlin, Germany*
Advisor: Dr. Konrad Polthier, Dr. Sunil Kumar Yadav

- Developed an algorithm for filtering point clouds robustly and adaptively.
- Proposed a robust point cloud denoising technique that automatically tunes the required parameters resulting in a filtered point cloud without the need of manual testing.

Fields Undergraduate Summer Research Programme 2020 July 2020 - August 2020
Research Intern *(Virtual) Toronto, Canada*
Advisor: Dr. Thomas Uchida

- Mechanical linkages define the motion of industrial robots, vehicle suspensions, and deployable structures like artificial satellites, aircraft landing gear, and umbrellas.
- Explored the reverse mechanism synthesis problem where given a path, the task is to design a mechanism that would trace the given path.
- Created, tested and analyzed an algorithm that could synthesize mechanisms that trace open curves.

Indraprastha Institute of Information & Technology Delhi August 2018 - August 2020
Research Assistant *New Delhi, India*
Advisor: Dr. Kaushik Kalyanaraman

- Developed DECAGT which is a C++ library which provides a general, extendable software framework for discretizations of the objects and operators of exterior calculus.
- Added support for interpolation on simplicial complexes using Gaussian quadratures and high-order finite element basis functions.

Indraprastha Institute of Information & Technology Delhi August 2018 - August 2020
Undergraduate Thesis *New Delhi, India*
Advisor: Dr. Donghoon Chang

- Analyzed Selfish Mining Strategy for multiple mining pools in Bitcoin Blockchain. Proved the dependency of the reward gained by the selfish pool on the total number of mining pools present using probabilistic analysis.
- Developed and analysed a mathematical model motivated from Multi-Stage Blockchain and proved it being resistant to Selfish Mining Attack.

AWARDS

- Fields Undergraduate Summer Research Program 2020: One of 32 selected students from 200+ applicants for a funded research opportunity at the Fields Institute, Canada.
- Dean's Award for Academic Excellence: For excellent academic performance in the 2018-19 academic session.

ACADEMIC COMMUNITY WORK

- Former member of the Conference Coffee team at SIGGRAPH Research Career Development Committee. Organized the conference coffee event for SIGGRAPH and SIGGRAPH ASIA 2021 & 2022.