Muhammad **Asif** Ali

Curriculum Vitae

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EDUCATION

2025-2029	Doctor of Philosophy Crop Sciences: Bioinformatics Department of Crop Sciences University of Illinois Urbana-Champaign
2024-2025	Doctor of Philosophy (Position terminated due to budget cuts) Department of Biological Sciences (BISI) Computational Biology, Bioinformatics, and Genomics University of Maryland College Park
2022-2024	Master of Science (4.0/4.0) Bioinformatics Department of Crop Sciences University of Illinois Urbana-Champaign
2017-2021	Bachelor of Science (3.8/4.0) Bioinformatics Department of Biosciences COMSATS University

PUBLICATIONS

4. **Ali, M. A.** (2024). AlphaFold2 reveals structural patterns of seasonal haplotype diversification in SARS-CoV-2 structural protein variants [Thesis, University of Illinois at Urbana-Champaign]. https://www.ideals.illinois.edu/items/131533

3. **Ali, M. A.**, & Caetano-Anollés, G. (2024). AlphaFold2 Reveals Structural Patterns of Seasonal Haplotype Diversification in SARS-CoV-2 Nucleocapsid Protein Variants. Viruses, 16(9), 1358. https://doi.org/10.3390/v16091358

2. **Ali, M. A.**, & Caetano-Anollés, G. (2024). AlphaFold2 Reveals Structural Patterns of Seasonal Haplotype Diversification in SARS-CoV-2 Spike Protein Variants. Biology, 13(3), 134. https://doi.org/10.3390/biology13030134

1. Tomaszewski, T., **Ali, M. A.**, Caetano-Anollés, K., & Caetano-Anollés, G. (2023). Seasonal effects decouple SARS-CoV-2 haplotypes worldwide. F1000Research, 12, 267. https://doi.org/10.12688/f1000research.131522.1

RESEARCH EXPERIENCE

2025-Present *Graduate Research Assistant*; *University of Illinois Urbana Champaign, IL, USA*
Mentor: Dr. Gustavo Caetano-Anolles, Department of Crop Sciences
Subject: Protein evolution, finding signals of most ancient amino acids using molecular measurements.

2024-2025 *Research Rotations; University of Maryland College Park, MD, USA*

- Simon Lab: Ran permutation analysis of various RNA sequences to determine if thermostability of RNA loops can impact RNA binding to transcription factors experimentally.
  Mentor: Dr. Anne Simon, Department of Molecular and Cellular Biology
- Pierce Lab: Benchmarked ESM-IF, ProteinMPNN, FoldX, and other tools to see if we can accurately predict binding capability between antibody-antigen complexes using their output scores.
  Mentor: Dr. Brian Pierce, Institute for Bioscience and Biotechnology Research
- Johnson Lab: Analyzed different ML techniques to filter out modern contaminant DNA from ancient DNA samples.
  Mentor: Dr. Phillip Johnson, Department of Biology

2022-2024 G*raduate Research Assistant*; *University of Illinois Urbana Champaign, IL, USA*
Mentor: Dr. Gustavo Caetano-Anolles, Department of Crop Sciences
Subject: Analysis of haplotypic diversification of SARS-CoV-2 structural proteins using AlphaFold2.

- Collaborated with researchers across departments to conduct an in-depth analysis of the structural implications of SARS-CoV-2 mutations, targeting haplotypes previously unexplored in current research literature.
- Utilized AlphaFold2, Chimera, and US-align to conduct detailed analyses of 13 Haplotypes and 3 Variants of Concern of the SARS-CoV-2 Spike-protein, resulting in the identification of key structural changes that could impact virus infectivity and transmission rates.
- Conducted comprehensive analyses elucidating the intricate structural and functional ramifications among protein mutations, contributing to a deeper understanding of molecular dynamics and disease mechanisms.

2021 *Student Researcher, COMSATS University, Islamabad, Pakistan*
Mentor: Dr. Malik Nadeem Akhtar, Department of BioSciences
Thesis Title: Development of a Workflow for the Large Scale Processing of Cancer-Specific Tandem Mass Spectrometry Datasets.

- Developed a robust pipeline tailored for the analysis of tandem mass spectral data, surpassing standalone solutions by up to 30% in protein identification efficiency. Integrated permutation testing using a decoy database and False Discovery Rate (FDR) analysis to ensure statistical robustness and mitigate false positives.
- Concluded that integrating multipronged methodologies and heuristic techniques yields superior protein identification rates with heightened confidence levels.

Proficiencies:

Programming	Python, R, SAS, BASH (Limited: C++, Java, C#)
Libraries	Numpy, Pandas, Matplotlib, Sklearn, Scipy, Pytorch
Software	AlphaFold, LocalColabFold, Chimera, PyMol, US-align, TM-align, Pajek, PAUP, IQ-Tree, Galaxy, OMSSA, MSGF+, Tide, X!Tandem, BindCraft, ProteinMPNN, ESM-IF, FoldX
Databases	SQL, mySQL, GCP
General lab skills	PCR, Gel Electrophoresis, Microscopy, Bacterial plating, Spectrophotometry, greenhouse management

TEACHING EXPERIENCE

2025-Present *Teaching Assistant*; *University of Illinois Urbana Champaign, IL, USA*
Mentor: Dr. Jennifer Nelson
Course: HORT 105 (Vegetable Gardening Lab)

- Co-instructor for two lab sections (~30 students per lab), responsible for taking students to the greenhouse and helping them with their projects and grading assignments.

2024-2025 *Teaching Assistant; University of Maryland College Park, MD, USA*
Mentor: Dr. Swarna Mohan, Department of Cell Biology & Molecular Genetics
Course: BSCI171 (Cellular and Molecular Biology Lab)

- Primary instructor for two lab sections (24 students per lab) that taught students wet lab skills such as bacterial plating, microscopy, spectrophotometry, and PCR.
- Organized multi-week research experiments to help students understand the scientific process and how to write a research paper and present their findings.
- Received excellent student ratings for both semesters taught, ranging from 4.6 to 4.8 out of 5.

2024 *Teaching Assistant; University of Illinois Urbana Champaign, IL, USA*
Mentor: Dr. Martin Bohn, Department of Crop Sciences
Course: CPSC116 (The Global Food Production Web)

- Facilitated semester long group projects and held office hours for students (Class size: 150).
- Provided bi-weekly summaries of student answers to discussion posts as a presentation before lectures relating their queries and course content to real world applications.
- Lead lecture independently for one session.
- Graded weekly assignments and project progress reports.

2023-2024 *Teaching Assistant; University of Illinois Urbana Champaign, IL, USA*
Mentor: Dr. Jennifer Nelson
Course: HORT 105 (Vegetable Gardening Lab)

- Co-instructor for 1 lab section (~30 students) where I held interactive lab activities and facilitated group discussions, resulting in an increase in student engagement and participation.

- Managed grading of student assignments with detailed feedback, maintaining a high average student satisfaction rating of 4.6 out of 5.
- Assessed and addressed students' learning needs during one-on-one consultations, leading to a 10% improvement in overall exam scores.

2023 *Teaching Assistant; University of Illinois Urbana Champaign, IL, USA*
Mentor: Dr. Kris Lambert, Department of Crop Sciences
Course: PLPA 200 (Plants, Pathogens, and People)

- Graded weekly assignments and held office hours (25 students).
- Maintained a student satisfaction rate of 4.5/5.

AWARDS, HONORS, AND SCHOLARSHIPS

2025 Student Group of the Year Award. Awarded to the student organization 'Queer Muslim' founded by me in service of the LGBTQ Muslim community at University of Maryland College Park, USA.

2025 Deans Fellowship. Financial supplement awarded to students based on academic merit to boost program retention rates. University of Maryland College Park, USA. Award: $2,500

2024 Deans Fellowship. Competitive award intended for new PhD students that show academic merit based on past accomplishments. University of Maryland College Park, USA. Award: $10,000.

2024 Excellent TA for HORT105 and CPSC116. Center for Innovation in Teaching & Learning (CITL)Graduate Academy: University of Illinois Urbana-Champaign. USA.

2021 Institute Gold Medal. Awarded for ranking highest across all 6 Campuses of COMSATS University for the BS Bioinformatics program. COMSATS University, Islamabad, Pakistan.

2021 Campus Gold Medal. Awarded for ranking highest for the BS Bioinformatics program. COMSATS University, Islamabad, Pakistan.

2018 PM's National Laptop Scheme. A laptop was awarded in a nationwide merit competition for academic excellence. Higher Education Commission, Pakistan.

SERVICE AND OUTREACH

2023 *Volunteer Instructor*
CITL Grad Academy University of Illinois Urbana-Champaign

- Led instructional sessions at The Graduate Academy for College Teaching, imparting expertise in classroom instruction to empower new TAs with essential strategies and valuable experience, fostering a culture of effective and inclusive teaching practices.
- Guided Microteaching sessions, mentoring new TAs in refining their teaching abilities and offering constructive feedback, while personally gaining valuable insights and knowledge in the process.

2023 *Volunteer*
Etc Coffeehouse, Wesley Church, Urbana, Illinois, USA

- Helped out with managing the student café on Wednesday nights.

2019 *Foster Fellow*
Foster Learning Pakistan (FLP), Islamabad, Pakistan

- Organized workshops in underdeveloped schools regarding future careers and opportunities
- Lead charity drives to collect donations for schools in underprivileged areas
- Organized a tree plantation drive

2017 *Survey Team Head*
Chadar Society, COMSATS University Islamabad, Pakistan

- Led a team to conduct surveys in the slums inhabited predominantly by religious minorities
- Participated in multiple charity drives to distribute clothes and food in slum areas for Christmas

LEADERSHIP

2024-2025 *President*
Queer Muslim, University of Maryland College Park

- Founded QM to provide LGBTQIA+ Muslim students a safe space to build community.
- Host semi-weekly gatherings to help students find others like them and build friendships.
- Organized a Ramadan dinner for QM members with the help of donors.

2024 *Graduate Student Representative*
Inclusion, Diversity, Equity and Access Committee, Department of Crop Sciences, University of Illinois Urbana-Champaign

- Provided strategic guidance and consultation to IDEA committee faculty members on matters pertaining to departmental inclusivity, fostering a more diverse and equitable academic environment.
- Partnered with fellow student representatives to spearhead initiatives aimed at enhancing student engagement and understanding student needs, facilitating a more responsive and student-centric campus community.

2023 *President*
Queer Muslim, University of Illinois Urbana-Champaign

- Established QM catering to LGBTQIA+ Muslims at UIUC, fostering inclusivity and community support unprecedented in university history.
- Organized Ramadan events promoting interfaith harmony among students of diverse faiths and sexual orientations, fostering understanding and unity within the community.
- Partnered with other student organizations and cultural centers to co-host inclusive events, fostering cross-cultural dialogue and collaboration within the university community.

EMPLOYMENT AND EXTRACURRICULARS

2023 *Speaking Queerly Panelist*
Gender and sexuality Resource Center, University of Illinois Urbana Champaign

- Co-lead a panel discussion on issues facing the LGBTQIA+ community with respect to interpersonal relationships and navigating life as a queer person at the UIUC

2021 *Jr. Software Developer*
Z-Axiss, Islamabad, Pakistan

- Managed a complex legacy code base, seamlessly integrating new features to meet evolving client needs while ensuring system stability and performance.
- Engineered robust Django APIs to enable efficient and accurate data retrieval, enhancing system performance and user experience.
- Partnered with the Quality Assurance team to identify and address software defects promptly, fostering a collaborative environment focused on continuous improvement.
- Spearheaded the standardization of bug reporting procedures office-wide, optimizing workflow efficiency and significantly reducing error rates through enhanced communication and accountability.

2018 *Lead Performer*
China Study Centre, COMSATS University

- Led a performance team for the arrival of the Chinese Ambassador to Pakistan
- Arranged rehearsals throughout the first half of the semester to train other team members