

# Anish Ghosh

Email : anishg1@umbc.edu

Address : 1145 Gloria Ave, Baltimore County, MD 21227

Mobile : +1 (267)-670-0801

Website: <https://theory-code.com>

## EDUCATION

---

- **University of Maryland, Baltimore County** Baltimore, Maryland  
*Ph.D. Applied Mathematics* 2025 - present
- **Drexel University** Philadelphia, Pennsylvania  
*MSc Mathematics* 2023 - 2025
- **Constructor University** Bremen, Germany  
*BSc Computer Science* 2019 - 2022

## RESEARCH EXPERIENCE

---

- **University of Maryland, Baltimore County (UMBC)** Maryland, USA  
*Ph.D. Student — Applied Mathematics* Aug 2025 – Present
  - **Project I: Hybrid Quantum Algorithm for PDE-Constrained Optimization**  
*Supervisor: Dr. Mohammadhossein Mohammadisiahroudi*
    - \* Replacing the linear solver in the adjoint method with QLSA.
    - \* Replacing inner-product computations with the swap test.
    - \* Achieving exponential speedup with respect to the state variables.
  - **Project II: Exploring GNO for Solving PDEs**  
*Supervisors: Dr. Matthias Gobbert and Dr. Mohammadhossein Mohammadisiahroudi*
    - \* Exploring GNO and other operator-learning architectures for PDE solution methods.
    - \* Investigating combinations of scalable AMR techniques with GNO for efficient PDE solving.
- **Fraunhofer FHR** Bonn, Germany  
*Research Assistant - Algorithm and Software Development* Jun 2022 - Dec 2022
  - Developed and implemented software components for the GESTRA project, focusing on system reliability and performance optimization.
  - Established a communication network using MODBUS/TCP protocol for multiple Pqube3 devices.
  - Contributed to monitoring for the GESTRA radar project, ensuring seamless integration of subsystems.
  - Utilized Qt Framework, C++, Linux for implementation.
- **Fraunhofer MEVIS** Bremen, Germany  
*Bachelor Thesis* Mar 2022 - Dec 2022
  - Conducted comprehensive literature research on Generative Adversarial Networks (GAN), with a focus on transformer-based architectures and advanced image generation techniques.
  - Worked extensively on developing a novel metric for comparing the quality of GAN-generated images, building upon the Fréchet Inception Distance (FID) metric and leveraging Transformer Architecture to improve comparison precision.
  - Implemented the metric using PyTorch, and NumPy, optimizing it for scalability and efficient processing of large image datasets.
  - Designed and developed a Transformer Network for comparing and analyzing generated images, nearing completion to provide deeper insights into model performance and output quality.
- **3d.aero** Hamburg, Germany  
*Working Student - Algorithm and Software Development* Sep 2021 - Feb 2022

- Researched and implemented 2D/3D image processing and computer vision algorithms in C# for industrial applications, improving image detection and processing accuracy.
- Designed and implemented user interface components using XAML to improve usability and user experience.
- Worked independently to address challenging technical problems, ensuring efficient and reliable solutions.

### • **Fraunhofer IPA**

Stuttgart, Germany

*Internship - Software and Algorithm Development*

*Jun 2021 - Aug 2021*

- Developed automatic grasp generation algorithms for bin-picking systems, increasing operational accuracy.
- Analyzed and improved existing algorithms for bin-picking systems to increase operational accuracy.
- Developed and implemented an algorithm to convert .stl files to .pcd format, optimizing point cloud data for 3D processing.
- Worked with libraries such as PCL, OpenCV, and HDF5 to streamline algorithm development.
- Reduced time complexity of algorithms by identifying and optimizing performance bottlenecks.
- Gained hands-on experience in integrating advanced algorithms into industrial automation systems.

## TEACHING EXPERIENCE

---

### • **University of Maryland Baltimore County**

Baltimore County, Maryland

*Teaching Assistant - Mathematics Department*

*Aug 2025 - Present*

- Delivering tutorials and practice materials for students in Calculus II, Multivariable Calculus.
- Grading quizzes and exams, providing constructive feedback to improve student performance.

### • **Drexel University**

Philadelphia, Pennsylvania

*Teaching Assistant - Mathematics Department*

*Jan 2023 - Jun 2025*

- Delivered tutorials and personalized learning sessions for students in Multivariable Calculus, Probability, and Intro to Analysis.
- Graded assignments and exams, providing constructive feedback to improve student performance.
- Assisted students with a wide range of mathematics courses at the Math Resource Center, providing support tailored to their specific questions and challenges.

### • **Constructor University**

Bremen, Germany

*Teaching Assistant - Stochastic Methods*

*Sep 2022 - Dec 2022*

- Topics: Binomial tree models, Discrete Brownian paths, stochastic integrals and ODEs, Ito's Lemma, Monte-Carlo methods, finite differences solutions, the Black-Scholes equation, and an introduction to time series analysis, parameter estimation, and calibration.
- Cleared doubts on the above mentioned.
- Graded and automated a portion of the grading for assignments using Python scripts, reducing feedback turnaround time.

### • **Constructor University**

Bremen, Germany

*Teaching Assistant - Applied Dynamical Systems*

*Sep 2021 - Dec 2021*

- Topics: ODE solvers (forward, backward euler methods, etc.), Logistic Map, Simple Model of Biochemical Switches and Oscillators, Chua's Circuit, Cellular Automata and Belousov-Zhabotinsky reaction
- Delivered tutorials and cleared doubts on the above mentioned.
- Graded assignments and Reports involving Python and Mathematica, ensuring detailed feedback and improvements

- **Constructor University** Bremen, Germany  
*Teaching Assistant - Human Computer Interaction* *Sep 2021 - Dec 2021*
  - Guided students in face detection, optical flow estimation, and GUI development using OpenCV, C++, CMake, and NodeJS.
  - Provided detailed assignment feedback, enhancing students' practical understanding of computer vision concepts.
  
- **Constructor University** Bremen, Germany  
*Teaching Assistant - Human Computer Interaction* *Feb 2021 - May 2021*
  - Wrote Lecture Slides.
  - Wrote lecture slides and guided students in implementing face detection, optical flow estimation, and GUI.
  - Graded assignments, focusing on computer vision tasks using OpenCV and C++.

## NOTABLE PROJECTS

---

- **Project I:** Designing hybrid quantum-classical modules applying QLSA to speed up large-scale PDE and adjoint simulations.
- **GESTRA Radar System:** Played a key role in optimizing communication protocols and controlling the radar system for the GESTRA project. Developed software components focused on improving hardware communication. Implemented a MODBUS/TCP protocol for multiple Pqube3 devices and contributed to the system's control. This improved communication reliability and data transmission rates.
- **Rivet Detection and Measurement(3d.aero):** Designed and implemented an image filter using MSHF algorithm to detect rivets and edges based on input from a line sensor, improving detection accuracy and consistency across various material types.
- **Bushing Measurement(3d.aero):** Developed a stereo camera-based filter for measuring the radius and height of bushings. Integrated the filter with a look-up table for efficient identification, reducing error rates in detecting faulty bushings.
- **Bin Picking(Fraunhofer IPA):** Developed an automatic grasp generation algorithm for parallel jaw and suction cup grippers, integrated into bin-picking software. Improved picking accuracy and object handling efficiency in industrial applications.

## OLD PROJECTS

---

- **Viola Jones Face Detector:** Implemented a real-time Viola-Jones face detection system using OpenCV and cascade classifiers. Developed with C++, CMake, and Xcode, the system utilized pre-trained classifiers and measured FPS, improving detection efficiency.
- **Xilinx Synthesis:** Designed and implemented an 8-bit adder, AND, and XOR gates using VHDL on Xilinx. Synthesized the circuits, validating functionality and performance for further hardware deployment.
- **FPGA programming:** Program a seven segment display of a spartan FPGA board

## SKILLS

---

- **Programming Languages:** Python, C/C++, C#, .NET Framework, JavaScript, MATLAB, Python, Julia, Angular, NodeJS, Java, SQL, HTML/CSS, PHP, Lua, Flutter/Dart, Latex
- **Hardware Description Languages:** VHDL, Assembly
- **Development Environments:** Visual Studio, Android Studio, Xcode
- **Libraries and Tools:** Qiskit, OpenCV, NumPy, SciPy, Pandas, PyTorch, PCL, Open3D, Pytorch, Keras
- **Cloud & DevOps:** Google Firebase, Docker, Jenkins
- **Version Control and Collaboration:** Git, GitLab, BitBucket, SourceTree
- **Cloud Platforms and DevOps:** Google Firebase, Cloud Compare, Docker
- **Software Testing and Debugging:** Valgrind, GDB, NUnit

## REFERENCES

---

- **Dr. Matthias Gobbert**

Professor

Department of Mathematics, University of Maryland, Baltimore County

Office: MP416 Phone: 410.455.2404

Email: gobbert@umbc.edu

- **Dr. Mohammadhossein Mohammadisiahroudi**

Assistant Professor

Department of Mathematics, University of Maryland, Baltimore County

Office: MP425 Phone: 410.455.2425

Email: mhms379@umbc.edu