Avirup Mandal, Ph.D.

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Education

2018 – 23 ◇ **IIT Bombay**, Mumbai, India.
Ph.D. (Expected 2023), Electrical Engineering, CGPA: 9.05/10.0.
Dissertation: *Fast Remeshing-Free Methods for Complex Cutting and Fracture Simulation*.
Advisors: Prof. Parag Chaudhuri and Prof. Subhasis Chaudhuri.

2016 – 18 ◇ **IIT Bombay**, Mumbai, India.
M.Tech., Electrical Engineering, CGPA: 9.52/10.0.
Thesis: *Haptic Rendering of Submerged Objects*.
Advisor: Prof. Subhasis Chaudhuri.

2011 – 15 ◇ **Jadavpur University**, Kolkata, India.
B.E., Electronics & Telecommunication Engineering, CGPA: 9.03/10.0.

Research Interests

I am broadly interested in developing *fast*, *efficient* and *robust* algorithms for ***physics-based animation***. I have worked on the following projects.

- Developed *remeshing-free graph-based Finite Element Method* for fracture simulation.
- Proposed *probabilistic damage mechanics* for impurity induced random fracture.
- Built an *interactive framework with haptic feedback* for virtual sculpting.
- Devised an algorithm for *non-linear Monte Carlo ray tracing* using General Relativity.
- Developed a *Smooth Particle Hydrodynamics-based* interactive framework for underwater haptic rendering.

I am also interested in *machine learning algorithms* applied to dynamic physical Systems.

Research Articles

Journal/Conference

1. **A. Mandal**, P. Chaudhuri, and S. Chaudhuri. *Remeshing-Free Graph-Based Finite Element Method for Fracture Simulation*. Computer Graphics Forum. 2022. (to be presented at Eurographics '23).
2. **A. Mandal**, P. Chaudhuri, and S. Chaudhuri. *Simulating Fracture in Anisotropic Materials Containing Impurities*. ACM SIGGRAPH Conference on Motion, Interaction and Games - MIG. Guanajuato, Mexico. November 2022.
3. **A. Mandal**, P. Chaudhuri, and S. Chaudhuri. *Interactive Physics-Based Virtual Sculpting with Haptic Feedback*. ACM SIGGRAPH Symposium on Interactive 3D Graphics and Games - I3D. Virtual event. May 2022. (Journal version appeared in Proceedings of the ACM on Computer Graphics and Interactive Techniques).
4. **A. Mandal**, P. Chaudhuri, and S. Chaudhuri. *Real-time Physics-based mesh deformation with haptic feedback and material anisotropy*. International Joint Conference on Computer Vision, Imaging and Computer Graphics Theory and Applications - GRAPP. Lisbon, Portugal. February 2023.
5. **A. Mandal***, K. Ayush*, and P. Chaudhuri. *Non-linear Monte Carlo Ray Tracing for Visualizing Warped Spacetime*. International Joint Conference on Computer Vision, Imaging and Computer Graphics Theory and Applications - IVAPP. Virtual event. February 2021. (Joint first authors).
6. **A. Mandal**, D. Sardar, and S. Chaudhuri. *Haptic Rendering of Solid Object Submerged in Flowing Fluid with Environment Dependent Texture*. EuroHaptics. Pisa, Italy. June 2018.

Posters

1. **A. Mandal**, P. Chaudhuri, and S. Chaudhuri. *Artist Controlled Fracture Design Using Impurity Maps*. SIGGRAPH Posters. Vancouver, BC, Canada. August 2022.

2. **A. Mandal**, P. Chaudhuri, and S. Chaudhuri. *Scalable Visual Simulation of Ductile and Brittle Fracture*. SIGGRAPH Posters. Virtual event. August 2021.

Patent

1. T. Kundu, K. Lahiri, **A. Mandal**, A. Mukherjee, M. K. Naskar, and S. Sinha. *Generic Data Compression for Heart Diagnosis*. U.S. Patent 9477701 B1 2016.

Awards and Achievements

2022 ◇ **Qualcomm Innovation Fellowship** *Super-Winner*, India.
◇ **ACM Student Research Competition** *Semi-Finalist*, SIGGRAPH.
2021 ◇ **Qualcomm Innovation Fellowship** *Winner*, India.
◇ **Best Paper Award** *Finalist*, IVAPP.
◇ **Best Teaching Assistant Award** (awarded twice), IIT Bombay.
2016 ◇ **All India Rank 113** out of 152k candidates in *GATE* with *ECE specialization*.
2011 ◇ **State Rank 94** out of 125k candidates in *West Bengal Joint Entrance Examination*.

Skills

Languages ◇ Strong reading, writing and speaking competencies for English, Bengali.
Coding ◇ C++, C, Python, Java, OpenGL, CUDA, OpenHaptics, LaTeX.
Tools ◇ MATLAB, Houdini, Visual Studio, Eclipse, Android Studio, MeshLab.
Web Dev ◇ HTML, CSS.

Experience as Teaching Assistant

2016 – 21 ◇ Digital Signal Processing (EE 603), Digital Communications (EE 328), Computer Vision (EE 702), Digital Signal Processing System Design and Implementation Lab (EE 750).

Research Experience

2014 ◇ **Indian Statistical Institute**, Kolkata, India.
Research Intern, Electronics and Communication Sciences Unit.
Topic: *Object Detection and Tracking in Variable Background using Fuzzy Kalman Filter*.
Mentor: Prof. Kumar Sankar Ray.

Relevant Courses

Graphics ◇ Computer Graphics, Advanced Computer Graphics.
Mathematics ◇ Applied Linear Algebra, Statistical Signal Analysis, Optimization Techniques, Engineering Statistics, Advanced Probability and Random Processes for Engineers.
Signal Processing ◇ Digital Signal Processing and its Applications, Adaptive Signal Processing, Recent Topics in Analytical Signal Processing.
Image Processing ◇ Image Processing, Computer Vision, Digital Image Processing of Remotely Sensed Data.
Machine Learning ◇ Foundations of Machine Learning, Deep Learning - Theory and Practice.

Extracurricular

Reading ◇ Novels, Short stories, Popular science books.
Interests ◇ Astrophysics, Special and General Relativity, Topology, Differential Geometry.
Administrator ◇ Vision and Image Processing Lab, Department of EE, IIT Bombay (2018 – 2022).
Organiser ◇ Department of ETCE alumni meet (SANJOG '13) at Jadavpur University.

References

- **Parag Chaudhuri**, Associate Professor of Computer Science and Engineering, IIT Bombay. paragc@cse.iitb.ac.in
- **Subhasis Chaudhuri**, Director of IIT Bombay & K. N. Bajaj Chair Professor of Electrical Engineering, IIT Bombay. sc@ee.iitb.ac.in