Francesco
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Research Scientist, Meta

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My research is at boundaries between programming languages, system programming, and computer architectures, with the overall goal of producing systems which are better-understood, more robust, and more secure.

MAIN RESEARCH PROJECTS

On Programming Language Design and Implementation

- Reverse engineered and formalised the Julia subtyping relation, relied upon by Julia runtime to implement multiple dispatch. Built a reference implementation of the algorithm, used for differential testing of Julia runtime.
- Designed LikeTypes, a gradual type system for dynamic languages. This design captures common programmer mistakes, is compatible with object-orientation and can be implemented efficiently. It is implemented in the Thorn language and in the StrongScript dialect of JavaScript.

On Weak Memory Models

- Defined the de-facto standard x86-TSO memory model of the x86 architecture, now relied upon by language standards and mainstream compiler implementations.
- Studied verified compilation for a concurrent dialect of C of top of x86-TSO, building the CompCertTSO verified compiler.
- Studied the correctness of compiler optimisations in the C and C++ memory models. Identified unexpected issues in the C++11 standard, and implemented a tool, cmmtest, to perform random testing of compiler optimizers.

On Tool Support for Semantics

- Designed and implemented the Ott tool for expressing semantics of large programming language definitions.

On Debug Information

- Designed and implemented tools to validate and synthesise DWARF unwind tables from binaries, and to speedup ~20x DWARF-based unwinding.

EDUCATION

École normale supérieure, France, *HdR*, Computer Science, 2013

Université Paris 7, France, *Ph.D*, Computer Science, 2003

Università di Pisa, Italy, *M.Sc.*, Computer Science, 2000

POSITIONS

2019 - present: Research Scientist, Meta

2015 - present: Professeur Chargé de Cours (part-time), École Polytechnique, France

2016 - 2019: Senior Research Scientist (DR), Inria Paris, France

2004 - 2015: Research Scientist (CR), Inria Paris, France

2003: PostDoc, Cambridge University, UK

PUBLICATIONS

Available online at

https://fzn.fr/publications.html

LANGUAGES

Italian (mother tongue)

English and French (fluent)