

Osama Muhammad Raisuddin

(678)-595-4163 | raisuo@rpi.edu | osamarais.github.io | linkedin.com/in/osama-raisuddin
21 24th St., Troy, NY 12180

EDUCATION

Rensselaer Polytechnic Institute, Troy, NY

January 2019 – December 2023

Ph.D. Candidate for Aeronautical Engineering. Research focus: Quantum Computing and Algorithms.

Middle East Technical University, Ankara, Turkey

September 2013 – July 2018

Bachelor of Science in Mechanical Engineering, Minor in Mechatronics, Full Tuition Scholarship, Dean's Honor List

Coursework: Machine Learning, Parallel Computing, Quantum Mechanics, Quantum Computer Programming, Computational Linear Algebra, Finite Elements (Programming, Theory, Nonlinearities), Fluid Mechanics (CFD, Turbulence), MEMS, Controls Systems, System Dynamics, Microcontrollers

SKILLS

PROGRAMMING: C, Python, MATLAB, CUDA, MPI, Assembly (ARM), GPU Supercomputing

SOFTWARE: SolidWorks, Siemens NX, PyTorch, Keras, D-Wave Ocean, Qiskit, Cirq, LabVIEW, Mathcad, ANSYS, Fluent, Abaqus, Microsoft Office Suite (Word, Excel, PowerPoint), Google Docs and Sheets, LATEX, Tkinter GUI

OS and CLI: Linux, Windows, MacOS, MS-DOS, UNIX Bash, Git, Slurm

HARDWARE: Robotics, Sensing, Control, Actuators, Microcontrollers, Conventional & Rapid Prototyping, CNC, 3D printing

MATHEMATICS: Linear & Tensor Algebra, Optimization, ODEs, PDEs, Finite Element Method, Theorem Proving

BUSINESS OPERATIONS: Customer Discovery, Market Segmentation, Sales Pitching, Leadership

LANGUAGES: English (Fluent), Urdu (Fluent), Hindi (Fluent) Turkish (Intermediate) Arabic (Elementary)

WORK EXPERIENCE & RESEARCH

Rensselaer Polytechnic Institute | Troy, NY

Research Scientist, Jan. 2024 – To Date

- Quantum electronic structure computations for calculation of material properties
- Work with campus leadership to successfully deploy the IBM One quantum computer and organize technical sessions

Rensselaer Polytechnic Institute | Troy, NY

Research Assistant, Sep. 2019 – Dec. 2023

- Implemented scientific computing codes in Python, C and Matlab from academic books and journals
- Developed novel algorithms for scientific computing on quantum computers and programmed quantum computers
- Prepared papers for publication in top-tier journals and presented research at conferences
- Proved mathematical theorems for breakthroughs in scientific computing

Rensselaer Polytechnic Institute | Troy, NY

Teaching Assistant, Jan. 2019 – Sep. 2019

- Concurrently led 3 teams of Teaching Assistants to teach CAD on Siemens NX
- Prepared and graded homework, exams, solutions for the Thermodynamics and Fluids courses
- Conducted regular office hours to assist students in learning key concepts and their applications to real-world problems

Yavuz Research Group | Ankara, Turkey

Undergraduate Researcher, Sep. 2017 – Jun. 2018

- Executed experiments on flow control over delta wings and airfoils using PIV, LDA & HWA
- Designed a high-precision remote controlled stage to improve throughput of the experimental setup

Yapi Destek | Ankara, Turkey

Part-time Consultant, Sep. 2016 – Jan. 2017

- Programmed microcontrollers to collect and wirelessly transmit accelerometer data for building health monitoring

METU MEMS Center | Ankara, Turkey

Mechanical Engineering Intern, Aug. 2016 – Sep. 2016

- Designed a syringe pump to deliver liquid samples to MEMS-microfluidic RF sensors

SciRobot | Ankara, Turkey

Mechatronics Intern, Jun. 2016 – Aug. 2016

- Created an LED matrix facial expression library in collaboration with industrial designers for a healthcare robot

Karachi Tools, Dies, and Molds Center | Karachi, Pakistan

Manufacturing Intern, Jul. 2015 – Sep. 2015

- Prepared report on the manufacturing processes and floor plan of a state-of-the-art dies and tools manufacturing facility

NSF I-Corps | Troy, NY

Entrepreneur, Jul. 2021 – To Date

- Customer Discovery for: Flexible hinge for foldable devices, Applications of speech-to-speech AI models
- Interviewed and networked with CEOs, CTOs, engineers, designers and consumers
- Created prototype mechanism to reduce cost, improve reliability, and enable water/dust-proof foldable electronic devices

ACADEMIC PROJECTS

Deep Learning

Apr. 2018 – To Date

- Investigating a novel 3D-moments loss to train MeshRCNN to reconstruct ShapeNet 3D models from images
- Hoyer measure loss functions and generalizations for compressed sensing and sparse solutions of the prostate cancer dataset
- Trained Deep RNN model to localize predict trajectory of sound source from raw audio signals

USACM Student Chapter

Jan. 2023 – To Date

- Appointed inaugural Chair by the USACM to lead a team of graduate students across 10 universities
- Team accomplishments: Chapter bylaws, Discord server, and events for networking, competitions, seminars and mentorship
- Established a Seminar Series for invited speakers, and planning an entrepreneurship program

Mobile Robots for Education

Jan. 2018 – Jun. 2018

- Led a team of engineers and industrial designers to synthesize a blueprint for educational robots
- Manufactured robots using 3D printing and delivered final product within deadline constraints

Turbine Flowmeters

Oct. 2017 – Jan. 2018

- Assembled and led team of 5 peers to develop insertable and 3D printable turbine flow meters
- Calibrated and benchmarked final design, reduced installation time & labor, parts, and equipment cost via. insertable design

Regenerative Heat Exchanger

Jan. 2017 – Jun. 2018

- Worked in a team of 3 to design a regenerative heat exchanger to recover heat from blast furnace exhaust

Shell Eco-Marathon

Jan. 2014 – Aug. 2014

- Participated in the METU Shell Eco-Marathon team, tasked with meeting safety requirements using finite element simulations

PATENTS

- Creaseless Foldable Displays (USPTO Provisional Patents)
- Insertable Turbine Flowmeter (Turkish Patent Office 2017/23382)
- Thumbwheel for Compact Electronic Devices (In progress)

PUBLICATIONS & CONFERENCES

- FEqa: Finite element computations on quantum annealers, CMAME, Volume 395, 2022, 115014
- qRLS: Quantum Relaxation Method for Linear Systems in Finite Element Problems (under review for publication) (SIAM-NNP 23)
- Plato's Adventures in Flatland: Exponential Increase in Cosine Measures (submitted to The Scientific American)
- qMG: Quantum Multigrid Algorithm (USNCCM17 and Coupled Conference)
- Quantum Algorithm for Inverse Kinematics of Binary Actuated Robots (require hardware access for results, in progress)
- Generalized Lanczos Derivative for Arbitrary Precision, Dimensions, and Degree (manuscript in preparation for submission to Journal of Computational and Applied Mathematics)
- FEqa: Extension to nonlinear problems and multigrid (require hardware access for results, in progress)

HONORS & AWARDS

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| • R. J. Melosh Medal Finalist '22 | • Rensselaer Founders Award of Excellence |
| • Change the World Challenge '23 Winner at Rensselaer | • Arcelik Design Challenge Winner |
| • IonQ, Microsoft QC Research Credits Award 22-23 | • IBM Qiskit GSS 22 Quantum Excellence |
| • USACM, IACM, SIAM Travel Awards | • Belsky Award for Computational Science and Engineering |

LEADERSHIP AND EXTRACURRICULARS

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| • Global Chair, USACM Student Chapter | • Member of the RPI Student Union Executive Board |
| • Squash, Racquetball, Hiking, and Motorcycling | • Philosophy, Piano, Literature, Entrepreneurship |
| • Volunteer at Al-Hidaya Iftar Soup Kitchen | • Student mentorship for scholarships, graduate studies |

CONFERENCES

- 2023 US National Congress on Computational Mechanics, Albuquerque NM, Awarded USACM Travel Grant
- 2022 World Congress on Computational Mechanics, Japan; Awarded IACM Travel Grant
- 2023 Society for Industrial and Applied Mathematics Conference on Computational Science and Engineering, Netherlands; Invited to give a talk on quantum computing for scientific and engineering computation
- 2023 Coupled Conference, Greece
- SIAM-NNP 2023, Student Travel Award