Junayed Mahmud

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EDUCATION

University of Central Florida, Florida, USA

Ph.D. in Computer Science — May 2025 (Expected)
- Advisor: Dr. Kevin Moran
- Studied Ph.D. in Computer Science at George Mason University from Aug 2019 to Aug 2023
- Dissertation: Multimodal Learning for Automated Bug Report Management

George Mason University, Virginia, USA

M.S. in Computer Science — May 2023
- Advisor: Dr. Kevin Moran

Islamic University of Technology, Dhaka, Bangladesh

B.S. in Computer Science and Engineering — Nov 2016
- Advisor: Dr. Abu Raihan Mostofa Kamal

WORK EXPERIENCE

University of Central Florida, Florida, USA

- *Graduate Research Assistant* — Aug 2023 – Present
  - Utilized Large language models (LLMs) for graphical user interface *(GUI)-based program repair*
  - *Assessed bug reproduction steps* by mapping to the GUI elements utilizing LLMs and program analysis to provide feedback to bug reporters so that they can rewrite the steps if necessary
  - Utilized LLMs for *automatically generating assertions* to validate the existence of diverse types of reported failures (i.e., crash and non-crash) in Android applications to aid in regression testing
  - Addressed the limitations of code-to-comment-translation models and *generated improved software documentation* using transformer-based models and contrastive learning

George Mason University, Virginia, USA

- *Graduate Research Assistant* — May 2021 – Aug 2023
  - Improved *text-retrieval-based bug localization* by leveraging GUI interaction data to mitigate the semantic gap between information in bug reports and code
  - Developed a *program analysis* tool that converts user-performed app actions into replayable scenarios and extracts detailed GUI information for automated testing and debugging
  - Built a *chatbot for bug reporting* to improve report quality and studied the usability of the tool
  - Analyzed the *characteristics of diverse types of reproducible bug reports* to build effective automated techniques for different bug report management activities
  - Generated *automated software documentation* using visual software data encoded in GUIs by fine-tuning neural image captioning models
  - Characterized the *shortcomings of code-to-comment-translation models* without relying on existing reference-based metrics in order to address the shortcomings in developing new models
- *Graduate Teaching Assistant* — Aug 2019 – May 2021
  - Assisted in the following courses: CS367 (Computer Systems and Programming) and CS222 (Computer Programming for Engineers)

Samsung R&D Institute Bangladesh Ltd., Dhaka, Bangladesh

- *Software Engineer* — Jan 2017 – Mar 2019
  - Worked in an iOS application named SmartThings, designed to enable users to monitor and control smart electronic devices or appliances through their phones
  - Worked on developing the IoTivity architecture, which enables seamless communication between cloud services and consumer electronics devices
  - Developed multiple GUIs for the SmartThings project

RESEARCH INTERESTS

Software Engineering, Bug Reporting, Bug Localization, Program Repair, Automated Mobile Testing, Natural Language Processing for Software Engineering, Source Code Analysis

REFERRED CONFERENCE PUBLICATIONS

C6. [ISSTA'24] A. Saha, Y. Song, **J. Mahmud**, Y. Zhou, K. Moran, and O. Chaparro, "Toward the Automated Localization of Buggy Mobile App UIs from Bug Descriptions," in *Proceedings of the 33rd ACM SIGSOFT International Symposium on Software Testing and Analysis*, Vienna, Austria, Sep 2024, pp. 1249-1261. (***21% acceptance rate***)

C5*. [ICSE'24] **J. Mahmud**, N. D. Silva, S. A. Khan, S. H. Mostafavi, S. M. H. Mansur, O. Chaparro, A. Marcus, and K. Moran, "On Using GUI Interaction Data to Improve Text Retrieval-based Bug Localization*," in *Proceedings of the 46th IEEE/ACM International Conference on Software Engineering*, Lisbon, Portugal, Apr 2024, pp. 1-13. (***7% acceptance rate***)

C4. [MSR'24] K. Baral, J. Johnson, **J. Mahmud**, S. Salma, M. Fazzini, J. Rubin, J. Offutt, and K. Moran, "Automating GUI-based Test Oracles for Mobile Apps," in *Proceedings of the 21st International Conference on Mining Software Repositories*, Lisbon, Portugal, Apr 2024, pp. 309-321. (***29% acceptance rate***)

C3*. [ESEC/FSE'22] Y. Song, **J. Mahmud**, Y. Zhou, O. Chaparro, K. Moran, A. Marcus, and D. Poshyvanyk, "Toward Interactive Bug Reporting for (Android App) End Users*," in *Proceedings of the 2022 ACM Joint European Software Engineering Conference and Symposium on the Foundations of Software Engineering*, Singapore, Nov 2022, pp. 344-356. (***22% acceptance rate***)

C2. [SANER'22] J. Johnson, **J. Mahmud**, T. Wendland, K. Moran, J. Rubin and M. Fazzini, "An Empirical Investigation into the Reproduction of Bug Reports for Android Apps," in *Proceedings of the 29th IEEE International Conference on Software Analysis, Evolution and Reengineering*, Honolulu, Hawaii, Mar 2022, pp. 321-332. (***24% acceptance rate***)

C1. [SANER'22] K. Moran, A. Yachnes, G. Purnell, **J. Mahmud**, M. Tufano, C. B. Cardenas, D. Poshyvanyk, and Z. H'Doubler, "An Empirical Investigation into the Use of Image Captioning for Automated Software Documentation," in *Proceedings of the 29th IEEE International Conference on Software Analysis, Evolution and Reengineering*, Honolulu, Hawaii, Mar 2022, pp. 514-525. (***24% acceptance rate***)

REFERRED SHORT CONFERENCE & WORKSHOP PUBLICATIONS

S5. [ICSE'24] **J. Mahmud**, "Toward Rapid Bug Resolution for Android Apps," in *Proceedings of the 46th IEEE/ACM International Conference on Software Engineering*, Doctoral Symposium Track, Lisbon, Portugal, Apr 2024, pp. 237-241. (***57% acceptance rate***)

S4. [ICSE'23] Y. Song, **J. Mahmud**, N. D. Silva, Y. Zhou, O. Chaparro, K. Moran, A. Marcus, and D. Poshyvanyk, "BURT: A Chatbot for Interactive Bug Reporting," in *Proceedings of the 45th IEEE/ACM International Conference on Software Engineering*, Formal Tool Demonstrations Track, Melbourne, Australia, May 2023, pp. 170-174. (***48% acceptance rate***)

S3. [NLP4Prog'21] **J. Mahmud**, F. Faisal, R. I. Arnob, A. Anastasopoulos, and K. Moran, "Code to Comment Translation: A Comparative Study on Model Effectiveness & Errors," in *Proceedings of the First Workshop on Natural Language Processing for Programming*, Co-located with ACL-IJCNLP'21, Bangkok, Thailand, Aug 2021, pp. 1-16.

S2. [MSR'21] T. Wendland, J. Sun, **J. Mahmud**, S. M. H. Mansur, S. Huang, K. Moran, J. Rubin and M. Fazzini, "AndroR2: A Dataset of Manually-Reproduced Bug Reports for Android Apps," in *Proceedings of the 18th Conference on Mining Software Repositories*, Data showcase track, Madrid, Spain, May 2021, pp. 600-604.

S1. [SAS'18] A. R. Chowdhury, **J. Mahmud**, A. R. M. Kamal, and M. A. Hamid, "MAES: Modified Advanced Encryption Standard for Resource Constraint Environments," in *Proceedings of the 2018 IEEE Sensors Applications Symposium*, Seoul, Korea (South), Mar 2018, pp. 1–6.

TALKS & FORMAL PRESENTATIONS

- **Dissertation Proposal Presentation** - University of Central Florida, Florida, USA Dec 04, 2024
  - "Multimodal Learning for Automated Bug Report Management"
- **Research Paper Presentation** - Software Engineering Seminar, University of Central Florida, Florida, USA Mar 27, 2024
  - "On Using GUI Interaction Data to Improve Text Retrieval-based Bug Localization"
- **Research Paper Presentation** - Software Engineering Class (CEN 5016), University of Central Florida, Florida, USA Mar 7, 2024
  - "Code to Comment Translation: A Comparative Study on Model Effectiveness & Errors"

*Top tier publications

- **Comprehensive Exam Presentation** - George Mason University, Virginia, USA Apr 29, 2022
  - "Automating Bug Report Management: A Survey"
- **Invited Seminar Talk** - Microsoft Research, Virtual Apr 20, 2022
  - "Automated Software Documentation: A Brief Retrospective & Future Directions"
- **Research Paper Presentation** - Proceedings of the 29th IEEE International Conference on Software Analysis, Evolution and Reengineering (SANER'22), Virtual (originally Honolulu, Hawaii) Mar 16, 2022
  - "An Empirical Investigation into the Use of Image Captioning for Automated Software Documentation"
- **Research Paper Presentation** - Software Engineering Seminar, George Mason University, Virginia, USA Nov 11, 2021
  - "Code to Comment Translation: A Comparative Study on Model Effectiveness & Errors"
- **Research Paper Presentation** - Proceedings of the First Workshop on Natural Language Processing for Programming (NLP4Prog'21), Co-located with ACL-IJCNLP'21, Virtual (originally Bangkok, Thailand) Aug 06, 2021
  - "Code to Comment Translation: A Comparative Study on Model Effectiveness & Errors"

PROFESSIONAL SERVICES

External Reviewer

- 47th IEEE/ACM International Conference on Automated Software Engineering (ICSE'25)
- 37th IEEE/ACM International Conference on Automated Software Engineering (ASE'22)
- 29th IEEE International Conference on Software Analysis, Evolution and Reengineering (SANER'22)
- 29th IEEE/ACM International Conference on Program Comprehension (ICPC'21)
- 2021 Mining Software Repositories (MSR'21)

TECHNICAL SKILLS

- Programming Languages: Python, Java, C, C++, Swift, Objective C, Perl, Kotlin, JavaScript, R, MATLAB, PHP, HTML
- Machine Learning: Pytorch, Tensorflow
- Development Frameworks: Spring, AngularJS, Hibernate, Bootstrap, NodeJS, Unity
- Mobile Development: Android, iOS
- Databases: Oracle, MySQL, PostgreSQL, MongoDB, SQLite, NoSQL

SELECTED PROJECTS

Utilizing Graphical User Interfaces (GUIs) for Bug Localization Paper | Source Code | Dataset

One of the most critical tasks in bug report management is localizing faults to apply fixes. Prior work considered automated bug localization as an information retrieval problem, ranking potentially buggy files according to their textual similarity to bug reports. We investigate the hypothesis that, for end user-facing applications, connecting information in a bug report with GUI information and using this to aid in retrieving potentially buggy files can improve upon existing techniques for bug localization. We conduct a comprehensive empirical study augmenting four baseline techniques: BugLocator, Lucene, SentenceBERT, and UnixCoder for bug localization with GUI interaction information from a reproduction scenario to (i) filter out potentially irrelevant files, (ii) boost potentially relevant files and (iii) reformulate text-retrieval queries. To carry out our study, we source the largest dataset of fully localized and reproducible real bugs for 80 bug reports from 39 popular Android apps. The study leads to a marked increase in Hits@10 of 13-18%.

HONORS & AWARDS

- Outstanding Graduate Creative Work Award Jan 2024
- Summer Research Initiation Award May 2020
- Professional level programmer at Samsung Electronics Jan 2018
- Icon of the month at Samsung R&D Institute Bangladesh Ltd. Apr 2018
- Received 4 years of OIC scholarship 2012
- Received 4 years of government scholarship for Higher Secondary Certificate result 2012

STUDENT MENTORSHIP

Undergraduate Mentees (via University of Central Florida's Software Engineering Project)

- Terry Achille, University of Central Florida — Fall 2024
- Darren Basil, University of Central Florida — Fall 2024
- Camilo Alvarez-Velez, University of Central Florida — Fall 2024
- James Chen, University of Central Florida — Fall 2024
- Patrick Ijieh, University of Central Florida — Fall 2024
- Samar Karanch, University of Central Florida — Fall 2024

High School Mentees (via George Mason University's Aspiring Scientists Summer Internship Program)

- Alyssa McGowan, Thomas Jefferson High School of Science & Technology — Summer 2023

REFERENCES

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