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SANJAY MALAKAR

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RESEARCH INTEREST

Software Engineering, Software Security, Programming Languages.

EDUCATION

University of California, Riverside — **CA, USA** — **Sep 2023 – Present**
- Ph.D. in Computer Science
- CGPA: *4.00/4.00*
- Advisor: Dr. Manu Sridharan

Bangladesh University of Engineering and Technology (BUET) — **Dhaka, Bangladesh** — **Mar 2016 – Feb 2021**
- B.Sc. in Computer Science and Engineering
- CGPA: *3.60/4.00* | Major CGPA: *3.81/4.00*
- Thesis supervisor: Dr. Rifat Shahriyar

Notre Dame College — **Dhaka, Bangladesh** — **Jul 2013 – Jun 2015**
- Higher Secondary School Certificate
- GPA – *5.00/5.00*

PROFESSIONAL EXPERIENCE

Senior Software Engineer — **OpenRefactory, Inc. | CA, USA** — **Feb 2021 – Aug 2023**

Developed Intelligent Code Repair (iCR), an innovative Static Application Security Testing (SAST) tool that automatically synthesizes fixes for over half of all detected bugs. Contributed remotely from Dhaka, Bangladesh, implementing iCR for Java, Python, and Go.

Key responsibilities and contributions:
- Contributed to iCR's core IP by working on static program analysis.
- Developed and implemented algorithms for a robust pointer analysis engine for Java, Python, and Go.
- Restructured the deployment architecture from monolithic to microservices for scalable enterprise use as a SaaS.
- Executed deep performance hacking to resolve memory issues, optimizing iCR's serialization with ProtoBuf.
- Contributed to creating deep learning-based algorithms to detect logical bugs in Python source code.
- Conducted research and development on identifying software weaknesses and vulnerabilities.
- Established CI/CD workflows, incorporating UI testing for streamlined deployment.

RESEARCH AND PUBLICATIONS

- **Developer Discussion Topics on the Adoption and Barriers of Low Code Software Development Platforms.**
  Md Abdullah Al Alamin, Gias Uddin, Sanjay Malakar, Sadia Afroz, Tameem Bin Haider, Anindya Iqbal
  The Empirical Software Engineering (EMSE) journal invited us to extend our MSR'21 paper. We applied topic modeling to 33K relevant Stack Overflow (SO) posts of 38 popular low-code platforms and manually annotated statistically significant data samples to reach our conclusions.
  Status: Published in *2023 Empirical Software Engineering Journal*. (preprint)
- **An Empirical Study of Developer Discussions on Low-Code Software Development Challenges.**
  Md Abdullah Al Alamin, Sanjay Malakar, Gias Uddin, Sadia Afroz, Tameem Bin Haider, Anindya Iqbal
  We presented a novel empirical study of around 5K SO posts that contain discussions of nine popular low-code development platforms. We discussed the difficulties that developers encounter while adopting these platforms. Our findings offered implications for low-code practitioners, platform providers, educators, and researchers.
  Status: Published in *2021 IEEE/ACM 18th International Conference on Mining Software Repositories (MSR)*. (preprint)
- **RaceFixer - An Automated Data Race Fixer** (BSc. Thesis)
  Sanjay Malakar, Tameem Bin Haider, Rifat Shahriar
  We developed a Clang-based tool that automates fixing single-variable atomicity violations. We utilized the bug reports of an existing bug-detection tool, ThreadSanitizer. We augmented them with static analysis to construct a suitable patch for each bug report, with the best effort to reuse locks and avoid deadlocks.
  Status: In preparation for *Concurrency and Computation: Practice and Experience*. (preprint)

Scholarships and Achievements

- Awarded **Dean's Distinguished Fellowship** at the University of California, Riverside
- Achieved **Merit Stipends** from BUET in four out of seven terms
- Got **Dean's Award** in Junior year from BUET for an extraordinary result
- Received **Shapla Cub Award** from the Prime Minister of Bangladesh for extraordinary performance as a Cub Scout
- Achieved **Bangladesh Education Board Scholarship** in Higher Secondary School Certificate Examination (2015-2020), Secondary School Certificate Examination (2014-2015) and Junior School Certificate Examination (2011-2012)

Languages and Technologies

- **Languages** Java, C, C++, Python, JavaScript, Matlab, Shell, Dart
- **Database:** Oracle, MySQL, MongoDB, SQLite, Firebase
- **Frameworks:** Django, React, Flutter, Express.js, JavaFX, Scrapy
- **Libraries:** NumPy, Pandas, TensorFlow, Scikit-learn, Matplotlib
- **Technical Writing:** LaTeX, Beamer, Overleaf
- **DevOps:** Docker, Kubernetes, OpenShift, Jenkins, Ansible, AWS, Linode
- **Others:** Git, LLVM, Eclipse JDT, IntelliJ Platform SDK, Gradle, Maven, CMake

Selected Academic Projects

- **DNS Cache Poisoning** (GitHub link)
  Remote DNS cache poisoning attack exploiting Kaminsky's DNS Cache poisoning flaw.
  Tools: Bind9, Virtual Machines
- **Website Development for Flight and Hotel Room Reservation System** (GitHub link)
  Developed a website where customers can book flight tickets and hotel rooms through card payment, and companies can update their page and manage bookings.
  Tools: Django, JavaScript, SQLite
- **Micro-controller Project: DX-Ball** (YouTube video link)
  The popular arcade game DX-Ball with LED Dot Matrix and Atmega32 micro-controller.
  Tools: Micro-Controller, Accelerometer Sensor, LED Matrix
- **Software Development for Football Club Management**(GitHub link)
  An application that stores all information about the club (players, managers, games). The club's Admin can update, add, and delete this information and generate graphs from given data.
  Tools: Java, JavaFX, Oracle Database
- **Tic-Tac-Toe** (GitHub link)
  Tic-Tac-Toe game using Minimax algorithm created in C++ using a wrapper for OpenGL in 2D.
  Tools: Game Theory, OpenGL
- **Miscellaneous**
  - **C Compiler:** Using lexical analyzer and parser designing tools.
  - **4-bit Microprocessor:** Using Atmel Studio, MIPS architecture.
  - **AI:** Simulating the Mancala game by using basic algorithms in Artificial Intelligence.
  - **Machine Learning:** Exploring different ML algorithms such as KNN, decision tree, naïve bayes, neural network, etc.
  - **Networking:** Modifying some functionalities of the computer network in NS2.
  - **Others:** Implementing some functionalities of an OS on XV6, Ray tracing using OpenGL.

Activities

- Attended Global DevSlam '22 in Dubai, UAE, as an exhibitor.
- Actively worked as an organizer of BUET CSE FEST 2019, 2020, which includes Hackathon, Inter-University Programming Contest, and other CS-related programs.
- Participant, ICPC Dhaka Regional
- Member, Notre Dame Nature Study Club
- Involved in community services as a Scout