

Fazle Rabbi Dayeen

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Education

Illinois Institute of Technology

Jan 2020- Present

Doctoral Researcher
Department of Physics

University of Illinois Chicago

Aug 2014- May 2019

Graduate Student
Department of Physics

University of Dhaka

Degree issued: Apr 2013
Exam held in: Mar 2012

Master of Science
Department of Theoretical Physics

University of Dhaka

Degree issued: Mar 2012
Exam held in: Sep 2010

Bachelor of Science (Hons.)
Department of Physics
Minor: Chemistry, Mathematics, Statistics

Research Experience

Project

2020-Present

Analyzing the property of pulmonary surfactant at high temperature using GIXD (Grazing incident X-ray diffraction).

- The primary goals of this research will be elucidating the role of individual molecules in pulmonary surfactants and their cooperation at the molecular scale and their effects on the collapse of mammal lungs. GIXD was used to collect the experimental data and Python and statistical software were used to analyze the data. The project was funded by the National Institutes of Health (HL130130 and 136734).

Project

2019-2020

Building a computational model to identify the emerging topics from the scientific literature.

- We used latent Dirichlet allocation (LDA)—a probabilistic approach to retrieve topics from the abstract of over 35,000 publications on industrial ecology to uncover the main topics (consisting of new terms) that naturally emerge from them. The evolution in time of the importance of some emerging topics is then analyzed based on their relative frequency. Overall, a rapid growth in climate change publications is observed. The project was funded by the National Science Foundation, Grant/Award Number: 155173.

Project

2018-2019

DFT+U Simulation of LaNiO_3 using Python and the Vienna Ab initio Simulation Package (VASP).

- We computed the structural property, the correlated electronic structure, and the vacancy energetics of LaNiO_3 thin films using computer simulation. In this project, the Vienna Ab-initio simulation package (VASP) was used to perform the Density Functional Theory (DFT) plus U calculations on the thin films of LaNiO_3 .

Project

2016

Cause-Effect Pair Detection: A classification based approach.

- We attempted to build a classification-based approach to solve the cause-effect pair detection problem and thus address the importance of attributing causes to effects which is pervasive in almost every aspect of our daily life involving human reasoning and decision-making.

Project

2013-2014

Application of Aboav-Weaire and Lewis' laws and calculation of Self-similarity in the weighted planar stochastic lattice.

- In this study, we show that the block size distribution function in the weighted planar stochastic lattice (WPSL) exhibits dynamic scaling. We also checked if the WPSL obeys the Lewis and the Aboav-Weaire laws by running simulations written in C++ programming language.

Project

2012-2013

Analysis of constraint structure of coupling of vector gauge field to a massive tensor field in the presence of pseudoscalar and a scalar mass term.

- The structural property of an atom can be explained using subatomic particles that carry energy and forces. We used the mathematical framework of quantum field theory to study the constraint structure of coupling of vector gauge fields in the presence of other fields for this thesis.

Project

2009

Generating and visualizing the fractal property of Julia-Mandelbrot set using C++ and Gnuplot.

- The Julia-Mandelbrot set is one of the most famous objects in computational physics and modern mathematics. We developed a C++ code that generates and plots the set by iterating a simple function on the points of the complex plane.

Journal publications

- **Dayeen, Fazle**; Brandner, Bret; Bu, Wei; Hall, Stephen; Gidalevitz, David, *Bond-Orientational Order in a Mimic of Pulmonary Surfactant*, Manuscript ID: am-2023-172475 submitted in ACS Applied Materials & Interfaces. (November 2023)
- **Fazle R Dayeen**, Bret A Brandner, Michael W Martynowycz, Kamil Kucuk, Michael J Foody, Wei Bu, Stephen B Hall, David Gidalevitz, *Effects of cholesterol on the structure and collapse of DPPC monolayers*, Biophysical Journal, Volume 121, Issue 18, Pages 3533-3541, Publisher: Elsevier. (September 2022)
- **F.R. Dayeen**, A.S. Sharma, Sybil Derrible, *A Text Mining Analysis of the Climate Change Literature in Industrial Ecology*, Journal of Industrial Ecology, Volume 24, Issue 2, Special Issue: Industrial Ecology of Climate Change Adaptation and Resilience, Pages 276-284. (April 2020)
- **F.R. Dayeen**, M.K. Hassan, *Multi-multifractality, dynamic scaling and neighborhood statistics in weighted planar stochastic lattice*, Chaos, Solitons & Fractals, Volume 91, Pages 228-234, ISSN 0960-0779. (October 2016)
- **F.R. Dayeen**, M.K. Hassan, *Self-similarity, Aboav-Weaire's and Lewis' laws in weighted planar stochastic lattice*, Preprint arXiv:1409.7928v1. (September 2014)

Conference presentations

- **Fazle R Dayeen**, Bret A Brandner, Stephen B Hall, David Gidalevitz, *Role of cholesterol in pulmonary surfactant at ambient and physiological temperatures*, Biophysical Journal, Volume 122, Issue 3, Pages 84a, Publisher: Elsevier. (February 2023)
- **Fazle Dayeen**, Bret Brandner, Stephen B Hall, David Gidalevitz, *The interfacial structure of pulmonary surfactant at physiological temperatures*, Biophysical Journal, Volume 121, Issue 3, Pages 489a, Publisher: Elsevier. (February 2022)

Work experience

Illinois Institute of Technology
Teaching Assistant

Aug 2022 - Present
Chicago, IL

- Collaborate with course instructor and design strategic lesson plans to accommodate multiple learning styles.
- Train undergraduates in using computational programming tools to analyze and solve physics challenges.
- Prepare and organize educational materials, including worksheets, and class quizzes.

Illinois Institute of Technology

Jan 2021- May 2022

Research Assistant

Chicago, IL

- Perform literature review and stay current in the latest advancements in the field of Soft condensed matter physics and lattice structure analysis.
- Assist in preparing research presentations and posters for the conference.
- Prepare samples, conduct experiments, and compile data at Argonne National Laboratory.
- Analyze collected data and prepare technical reports.
- Participate in weekly research group meetings and contribute to discussions on project progress and strategies.

Illinois Institute of Technology

Jan 2020 - Dec 2020

Teaching Assistant

Chicago, IL

- Guide undergraduate students with their lab experiments and data analysis.
- Tutor students who need additional assistance with their lab experiments, quizzes, and assignments.
- Attend meetings, reply to emails, and hold office hours.

University of Illinois Chicago

2014-2019

Teaching Assistant

Chicago, IL

- Facilitate lab sessions to aid students in understanding the materials for approximately 50 students.
- Ensure laboratory safety protocols are followed and maintain an organized workspace.
- Proctor and grade exams and keep records of the students' grades.

University of Dhaka

2012 - 2013

Research Assistant

Dhaka, Bangladesh

- Collaborate with the professor and his Ph.D. student and contribute to the development of research methodologies and design.
- Develop a programming model, run simulations, and collect data.
- Prepare plot, data table and compose draft for journal publication.

Awards and Achievements

- Awarded the Research Assistant position at the Center for Molecular Study of Condensed Soft Matter within Illinois Tech, contributing to the project from January 2021 to May 2022.
- Standing among exceptional graduate researchers at the Lewis College of Science and Letters Research Day at Illinois Tech, my research poster emerged victorious, securing the coveted 3rd place Lewis College Award.

Leadership activities

Graduate Student Council (UIC)

Aug 2016 - May 2017

Departmental Representative

Represent department's Graduate students in many different committees and meetings throughout the year and support Graduate students by hosting academic seminars and workshops.

Trade Winds

Aug 2017 - Dec 2017

Leader of Team Uno

Active participant of intercultural friendship program between international students and U.S. students.

Skills

- **Scientific computing:** Wolfram Mathematica, Gnuplot, OriginPro.
- **Programming Language:** C, C++, Python.
- **Others:** Crystal structure analysis, Material property analysis, Data analysis, Computational modeling, synthesizing information.