James C. Davis

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RESEARCH INTERESTS

My research improves computing systems through empirical measurements of how and why they are used.

PROFESSIONAL EXPERIENCE

Assistant Professor — Fall 2020-present
Purdue University — Electrical and Computer Engineering

Intern, Microsoft Research (RiSE group: Cloud Security) — Summer 2019
Microsoft Research, Redmond, WA — Mentored by Patrice Godefroid

Intern, IBM Research (Storage) — Summer 2018
IBM Research, Almaden, CA — Mentored by Deepavali Bhagwat

Graduate Research Assistant — 2016-2020
Virginia Tech — Advised by Dongyoon Lee

Software Engineer, IBM (GPFS) — 2012-2015, Summer 2016, Summer 2017
IBM, Poughkeepsie, NY

EDUCATION

Ph.D, Computer Science and Applications — 2015-2020
Virginia Tech, Blacksburg, VA

B.Sc. Computer Science, B.Sc. Mathematics — 2008-2012
Clarkson University, Potsdam, NY

RESEARCH GRANTS

[1] **Google, LLC**

Co-Principal Investigator (PI: Yung-Hsiang Lu)

Unrestricted Gift

2020. $20,000

REFEREED CONFERENCE PUBLICATIONS

[1] Cha, Wittern, Baudart, **Davis**, Mandel, Laredo. *A Principled Approach to GraphQL Query Cost Analysis.* Proceedings of the 28th ACM Joint European Software Engineering Conference and Symposium on the Foundations of Software Engineering (**ESEC/FSE'20**). *ACM Distinguished Paper Award.*

[2] Rupprecht, **Davis**, Arnold, Gur, Bhagwat. *Improving Reproducibility of Data Science Pipelines through Transparent Provenance Capture.* Proceedings of the 46th International Conference on Very Large Data Bases (**VLDB'20 Industry track**).

[3] **Davis**, Moyer, Kazerouni, and Lee. *Testing Regex Generalizability And Its Implications: A Large-Scale Many-Language Measurement Study.* Proceedings of the 34th IEEE/ACM International Conference on Automated Software Engineering (**ASE'19**).

[4] Michael, Donohue, **Davis**, Lee, and Servant. *Regexes are Hard: Decision-making, Difficulties, and Risks in Programming Regular Expressions.* Proceedings of the 34th IEEE/ACM International Conference on Automated Software Engineering (**ASE'19**). *ACM Distinguished Paper Award.*

[5] **Davis**, Michael, Coghlan, Servant, and Lee. *Are Regular Expressions a Lingua Franca? An Empirical Study on the Re-use and Portability of Regular Expressions.* Proceedings of the 27th ACM Joint European Software Engineering Conference and Symposium on the Foundations of Software Engineering (**ESEC/FSE'19**).

[6] Wittern, Cha, **Davis**, Baudart, Mandel. *An Empirical Study of GraphQL Schemas.* Proceedings of the 17th International Conference on Service-Oriented Computing (**ICSOC'19**).

[7] Fu, Ghaffar, **Davis**, and Lee. *EdgeWise: A Better Stream Processing Engine for the Edge.* 2019 USENIX Annual Technical Conference (**USENIX ATC'19**).

[8] **Davis**, Coghlan, Servant, and Lee. *The Impact of Regular Expression Denial of Service (REDOS) in Practice: an Empirical Study at the Ecosystem Scale.* Proceedings of the 26th ACM Joint European Software Engineering Conference and Symposium on the Foundations of Software Engineering (**ESEC/FSE'18**). *ACM Distinguished Paper Award.*

[9] **Davis**, Williamson, and Lee. *A Sense of Time for JavaScript and Node.js: First-Class Timeouts as a Cure for Event Handler Poisoning.* Proceedings of the 27th USENIX Security Symposium (**USENIX Security'18**).

[10] **Davis**, Thekumparampil, and Lee. *Node.fz: Fuzzing the Server-Side Event-Driven Architecture.* Proceedings of the Twelfth European Conference on Computer Systems (**EuroSys'17**).

JOURNAL ARTICLES

[1] Ozkan, Davis, **Davis**, James, Murzi, Knight. *Expectations and Experiences of Short-Term Study Abroad Leadership Teams.* Journal of International Engineering Education (**JIEE 2020**).

SHORT PAPERS

[1] **Davis**. *On the Impact and Defeat of Regex DoS.* **ACM SRC – Grand Finals**. *Second place, graduate student division*.

[2] **Davis**. *Rethinking Regex Engines to Address ReDoS.* **ACM SRC – ESEC/FSE'19**. *First place, graduate student division*.

[3] Rupprecht, **Davis**, Arnold, Lubbock, Tyson, and Bhagwat. *Ursprung: Provenance for Large-Scale Analytics Environments.* Proceedings of the 2019 International Conference on Management of Data (**SIGMOD'19 Demo**).

[4] **Davis**, Kildow, and Lee. *The Case of the Poisoned Event Handler: Weaknesses in the Node.js Event-Driven Architecture.* Proceedings of the 10th European Workshop on Systems Security (**EuroSec'17**).

POSTERS

[1] Vivek, Chinnakotla, Banna, Vegesana, Yan, **Davis**, Lu, Thiruvathukal. *Exemplars for Machine Learning: Towards Software Engineering & Reproducibility.* SIAM Conference on Computational Science and Engineering (**CSE'20**).

PATENTS

[1] Davis, **Davis**. *Injection of Simulated Hardware Failure(s) in a File System for Establishing File System Tolerance-to-Storage-Failure(s)*. IBM, U.S. patent application 20200264961. U.S. patent pending.

[2] Davis, **Davis**. *Verification of the integrity of data files stored in copy-on-write (CoW) based file system snapshots*. IBM, U.S. patent application 20200242075. U.S. patent pending.

[3] **Davis**, Davis. *File metadata verification in a distributed file system*. IBM, U.S. patent 10,678,755B2, granted Jun. 9, 2020..

[4] Davis, **Davis**. *Testing of lock managers in computing environments*. IBM, U.S patent 10,061,777 B1, granted Aug. 28, 2018.

[5] **Davis**, Davis, Knop. *Detection of file corruption in a distributed file system*. IBM, U.S. patent 10,025,788, granted Jul. 17, 2018.

COURSES TAUGHT

ECE 368 — Data Structures   Fall 2020
Purdue University

VIP: Open-Source TensorFlow Software   Fall 2020
Purdue University

VIP: SafeRegex   Fall 2020
Purdue University

CS 3114 — Data Structures and Algorithms   Fall 2019
Virginia Tech

CS 1064 — Introduction to Programming in Python   Spring 2019
Virginia Tech

Rising Sophomore Abroad Program (Track Leader)   Spring 2018, Spring 2019
Virginia Tech

UNDERGRADUATE STUDENTS

Albert Sun (BS, Purdue University)	2020-present
Jitesh Motati (BS, Purdue University)	2020-present
Tuhin Sarkar (BS, Purdue University)	2020-present
Jonathan Alexander (BS, Virginia Tech)	2018-2019
Christy Coghlan (BS, Virginia Tech)	2018

INVITED TALKS

Regexes Awry: Characterizing and Defeating Regex-based Denial of Service   2020
Clemson University CS department colloquium

Regex-based Denial of Service   2020
Clarkson University CS department colloquium

Regexes are Hard: Qualitative and Quantitative Perspectives   2019
NC State CS department colloquium

The Dangers of Copy/Pasting Code   2019

Regexes in the Wild 2019
Virginia Tech department seminar

Academic Perspectives on Node.js 2018
Node.js Collaborator Summit, Vancouver

International Engineering Annual, 2015-2019
Rising Sophomore Abroad Program, Virginia Tech

AWARDS AND RECOGNITION

ACM Distinguished Paper Award, ESEC/FSE 2020	2020
Outstanding Graduate Student Service Award, CS@VT	2020
Second place, Grand Finals of the ACM Graduate Student Research Competition	2020
First place, Graduate Student Research Competition, ESEC/FSE 2019	2019
ACM Distinguished Paper Award, ASE 2019	2019
ACM Distinguished Paper Award, ESEC/FSE 2018	2018
Microsoft Security Researcher Acknowledgments (Regex DoS)	2018
Pratt Fellowship, Virginia Tech College of Engineering	2017-2019
Davenport Fellowship, Virginia Tech College of Engineering	2019
Graduate Fellow, VT Academy for Global Engineering	2019-2020
IBM Significant Contributor Award (Node.js)	2018
IBM Poughkeepsie's New hire of the month	2014
Frederica Clarkson Award	2012
Clarkson University's Outstanding Senior (x2): Mathematics, Computer science	2012
Clarkson University Phalanx Commendable Leadership	2011

EXTERNAL SERVICE

Reviewer, ACM Transactions on Software Engineering (TSE)	2020-present
Member, ICSE Demonstrations Track	ICSE 2021
Member, ESEC/FSE Artifact Evaluation Committee	ESEC/FSE 2020
Member, CGO Artifact Evaluation Committee	CGO 2019
Sub-reviewer: ASPLOS'18, EuroSys'18, MASCOTS'18, HPCA'19, CGO'19, ISMM'19	2016-2019
Regional Judge, ACM ICPC	Fall 2015

DEPARTMENTAL SERVICE

Committee member, Purdue ECE Undergraduate Curriculum Committee	2020-present
President, VT CS Graduate Student Council	2018-2019
Organizer, VT Systems Reading Group	2017-2020

PROFESSIONAL MEMBERSHIPS

Member, Association for Computing Machinery