Alex (Oleksandr) Polozov

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EDUCATION

Ph.D. in Computer Science 2012-2017

University of Washington, Seattle, USA

Advisors: Dr. Sumit Gulwani & Prof. Zoran Popović

Ph.D. Thesis: "A Framework for Mass-Market Inductive Program Synthesis"

B.Math. in System Analysis 2008-2012

National Technical University of Ukraine "Kyiv Polytechnic Institute"

Advisor: Prof. Yuriy Tymoshenko

Thesis: "Structure and Term Prediction for Mathematical Text"

PUBLICATIONS

Books, book chapters, journal articles, monographs

[1] S. Gulwani, O. Polozov, and R. Singh, "Program Synthesis", in *Foundations and Trends® in Programming Languages:* Vol. 4: No. 1-2, pp 1-119, 2017.

Peer-reviewed conference publications, talks

[2] R. Rolim, G. Soares, L. D'Antoni, O. Polozov, S. Gulwani, R. Gheyi, R. Suzuki, and B. Hartmann, "Learning syntactic program transformations from examples", in *39th International Conference on Software Engineering (ICSE),* 2017.

[3] O. Polozov and S. Gulwani, "Program synthesis in the industrial world: inductive, incremental, interactive", in *5th Workshop on Program Synthesis (SYNT)*, 2016.

[4] M. Mayer, G. Soares, M. Grechkin, V. Le, M. Marron, O. Polozov, R. Singh, B. Zorn, and S. Gulwani, "User interaction models for disambiguation in programming by example", in *ACM Symposium on User Interface Software and Technology (UIST)*, 2015.

[5] O. Polozov and S. Gulwani, "FlashMeta: a framework for inductive program synthesis", in *ACM Conference on Object-Oriented Programming Systems, Languages, and Applications (OOPSLA)*, 2015.

[6] O. Polozov, E. O'Rourke, A. M. Smith, L. Zettlemoyer, S. Gulwani, and Z. Popović, "Personalized mathematical word problem generation", in *International Joint Conference on Artificial Intelligence (IJCAI)*, 2015.

[7] O. Polozov and S. Gulwani, "LaSEWeb: automating search strategies over semi-structured web data", in *ACM Conference on Knowledge Discovery and Data Mining (KDD)*, 2014.

Preprints, technical reports

[8] S. Padhi, P. Jain, D. Perelman, O. Polozov, S. Gulwani, and T. Millstein, "FlashProfile: Interactive Synthesis of Syntactic Profiles". *arXiv preprint arXiv:1709.05725*, 2017.

[9] V. Le, D. Perelman, O. Polozov, M. Raza, A. Udupa, and S. Gulwani, "Interactive Program Synthesis". *arXiv preprint arXiv:1703.03539,* 2017.

[10] O. Polozov, S. Gulwani, and S. Rajamani, "Structure and term prediction for mathematical text". Tech. Rep. MSR-TR-2012-7, 2012.

PROFESSIONAL EXPERIENCE

Researcher August 2017 – present

Microsoft Research AI, Redmond, USA

Working on the combination of symbolic and neural techniques for automatic program synthesis, as well as on various applications of it in developer assistance, tutoring systems, artificial intelligence, and data wrangling.

Software Development & Research Contractor October 2014 – April 2017
Populus Group at Microsoft, Redmond, USA

A founding member of the Program Synthesis using Examples (PROSE) R&D team at the Microsoft Data Group.

Developed the PROSE framework for automatic synthesis of data wrangling scripts from incomplete specifications (input-output examples, constraints, demonstrations). It unified and generalized 12+ prior publications (5 years of prior work) in the field of programming by examples, allowing one to develop a by-example technology in 10 weeks instead of 10 months. Its applications are deployed in multiple Microsoft products:

- FlashFill: string transformations by example in Excel,
- `ConvertFrom-String` and `Convert-String` cmdlets in PowerShell,
- Text extraction in Azure Operational Management Suite,
- Web & email processing in Exchange and Cortana.

I have been working with a team of 10+ researchers and engineers at Microsoft concurrently with completing my Ph.D.

Research Intern March 2014 – September 2014
Microsoft Research, Redmond, USA

Designed and developed a modular algorithmic framework for automatic synthesis of programs in domain-specific languages from inductive specifications. Generalizes 5 years of prior work in programming by examples done by the Sumit Gulwani's group and collaborators. This work became a foundation for the Microsoft PROSE team (see above).

Research Intern June 2013 – September 2013
Microsoft Research, Redmond, USA

Designed a declarative language and an efficient interpreter for designing search strategies for microsegment queries based on linguistic predicates and semi-structured data on the Web.

Research Intern June 2012 – September 2012
Microsoft Research, Redmond, USA

Developed a language and an algorithm for 2D data visualization by example and data extraction from semi-structured images.

Software Development & Research Practice Intern November 2011 – May 2012
Yandex, Kyiv, Ukraine

Built a dictionary-based morphological engine with inflection prediction for Russian, Ukrainian, and English.

Software Development Intern June 2011 – September 2011
Microsoft, Redmond, USA

Team: Office Labs

Built a home/work location prediction with further exploration of user scenarios for a mobile digital assistant.

SKILLS

Programming	C#, C/C++, Python, Wolfram Language, Java, Scala, F#, AnsProlog, TypeScript/JavaScript
Technologies	Potassco ASP toolkit, Z3 constraint solver, Web development
Theory	• Program synthesis, programming languages, software engineering • Answer set programming, SAT/SMT solving, formal logic • Deep learning, neural networks • Natural language processing: morphology, reference resolution, language generation
Languages	English (fluent), Russian (native), Ukrainian (native)

TEACHING EXPERIENCE

CSEP 590C: Domain-Specific Languages Spring 2016, Spring 2017
Teaching Assistant & *Lecturer*

Together with Prof. Rastislav Bodik and Pavel Panchekha, we co-designed and taught a graduate course on DSLs. Audience: professional software engineers with multiple years of industry experience. Course content includes

foundations of compiler/interpreter development, a collection of well-known DSLs (D3.js, Mustache, Hadoop, React.js, Rx), program synthesis in PROSE, and lessons on DSL design.

Functional Programming 2011 – 2012

Lecturer

Self-designed and taught an optional 2-semester course for undergraduate Applied Math students. Covered basic FP concepts, parallel programming with monoids and MapReduce, purely functional data structures, monads and type classes, lambda calculus.

Algorithms and Data Structures 2009 – 2012

ACM ICPC lecturer & *team coach*

Taught advanced algorithms and data structures for undergraduate ACM ICPC teams, with focus on performance and programming competitions.

REFERENCES

- Rastislav Bodik, professor: bodik@cs.washington.edu
- Sumit Gulwani, partner research manager: sumitg@microsoft.com
- Pushmeet Kohli, senior scientist: pushmeet@google.com
- Zoran Popović, professor: zoran@cs.washington.edu
- Danny Simmons, principal software engineer: dsimmons@microsoft.com
- Ben Zorn, principal researcher & research manager: zorn@microsoft.com