Robert McLaughlin

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Summary   My research focuses on program analysis of VM-based software, in particular the Ethereum Virtual Machine (EVM). I have used both static and dynamic analysis techniques to assess issues including financial manipulation, theft of digital assets, and to conduct generalized vulnerability discovery. I also have several works examining high-frequency financial value extraction (MEV) on blockchains. I have work experience at 3 large technology companies, and have mentored students on several occasions.

Education

University of California, Santa Barbara   Santa Barbara, California

PhD in Computer Science   September 2019 – Present

Advisors: Professors Christopher Kruegel & Giovanni Vigna

Rochester Institute of Technology   Rochester, NY

BS in Software Engineering   September 2013 – May 2019

Minors: Philosophy, Mathematics, Computer Science

Publications

CLVR Ordering of Transactions on AMMs

Robert McLaughlin, Nir Chemaya, Dingyue Liu, Dahlia Malkhi.

WIP: available on arxiv.org

Approve Once, Regret Forever: On the Exploitation of Ethereum's ERC20 Approve-TransferFrom Ecosystem

Nicola Ruaro, Robert McLaughlin, Dongyu Meng, Fabio Gritti, Ilya Grishchenko, Christopher Kruegel, Giovanni Vigna.

Under Submission

HOUSTON: Real-Time Anomaly Detection of Attacks Against Ethereum DeFi Protocols

Dongyu Meng, Fabio Gritti, Nicola Ruaro, Robert McLaughlin, Lukas Dresel, Ilya Grishchenko, Christopher Kruegel, Giovanni Vigna.

Under Submission

The Power of Default: Measuring the Effect of Slippage Tolerance in Decentralized Exchanges

Nir Chemaya, Dingyie Liu, Robert McLaughlin, Nicola Ruaro, Christopher Kruegel, Giovanni Vigna.

Financial Cryptography, 2024.

Not your Type! Detecting Storage Collision Vulnerabilities in Ethereum Smart Contracts

Nicola Ruaro, Fabio Gritti, Robert McLaughlin, Ilya Grishchenko, Christopher Kruegel, Giovanni Vigna.

Network and Distributed System Security, 2024.

A Large Scale Study of the Ethereum Arbitrage Ecosystem

Robert McLaughlin, Christopher Kruegel, Giovanni Vigna.

USENIX Security, 2023.

Confusum Contractum: Confused Deputy Vulnerabilities in Ethereum Smart Contracts

Fabio Gritti, Nicola Ruaro, Robert McLaughlin, Priyanka Bose, Dipanjan Das, Ilya Grishchenko, Christopher Kruegel, Giovanni Vigna.

USENIX Security, 2023.

Regulator: Dynamic Analysis to Detect ReDoS

Robert McLaughlin, Fabio Pagani, Noah Spahn, Christopher Kruegel, Giovanni Vigna.

USENIX Security, 2022.

Honors and scholarships		
Outstanding Publication (UCSB Dept. of Computer Science)	2023
Kearse Undergraduate Writing Award in Philosophy (RIT Dept. of Philosophy)	2018

Teaching experience

PIPELINES mentor, US Navy — Summer 2021
Oversaw a small team of undergraduate student interns at Port Hueneme as they developed an embedded software system for the US Navy.

Teaching assistant, Computer Science (UCSB) — Fall 2019 - Winter 2020
CS 32: Object Oriented Design (C++)

Tutor, Software Engineering (RIT) — January 2015 - May 2018
Volunteer tutor (4hr / week) for introductory computer science and software engineering topics. Created and proctored practice exams.

Industry experience

Microsoft, Azure — Redmond, WA
Software Engineer II — July 2018 - September 2019
Productivity and engineering systems team. Maintained internal legacy software delivery (build & release) tools, and integrated them with modern systems. Participated in on-call rotation for emergency maintenance of Azure.

Microsoft, Universal Store — Redmond, WA

Software Engineering Intern   Summer 2017

Developed an internal system which monitors publication progress of millions of Store catalog items including apps, music, books, and movies. Includes business-specific logic such as international availability restrictions, sales, etc. Technologies include C#/.NET, Azure, message queues, and internal tooling.

Twitter, Fabric   Boston, MA

Software Engineering Intern   Summer 2016

Worked on Fabric team, a business-facing mobile app analytics platform. Developed an internal business growth metrics and analytics system capable of handling over 1 billion data points daily, sourced from nearly every mobile device around the globe. Used Hadoop, HP Vertica, Go, and AWS.

Constant Contact   Waltham, MA

Software Engineering Intern   Summer 2015

Developed a suite of microservice-based SaaS applications for small businesses to manage events, coupons, and donations using technologies such as Rails, Node.js, Mongodb and Java Spring.

SnipSnap Coupon App   Philadelphia, PA

Software Engineering Intern   Summer 2014

Developed an online business-facing coupon management system for authoring, scheduling, publishing, and monitoring coupons. Also maintained a user-facing coupon redemption system. All developed using Ruby on Rails and cloud hosting.

Skills   **Programming**

Python, SQL, Java, C++, C#, Bash, Ruby, JavaScript, Go, Datalog

Technologies and Techniques

Debuggers, decompilers, bytecode analysis, dynamic tracing, SMT solvers, function optimization, economic simulation, statistical analysis methods.

Languages

English (fluent, native), Chinese (intermediate)

Organizations   **Shellphish**   2020 – Present

Member of Shellphish capture-the-flag (CTF) hacking team, participated in several DEFCON CTF international finals. Participated in writing hacking challenges for several CTFs with participants ranging from experienced cybersecurity experts to high school students.

Other interests

– Language learning: Chinese, Japanese
– Hiking and camping
– Automotive maintenance