

Dimitrios Vytiniotis

Microsoft Research Ltd,
7 JJ Thomson Avenue,
Cambridge CB3 0FB, UK
+44(0)7517518524

dimitris@microsoft.com

<http://research.microsoft.com/people/dimitris>

GENERAL

Electrical and Computer Engineer, National Technical University of Athens (2002). PhD from the University of Pennsylvania (2008) on programming languages. Researcher on programming languages for Microsoft Research, Cambridge (2008-2010). Work experience as software engineer (2000-2003).

EDUCATION

University of Pennsylvania, Philadelphia, USA **2003-2008**

Doctor of Philosophy in Computer Science

Topic: "Practical type inference for first-class polymorphism". Advisor: Stephanie Weirich.

Supported by Dean's Fellowship.

National Technical University of Athens **1997-2002**

Electrical and Computer Engineering Diploma

Graduated with GPA 9.26/10 (top 3%).

Thesis title: "Design and implementation of code generator for Intelligent Network services".

RESEARCH EXPERIENCE

Microsoft Research, Cambridge, UK **09/2008-today**

Postdoctoral Researcher

Research position in the Programming Principles and Tools group. Broadly interested in programming languages and verification theoretical and implementation problems. Recent research includes:

- Type inference for generalized algebraic datatypes using implication constraints. With Tom Schrijvers (KU Leuven), Simon Peyton Jones (Microsoft Research), Martin Sulzmann (Intaris Software GmbH).
- Type inference in the presence of type functions, generalized algebraic datatypes, and type classes. The goal of this project is the combination of these features in a type checker, and the feasibility of sound and complete type inference with respect to a type system specification that requires type annotations to guide type inference. With Tom Schrijvers (KU Leuven) and Simon Peyton Jones (Microsoft Research).
- A simple proposal called QML for type inference for first-class polymorphism based on explicit polymorphism introduction and elimination. Formalization of type-inference related lemmas in the automated proof assistant Coq. With Claudio Russo (Microsoft Research).
- Working on an intermediate language with support for type equalities and equality proof witnesses. With Simon Peyton Jones (Microsoft Research).
- Program equivalence proof methods, and in particular on the relationship between step-indexed logical relations and bisimulations. With Vasileios Koutavas (Trinity College, Dublin).

Other research directions and collaborations include dependent kinds for Haskell, using type classes for automated encoding of various program analyses such as provenance tracking or information flow analysis, (un-)marshalling combinators, and more recently logical specifications of distributed systems.

Microsoft Research, Cambridge, UK **07-09/2005**

Internship

Type inference for first-class polymorphism and generalized algebraic data types.

Supervised by S. Peyton Jones.

University of Pennsylvania, Philadelphia, USA **2003-2008**

Research projects

- Type inference for first-class polymorphism with practical considerations, such as simplicity of the algorithmic implementation and the type system specification. Full type inference for first-class polymorphism is undecidable and the results of this work show ways to make it decidable provided the programmer is willing to provide some type annotations. With Stephanie Weirich (Penn) and Simon Peyton Jones (Microsoft Research).
- Type inference for generalized algebraic datatypes. A sound and complete type inference system which provided the basis for the initial implementation of generalized algebraic datatypes in the Glasgow Haskell Compiler. With Stephanie Weirich, Simon Peyton Jones, and Geoff Washburn (ITU, Denmark).
- Design and implementation of the language Pie that supports dependent types. Expressivity and type checker implementation issues. With Stephanie Weirich.
- Using automated proof assistants and techniques in programming languages metatheory. Encoding of the Featherweight Java syntax and semantics, and proofs of type soundness in Isabelle/HOL. Encoding of a language with runtime type representations using the locally nameless techniques, and full proofs of type soundness in Isabelle/HOL.
- The study of parametricity in the presence of runtime type representations. Showed that parametricity theorems are still valid in the presence of runtime type representations and case analysis on these representations. With Stephanie Weirich.
- Design and implementation of a language with type analysis in the presence of generative types and proofs of type soundness. With Stephanie Weirich and Geoff Washburn.

National Technical University of Athens (Software Engineering Laboratory)

2002-2003

Graduate research work

Worked on implementing a compiler for proof-carrying code. Supervised by Nikolaos Papaspyrou.

University Of Pennsylvania and Microsoft Research

2004-today

Academic activities

1. External reviewer for international journals and conferences: ACM ICFP 2005, ESOP 2006, FLOPS 2006, ACM POPL 2007, ACM Haskell Symposium 2007, ACM ICFP 2007, ACM POPL 2008, Information and Computation, Journal of Functional Programming, ACM ICFP 2008, ACM POPL 2009, ACM Haskell Symposium 2009, Theoretical Computer Science.
2. Member of the Penn POPLMark team, helped co-organize the tutorial "Using proof assistants for programming languages metatheory", ACM POPL 2008.
3. Member of the Penn team that organized the international programming contest ICFP 2004.
4. Maintained programming languages group (PLclub) web site.

TEACHING EXPERIENCE

University of Pennsylvania

2004-2005

- Teaching assistant for: "Advanced Functional Programming" (CSE 399, Benjamin Pierce, Penn, 2005).
- Teaching assistant for: "Software Foundations" (CIS 500, Stephanie Weirich, Penn, 2004).

National Technical University of Athens

2002-2003

- Teaching assistant in "Compilers" (Skordalakis-Papaspyrou, NTUA ECE, 2003).
- Teaching assistant in "Introduction to Programming" (Zachos-Papaspyrou, NTUA ECE, 2002).

WORK EXPERIENCE

Semantix SA, Athens

2002-2003

Software Engineer

- Member of a team that designed and implemented code generators from ASN1 specifications.
- Member of a team that designed and implemented a data clearing house project for the VODAFONE group.
- Designed and implemented device controlling software and signal routing protocols.

Navel Ltd, Athens

2000-2001

Programmer

Implementation of syntactic and grammatical checker for greek technical texts, in collaboration with the Demokritos institute; development of web applications.

PUBLICATIONS – PRESENTATIONS

Doctoral Dissertation

Practical type inference for first-class polymorphism, University of Pennsylvania, 2008.

Publications in Journals and Proceedings

1. Tom Schrijvers, Simon Peyton Jones, Martin Sulzmann, and Dimitrios Vytiniotis. Complete and decidable type inference for GADTs. In *ICFP '09: Proceedings of the 9th ACM SIGPLAN International Conference on Functional Programming*, Edinburgh, UK, 2009.
2. Claudio Russo and Dimitrios Vytiniotis. QML: Explicit first-class polymorphism for ML. In *ML' 09: Proceedings of the 2009 ACM SIGPLAN ML Workshop*, Edinburgh, UK, 2009.
3. Dimitrios Vytiniotis, Stephanie Weirich, and Simon Peyton Jones. FPH: First-class polymorphism for Haskell. In *ICFP '08: Proceedings of the 8th ACM SIGPLAN International Conference on Functional Programming*, pages 295-306, New York, NY, USA, 2008. ACM Press.
4. Simon Peyton Jones, Dimitrios Vytiniotis, Stephanie Weirich, and Mark Shields. Practical type inference for arbitrary-rank types. *Journal of Functional Programming*, 17(1):1-82, 2007.
5. Dimitrios Vytiniotis and Stephanie Weirich. Free theorems and runtime type representations. In M. Fiore and M. Mislove, editors, *Proceedings of the 23rd Annual Conference on Mathematical Foundations of Programming Semantics (MFPS XXIII)*, volume 173 of Electronic Notes in Theoretical Computer Science, pages 357-373, 2007.
6. Simon Peyton Jones, Dimitrios Vytiniotis, Stephanie Weirich, and Geoffrey Washburn. Simple unification-based type inference for GADTs. In *ICFP '06: Proceedings of the Eleventh ACM SIGPLAN International Conference on Functional Programming*, pages 50-61, New York, NY, USA, 2006. ACM Press.
7. Dimitrios Vytiniotis, Stephanie Weirich, and Simon Peyton Jones. Boxy types: inference for higher-rank types and impredicativity. In *ICFP '06: Proceedings of the Eleventh ACM SIGPLAN International Conference on Functional Programming*, pages 251-262, New York, NY, USA, 2006. ACM Press.
8. B. Aydemir, A. Bohannon, M. Fairbairn, J. Foster, B. Pierce, P. Sewell, D. Vytiniotis, G. Washburn, S. Weirich, and S. Zdancewic. Mechanized metatheory for the masses: The POPLmark challenge. In *Proceedings of the Eighteenth International Conference on Theorem Proving in Higher Order Logics (TPHOLs 2005)*, 2005.
9. Dimitrios Vytiniotis, Geoffrey Washburn, and Stephanie Weirich. An open and shut typecase. In *Proceedings of The Second ACM SIGPLAN Workshop on Types in Language Design and Implementation*, pages 13-24, Long Beach, California, January 2005.
10. Nikolaos Papaspyrou, Dimitrios Vytiniotis, and Vasileios Koutavas. Logic-enhanced type systems: Programming language support for reasoning about security and other program properties. In *Proceedings of the Fourth Panhellenic Logic Symposium*, Thessaloniki, July 2003.

Technical Reports

1. Dimitrios Vytiniotis, Vasileios Koutavas, Relating step-indexed logical relations and bisimulations, Technical Report MSR-TR-2009-25, Microsoft Research, March 2009.
2. Dimitrios Vytiniotis and Stephanie Weirich. Dependent types: Easy as Pie. In Marco T. Morazan and Henrik Nilsson, editors, *Draft Proceedings of the 8th Symposium on Trends in Functional Programming*. Dept. of Math and Computer Science, Seton Hall University, TR-SHU-CS-2007-04-1, April 2007.
3. Dimitrios Vytiniotis, Stephanie Weirich, and Simon Peyton Jones. Boxy type inference for higher-rank types and impredicativity, Technical Appendix. Technical Report MS-CIS-05-23, University of Pennsylvania, April 2006.
4. Dimitrios Vytiniotis, Stephanie Weirich, and Simon Peyton Jones. Simple unification-based type inference for GADTs, Technical Appendix. Technical Report MS-CIS-05-22, University of Pennsylvania, April 2006.
5. Nate Foster and Dimitrios Vytiniotis. A Theory of Featherweight Java in Isabelle/HOL. In Gerwin Klein, Tobias Nipkow, and Lawrence Paulson, editors, *The Archive of Formal Proofs*. <http://afp.sourceforge.net/entries/FeatherweightJava.shtml>, March 2006. Formal proof development.
6. Dimitrios Vytiniotis, Stephanie Weirich, and Simon Peyton Jones. Practical type inference for arbitrary-rank types, Technical Appendix. Technical Report MS-CIS-05-14, University of Pennsylvania, July 2005.
7. Dimitrios Vytiniotis, Stephanie Weirich, and Geoffrey Washburn. An open and shut typecase. Technical Report MS-CIS-04-26, University of Pennsylvania, April 2004.

Other works

1. Dimitrios Vytiniotis and Stephanie Weirich. Type-safe cast does no harm. Syntactic parametricity for F-omega and

beyond. Submitted for publication. March 2009.

Presentations

1. Complete and decidable type inference for GADTs, INRIA Rocquencourt Gallium seminar, Paris, April 2009.
2. FPH: First-class polymorphism for Haskell, ICFP 2008, Victoria, BC, Canada, September 24, 2008.
3. Practical type inference for first-class polymorphism, NTUA PL Seminar 2007, Athens, December 28, 2007.
4. Free theorems and runtime type representations, MFPS XXIII, New Orleans, LA, April 14, 2007.
5. Dependent Types: Easy as Pie, TFP 2007, New York, NY, April 2, 2007.
6. Dependently typed programming with GADTs, NTUA PL Seminar 2006, Athens, December 2006.
7. Boxy Types, ICFP 2006, Portland, OR, September 20, 2006.
8. Boxy Types, Microsoft Research Cambridge, UK, August 2005.
9. An open and shut typecase, NJPLS, Philadelphia, PA, February 25, 2005.
10. An open and shut typecase, TLDI 2005, Long Beach, CA, January 10, 2006.