



# Department of Computer Science

Programmable Software Systems for Correct High-performance Applications

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## Hosted by Martin Kellogg

**Date:** Wednesday, January 31, 2024

**Coffee:** 2:15 PM – 2:30 PM

**Time:** 2:30 PM – 4:00 PM

**Location:** GITC 4402 (4<sup>th</sup> floor Seminar Lecture Hall)

**Webex Link:** <https://njit.webex.com/njit/j.php?MTID=m267251d284afef2d5f945baf20620224>

## Abstract:

We live in an era of unprecedented compute availability. The advent of the cloud allows anyone to deploy critical high-performance applications that serve millions of users without owning or managing any computational resources. The goal of my research is to enable the development of such high-performance applications with robust correctness guarantees. To achieve this goal, I build practical programmable software systems that target realistic workloads in widely-used environments. My systems are rooted in solid foundations, incorporating formal specifications and techniques drawn from the programming languages, compilers, and formal methods literature.

In this talk I will present some of my work on such systems, including PaSh, the first optimization system for the Unix shell since its inception 50 years ago, as well as MuCache, a caching system for microservice graphs. Surprisingly, the shell and microservices have a key characteristic in common, they are both used to compose black-box components to create applications that are greater than the sum of their parts. I will conclude the talk by describing ongoing and future directions towards improving the performance and efficiency of cloud applications.

## Bio:

Konstantinos Kallas is a PhD student at the University of Pennsylvania working with Rajeev Alur. He is interested in building systems that enable the development of high-performance applications with robust correctness guarantees, both in theory and in practice. His research spans several domains, from serverless and microservices to the Unix shell, has appeared at several venues including OSDI, NSDI, EuroSys, POPL, OOPSLA, and VLDB, and has received the best paper award at EuroSys 21, the best presentation award at HotOS 21, and the 2nd place at the ACM SRC Grand Finals. His research on optimizing shell scripts for parallel and distributed computing environments is supported by the Linux Foundation and part of his research on serverless is incorporated in the Durable Functions framework that is offered by Azure and serves thousands of active users. You can find more information about him on his website: <https://www.cis.upenn.edu/~kallas/>.