Theophilos Giannakopoulos

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Professional Profile

Solution-oriented researcher and software engineer with extensive knowledge of formal methods, applied logic and language design. Proficient at applying mathematical techniques and leadership experience to create high-quality deliverables.

Technical Skills

- Haskell, C, Bash, Rust, Datalog, Lean, Coq, Scala, Java, SQL, Racket, Perl, OCaml, SML
- GitLab CI, Linux, Docker, CVC4, Z3, LaTeX, Typst, Emacs, Vim, Git
- Formal methods, compiler construction, probabilistic programming
- Mathematical background: applied logic, measure theory, abstract algebra, category theory, graph theory

Business Experience

- Led 20-person technical team on direct-to-transition R&D project
- Principal Investigator for DARPA projects
- Led local, remote, and hybrid teams
- Led teams with academic subcontractors
- Authored white papers, DARPA proposals, and other project proposals
- Experience working with back office business processes in the financial industry

Experience

STR , **Principal Researcher** **June 2018–Present**

- Principal Investigator for project developing tools for machine-assisted independent verification and validation of safety critical software projects
  - Grew and managed a team of 20 people to implement the full solution
  - Successfully handed off project management in order to re-focus on technical aspects of project
  - Designed and lead development of extensible mechanism for aggregating information about a software system in a queryable form
  - Designed and led development of a language for querying over source code and other system artifacts, exposing data generated by semantic analyses in a programmer-friendly way
- Research and technical lead for MASON project on the DARPA ConSec program
  - Designed algorithms based on model checking, SMT solvers, and Prolog engines for synthesizing and verifying secure configurations based on high-level system models
  - Led team of three software engineers implementing and evaluating algorithms
- Computational Research/Formal Methods team lead, managing two software engineers
- Research and technical lead for MITCHELL project on the DARPA SDH program
  - Created an automatically parallelizable language based on the Standard ML MLton compiler targeting Intel's PIUMA architecture

BAE Systems , **Principal Scientist** **February 2014–June 2018**

- Software Engineering Lead for the RINGS project on the DARPA BRASS program
  - Developed prototype software for automatic detection of and adaptation to changes in runtime environment and available system resources
  - Managed collaboration with researchers at MIT and University of Pennsylvania
- Principal Investigator for the OP3 project on the DARPA PPAML program
  - Managed a team of five researchers, including professors at Northeastern University
  - Developed semantics for probabilistic programming languages (see publications below)
  - Implemented a notebook IDE for the Gamble probabilistic programming language
  - Created machine checked proofs for publications on probabilistic programming semantics
- Software Engineering Lead for the SAFE project on the DARPA CRASH program
  - Maintained and extended a compiler for Tempest, a C-like programming language
  - Designed and analyzed instruction set security polices on novel SAFE hardware
  - Implemented operating system components for the SAFE system

Other Experience

- **Vistaprint, Senior Software Engineer** **April 2012–January 2014**
  - Developed and maintained a high availability payment system with an international team
- **Worcester Polytechnic Institute, Research Assistant** **2008–2010, 2011–2012**
  - See publications below
- **Worcester Polytechnic Institute, Teaching Assistant** **2008–2010, 2011–2012**
- **Galatea Associates** **2010–2011**
  - Created, maintained and provided support for back-office financial software
- **Milliman Global** **2004–2007**
  - Developed insurance valuation system automation tools and quality assurance software

Selected Publications

Synthesizing Mutable Configurations: Setting up Systems for Success
Nelson, Danas, Giannakopoulos, and Krishnamurthi
Automated Software Engineering Workshop 2019 (ASE2019)
Designed and proved correctness of an algorithm for deriving the root cause for linear temporal logic requirements violations in a state machine and using those root causes in a counterexample-guided process to synthesize a configuration that satisfies the requirements.

Contextual Equivalence for a Probabilistic Language with Continuous Random Variables and Recursion
Wand, Culpepper, Giannakopoulos, and Cobb
International Conference on Functional Programming 2018 (ICFP18)
Defined a logical relation for proving contextual equivalence in a probabilistic programming language with continuous random variables and recursion. The logical relation is useful for proving the correctness of compiler optimizations and other program transformations.

Finite-depth HOAS trees for reasoning about probabilistic programs
Giannakopoulos, Wand, and Cobb
Probabilistic Programming Semantics Workshop 2016 (PPS16)
Designed a core calculus for the purpose of investigating reasoning principles of probabilistic programming languages. The calculus captures the semantics of a stochastic language with observation while being agnostic to the details of its deterministic portions.

Multi-Decision Policy and Policy Combinator Specifications
Master's Thesis (Worcester Polytechnic Institute)
Designed semantics for a core language for policies and policy combinators, with a specific focus on multi-decision access control policies and the Margrave policy language.

Education

Worcester Polytechnic Institute

- M.S. Computer Science, May 2012, GPA 4.0
- B.S. Computer Science, May 2009, GPA 4.0
  - Minor in Mathematics
  - Graduation with High Distinction