Samia Zaman Mahmood

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Education:

- Bellarmine University, 2001 Newburg Rd., Louisville, KY 40205
  - Dual Major: Physics and Data Science (Bachelor of Science)
  - Minor: Mathematics
  - Major GPA (Physics): 4.00; Major GPA (Data Science): 4.00
  - Cumulative GPA: 4.00
  - Expected Graduation Date: May 2026

- Eastern High School, 12400 Old Shelbyville Rd, Louisville, KY 40243
  - Program: Advanced Placement and Honors Program (Valedictorian)
  - Cumulative GPA: 4.33 (weighted out of 4.00)
  - Graduation Date: May 2022 (Advanced High School Diploma)

Software Skills:

- Web development using HTML and CSS; Microsoft Word, Excel and PowerPoint; Maple; Python; JavaScript; GitHub; Jupyter Notebook; Data Visualization using Tableau; SQL; R/RStudio; Stata; IORTutorial; C++ and C#; Microsoft Visual Studio, Unity, and Expo.; Mobile App Development using React Native; Canva; Adobe Photoshop; Video Editing using WeVideo; Visual Studio (VS) Code; DS9; Linux OS; OpenMPI, Bloomberg Terminal.

Awards and Honors:

- Scarlet Scholarship - Bellarmine University (November 2021 - Present).
- Joan and Lee Thomas Multicultural Grant – Bellarmine University (November 2021 - Present).
- Bellarmine Trustee Scholar – Bellarmine University (November 2021 - Present).
- Kentucky Educational Excellence Scholarship (KEES) (Fall 2022 – Present).
- Bellarmine Distinguished Scholar - Bellarmine University (2022).
- Dean's List - Bellarmine University (Summer 2022 - Present).
- First Place Award for the Top Presenter at the 2022 Kentucky Academy of Science (KAS) Oral presentation session in the Computer Science Category (November 2022).
- First Place Award for the Top Presenter 2023 Kentucky Academy of Science (KAS) Oral presentation session in the Physics and Astronomy Category (November 2023).
- Travel Grant Award to Present at the 2023 Annual Southeastern Section of the American Physical Society (SESAPS) Meeting, held at Eastern Kentucky University (November 11, 2023).
- Bellarmine Univ. STEM Maker Fair Certificate - funded by the NSF Noyce Grant (March 2024).
- Top Presenter at the Virtual Poster Session I - 2024 Annual American Physical Society (APS) Meeting (April 17, 2024).
- Travel Grant Award to present a talk at the Rubin Observatory (LSST) Community Workshop at Stanford University (July 22 to July 27, 2024).
- Arts and Craftsmen Award Recipient for artwork presented at the 2025 Student Art and Creativity Showcase at McGrath Gallery in Bellarmine University (April 17, 2025).

Presentations:

1. 30-Node Raspberry Pi4 HTC (High Throughput Computing) Beowulf Cluster, talk presented at the 2022 Annual Kentucky Academy of Science (KAS) Meeting, held at Morehead State University, November 12, 2022.
2. Showcased my research work on the Muon Detector and 30-Node Raspberry Pi4 HTC (High Throughput Computing) Beowulf Cluster at the 2023 STEM Maker Fair event, held at Bellarmine University, March 16, 2023.
3. 30-Node Raspberry Pi4 HTC (High Throughput Computing) Beowulf Cluster, poster presented at the Spring 2023 Celebration of Student Research and Creativity event, held at Bellarmine University, April 20, 2023.
4. Measurement of Muon Flux, Muon Lifetime, and Fermi Coupling Constant Using a Cosmic Ray Muon Detector, talk presented at the 2023 Annual Kentucky Academy of Science (KAS) Meeting, held at Northern Kentucky University, November 4, 2023.
5. 30-Node Raspberry Pi4 HTC (High Throughput Computing) Beowulf Cluster, talk presented at the 2023 Annual Southeastern Section of the American Physical Society (SESAPS) Meeting, November 11, 2023.
6. Rover the Robotic Dog – Showcased and presented my work on the Robotic Dog at the Spring 2024 Noyce Knights Scholars Program (NKSP) Orientation Meeting, held at Bellarmine University, January 27, 2024.
7. Showcased my work on the Robotic Dog at the 2024 STEM Maker Fair event, held at Bellarmine University, March 7, 2024.
8. Properties of the Weak Interaction from Cosmic Ray Muons, virtual talk presented at the Kentucky Area Astronomical Society (KAAS) meeting, March 15, 2024.
9. 30-Node Raspberry Pi4 HTC (High Throughput Computing) Beowulf Cluster, virtual poster presented at the 2024 Annual American Physical Society (APS) Meeting, April 3, 2024.
10. Determining the Properties of the Weak Interaction Using a Cosmic Ray Muon Detector, virtual poster presented at the 2024 Annual American Physical Society (APS) Meeting, April 5, 2024.
11. Robotic Dog Project, presented at the 2024 Celebration of Student Research and Creativity event, held at Bellarmine University, April 18, 2024.
12. Object-Brightness Analyzer for Rubin Observatory (OBARO) Using Machine Learning (ML), talk presented at the Rubin Observatory (LSST) Community Workshop, held at SLAC (Stanford Linear Accelerator Center), July 22 – July 27, 2024.
13. Data Science Research Project: Search for Earth-Like Exoplanets Using Data Analytics, talk presented at the 2024 Annual Kentucky Academy of Science (KAS) Meeting, held at Kentucky State University, November 1, 2024.
14. Object-Brightness Analyzer for Rubin Observatory (OBARO) Using Machine Learning (ML), talk presented at the 2024 Annual Kentucky Academy of Science (KAS) Meeting, at Kentucky State University, November 2, 2024.
15. Showcased my work on the Robotic Dog at the 2025 STEM Maker Fair event, held at Bellarmine University, March 27, 2025.
16. Object-Brightness Analyzer for Rubin Observatory (OBARO) Using Machine Learning (ML), virtual talk presented at the American Physical Society (APS) Global Physics Summit, April 11, 2025.
17. Data Science Research Project: Search for Earth-Like Exoplanets Using Data Analytics, poster presented at the 2025 Celebration of Student Research and Creativity event, held at Bellarmine University, April 22, 2025.

18. Artwork presented at the 2025 Student Art and Creativity Showcase at McGrath Gallery at Bellarmine University, April 17, 2025.
19. Guest speaker on behalf of MSA, talk presented at the Annual 2024 Multicultural Graduation event, held at Bellarmine University, May 2024.

Publication (Submitted):

- Dr. Cody Nygard, Dr. Akhtar Mahmood, Dr. Kristin Cook, Dr. Jung Colen, and Samia Mahmood, *Undergraduate STEM Students' Informal Education Internship Experience and its Impact on Interest in STEM Teaching,* submitted for publication to the Journal of Research in STEM Education, 2025 (under review).

Paper in Progress:

- Samia Mahmood and Dr. Akhtar Mahmood, *Determining the Properties of the Weak Interaction Using a Cosmic Ray Muon Detector.* In Preparation.
- Samia Mahmood, Jordan Dowdy, Dr. Akhtar Mahmood, *30-Node Raspberry Pi4 HTC (High Throughput Computing) Beowulf Cluster*. In Preparation.
- Samia Mahmood, Inara Rahman, Dr. Sayani Sarkar, and Dr. Akhtar Mahmood, *Discovering Earth 2.0: A Data Driven Exploration of NASA's Exoplanet Dataset*. Conference Paper in Progress for submission to IEEE International Conference on Artificial Intelligence, Computer, Data Sciences and Applications (ACDSA 2026).

Featured in Media:

1. Featured on Louisville WDRB channel's news segment that showcased the Robotic Dog which I programmed and calibrated for the STEM Maker Fair event at Bellarmine University , March 7, 2024.
2. Featured on Louisville WAVE3 news segment that showcased the Robotic Dog which I programmed and calibrated for the STEM Maker Fair event at Bellarmine University , March 7, 2024.
3. Featured in the Bellarmine Student Spotlight segment of the Bellarmine IMPACT Newsletter, November 13, 2024.

Work Experience:

1. *Math Tutor*, Math Center-Bellarmine University (August 2025 – Present) – Tutor for Calculus I, Calculus II, Calculus III, Statistics, Business Calculus, College Algebra. Assisted with exam preparation and one-on-one academic help.
2. *Physics Tutor*, Student Success Center-Bellarmine University (August 2023 - Present) – Tutor students for calculus-based University Physics I and II, algebra-based College Physics I and II courses. Assisted with exam preparation and one-on-one academic help at the Student Success Center at Bellarmine University.
3. *Summer Intern*, Kambaii Health (Summer 2021) - Developed marketing materials using PowerPoint and Canva for Kambaii Health services and assisted with writing the text for Kambaii Health's website.
4. *Intern*, Onera AI Technologies, CA (February 2024 – May 2023) – Assisted with the logo design and development for ONERA AI Technologies.
5. *Student Teacher Aid*, Eastern High School, Louisville, KY (August 2021 - May 2022) – Served as an assistant to the teacher for the Pre-Calculus course, graded papers for the teacher, and

assisted students at Eastern High School.

<u>Research Work</u> (Physics, Astrophysics/Astronomy, Data Science/Computer Science):

1. Cosmic Ray Physics - Conducted a research project to measure the muon flux, muon lifetime, and Fermi coupling constant to determine the properties of the Weak interaction using a Muon Detector at Bellarmine University (Fall 2022 – Fall 2023).

2. Astronomy – Analyzed NASA's large exoplanet raw dataset comprising over one million data parameters using data analytics and perform data preprocessing to refine the raw dataset. Wrote data visualization code in Python and incorporated various data filtering techniques using statistical methods and used complex querying to identify key features of exoplanets to compare to Earth's parameters to identify potentially habitable Earth-like and Super-Earth like exoplanets orbiting a Sun-like (Type-G) star in the Milky Way Galaxy's habitable zone (HZ) (Summer 2024 – Summer 2025).

3. Robotics - Calibrated and programmed a robotic dog so that it can perform certain actions upon receiving commands. (Spring 2024 – Fall 2024).

4. High Performance Parallel Computing – Conducted research work to analyze the performance of a custom-made table-top 30-Node 120-core Raspberry Pi4 (nicknamed Orchard) Beowulf Cluster that was used to conduct various CPU-intensive computational tasks, which was built at a fraction of the cost compared to the conventional rack-mounted clusters. I tested and studied the capabilities of Raspberry Pis to determine how well the Raspberry Pis perform in a cluster computing environment for parallel processing computational tasks using OpenMPI (Fall 2022 -Fall 2023).

5. Astrophysics – Developed a software called Object-Brightness Analyzer for Rubin Observatory (OBARO) in Python using the Gaussian Mixture (GMM) Model machine learning algorithm for Rubin Observatory's LSST-PhoSim (Photon Simulator) project. PhoSim is a simulation tool that can produce realistic simulated LSST images by converting photons into pixels. OBARO can scan and detect all astronomical objects from the PhoSim Rubin(LSST)-Survey-#1 data sets (FITS files) and the Rubin-Data Preview (DP0.2) simulation data sets and calculate the mean pixel value, mean pixel value error, surface brightness, surface brightness error, area, pixel count for both the object and its background, as well as the flux and magnitude of all astronomical objects. The PhoSim Rubin(LSST)-Survey-#1 data sets were generated using Bellarmine University's Tier2 Grid Supercomputer that is linked to the Open Science Grid (OSG) cyberinfrastructure. (Summer 2024 – Fall 2024).

6. STEM Education – Worked on a STEM Education research project - *Undergraduate STEM Students' Informal Education Internship Experience at the Kentucky Science Center and its Impact on Interest in STEM Teaching*. I conducted the data analysis to evaluate the interns' facilitation skills and performance trends across multiple cohorts - identifying key patterns and insights. In addition, I developed a custom visualization software written in Python that have named as "Viz Plot", to graphically display the results from the complex datasets. This software enhanced the clarity and accessibility of performance metrics, enabling more effective communication of results to both technical and non-technical audiences. This work was funded NSF's Noyce Program to Bellarmine University titled - Recruiting,

Preparing, and Supporting Highly Qualified Kentucky Science (Grant # 2149370). (Summer 2023 – Summer 2024).

7. High Energy Physics – Working on a research project to search for the Z-Prime Boson (in the electron-positron and muon-antimuon decay modes) using a subset of the LHC-ATLAS datasets using Hypatia and Camelia. (Fall 2025 – Present).

8. Particle Physics – Working on a research project to develop a table of all the possible ground-state Standard Model subatomic particles - quarks, leptons, mesons, baryons and The force-carrier particles, including the Higgs Boson with all quantum properties – Mass (if measured), Lifetime (if measured) Spin, Total Angular Momentum, Parity, Charge-Conjugation, Isospin, Hypercharge, Baryon, and Lepton number (L). This table of Standard Model ground-state subatomic particles will be like the periodic table of elements which can be hung next to the periodic table of elements in Physics classrooms and labs. (Fall 2025 – Present).

Extra-Curricular and Service Activities:

- Member of the President's Advisory Board for Mission Committee (October 2025 – Present).
- Member of the Rubin-LSST Dark Energy Science Collaboration (DESC) (July 2025 - Present).
- Member of the Rubin Observatory's Rubin Undergraduate Network (RUN) (July 2024 - Present).
- Member of the Kentucky Area Astronomical Society (KAAS) (March 2024 - Present).
- Member of the Kentucky Academy of Science (KAS) (August 2022 – Present).
- Member of the American Physical Society (APS) (September 2023 - Present).
- Member of the Chemistry Club (August 2023 - Present).
- Member of the Bellarmine Eureka Learning Community (August 2022 - Present).
- Member of the Physics Club (August 2022 – Present).
- Member of the Identity Registered Student Organization (RSO) Council (May 2024 – Present).
- Member of the Hispanic Organization Latino Alliance (HOLA) (August 2023 - Present).
- Participated and Assisted in setting up the on-campus STEM Maker Fair (March 2023).
- Participated and Assisted in setting up the on-campus STEM Maker Fair (March 2024).
- Member of the Asian and Asian American Student Union (AAASU) (August 2022 - Present.
- Member of the Bellarmine University Center for Community Engagement (August 2022 Present).
- Co-President on the Executive Board for the Bellarmine University Muslim Student Association (MSA) (May 2024 – Present).
- Organized and hosted for an on-campus collaborative event between the Bellarmine Catholic Association and Bellarmine Muslim Student Association (MSA) (March 2024).
- Public Relations Chair and Social Media Coordinator on the Executive Board for the Bellarmine University Muslim Student Association (MSA) (August 2022 – May 2024).
- Member of the Bellarmine University Multicultural Dance Team (August 2022 - Present).

Workshops Attended:

- Think Tank for Data Science and Data Analytics at Bellarmine University (March 21, 2024).
- Rubin LSST Community Workshop at Stanford University (July 22 – July 27, 2024).
- 2024 Midwest Annual Robert Noyce Teacher Scholarship Program Conference on Fostering STEM Futures: Resiliency and Assessment Practices, St. Louis, MO (October 18 - 20, 2024).

Languages:

- English, Bengali, and Intermediate Spanish.