

Rangeet Pan

Senior Research Scientist, IBM Research

[Google Scholar](#)

SUMMARY

Rangeet Pan is a Senior Research Scientist at the IBM T.J. Watson Research Center, Yorktown Heights. His research interests are in the field of software engineering, focusing on deep learning, modularity, and program analysis.

He received his Ph.D. degree from the Department of Computer Science at Iowa State University. His supervisor was Dr. Hridesh Rajan. His Ph.D. works are focused on understanding the characteristics of deep learning software and applying various programming techniques, e.g., enabling decomposition in deep learning-based models. His works are published at the top two research venues in software engineering, ESEC/FSE and ICSE. His work on decomposing deep neural networks into modules has been awarded the ACM SIGSOFT Distinguished Paper award at ESEC/FSE, 2020. He won 2nd place at the ACM Student Research Competition at ICSE, 2020. He has also been awarded the Research Excellence award and Robert Stewart Early Research Recognition from the Department of Computer Science at Iowa State University.

At IBM Research, his research works are related to incorporating program analysis while using Large Language Models (LLM) for various code-to-code tasks, i.e., code translation (converting code written in one programming language to another), test generation (automatically generating test cases given applications source code), modernizing application (moving from an older platform to newer, incorporating modern architectures, etc.). His work has already been part of various products and is also in line with multiple upcoming products. His work on test generation has been awarded ACM SIGSOFT Distinguished Paper award at ICSE, SEIP 2025. His work on code translation has been awarded the most prestigious research award at IBM Research, Pat Goldberg Award under the “Honorable Mention” category.

His works are published in top-tier software engineering conferences, i.e., ICSE, ESEC/FSE, ICLR, and PLDI. He has served as a program committee member at ESEC/FSE, ICSE, and ASE. Apart from various conferences, he has reviewed several papers from the IEEE Transactions on Software Engineering (TSE), Transactions on Software Engineering and Methodology (TOSEM), and Springer Empirical Software Engineering (EMSE).

EDUCATION

Iowa State University – Ph.D. in Computer Science (2018 – 2022)

Thesis: Decomposing Deep Learning Models into Modules

GPA: 3.89

University of Houston – M.S. in Computer and Systems Engineering (2016–2018)

GPA: 3.93

PROFESSIONAL EXPERIENCE

IBM Research –Senior Research Scientist

(06/2022– Present)

- Building a unified approach to generate test cases automatically for various programming languages using large language models, which will help developers tremendously, as with 2-3 decades of research on test generation, most approaches are limited to the popular programming languages, i.e., Java, Python, C. Beyond that, there is not enough support for generating test cases automatically. Also, the test cases that the current approaches generate are not natural because a human developer would never write such test cases. This work will address both of these research gaps.
- Worked on the test generation features which has been added to IBM's flagship product, watsonx Coding Assistant, and has been playing a key differentiating factor when compared to existing coding assistants.
- This work has now evolved to generating service level test cases, change-focus test cases, and generating tests from natural language-based test descriptions.
- In the test generation space, working on various client engagement and releasing features to the market.
- Worked as a researcher for modernizing legacy applications, translating programming languages, and building state-of-the-art approach for automated test generation.
- Built innovative approaches for decomposing legacy software written as monoliths into partitions and eventually transforming and converting them into Microservice-based architectures. This will eventually help developers maintaining their software and reduce the overall cost of maintenance.
- Worked on creating innovative solutions to test artifacts produced in the code translation process using software engineering and programming language-based approaches i.e., symbolic execution, metamorphic testing, differential testing, and AI-based approaches.
- Worked on several methodologies based on program analysis and artificial intelligence to translate software code. In this project, our goal is to convert code written in one programming language to another. The primary use cases are to translate the code written in legacy programming languages to comparatively newer programming languages. Also, this approach can help utilize the benefit of different programming languages i.e., using JavaScript for UI, Java for backend, etc.

Iowa State University – Graduate Assistant

(08/2018 – 05/2022)

- Performed grading, mentoring students, arranging labs for COMS 309, Software Development Practices, which is one of the biggest classes in Iowa State University with 300+ students.
- Created assignments, graded exams, assignments, mentored students for COMS 319: Construction of User Interfaces course.
- Taught as an independent instructor for COMS 342 – Principles to Programming Languages course with 60+ students for a semester. Created assignments, exams, class notes, and delivered lectures.

Microsoft Research – Research Intern

(05/2020 – 08/2020)

- Studied merge conflicts found in the Microsoft Edge.

- Performed empirical evaluation of 8 weeks of merge conflict data that consists of thousands of conflicts seen while merging Microsoft Edge code with Google Chromium, which is the upstream application.
- Identified various patterns of conflicts and how developers have resolved them in the past.
- Proposed an approach using program synthesis to learn the conflict resolution strategies automatically and recommend developers the fixes.

University of Houston - Research Assistant

(01/2017 – 05/2018)

- Worked as a research assistant at the measurement and the evaluation center.
- Prepared end-of-course faculty evaluation reports for each academic department, including extracting data with SQL and evaluating data with SPSS.
- Performed statistical calculation using Python and visualize the same using tableau.
- Conducted customized statistical analysis, for example, Point- Biserial Correlation Analysis for exam questions, per the instructor's request to help the instructor determine the quality of the exam.

Infosys Limited - Test Engineer

(03/2013 – 07/2016)

- Worked for the Aetna Life Insurance specifically related to group insurance.
- Involved in both mainframe and web application-based testing.
- Handled various large projects i.e., more than 10,000 work-hour projects.
- Created test plan, test strategy, test scripts.
- Performed both functional and regression testing.
- Automated regression test suite using various tools i.e., Selenium.
- Worked in both waterfall and agile delivery model.

PUBLICATIONS

PLDI: Programming Language Design and Implementation, **ICSE:** International Conference on Software Engineering, **ESEC/FSE:** European Software Engineering Conference and Symposium on the Foundations of Software Engineering, **ASE:** ACM International Conference on the Foundations of Software Engineering, **ICLR:** International Conference on Machine Learning.

2026:

1. Tyler Stennett, [Rangeet Pan](#), Bridget McGinn, Alessandro Orso, and Saurabh Sinha. " Sakura: An Approach for Generating Complex Tests from Natural Language Test Descriptions." **ISSTA, 2026**
2. [Rangeet Pan](#), Raju Pavuluri, Ruikai Huang, Rahul Krishna, Tyler Stennett, Alessandro Orso, and Saurabh Sinha. "SAINT: Service-level Integration Test Generation with Program Analysis and LLM-based Agents." In *2026 IEEE/ACM 48th International Conference on Software Engineering, ICSE, 2026.*
3. [Rangeet Pan](#), Tyler Stennett, Raju Pavuluri, Nate Levin, Alessandro Orso, and Saurabh Sinha. "Hamster: A Large-Scale Study and Characterization of Developer-Written Tests." In *2026 IEEE/ACM 48th International Conference on Software Engineering: Software Engineering in Practice (ICSE-SEIP), ICSE, 2026.*

2025:

4. [Rangeet Pan](#), Myeongsoo Kim, Rahul Krishna, Raju Pavuluri, and Saurabh Sinha. "Aster: Natural and multi-language unit test generation with LLMs." In *2025 IEEE/ACM 47th International Conference on Software Engineering: Software Engineering in Practice (ICSE-SEIP)*, **ICSE, 2025 (ACM SIGSOFT Distinguished Paper Award)**.
5. Rahul Krishna, [Rangeet Pan](#), Raju Pavuluri, Maja Vukovic, and Saurabh Sinha. "Codellm-Devkit: A Framework for Contextualizing Code LLMs with Program Analysis Insights Tool Demo." In *ACM/IEEE International Conference on Software Engineering*. **ICSE, 2025**.
6. Ali Reza Ibrahimzada, Kaiyao Ke, Mrigank Pawagi, Muhammad Salman Abid, [Rangeet Pan](#), Saurabh Sinha, and Reyhaneh Jabbarvand. "AlphaTrans: A Neuro-Symbolic Compositional Approach for Repository-Level Code Translation and Validation." *Proceedings of the ACM on Software Engineering 2*, **FSE, 2025**.
7. Rahul Krishna, [Rangeet Pan](#), Saurabh Sinha, Srikanth Tamilselvam, Raju Pavuluri, and Maja Vukovic. "Codellm-devkit: A framework for contextualizing code llms with program analysis insights." In *Proceedings of the 33rd ACM International Conference on the Foundations of Software Engineering*, **ASE, 2025**.
8. Toufique Ahmed, Jatin Ganhotra, [Rangeet Pan](#), Avraham Shinnar, Saurabh Sinha, and Martin Hirzel. "Otter: Generating Tests from Issues to Validate SWE Patches." In *Forty-second International Conference on Machine Learning*, **ICLR, 2025**.

2024:

9. [Rangeet Pan](#), Ali Reza Ibrahimzada, Rahul Krishna, Divya Sankar, Lambert Pougues Wassi, Michele Merler, Boris Sobolev, Raju Pavuluri, Saurabh Sinha, Reyhaneh Jabbarvand. "Lost in Translation: A Study of Bugs Introduced by Large Language Models while Translating Code.", **ICSE, 2024**.

2023:

10. [Rangeet Pan](#), Rahul Krishna, Divya Sankar, Saurabh Sinha, Julian Dolby, and Raju Pavuluri. "Towards Supporting Universal Static Analysis using WALA.", **PLDI Tutorial, 2023**.
11. Sayem Imtiaz, Fraol Batole, Astha Singh, [Rangeet Pan](#), Breno Dantas Cruz and Hriday Rajan. "Decomposing a Recurrent Neural Network into Modules for Enabling Reusability and Replacement.", **ICSE, 2023**.

2022:

12. [Rangeet Pan](#) and Hriday Rajan. "Decomposing Convolutional Neural Network into Reusable and Replaceable Modules.", **ICSE, 2022**.
13. Giang Nguyen, Md Johirul Islam, [Rangeet Pan](#), and Hriday Rajan. "Manas: Mining Software Repositories to Assist AutoML.", **ICSE, 2022**.

2021:

14. Rangeet Pan, Vu Le, Nachiappan Nagappan, Sumit Gulwani, Shuvendu Lahiri, and Mike Kaufman. "Can Program Synthesis be Used to Learn Merge Conflict Resolutions? An Empirical Analysis.", **ICSE, 2021**.

2020:

15. Rangeet Pan and Hridesh Rajan. "On Decomposing a Deep Neural Network into Modules.", **ESEC/FSE, 2020 (ACM SIGSOFT Distinguished Paper Award)**.
16. Rangeet Pan. "Does Fixing Bug Increase Robustness in Deep Learning?.", **ICSE SRC, 2020 (2nd place at Student Research Competition)**.
17. Md Johirul Islam, Rangeet Pan, and Hridesh Rajan. "Repairing Deep Neural Networks: Fix Patterns and Challenges.", **ICSE, 2020**.

2019:

18. Rangeet Pan. "Static deep neural network analysis for robustness.", **ESEC/FSE SRC, 2019**.
19. Md Johirul Islam, Giang Nguyen, Rangeet Pan, and Hridesh Rajan. "A Comprehensive Study on Deep Learning Bug Characteristics.", **ESEC/FSE, 2019**.

Arxiv:

20. Toufique Ahmed, Martin Hirzel, Rangeet Pan, Avraham Shinnar, and Saurabh Sinha. "TDD-Bench Verified: Can LLMs Generate Tests for Issues Before They Get Resolved?." arXiv preprint arXiv:2412.02883 (2024).
21. Rangeet Pan, Sumon Biswas, Mohna Chakraborty, Breno Dantas Cruz, Hridesh Rajan. "An Empirical Study on the Bugs Found while Reusing Pre-trained Natural Language Processing Models.", **arXiv preprint arXiv:2212.00105 (2022)**.
22. Rangeet Pan, Md Johirul Islam, Shibbir Ahmed, and Hridesh Rajan. "Identifying Classes Susceptible to Adversarial Attacks.", **arXiv preprint arXiv:1905.13284 (2019)**.
23. Md Johirul Islam, Hoan Anh Nguyen, Rangeet Pan, and Hridesh Rajan. "What Do Developers Ask About ML Libraries? A Large-scale Study Using Stack Overflow.", **arXiv preprint arXiv:1906.11940 (2019)**.

NEWS COVERAGE

1. "ASTER: Natural and multi-language unit test generation with LLMs", IBM Research Blog, Apr, 2025, (<https://research.ibm.com/blog/aster-llm-unit-testing>)
2. "Simplify your Code LLM solutions using CodeLLM DevKit", IBM Research Blog, Sep, 2024, (<https://research.ibm.com/blog/cldk-codellm-devkit>)

3. "Safe program merges at scale: A grand challenge for program repair research", Microsoft Research Blog, Aug, 2021.
(https://www.microsoft.com/en-us/research/blog/safe-program-merges-at-scale-a-grand-challenge-for-program-repair-research/?OCID=msr_blog_Programinglanguages_tw)
4. "Two papers receive ACM SIGSOFT Distinguished Paper Award", Iowa State News, Aug, 2020.
(<https://www.cs.iastate.edu/two-papers-receive-acm-sigsoft-distinguished-paper-award>)
5. "Pan earns 2nd Place at the ACM Student Research Competition at the International Conference on Software Engineering (ICSE)", Iowa State News, July, 2020.
(<https://www.cs.iastate.edu/pan-earns-2nd-place-acm-student-research-competition-international-conference-software-engineering>)
6. "Huang, Khoshmanesh, and Pan win Robert Stuart Early Research Recognition Award", Iowa State News, May, 2020.
(<https://www.cs.iastate.edu/announcements/huang-khoshmanesh-and-pan-win-robert-stuart-early-research-recognition-award>)
7. "Open data set to increase efficiency of COVID-19 research", Iowa State Daily, Apr, 2020. (<https://tinyurl.com/yawbgaho>)
8. "Two papers accepted at ICSE 2020 Research Track", Iowa State News, Dec, 2019.
(<https://www.cs.iastate.edu/two-papers-accepted-icse-2020-research-track>)
9. "CS Students Showcase Entrepreneurship and Innovation", Iowa State News, Sep, 2019.
(<https://www.cs.iastate.edu/cs-students-showcase-entrepreneurship-and-innovation>)

TEACHING EXPERIENCE

COMS 309 - Software Development Practices:- Teaching Assistant

- Graded, mentored 40+ students from a class of 300+ student.

COMS 319 - Construction of User Interfaces:- Teaching Assistant

- Assignment creation, grading, lab setup, mentoring students.

COMS 342 – Principles to Programming Languages: - Teaching Assistant and Co-Instructor.

- Recitation, assignment, and solution creation, mentoring students.
- Teaching as an **independent instructor** in Spring 2022 (60+ students).

AWARDS AND RECOGNITION

- "ACM SIGSOFT Distinguished Paper Award" ICSE, 2025, Ottawa, Canada.
- "Pat Goldberg Award", under honorable mention, IBM Research, 2024.
- "Research Excellence Award", Iowa State University, 2021.
- "ACM SIGSOFT Distinguished Paper Award" ESEC/FSE, 2020, virtual.
- "2nd Place at Student Research Competition.", ICSE, 2020, virtual.

- “Robert Stewart Early Research Recognition Award”, Iowa State University, 2020.
- “ACM Travel Award”, ESEC/FSE, 2019, Tallinn, Estonia.
- “Merit Scholarship”, Phi Beta Delta, University of Houston, 2017.

SERVICES

- Program Committee Member, FSE Research Track, 2027.
- Program Committee Member, ICSE Research Track, 2026.
- PC Co-Chair, ReCode Workshop, ICSE, 2026.
- Program Committee Member, ICSE NIER Track, 2026.
- Program Committee Member, ICSE Research Track, 2025.
- Program Committee Member, ICSE SEIP Track, 2024.
- Program Committee Member, ASE Research Track, 2024.
- Program Committee Member, ESEC/FSE Research Track, 2023.
- Program Committee Member, OOPSLA Artifact Track, 2021.
- Shadow Program Committee Member, Mining Software Repositories (MSR), 2021.
- Web Chair and Organizing Committee Member, SPLASH, 2021.
- Web Chair and Organizing Committee Member, SPLASH, 2020.
- External Reviewer, IEEE Transactions on Software Engineering.
- External Reviewer, Springer Empirical Software Engineering Journal.

COURSES TAKEN

- Theory of Computing
- Programming Language
- Principles of Artificial Intelligence
- Distributed Software Development
- Advanced Topics in Language Semantics
- Advanced Design and Analysis of Algorithms
- Introduction to Cybersecurity
- Advanced Computer Architecture
- Big Data Analysis
- Software Design