



# **Hannah Gommerstadt**

## **Session-Typed Concurrent Contracts**

**Friday, December 7, 2018 – 10:00 a.m. – GHC 6501**

**Multi-process systems control the behavior of everything from datacenters storing our information to banking systems managing money. Each one of these processes has a prescribed role, their contract, that governs their behavior during the joint computation. When a single process violates their communication contract, the impact of this misbehavior can rapidly propagate through the system. This thesis develops techniques for dynamically monitoring expressive classes of concurrent contracts. We provide multiple mechanisms to monitor contracts of increasing complexity. In order to model message-passing concurrent computation, we use a session type system. First, we present a method for dynamic monitoring and blame assignment where communication contracts are expressed using session types. Second, we describe contract-checking processes that handle stateful contracts that cannot be expressed with a session type. These contract-checking processes are also able to encode type refinements. In the proposed work, we aim to encode dependent types in our system which will allow us to monitor complex invariants. Finally, we propose a number of other monitoring extensions including a formal mechanism to analyze the resource consumption of our monitoring processes.**

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