Konstantinos Kallas

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Employment

Assistant Professor *Fall 2024 – today*
Department of Computer Science
University of California, Los Angeles

Research Intern *Summer 2020*
Microsoft Research, Redmond, US
Internship in the RiSE group; advised by Sebastian Burckhardt.
Worked on Durable Functions, a programming model for serverless applications.

Research Intern *Summer 2019*
Amazon Web Services, New York, US
Internship in the Automated Reasoning Group; advised by Daniel Schwartz-Narbonne.
Worked on the verification of critical C code.

Big Data Application Developer *Summer 2016*
Everis, Barcelona, Spain
Internship at the Big Data Center of Excellence.
Developed Big Data Applications using tools in the Hadoop ecosystem.

Honors and Awards

Dennis M. Ritchie Doctoral Dissertation Award *2024*
Dissertation award given annualy by ACM SIGOPS.

Morris and Dorothy Rubinoff Award *2024*
Best Computer Science Ph.D. thesis at Penn.

A.G. Leventis Foundation PhD Grant *2021-2023*

ACM SRC Grand Finals *2021*
2nd place among SRC winners across all ACM conferences.

HotOS 2021 Distinguished Presentation Award *2021*
Awarded for "Unix Shell Programming: The Next 50 Years".

EuroSys 2021 Best Paper Award *2021*
Awarded for "PaSh: Light-touch Data-Parallel Shell Processing".

POPL Student Research Competition *2021*
1st place at the graduate category of the research competition.
Presented work on a parallelizing JiT compiler for shell scripts.

Gerondelis Foundation PhD Award *2020*

Education

University of Pennsylvania *September 2018 – July 2024*
Computer and Information Science, PhD student
Dissertation: *"Just-in-time Scale-out of Shell Programs, Correctly"*
Advisor: Prof. Rajeev Alur

National Technical University of Athens *October 2012 – February 2018*
Electrical and Computer Engineering, Diploma

Thesis: *"HiPErJiT: A Profile-Driven Just-in-Time Compiler for Erlang"*
Advisor: Prof. Kostis Sagonas

Publications

The Koala Benchmarks for the Shell: Characterization and Implications.
Evangelos Lamprou, Ethan Williams, Georgios Kaoukis, Zhuoxuan Zhang, Michael Greenberg, Konstantinos Kallas, Lukas Lazarek, and Nikos Vasilakis.
2025 USENIX Annual Technical Conference (USENIX ATC 25).
Best Paper Award.

Rajomon: Decentralized and Coordinated Overload Control for Latency-Sensitive Microservices.
Jiali Xing, Akis Giannoukos, Paul Loh, Shuyue Wang, Justin Qiu, Henri Maxime Demoulin, Konstantinos Kallas, and Benjamin Lee.
22nd USENIX Symposium on Networked Systems Design and Implementation (NSDI 25).

Netherite: efficient execution of serverless workflows.
Sebastian Burckhardt, Badrish Chandramouli, Chris Gillum, David Justo, Konstantinos Kallas, Connor McMahon, Christopher S Meiklejohn, and Xiangfeng Zhu.
The VLDB Journal (Best of VLDB 22), Volume 34, Springer.

MuCache: a General Framework for Caching in Microservice Graphs.
Haoran Zhang*, Konstantinos Kallas*, Spyros Pavlatos, Rajeev Alur, Sebastian Angel, and Vincent Liu.
21th USENIX Symposium on Networked Systems Design and Implementation (NSDI 24).

Executing Shell Scripts in the Wrong Order, Correctly.
Georgios Liargkovas, Konstantinos Kallas, Michael Greenberg, and Nikos Vasilakis.
Workshop on Hot Topics in Operating Systems (HotOS 23).

DiSh: Dynamic Shell-Script Distribution.
Tammam Mustafa, Konstantinos Kallas, Pratyush Das, and Nikos Vasilakis.
20th USENIX Symposium on Networked Systems Design and Implementation (NSDI 23).

Executing Microservice Applications on Serverless, Correctly.
Konstantinos Kallas*, Haoran Zhang*, Rajeev Alur, Sebastian Angel, and Vincent Liu.
Proceedings of the ACM on Programming Languages (POPL 23).

Practically Correct, Just-in-Time Shell Script Parallelization.
Konstantinos Kallas, Tammam Mustafa, Jan Bielak, Dimitris Karnikis, Thurston Dang, Michael Greenberg, and Nikos Vasilakis.
16th USENIX Symposium on Operating Systems Design and Implementation (OSDI 22).

Netherite: Efficient Execution of Serverless Workflows.
Sebastian Burckhardt, Badrish Chandramouli, Chris Gillum, David Justo, Konstantinos Kallas, Connor McMahon, Christopher S. Meiklejohn, and Xiangfeng Zhu.
Proceedings of the VLDB Endowment (VLDB 22).

Stream Processing with Dependency-Guided Synchronization.
Konstantinos Kallas*, Filip Niksic*, Caleb Stanford*, and Rajeev Alur.
Proceedings of the 27th ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming (PPoPP 22).

Charon: A Framework for Microservice Overload Control.
Jiali Xing, Max Demoulin, Konstantinos Kallas, and Benjamin C. Lee.
Proceedings of the 18th ACM Workshop on Hot Topics in Networks (HotNets 21).

Durable Functions: Semantics for Stateful Serverless.
Sebastian Burckhardt, Chris Gillum, David Justo, Konstantinos Kallas, Connor McMahon, and Christopher S. Meiklejohn.
Proceedings of the ACM on Programming Languages (OOPSLA 21).

An Order-aware Dataflow Model for Parallel Unix Pipelines.
Shivam Handa*, Konstantinos Kallas*, Nikos Vasilakis*, and Martin Rinard.
Proceedings of the ACM on Programming Languages (ICFP 21).

Synchronization Schemas.
Rajeev Alur, Phillip Hillard, Zachary G. Ives, Konstantinos Kallas, Konstantinos Mamouras, Filip Niksic, Caleb Stanford, Val Tannen, and Anton Xue.
Invited Paper at Proceedings of the 40th Symposium on Principles of Database Systems (PODS 21).

Unix Shell Programming: The Next 50 Years.
Michael Greenberg*, Konstantinos Kallas*, and Nikos Vasilakis*.
Proceedings of the Workshop on Hot Topics in Operating Systems (HotOS 21).
Distinguished Presentation Award.

The Future of the Shell: Unix and Beyond.
Michael Greenberg*, Konstantinos Kallas*, and Nikos Vasilakis*.
Panel at the Workshop on Hot Topics in Operating Systems (HotOS 21).

PaSh: Light-touch Data-Parallel Shell Processing.
Nikos Vasilakis*, Konstantinos Kallas*, Konstantinos Mamouras, Achilleas Benetopoulos, and Lazar M. Cvetković.
Proceedings of the Sixteenth European Conference on Computer Systems (EuroSys 21).
Best Paper Award.

Preventing Dynamic Library Compromise on Node. js via RWX-Based Privilege Reduction.
Nikos Vasilakis, Cristian-Alexandru Staicu, Grigoris Ntousakis, Konstantinos Kallas, Ben Karel, André DeHon, and Michael Pradel.
Proceedings of the ACM SIGSAC Conference on Computer and Communications Security (CCS 21).

Code-level model checking in the software development workflow at Amazon Web Services.
Nathan Chong, Byron Cook, Jonathan Eidelman, Konstantinos Kallas, Kareem Khazem, Felipe R. Monteiro, Daniel Schwartz-Narbonne, Serdar Tasiran, Michael Tautschnig, and Mark R. Tuttle.
Software: Practice and Experience 2021.

DiffStream: Differential Output Testing for Stream Processing Programs.
Konstantinos Kallas*, Filip Niksic*, Caleb Stanford*, and Rajeev Alur.
Proceedings of the ACM on Programming Languages (OOPSLA 20).

Code-Level Model Checking in the Software Development Workflow.
Nathan Chong, Byron Cook, Konstantinos Kallas, Kareem Khazem, Felipe R. Monteiro, Daniel Schwartz-Narbonne, Serdar Tasiran, Michael Tautschnig, and Mark R. Tuttle.
42st International Conference on Software Engineering: Software Engineering in Practice (ICSE-SEIP 20).

Security Criteria for a Transparent Encryption Layer.
Konstantinos Kallas, Clara Schneidewind, Benjamin C. Pierce, and Steve Zdancewic.
Workshop on Foundations of Computer Security (FCS 2019).

HiPErJiT: A Profile-Driven Just-in-Time Compiler for Erlang.
Konstantinos Kallas and Konstantinos Sagonas.
30th Symposium on Implementation and Application of Functional Languages (IFL 2018).

Notes: * indicates equal contribution.

Software

PaSh (Github: binpash/pash)
A bolt-on system that automatically parallelizes arbitrary shell programs with theoretical and practical correctness guarantees.
Hosted by the Linux Foundation.

try (Github: binpash/try)
A tool that lets you run a command and inspect its effects before committing them to your system.

DiSh (Github: binpash/dish)
A system that automatically scales out shell scripts that operate on files in HDFS.

mucache (Github: eniac/mucache)
A system that automatically adds and manages caches in microservice applications.

mu2sls (Github: eniac/mu2sls)
A framework for correctly implementing stateful microservice applications on serverless using standard Python.

Flumina (Github: angelhof/flumina)
A programming model and system for stateful distributed streaming computations.

DiffStream (Github: fniksic/diffstream)
A differential testing library for stream processing applications in Apache Flink.

Selected Press

Static analysis proposed to 'rehabilitate' shell programs (link)
InfoWorld Article, written by Paul Krill. May 2025.

Practically Correct, Just-in-Time Shell Script Parallelization (link)
Disseminate Podcast Episode 20, hosted by Jack Waudby. January 2023.

Faster computing results without fear of errors (link)
MIT News Article, written by Adam Zewe. June 2022.

The PaSh Project – Advancing the Unix Philosophy One Step Further (link)
I-Programmer News Article, written by Nikos Vaggalis. November 2021.

Linux Foundation to Host the PaSh Project, Accelerating Shell Scripting with Automated Parallelization for Industrial Use Cases (link)
Linux Foundation Press Release, written by Kristin OConnell. September 2021.

Outreach

CS PhD MentoRes *2021 – present*
Co-organizer of mentoring initiative for students that are interested in applying for PhD programs in CS but lack adequate resources. We have provided mentoring and resources to more than 40 students since the initiative's start.

SIGPLAN-M *2021 – present*
Participating mentor for students in the programming languages community.

SOSP Mentoring *2023*
Student mentor in SOSP 2023.

Service

Program Committees
OSDI 2026, ASPLOS 26, PLDI 25, PLDI 25 SRC, OOPSLA 23 (ERC, AEC), VMCAI 21 (AEC)

PLDI 2025 Publicity Co-Chair *2025*

POPL 2023 Student Volunteer Co-Chair *2023*

POPL 2022 Student Volunteer Co-Chair *2022*

HotOS 2021 Co-organizer of a panel on the future of the shell (link) *2021*

Teaching

Teaching Assistant *Fall 2021*
Institution: University of Pennsylvania
Course: *Computer-Aided Verification*, Graduate level
Professor: Rajeev Alur

Teaching Assistant *Fall 2019*
Institution: University of Pennsylvania
Course: *Software Foundations*, Graduate level
Professor: Benjamin Pierce

Lab Assistant *Fall 2017*
Institution: National Technical University of Athens
Course: *Introduction to Programming*, Undergraduate level
Professors: S. Zachos, N. Papaspyrou, V. Kantere, and P. Potikas

Invited Talks

Performance and Correctness for Microservice Applications. *2025*
Event: Invited talk @ Workshop on Verification of Distributed Systems (VDS).

Programmable Software Systems for Correct High-performance Applications. *2024*
Event: Invited talk @ University of Wisconsin-Madison.
Host: Tej Chajed.

Programmable Software Systems for Correct High-performance Applications. *2024*
Event: Invited talk @ University of Michigan.
Host: Manos Kapritsos.

Programmable Software Systems for Correct High-performance Applications. *2024*
Event: Invited talk @ University of California, Los Angeles.
Host: Jens Palsberg.

Programmable Software Systems for Correct High-performance Applications. *2024*
Event: Invited talk @ Rutgers University.
Host: Santosh Nagarakatte.

Programmable Software Systems for Correct High-performance Applications. *2024*
Event: Invited talk @ Yale University.
Host: Ruzica Piskac.

Programmable Software Systems for Correct High-performance Applications. *2024*
Event: Invited talk @ Imperial College London.
Host: Holger Pirk.

Programmable Software Systems for Correct High-performance Applications. *2024*
Event: Invited talk @ Brown University.
Host: Nikos Vasilakis.

Programmable Software Systems for Correct High-performance Applications. *2024*
Event: Invited talk @ University of Maryland, College Park.
Host: Leonidas Lampropoulos.

Programmable Software Systems for Correct High-performance Applications. *2024*
Event: Invited talk @ Stevens Institute of Technology.
Host: Eric Koskinen.

Programmable Software Systems for Correct High-performance Applications. *2024*
Event: Invited talk @ IMDEA Software Institute.
Host: Niki Vazou.

Programmable Software Systems for Correct High-performance Applications. *2024*
Event: Invited talk @ ETH Zurich.
Host: Gustavo Alonso.

Programmable Software Systems for Correct High-performance Applications. *2024*
Event: Invited talk @ Georgia Institute of Technology.
Host: Qirun Zhang.

Programmable Software Systems for Correct High-performance Applications. *2024*
Event: Invited talk @ Boston University.
Host: Wenchao Li.

Programmable Software Systems for Correct High-performance Applications. *2024*
Event: Invited talk @ Institute of Science and Technology Austria (ISTA).
Host: Tom Henzinger.

Programmable Software Systems for Correct High-performance Applications. *2024*
Event: Invited talk @ New Jersey Institute of Technology.
Host: Martin Kellogg.

PaSh: Practically Correct, Just-in-Time Shell Script Parallelization. *2023*
Event: Invited lecture at Programming Language and Translators (COMS 4115) @ Columbia University.
Host: Baishakhi Ray.

PaSh: Practically Correct, Just-in-Time Shell Script Parallelization. *2023*
Event: Compute Seminar @ Technical University of Denmark (DTU).
Host: Christian Gram Kalhauge.

Executing Microservices on Serverless, Correctly. *2023*
Event: Sysread Seminar @ Brown University.
Host: Shriram Krishnamurthi.

Advancing the Serverless Paradigm. *2023*
Event: Invited Lecture at Systems Transforming Systems Course @ Brown University.
Host: Nikos Vasilakis.

PaSh: Practically Correct, Just-in-Time Shell Script Parallelization. *2023*
Event: Portland Programming Languages Seminar @ Portland State University.
Host: Yao Li.

Executing Microservices on Serverless, Correctly. *2023*
Event: Programming Languages Seminar @ Harvard University.
Host: Stephen Chong.

PaSh: Practically Correct, Just-in-Time Shell Script Parallelization. *2023*
Event: CSLab Computing Systems Day @ National Technical University of Athens.
Host: Georgios Goumas.

PaSh: Practically Correct, Just-in-Time Shell Script Parallelization. *2022*
Event: Invited Lecture at Systems Transforming Systems Course @ Brown University.
Host: Nikos Vasilakis.

PaSh: Practically Correct, Just-in-Time Shell Script Parallelization. *2022*
Event: New England Programming Languages and Systems Symposium (NEPLS) @ Harvard University.

PaSh: Practically Correct, Just-in-Time Shell Script Parallelization. *2022*
Event: New Jersey Programming Languages and Systems Seminar (NJPLS) @ Stevens University.

PaSh: Practically Correct, Just-in-Time Shell Script Parallelization. *2022*
Event: Languages, Systems, and Data Group Seminar @ University of California Santa Cruz.
Host: Lindsey Kuper.

PaSh: Data-parallel shell scripting. *2022*
Event: Programming Research Laboratory Seminar @ Northeastern University (Virtual).
Host: Arjun Guha.

Flumina: Correct Distribution of Stateful Streaming Computations. *2020*
Event: Programming Languages Tea @ University of California San Diego.
Host: Nadia Polikarpova.

Flumina: Correct Distribution of Stateful Streaming Computations. *2019*
Event: Athens Programming Languages Seminar @ National Technical University of Athens.
Host: Kostis Sagonas and Nikos Papaspirou.

HiPErJiT: A Profile-Driven Just-in-Time Compiler for Erlang. *2018*
Event: Athens Programming Languages Seminar @ National Technical University of Athens.
Host: Kostis Sagonas and Nikos Papaspirou.