

# Dev Chheda

[dchheda@mit.edu](mailto:dchheda@mit.edu) | [vedadehbc.github.io](https://vedadehbc.github.io) | 704-981-1789

**Languages/Tools:** Python, C++, C, CUDA, SystemVerilog, FPGA, PyTorch, Java, RISC-V Assembly, React, TypeScript, Node.js, AWS

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## Education

**Massachusetts Institute of Technology (MIT)**, GPA: 5.0/5.0

**Sep 2021 - May 2025**

- Pursuing a B.S. in Electrical Engineering and Computer Science (6-2)
  - *Relevant Coursework:* 6.5931 Hardware Architecture for Deep Learning (G), 6.5940 Efficient Deep Learning Computing (G), 6.1060 Software Performance Engineering, 6.1810 Operating Systems Engineering, 6.5210 Advanced Algorithms (G), 6.S966 Symmetry and Machine Learning (G), 6.2050 Digital Systems Laboratory, 6.2400 Quantum Systems Engineering, 6.1800 Computer Systems Engineering
  - *Tentative Coursework:* 6.2500 Nanoelectronics and Computing, 6.5840 Distributed Computer Systems (G), 6.5060 Algorithm Engineering (G), 6.1100 Computer Language Engineering, 6.5660 Computer Systems Security (G)
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## Experience

**MIT Low-Energy Autonomy and Navigation Group** | *Algorithms and Hardware Researcher*

**May 2023 - Present**

- Co-designing algorithms and hardware to design energy efficient solutions to localization and mapping tasks
- Benchmarking algorithms for SLAM and multi-view stereo tasks to analyze memory-efficiency and throughput

**MIT Parallel Algorithms Group** | *Parallel Computing Researcher*

**Feb 2023 - Present**

- Designing a generalized framework for parallel algorithms for spatial grid-based clustering
- Developing sequential baselines to verify correctness and measure overheads and work efficiency of parallel implementations
- Optimizing parallel implementations of clustering algorithms to improve performance in practical, limited-scale use cases
- Exploring the design of novel parallel grid-based clustering algorithms by combining key ideas from existing algorithms

**MIT 6.191 Computation Structures** | *Lab Assistant*

**Sep 2022 - May 2023**

- Teaching topics in computer architecture, digital logic, operating systems to students during office hours

**Five Rings Capital** | *Quantitative Trading Intern*

**Jan 2023**

- Participated in mock trading to obtain familiarity with how the market operates at the level of individual orders
- Competed in automated trading strategy and design competition and in an complex zero-sum game

**Advanced Micro Devices (AMD)** | *Silicon Design Engineer Intern*

**May 2022 - Aug 2022**

- Working with AMD's Fast Platform Modeling Team to develop the SimNow simulator software for pre-silicon validation
- Using C++ to build performant models involving interactions between CPUs, GPUs, motherboards, memory devices, etc.
- Using Python to develop testing scripts to ensure model correctness and support internal customer needs

**NASA Goddard Space Flight Center** | *Software Engineer Intern*

**Jul 2021 - Aug 2021**

- Used C# and Unity to design and implement the new Motion Constraints mode for interacting with objects into NASA's Mixed Reality Exploration Toolkit, an AR/VR software for science and engineering use cases

**MIT Geometric Data Processing Research Group** | *Research Science Institute (RSI) Scholar*

**Jun 2020 - Dec 2020**

- One of 80 students selected worldwide for RSI, the premier research institute for high school students
- Developed innovative machine learning methods for shape classification and analysis by studying the isoperimetric profile
- Used both numerical and analytical techniques to develop theoretical and experimental computations for the gradient of the isoperimetric profile with integrations into machine learning pipelines and gradient descent optimization algorithms
- Accolades received at Regeneron ISEF and STS [[Abstract](#)]

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## Projects

<b>Cryo-Sphere: SO(3)-equivariant method for Cryo-EM pose estimation</b> [ <a href="#">Poster</a> , <a href="#">Code</a> ]	<b>Mar 2023 - Present</b>
<ul style="list-style-type: none"><li>• Built a novel model based on SO(3)-equivariant layers and spherical CNNs for the Cryo-EM pose estimation task</li><li>• Developed new method for predicting pose distributions over SO(3) in order to capture symmetries in protein structure</li><li>• Optimized data representation and model architecture, exploiting sparsity to improve memory efficiency by 5x, and runtime by 20x</li></ul>	
<b>Experimental Tango Trees</b> [ <a href="#">Paper</a> ]	<b>Nov 2022 - Present</b>
<ul style="list-style-type: none"><li>• Developed the first ever experimental implementation of tango trees, a binary search tree proven to be <math>O(\lg \lg n)</math>-competitive</li><li>• Proved lower bounds on tango tree access time for certain access sequences, and provided intuitive explanations for why the tango tree is suboptimal on many access sequences</li><li>• Compared the running time of tango trees with the multi-splay tree and splay tree on a variety of access sequences</li><li>• Investigated the unified property of binary search trees and provided experimental evidence that splay trees and multi-splay trees follow this property, indicating their dynamic optimality</li></ul>	
<b>REND3R: Ray-tracing Engine and Networked Device for 3D Rendering</b> [ <a href="#">Paper</a> , <a href="#">Code</a> ]	<b>Oct 2022 - Dec 2022</b>
<ul style="list-style-type: none"><li>• Designed a specialized hardware accelerator for rendering 3D ray-tracing graphics to a VGA-connected monitor</li><li>• Designed a custom instruction set architecture (ISA) to send commands to processor over an ethernet interface</li><li>• Implemented design on a Nexys A7 FPGA board and optimized performance over several parameters, balancing the tradeoff between using hardware resources for compute or memory</li><li>• Evaluated system design based on performance and resource usage; optimized ray tracing algorithms to improve performance</li></ul>	
<b>RISC-V Assembly Sokoban</b> [ <a href="#">Code</a> ]	<b>Feb 2022 - Mar 2022</b>
<b>Socialyze - Social Connection for Students</b>	<b>Jan 2022 - Aug 2022</b>
<b>Tango - AI Dance Coach</b> [ <a href="#">Summary</a> , <a href="#">Code</a> ]	<b>Sep 2021 - May 2022</b>
<b>Genetic Algorithm for Musical Composition of Four-Part Harmonies</b> [ <a href="#">Summary</a> ]	<b>Apr 2020 - Jun 2020</b>
<b>COVID-19 Pandemic Simulator</b> [ <a href="#">Demo</a> , <a href="#">Code</a> ]	<b>Mar 2020 - May 2020</b>
<b>iCoPAM - Cancer Drug Discovery using AI</b> [ <a href="#">Summary</a> ]	<b>Oct 2019 - May 2020</b>
<b>Mood Detection using AI</b> [ <a href="#">Code</a> ]	<b>Jun 2019 - Aug 2019</b>
<b>Clustering and Network Algorithms to Address Gerrymandering</b> [ <a href="#">Summary</a> , <a href="#">Interview</a> ]	<b>Sep 2018 - May 2019</b>

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## Selected Honors & Awards

### *Regeneron International Science and Engineering Fair (ISEF) and other research contests*

- 3rd Place Grand Award in Mathematics and 1st Place Special Award at ISEF
- Top 300 Regeneron STS Scholar in the “most prestigious STEM competition for high school seniors”
- Repeat ISEF Grand Prize Winner and 1st Place Award winner at North Carolina Science and Engineering Fair
- Top 10 Research Presentation at the 2020 Research Science Institute (RSI)

### *USA Computing and Mathematics Olympiads*

- Ranked among the Top 50 across the country in competitive programming in the USACO Platinum Division
- Competed in the USACO Platinum division for 3+ years and studied graduate-level algorithms and data structures
- Ranked among the Top 100 across the country in the USA Junior Mathematics Olympiad
- 6-time AIME Qualifier with a top score of 12/15; consistently ranked in the top 2.5% of AMC 10/12 competitors

### *Hackathons*

- Jane Street Electronic Trading Competition (ETC) at FTTP 2022 - 1st Place
- ShellHacks 2021 - 1st Place overall
- HackMIT 2021 - Facebook and DRW (Best Data Visualization) Sponsor Prizes
- PackHacks 2021 - 1st Place in Competitive Programming track