

Mit Kotak

<https://mitkotak.github.io>

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Education

Massachusetts Institute of Technology, Cambridge, MA
SM Computational Science and Engineering

July 2023-Present

University of Illinois at Urbana-Champaign, Champaign, IL
Bachelor of Science in Engineering Physics (with **Highest Honors**)

August 2019-May 2023

Senior Thesis: [Efficient Execution of DG-FEM workloads on GPUs via CUDAGraphs](#)

Advisor: [Dr. Andreas Klöckner](#)

Minors: [Computational Science and Engineering](#), [Statistics](#)

GPA: 3.91/4.0

Dean's List: Fall 2019, Spring 2020, Fall 2020, Spring 2021

Parkland College, Champaign, IL

Summer 2020-Fall 2020

Associate in General Studies

Received: May 2021

GPA: overall 4.0/4.0;

Dean's List: Fall 2020

Grants/Awards

2023 ACCESS Explore: "Symmpiler: Symmetry aware compiler for Equivariant Neural Networks" (5k GPU hours)

2023 Office of Undergraduate Summer Research Support Grant – \$1,000

2022 National Center for Supercomputing Applications Student Pushing Innovation (**SPIN**) – \$7,200

2022 1st place in UIUC Image of Research Competition — \$300

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2021 Philip J. and Betty M. Anthony Undergraduate Summer Research Award – \$3,000

Publications

What happens when Black Holes collide ?

Mit Kotak, Eric Yu, Jinghan Huang, Jing Zhou, Milton Ruiz, Antonios Tsokaros, Lunan Sun, Stuart L. Shapiro

[Coalition for Academic Scientific Computation 2023 Brochure, Page 14](#)

Streamlined HPC Environments with CVMFS and CyberGIS-Compute

Alexander Michels, Mit Kotak, Anand Padmanabhan, Shaowen Wang

[IGUIDE Forum 2023](#)

CyberGIS-Compute: Middleware for Democratizing Scalable Geocomputation

Alexander Michels, Anand Padmanabhan, Zimo Xiao, Mit Kotak, Furqan Baig, Shaowen Wang

Under review at [SoftwareX](#)

Talks

Optimizing Equivariant Tensor Products (MIT Graphics Seminar 2023)

Optimizing Equivariant Tensor Products ([Sparse Tensor Computation Workshop 2023](#))

Efficiently Executing Discontinuous Galerkin Finite-Element (DG-FEM) workloads on GPUs via Data Flow Graphs ([UIUC URS 2023](#), [NCUR 2023](#))

Task Graph Parallelism on GPUs via CUDAGraphs ([CEESD AST Review 2022](#))

Posters

Efficiently Executing NumPy on GPUs via the CUDAGraph API ([UIUC URS 2022](#))

Analysis of bottle bioassay data: Creating an RShiny app to assist in insecticide resistance monitoring ([Entomology 2023](#))

Research

Research Lab for Electronics

July 2023-Present

Experience

Dr. Tess Smidt

Working on optimizing tensor product operation in [e3nn framework](#) through domain specific computing.

Center for Exascale-enabled Scramjet Design

May 2021-May 2023

Dr. Andreas Klöckner

Worked on Efficient execution of array dataflow graphs on GPU hardware.

- **Co-designed and Co-developed a multi-layered framework** with a graduate student for executing data flow graphs on GPUs via an array-based programming interface.
 - Extended *PyCUDA*, a python-based GPU scripting language, to provide runtime code generation for NVIDIA's *CUDA*Graph API.
 - Implemented a *CUDA*Graph backend for *Pytato*, a lazy-evaluating array interface that lowers *n-d* array programs to computation graphs.
 - Developed a *CUDA*Graph backend for *Arraycontext*, an array abstraction for mapping *numpy*-like operations onto *CUDA*Graph driver API calls.
- **Benchmarked a speedup of upto 5x** for Finite-Element based Discontinuous Galerkin Operators.
- **Presented results** at semestrial lab funding reviews (*CEESD AST Review 2022*) and annual undergraduate research symposium (*UIUC URS 2022*).

Center for Theoretical Astrophysics

June 2021-June 2023

Dr. Stuart L. Shapiro

Worked on 3D Visualization of Relativistic Magnetohydrodynamics.

- **Led a team of 4 undergraduates** to create 3D visualizations of neutron stars, black hole binaries and black holes disks using a *VisIt-CLI* based software package across 6 supercomputing clusters .
- **Spearheaded** the usage of isosurface shell rendering (5-10 times faster than the conventional volume rendering) for visualizing the density profile.
- **Co-developed a set of Python scripts** for efficiently measuring the circumference of a black hole disk at a given density.
- **Visualizations featured** in 2 *Phys. Rev. Journal* articles, *CASC 2023*, *department news website*, and *NCSA's award winning exhibit at Engineering Open House*.
- **Applied for and received** undergraduate research support grants for summer research (RSG 2022, RSG 2023).

CyberGIS Center for Advanced Digital and Spatial Studies

March 2022-May 2023

Dr. Anand Padmanabhan

Worked on *CyberGIS-Compute*: Geospatial Middleware for Simplifying Access to High-Performance Computing.

- **Provided continued software support** for a *Python*-based GUI and *Typescript*-based *RESTful* API server.
- **Integrated** the *CyberGIS-Compute* framework with *CVMFS* (Cern Virtual Machine File System).

National Center for Supercomputing Applications

August 2022-June 2023

Dr. Antonios Tsokaros

Worked on High Performance Computing for Magnetized Neutron Stars.

- **In progress: Writing** a 100 page primer for 3D visualizations in numerical relativity.

Work
Experience

College of Veterinary Medicine

January 2023-May 2023

Dr. Becky Smith

- Built an *R shiny* web application for *CDC-funded Midwest Center of Excellence in Vector-Borne Disease* for monitoring pesticide usage which was presented at Entomology 2023.

Office of Undergraduate Research

March 2021-May 2023

Undergraduate Research Ambassador

- **Held one-to-one peer mentoring sessions** with **50+ undergraduates**, **Led** "Getting Started with Research" workshops and helped organize the annual undergraduate research symposium (latest one had 500 presenters).
- **Developed a chatbot** that could answer commonly asked questions regarding finding research opportunities.