Piotr (Peter) Mardziel

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Education

2008-2015 • **University of Maryland**, College Park, Maryland
Ph.D. In Computer Science

2005-2007 • **Worcester Polytechnic Institute**, Worcester, Massachusetts
M.S. In Computer Science

2002-2005 • **Worcester Polytechnic Institute**, Worcester, Massachusetts
B.S. In Computer Science

Research Experience

2010-present • **University of Maryland**, College Park, Maryland

2015-present **Faculty Research Assistant** (postdoc)

- *Probabilistic programming:* Developing techniques and tools for probabilistic inference for models written in a programming language, with emphasis on soundness relative to security concerns. The project aims to extent the work below with richer languages and more efficient inference.

2010-2014 **Graduate Research Assistant**, supervised by Prof. Michael Hicks

- *Information flow in dynamic systems:* I developed a model for measuring the information flow of systems with time-varying secrets against adversaries that have the ability to decide when they attack adaptively [2, 3].
- *Knowledge in secure multi-party computation:* I developed and formalized techniques for knowledge inference to improve the efficiency of secure multi-party computation [5]. I analyzed and quantified the release of information in secure computations among multiple parties each protecting their secrets [6].
- *Knowledge-based security policies:* I developed techniques for static analysis of information flow within programs using probabilistic abstract interpretation [7, 4].

This work included the design and implementation of a probabilistic abstract interpreter for a simple imperative language. The interpreter is composed of almost 10,000 lines of OCaml code.

Summer 2012 • **IMDEA Software Institute**, Madrid, Spain
Research intern, supervised by Boris Köpf. I worked on the expression of information flow metrics as games among competing parties as opposed to purely information theoretic quantities. This work inspired the models I later developed for information flow for dynamic secrets and allowed such them to easily take into account important aspects of real-world scenarios that are beyond the scope of simple channels.

2005-2007 • **Worcester Polytechnic Institute**, Worcester, Massachusetts
M.S. research project, supervised by Prof. Daniel Dougherty:

- "Noninterference in Concurrent Game Structures": I designed a formulation of noninterference based on concurrent game structures and explored the benefits of such a formulation over existing works on noninterference with particular focus on nontransitive information flow policies. (pdf)

2004-2005 • **Worcester Polytechnic Institute**, Worcester, Massachusetts
B.S.research project, supervised by Prof. Carolina Ruiz:

- "Improved Two-Dimensional Warping": I analytically and experimentally studied a polynomial time approximation algorithm for 2-dimensional warping. I described a time complexity improvement of said algorithm from $O(N^6)$ to $O(N^4)$. I developed an extension of the algorithm for 3D and potential higher-dimensional applications. (pdf)

Publications

2015 [1] • MHR Khouzani, Piotr Mardziel, Carlos Cid, and Mudhakar Srivatsa. "Picking vs. Guessing Secrets: A Game-Theoretic Analysis". In: *Proceedings of the IEEE Computer Security Foundations Symposium (CSF)*. (To appear). July 2015

2014 [2] • Piotr Mardziel, Mário S. Alvim, and Michael Hicks. "Adversary Gain vs Defender Loss in Quantified Information Flow". In: *Workshop on Foundations of Computer Security (FCS)*. July 2014. (pdf)

[3] • Piotr Mardziel, Mario Alvim, Michael Hicks, and Michael Clarkson. "Quantifying Information Flow for Dynamic Secrets". In: *Proceedings of the IEEE Symposium on Security and Privacy (S&P)*. May 2014. (pdf)

2013 [4] • Piotr Mardziel, Stephen Magill, Michael Hicks, and Mudhakar Srivatsa. "Dynamic Enforcement of Knowledge-based Security Policies using Abstract Interpretation". In: *Journal of Computer Security* 21.4 (Jan. 2013), pp. 463–532. (pdf)

[5] • Aseem Rastogi, Piotr Mardziel, Matthew Hammer, and Michael Hicks. "Knowledge Inference for Optimizing Secure Multi-party Computation". In: *Proceedings of the ACM SIGPLAN Workshop on Programming Languages and Analysis for Security (PLAS)*. June 2013. (pdf)

2012 [6] • Piotr Mardziel, Michael Hicks, Jonathan Katz, and Mudhakar Srivatsa. "Knowledge-Oriented Secure Multiparty Computation". In: *Proceedings of the ACM SIGPLAN Workshop on Programming Languages and Analysis for Security (PLAS)*. June 2012. (pdf)

2011 [7] • Piotr Mardziel, Stephen Magill, Michael Hicks, and Mudhakar Srivatsa. "Dynamic Enforcement of Knowledge-based Security Policies". In: *Proceedings of the IEEE Computer Security Foundations Symposium (CSF)*. June 2011. (pdf)

Talks

- **Modeling, Measuring, and Limiting Adversary Knowledge**
  - presented at the Galois, March 2015
  - presented at the MIT Lincoln Laboratories, March 2015
  - presented at the JHU Applied Physics Laboratory, February 2015
  - presented at Microsoft Research, Cambridge UK, February 2015
  - presented for the Applied Logic and Security group at Worcester Polytechnic Institute, January 2015
  - presented at the Applied Communication Sciences, January 2015
- **Adversary Gain vs. Defender Loss in Quantified Information Flow**
  - presented at 2014 Workshop on Foundations of Computer Security, Vienna, Austria
- **Quantifying Information Flow for Dynamic Secrets**
  - presented at the 2014 IEEE Symposium on Security & Privacy, San Jose, CA
  - presented at the 2014 meeting of the International Technology Alliance, Cardiff, UK
- **Probabilistic Computation for Information Security**
  - presented at the 2012*NIPS Workshop on Probabilistic Programming, Lake Tahoe, NV
- **Dynamic Enforcement of Knowledge-based Security Policies**
  - presented at the 2011 Symposium on Computer Security Foundations, Paris, France
  - presented at the April 2011 NJ Programming Languages and Systems Seminar, Princeton, NJ
  - presented at the George Washington University Computer Security Seminar

Professional Activities

(sub)reviewer • CSF(2013,2014,2015), POPL 2013, JCSS, S&P 2015

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References

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2 Dr. Mudhakar Srivatsa, Research scientist at IBM T.J. Watson Research Center

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3 Dr. Michael R. Clarkson, Lecturer of Computer Science at Cornell University

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