Bogdan Alexandru Stoica

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Research Interests

My research centers around software reliability, efficiency, and security with a focus on automated debugging at scale. To this end, I build tools to help developers better reason about their code and diagnose bugs faster. I am interested in program analysis, efficient code instrumentation, emerging hardware and OS support for execution profiling, compiler optimization techniques, and performance analysis.

Education

University of Chicago   Chicago, IL, United States

Ph.D. Student in Computer Science (Area: Systems and Programming Languages)   September 2019 – *present*
Advisor: Prof. Shan Lu

M.Sc. in Computer Science (Area: Systems and Programming Languages)   September 2019 – June 2022
Thesis: Exposing Memory Ordering Bugs Efficiently with Active Delay Injection
Advisor: Prof. Shan Lu
Mentors: Dr. Suman Nath and Dr. Madan Musuvathi (Microsoft Research)

École Polytechnique Fédérale de Lausanne (EPFL)   Lausanne, Switzerland

Graduate Coursework (Area: Systems and Programming Languages)   September 2014 – August 2015
Mentors: Prof. Bernard M. E. Moret (EPFL), Prof. Viktor Kunčak (EPFL) and Prof. Vikram S. Adve (UIUC)

École Polytechnique Fédérale de Lausanne (EPFL)   Lausanne, Switzerland

M.Sc. in Communication Systems (Area: Information Security)   September 2011 – January 2014
Thesis: Robust Web Content Evaluation
Advisor: Prof. Karl Aberer

University of Bucharest (UB)   Bucharest, Romania

B.Sc. in Computer Science (Area: Algorithms and Software Security)   October 2008 – June 2011
Thesis: On Intrusion Detection Systems
Advisor: Prof. Adrian Atanasiu

Peer-Reviewed Publications

[C1] **Waffle: Exposing Memory Ordering Bugs Efficiently with Active Delay Injection.** EuroSys
Bogdan Alexandru Stoica, Shan Lu, Madan Musuvathi, and Suman Nath. *In Proceedings of the* ’23
*18th ACM SIGOPS European Conference on Computer Systems. Rome, Italy. May 2023. (Acceptance
rate: ≈16%, 54 out of 335)*

Awards and Honors

Eckhardt Graduate Fellowship (University of Chicago)   2019 – 2024
Teaching Assistant Award for Outstanding Service (EPFL)   2016 – 2017

Excellence Fellowship for Master's Studies (EPFL)   2011 – 2013
Excellence Scholarship for Bachelor's Studies (UB)   2008 – 2011
Bronze Medal, Baltic Olympiad in Informatics (Tuymaada), Russian Federation   2007

EMPLOYMENT

University of Chicago   Chicago, IL, United States

Research Assistant   September 2019 – present

Advisor: Prof. Shan Lu

I design automated fault diagnosis techniques for large-scale distributed software systems written in C, C++, C#, and Java. I build tools that combine program analysis, fault injection, code instrumentation, and execution profiling to isolate and expose correctness and performance bugs.

Google   Sunnyvale, CA, United States

PhD Software Engineering Intern (Core ML Engineering)   June 2023 – September 2023

Mentors: Gloria Shen and Dr. Ilya Kavalerov

I prototyped a pipeline that helps software engineers pinpoint regression bugs in Google's ML infrastructure more efficiently. The key functionality of the pipeline is matching character-level differences between consecutive builds to high-order program structures (e.g. class, package, etc.) which are later traced back to the relevant tests exercising these code changes. The prototype is currently being integrated with TensorFlow's build framework.

Meta   Seattle, WA, United States

Research Intern (Systems & Infrastructure, Profiling)   June 2022 – October 2022

Mentors: Nathan Slingerland and Jacie Fan

I developed a rules-based engine that identifies inefficient C++ code patterns at scale by analyzing billions of low-level execution profiles collected across Cloud services. The tool is currently being integrated with Meta's existing code efficiency analysis protocols to help developers pinpoint difficult-to-find performance bottlenecks.

Microsoft Research   Redmond, WA, United States

Research Collaborator   January 2020 – June 2020

Mentors: Dr. Suman Nath and Dr. Madan Musuvathi

I explored a series of bug diagnosis techniques that integrate with existing software testing frameworks. I investigated fault injection strategies to help expose difficult-to-reproduce order violations in C# distributed applications. This exploratory work led to WAFFLE, a push-button fault injection tool that helps developers trigger memory ordering concurrency bugs [C1].

Microsoft Research   Redmond, WA, United States

Research Intern   July 2018 – September 2018

Mentors: Dr. Weidong Cui and Dr. Ben Niu

I designed and implemented a C++ tool for tracing heap memory management requests to help program state recovery during offline execution replay. This extended Windows Debugger's reverse debugging engine by increasing the current recovery rate and allowing it to replay longer execution traces.

École Polytechnique Fédérale de Lausanne (EPFL)   Lausanne, Switzerland

Research Assistant   September 2015 – December 2018

Mentors: Prof. Vikram S. Adve (UIUC), Prof. Bernard M. E. Moret (EPFL), and Dr. Swarup K. Sahoo (CMU)

I designed techniques to help developers analyze their code more efficiently. I prototyped a suite of C and C++ tools for scalable bug diagnosis using program analysis, efficient code instrumentation, and emerging hardware support for execution tracing.

Microsoft   Prague, Czech Republic

Software Development Engineer (Automated Testing Infrastructure)   February 2014 – August 2014
Mentor: Travis Merkel

I helped develop automated testing frameworks (C, C++ and Python) for the Skype tool chain. I used these to design performance testbeds which identified several critical memory leaks and buffer overflow bugs.

Bitdefender Labs   Bucharest, Romania

Software Development Engineering Intern (R&D)   June 2012 – September 2012
Mentor: Teodor Stoenescu

I developed a stand-alone, secondary SSL certificate validation tool for the Bitdefender Anti-virus suite (C/C++). Parts of my code were integrated in the 2013 release of the software.

Bitdefender Labs   Bucharest, Romania

Software Development Engineer (R&D)   May 2010 – August 2011
Mentors: Mihai Chiriac and Teodor Stoenescu

I developed several modules of a new Anti-virus suite for virtual environments (C/C++). I focused on optimizing network traffic processing and implemented a multi-layer cache which increased scanning throughput by 50%.

Talks

[T5] **Artifact Reproducibility as a Classroom Tool.**
ACM REP'24. Rennes, France. Invited Tutorial Talk.   June 2024

[T4] **Waffle: Exposing Memory Ordering Bugs Efficiently with Active Delay Injection.**
EuroSys'23. Rome, Italy. Conference Talk.   May 2023

[T3] **Failure Diagnosis with Hardware Support**
Imperial Collage London, London, UK. Seminar.   Jan. 2019
University of Illinois at Urbana-Champaign. Champaign, IL, USA. Invited Talk.   Sept. 2018

[T2] **Exploring Hardware Data Logging on Modern CPUs**
Microsoft Research. Redmond, WA, USA. Seminar.   Sept. 2018

[T1] **Modern Hardware and OS Support for Efficient Execution Tracing**
University of Zurich. Zurich, Switzerland. Invited Talk.   Dec. 2017

Professional Service

Symposium on Operating Systems Principles (SOSP), Artifact Evaluation Committee   2023
The Annual Conference on Machine Learning and Systems (MLSys), Artifact Evaluation Committee   2023
Symposium on Operating Systems Design and Implementation (OSDI), Artifact Evaluation Committee   2022
European Conference on Computer Systems (EuroSys), Artifact Evaluation Committee   2022
Intl. Conf. on Arch. Support for Prog. Lang. and Operating Systems (ASPLOS), Artifact Evaluation Committee 2022
Symposium on Operating Systems Principles (SOSP), Artifact Evaluation Committee   2021
Intl. Conf. on Programing Languages Design and Implementation (PLDI), Artifact Evaluation Committee   2019
Symposium on Principles and Practice of Parallel Programming (PPoPP), Artifact Evaluation Committee 2018, 2019

Teaching Experience

Co-instructor

UChicago, CMSC-33200: Topics in Operating Systems (graduate)   2024

Guest Lecturer

UChicago, CMSC-33200: Topics in Operating Systems (graduate)   2023

Teaching Assistant

UChicago, CMSC-14300: Systems Programming (undergraduate), lead teaching assistant   2023

UChicago, CMSC-22001: Software Construction (undergraduate), lead teaching assistant   2022

UChicago, MPCS-52030: Operating Systems (graduate), teaching assistant   2020

UChicago, CAPP-30122: Computer Science with Applications II (graduate), teaching assistant   2020

UChicago, MPCS-55001: Algorithms (graduate), teaching assistant   2019

EPFL, CS-173: Digital Systems Design (EPFL, undergraduate), lead teaching assistant   2018

EPFL, CS-207: Systems Oriented Programming (EPFL, undergraduate), lead teaching assistant   2015, 2017

EPFL, CS-250: Algorithms (EPFL, undergraduate), teaching assistant   2015, 2016, 2017

EPFL, CS-450: Advanced Algorithms (EPFL, graduate), teaching assistant   2013, 2014, 2016

EPFL, CS-150: Discrete Structures (EPFL, undergraduate), teaching assistant   2013

Research Mentoring

Liam Fox (2nd year undergraduate)   June 2017 – August 2017
Liam and I worked on a tool that computes imprecise dynamic program slices on x86 binaries starting from partial data-flow trace information as part of the *Statistical Program slicing* Project.

Siddhant Garg (3rd year undergraduate)   May 2017 – July 2017
Siddhant and I worked on optimizing the decoding library for Intel Processor Trace byproducts relying on clever static program analysis (LLVM).

Bobbie Lynn Eicher (2nd year Master's)   June 2016 – August 2016
Bobbie and I worked on an early dynamic program slicing prototype using DynamoRIO as a dynamic instrumentation framework.

Kishalay Raj (3rd year undergraduate)   May 2016 – July 2016
Kishalay and I worked on static program slicing (LLVM) and set the foundation for a more efficient program slicing technique to be used on large-scale code bases (e.g., 100K+ lines of code).

Van Quoc Dung (1st year Master's)   June 2015 – August 2015
Van and I analyzed execution patterns in production runs using static instrumentation (LLVM) and software path profiles to characterize deviant program behavior.

Languages

English – fluent
French – intermediate
German – beginner
Romanian – native

References

Available upon request.