

EFFAT FARHANA

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<https://effat.github.io/>

RESEARCH INTERESTS

- Designing Data Mining, Artificial Intelligence (AI), and Machine Learning (ML) methods addressing unique challenges in specific application domains, such as education and healthcare.
 - Empirical software engineering research, particularly mining software repositories to extract information that is useful for software engineers, educators, and researchers.
 - Publications in EAAI@AAAI, ICLR- Tiny Track, GECCO, ICSE, and top domain conferences, such as EDM and L@S. Reviewer for NeurIPS, EMNLP, EAAI@AAAI, ICLR- Tiny Paper, and AIED.
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EDUCATION

- **Doctor of Philosophy (Ph.D.) in Computer Science** Aug 2015 - April 2021
 - Dissertation title: “Science Reading Behavior of Middle School Students within a Digital Literacy Platform”
 - Adviser: Dr. Collin F. Lynch
 - Committee: Dr. James Lester, Dr. Noboru Matsuda, and Dr. Teomara Rutherford
 - North Carolina State University, Raleigh, NC, USA
 - **Bachelor of Science (B.Sc.) in Computer Science and Engineering** Feb 2011
 - Bangladesh University of Engineering and Technology, Dhaka, Bangladesh
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AWARDS & HONORS

- **Rising Star in Data Science- Jan 2021, University of Chicago.**
For my Ph.D. work. organized by the Center for Data and Computing (CDAC), University of Chicago.
- **Scholarship by ACM Richard Tapia Celebration of Diversity in Computing, 2020**
To present a poster based on my Ph.D. work in ACM Student Research Competition.
- **Travel award**
To attend the Women in Machine Learning (WiML) workshop, co-located with NeurIPS 2020 (virtual).
- **Travel award**
For [CRA-WP Widening Participation Early and Mid Career Mentoring Workshop, 2020](#)
- **Scholarship by Women in Computer Science (WiCS), NC State**
To attend Grace Hopper Conference, 2018.
- **Dean’s List Award**
Received this award for achieving academic excellence for six semesters during the Bachelor’s program in the Bangladesh University of Engineering and Technology.
- Attended Computer and Information Science and Engineering (CISE) CAREER Proposal Writing workshop Spring 2022

EMPLOYMENT HISTORY

- **Postdoctoral Research Scholar** Jul 2021 - Present
Department of Computer Science, Vanderbilt University Nashville, TN
 - **Graduate Teaching Assistant / Research Assistant** Aug 2015 -May 2021
Department of Computer Science, North Carolina State University Raleigh, NC
 - **Lecturer, Department of Computer Science** Apr 2011 - Dec 2014
Ahsanullah University of Science and Technology Dhaka, Bangladesh
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SELECTED RESEARCH EXPERIENCE

My research has been sponsored by the National Science Foundation (NSF) and the Institute of Education Sciences (IES).

North Carolina State University

- Topic: **Sequential User Behavior Modelling in an Online Reading Platform** (ML, Explainable NLP, Data Mining)
 - Designed a transformer-based model to predict 12,000 students' question scores incorporating contextual information of questions and learning activities. The goal of this study was to communicate actionable personalized insights to students. The proposed model performed better than state-of-the-art approaches.
 - Interpretable visualization of the transformer's attention can help teachers to identify students' study habits and performance ([EAAL-AAAI 2022](#)).
 - Identified reading and meta-cognitive behavior patterns for 12.5K science and 16.2K social study student data. ([L@S 2020](#))
- Topic: **Explainable AI: Interpretable Classification Algorithm Design** (Explainable AI)
 - Developed a rule-based classification algorithm, BBO-RM, using an evolutionary algorithm, Biogeography- based optimization (BBO). BBO-RM performed significantly better compared to baseline classification algorithms on 14 UCI repository datasets ([GECCO 2017](#)).
 - Designed a parallel version of the BBO-RM algorithm utilizing Julia programming language's data-slicing techniques and Julia's parallelization features. ([GECCO 2018](#)).

Vanderbilt University

Working on research projects involving people with autism spectrum disorder (ASD). Cross-disciplinary research between departments of computer science, psychology, and medical school at Vanderbilt.

- Topic: **Block Design Test and ASD** (Time Series Analysis, Pattern Mining)
 - Understanding users' behavior patterns in the block design test– where a user has to rearrange a pile of colored blocks to a target design.
 - Crowdsourcing ASD and non-ASD users' data on the Prolific platform. Extract user behavior from surveys and an online app for the block design test. Linking behavioral patterns to users' visual thinking abilities (i.e., how well they can reason about visual information).
- Topic: **Educational Game to Teach Social Skills to ASD Kids** (ML, Data Mining, Psychology)
 - Educational game development for middle school kids with ASD. Designing user surveys and applying data mining and machine learning techniques to connect kids' in-game performance with their social skills.
- Topic: **ASD and Visual Spatial Skills in the Workplace** (ML, Data Mining, Psychology)
 - Crowdsourcing data for ASD people about their visual and spatial skills, and comparing the data to the O*NET database, which contains information on job descriptions and skills.

Preprints and Drafts In-preparation

1. [LREC-COLING 2024] Subjective Readability from Cognitive Signals in an Educational Context
Effat Farhana, Pradeep Balaji Muthukumar, Teomara Rutherford, Collin F. Lynch. LREC-COLING 2024 - The 2024 Joint International Conference on Computational Linguistics, Language Resources and Evaluation. *Under Review*.
2. [AAAI 2024] A Cognitively-Inspired Neural Architecture for Visual Abstract Reasoning Using Contrastive Perceptual and Conceptual Processing
Yuan Yang, Deepayan Sanyal, James Ainooson, Joel P. Michelson, **Effat Farhana**, Maithilee Kunda. AAAI 2024 - The Thirty-Eighth AAAI Conference on Artificial Intelligence. *Under Review*.
3. [AAMAS 2024] Standoff: A computational benchmark for investigating representation learning for non-verbal theory of mind tasks
Joel Michelson, Deepayan Sanyal, James Ainooson, **Effat Farhana**, Maithilee Kunda. AAMAS 2024 - The 23rd International Conference on Autonomous Agents and Multi-Agent Systems. *Under Review*.
4. WOMBAT: Web-based Online Measurement of a Block Arrangement Task for Characterizing Visuospatial Cognition in Neurodivergent Individuals
Effat Farhana, Deepayan Sanyal, James Ainooson, Caoimhe Harrington Stack, Yejin Jeong, Raymond Yates, and Maithilee Kunda.
5. Automated Question Generation for Science Education
Effat Farhana et al.

Peer-Reviewed Journals and Conference Publications

1. [ICLR Tiny Paper23] Rethinking Positional Embedding: A Case Study in Temporal Event Sequence Modelling
Effat Farhana
Co-located with Eleventh International Conference on Learning Representations (ICLR) 2023.
2. [EAAI@AAAI 22] Predictive Student Modelling in an Online Reading Platform
Effat Farhana, Teomara Rutherford, and Collin F. Lynch.
Twelfth AAAI Symposium on Educational Advances in Artificial Intelligence (EAAI-AAAI 2022).
3. [ACS 22] Framework for a multi-dimensional test of theory of mind for humans and AI systems
Caoimhe Harrington Stack, Sarah Myers, **Effat Farhana**, Aviv Roskes, Xinyu Shen, Simeng Zhao, Angela Maliakal, Roxanne Rashedi, Joel Michelson and Maithilee Kunda
The Tenth Annual Conference on Advances in Cognitive Systems (ACS 2022).
4. [L@S 20] Understanding Reading Behaviors of Middle School Students
Effat Farhana, Teomara Rutherford, and Collin F. Lynch.
Proceedings of the Seventh ACM Conference on Learning @ Scale (L@S 2020).
5. [ICLS 20] Associations Between Self-Regulated Learning Strategies and Science Assignment Score in a Digital Literacy Platform
Effat Farhana, Teomara Rutherford, and Collin F. Lynch.
Proceedings of the International Conference of the Learning Sciences (ICLS 2020).
6. [EDM 20] Investigating Relations between Self-Regulated Reading Behaviors and Science Question Difficulty
Effat Farhana, Teomara Rutherford, and Collin F. Lynch.
Proceedings of the 13th International Conference on Educational Data Mining (EDM 2020).
7. [ICSE 20] Gang of eight: A Defect Taxonomy for Infrastructure as Code Scripts
Akond Rahman, **Effat Farhana**, Chris Parnin, and Laurie Williams.
Proceedings of the 42nd International Conference on Software Engineering, (ICSE 2020)
8. [EMSE 20] The ‘as code’ Activities: Development Anti-patterns for Infrastructure as Code
Akond Rahman, **Effat Farhana** and Laurie Williams.
Empirical Software Engineering. 25, 3430–3467 (EMSE 2020).

9. [ICSME 19] Synthesizing Program Execution Time Discrepancies in Julia Used for Scientific Software
Effat Farhana, Nasif Imtiaz and Akond Rahman,
IEEE International Conference on Software Maintenance and Evolution (ICSME 2019)
10. [MSR 19] Challenges with Responding to Static Analysis Tool Alerts
Nasif Imtiaz, Akond Rahman, **Effat Farhana** and L. Williams.
IEEE/ACM 16th International Conference on Mining Software Repositories (MSR 2019)
11. [GECCO 17] Biogeography-based Rule Mining for Classification
Effat Farhana and Steffen Heber.
Proceedings of the Genetic and Evolutionary Computation Conference (GECCO 2017).
12. [Inf. Sci. 15] Constrained sequence analysis algorithms in computational biology
Effat Farhana, and M. Sohel Rahman.
Information Sciences 295 (2015).
13. [Inf. Process. Lett. 12] Doubly-constrained LCS and hybrid-constrained LCS problems revisited
Effat Farhana, and M. Sohel Rahman.
Information Processing Letters 112.13 (2012).
14. [SPIRE 15] Finite Automata Based Algorithms for the Generalized Constrained Longest Common Subsequence Problems
Effat Farhana, Jannatul Ferdous, Tanaeem M. Moosa, M. Sohel Rahman.
17th International Symposium of String Processing and Information Retrieval, (SPIRE 2010).

Peer-Reviewed Workshop, Poster Publications, and Others

1. [EDM 18] Predicting Post-College STEM Enrollment from Middle School Clickstream Data
Effat Farhana, Maaz Saleem Kapadia, Wenjia Cao, and Collin F. Lynch.
Workshop on Scientific Findings from the ASSISTments Longitudinal Data Competition: (EDM 2018).
2. [GECCO 18] A Parallel Island Model for Biogeography-based Classification Rule Mining in Julia
Samuel Ebert, **Effat Farhana**, and Steffen Heber.
Proceedings of the Genetic and Evolutionary Computation Conference Companion (GECCO 2018).
3. [EDM 21] Feedback and Self-regulated Learning in Science Reading
Effat Farhana, Andrew Potter, Teomara Rutherford, and Collin F. Lynch.
Proceedings of the 14th International Conference on Educational Data Mining (EDM 2021) (Poster).
4. [EDM 20] Self-Regulated Learning and Science Reading of Middle-School Students
Effat Farhana, Teomara Rutherford, and Collin F. Lynch.
Doctoral Consortium. The 13th International Conference on Educational Data Mining (EDM 2020).

GRANT PROPOSAL WRITING

- Collaborative Research: EAGER: AI-Assisted Just-in-Time Scaffolding Framework for Exploring Modern Computer Design
PIs: Dr. Mohammad Alian, Dr. Md Tauhidur Rahman
 - **Role: Senior Personnel.** I will collaborate with PIs to design AI-driven modules for personalized learning.
Result: Awarded by [the National Science Foundation \(NSF\)](#).
- MD-ToM: Multi-domain assessment of theory of mind skills for adolescents on the autism spectrum.
PI: Dr. Maithilee Kunda.
 - **Role:** Designed and wrote the Data Analysis part under the Research Plan Section.
Result: Submitted to the Institute of Education Science (IES).

MENTORING

North Carolina State University.

- Samuel Ebert, CS undergraduate Aug 2017- Aug 2018
Interpretable ML algorithm project at NC State. This work resulted in a student's lead author paper (GECCO 2018).

Vanderbilt University

- Jeannie Jeong, undergraduate in Cognitive Science and Psychology Fall 2021 - Summer 2022
Project on visual-spatial skills in the workplace.
Current position: Stanford Department of Medicine, Healthcare AI Applied Research Team.
- James Foglio, an undergraduate in CS Summer 2022
Project on Block Design and ASD performance.
- Raymond Yates, MS intern at the Frist Center for Autism and Innovation Summer 2022
Visualization on ASD project.

TEACHING EXPERIENCE

- **North Carolina State University** Fall 2016 - Spring 2020
 - Teaching Assistant (TA) for graduate level courses: Design and Analysis of Algorithm (~ 200 students), Software Engineering (~ 30 students), and Artificial Intelligence (~ 60 students).
 - Created assignments and exam questions, held office hours, and graded.
- **Ahsanullah University of Science and Technology** April 2011 - Dec 2014
 - Lecturer in Computer Science and Engineering
 - Instructor for undergraduate-level introductory programming language, design and analysis of the algorithm, and compiler courses.

SERVICES

Organizing

2024 Area co-chair for [AI in Education Track in EAAI-2024](#)

Reviewer

2024 International Conference on Learning Representations (ICLR)
2023 Empirical Methods in Natural Language Processing (EMNLP)
2023 Neural Information Processing Systems (NeurIPS)
2023 International Conference on Learning Representations (ICLR) Tiny Paper
2023 AAAI Symposium on Educational Advances in AI (EAAI) at AAAI (AI in Education Track)
2023 International Conference on Artificial Intelligence in Education (AIED)
2022 AAAI/ACM Conference on Artificial Intelligence, Ethics, and Society (AIES)
2022 International Conference on Artificial Intelligence in Education (AIED)
2022 ACM Transactions on Computing Education (TOCE)
2022 Advances in Cognitive Systems (ACS)

Sub-reviewer/Shadow PC

2021 International Conference on Educational Data Mining
2021 Mining Software Repository (MSR)

Volunteering

2021 Judge for VandyHacks (Vanderbilt's premier student hackathon)
2020 Ph.D. panel member at Doctoral Recruiting Day, NCSU
2017 NC State International Graduate Student Orientation

INVITED TALKS

- Machine Learning and Data Science for Social Good (Spring 2022) Florida International University
- Theory-grounded Predictive Systems and Interpretability (Spring 2023) Auburn University

PROFESSIONAL MEMBERSHIPS

- [Affiliate](#) at The Frist Center for Autism and Innovation, Vanderbilt University
- ACM Professional Member
- AAAI Member