Julia Belyakova

Curriculum Vitae

Sep 25, 2025

Current position	Postdoc at Purdue University (West Lafayette, IN, USA)
Email	julbinb@gmail.com (preferred), ybelyako@purdue.edu
Homepage	https://julbinb.github.io

RESEARCH INTERESTS

Programming languages design, semantics, and implementation; compilers; software correctness and program analysis; type theory; theorem proving; generic programming; human aspects of programming languages; CS education; software engineering.

EDUCATION

PhD in Computer Science 2018–2023
Khoury College of Computer Sciences (Programming Research Laboratory)
Northeastern University, Boston, MA, USA
Academic/Research advisor: Prof. Jan Vitek
Decidable Subtyping of Existential Types for the Julia Language [thesis PDF] [slides]

MS in Computer Science and Information Technologies 2012–2014
I. I. Vorovich Institute of Mathematics, Mechanics and Computer Science
Southern Federal University, Rostov-on-Don, Russia
Academic/Research advisor: Assoc. prof. Stanislav Mikhalkovich
A Model of Concepts for an Imperative Programming Language
[thesis PDF (in Russian)] [slides (in Russian)]

BS in Computer Science and Information Technologies 2008–2012
I. I. Vorovich Institute of Mathematics, Mechanics and Computer Science
Southern Federal University, Rostov-on-Don, Russia
Academic/Research advisor: Assoc. prof. Stanislav Mikhalkovich
Automatic Constraints Collection in a Programming Language with Generic Functions and Type Inference [thesis PDF (in Russian)] [slides (in Russian)]

EMPLOYMENT

Post-Doctoral Research Associate Sep 2023–present
Purdue University Programming Languages Group
Purdue University, West Lafayette, IN, USA
Postdoc advisor: Prof. Suresh Jagannathan

Research Scientist Sep 2017–Jul 2018
Programming Languages Laboratory, Faculty of Information Technology
Czech Technical University in Prague, Prague, Czech Republic

Research Assistant Jan–Jul 2017
Programming Research Laboratory, College of Computer and Information Science
Northeastern University, Boston, MA, USA

Teaching Assistant, Lecturer 2014–2016
I. I. Vorovich Institute of Mathematics, Mechanics and Computer Science
Southern Federal University, Rostov-on-Don, Russia

Part-Time Software Engineer 2012–2013
Laboratory Angstrem-SFEDU, Rostov-on-Don, Russia

PUBLICATIONS

PEER-REVIEWED CONFERENCE/JOURNAL PUBLICATIONS

1. **POPL'25** Yongwei Yuan, Zhe Zhou, Julia Belyakova, Suresh Jagannathan. *Derivative-Guided Symbolic Execution*. Proceedings of the ACM on Programming Languages. Volume 9, Issue POPL, DOI 0.1145/3704886.
   ACM New York, 2025, p. 1475–1505. [extended version]

2. **PLDI'24** Julia Belyakova, Benjamin Chung, Ross Tate, Jan Vitek. *Decidable Subtyping of Existential Types for Julia*. Proceedings of the ACM on Programming Languages. Volume 8, Issue PLDI, DOI 10.1145/3656421.
   ACM New York, 2024, p. 191:1–191:24. [project page] [preprint] [extended version]

3. **OOPSLA'21** Artem Pelenitsyn, Julia Belyakova, Benjamin Chung, Ross Tate, Jan Vitek. *Type Stability in Julia: Avoiding Performance Pathologies in JIT Compilation*. Proceedings of the ACM on Programming Languages. Volume 5 Issue OOPSLA, DOI 10.1145/3485527.
   ACM New York, 2021, p. 150:1–150:26.
   [project page] [video] [preprint] [extended version]

4. **OOPSLA'20** Julia Belyakova, Benjamin Chung, Jack Gelinas, Jameson Nash, Ross Tate, Jan Vitek. *World Age in Julia: Optimizing Method Dispatch in the Presence of Eval*. Proceedings of the ACM on Programming Languages. Volume 4 Issue OOPSLA, DOI 10.1145/3428275.
   ACM New York, 2020, p. 207:1–207:26.
   [project page] [video] [preprint] [extended version]

5. **VIS'20** Cameron Moy, Julia Belyakova, Alexi Turcotte, Sara Di Bartolomeo, Cody Dunne. *Just TYPEical: Visualizing Common Function Type Signatures in R*. 2020 IEEE Visualization Conference Short Papers, OSF Preprints, DOI 10.31219/osf.io/pyqac. 5 pages.
   [project page] [video] [preprint]

6. **OOPSLA'18** Francesco Zappa Nardelli, Julia Belyakova, Artem Pelenitsyn, Benjamin Chung, Jeff Bezanson, Jan Vitek. *Julia Subtyping: A Rational Reconstruction*. Proceedings of the ACM on Programming Languages. Volume 2 Issue OOPSLA, ISSN 2475-1421, DOI 10.1145/3276483. ACM New York, 2018, p. 113:1–113:27.
   [project page] [preprint]

7. **PLC'17** Julia Belyakova. *Implementation of Certified Interpreter for an Extension of Simply Typed Lambda Calculus with Concept Parameters*. Proceedings of "A. L. Fuksman Conference on Programming Languages and Compilers 2017". Rostov-on-Don, Russia, 2017, p. 53–58.
   [e-print (in Russian)]

8. **SBLP'16** Julia Belyakova. *Language Support for Generic Programming in Object-Oriented Languages: Peculiarities, Drawbacks, Ways of Improvement*. Lecture Notes in Computer Science. Programming Languages: 20th Brazilian Symposium, SBLP 2016, ISBN 978-3-319-45279-1 (Online), DOI 10.1007/978-3-319-45279-1_1, No 9889. Springer International Publishing, 2016, p. 1–15. [project page] [preprint]

9. Julia Belyakova. *Language Support for Generic Programming in Object-Oriented Languages: Design Challenges*. Proceedings of the Institute for System Programming, ISSN 2220-6426 (Online), No 28(2). Moscow, Russia, 2016, p. 5–32.
   [project page] [e-print in ACM format] [e-print]

10. Julia Belyakova, Stanislav Mikhalkovich. *Pitfalls of C# Generics and Their Solution Using Concepts*. Proceedings of the Institute for System Programming, ISSN 2220-6426 (Online), No 27(3). Moscow, Russia, 2015, p. 29–45.
    [project page] [e-print in ACM format] [e-print]

11. Michail Abramyan, Julia Belyakova, Stanislav Mikhalkovich. *Using Web Development Environment PascalABC.NET for a Distance Learning of Programming*. J. Distancionnoe I Virtualnoe Obuchenie [J. Distant and Virtual Learning], ISSN 1561-2449, No 57(3). Moscow, Russia, 2012, p. 14–24. [project page (in Russian)] [e-print (in Russian)]

PEER-REVIEWED WORKSHOP PUBLICATIONS

1. **TPSA'25** Yongwei Yuan, Zhe Zhou, Julia Belyakova, Ben Delaware, Suresh Jagannathan. *From Traces to Program Incorrectness: A Type-Theoretic Approach*. Theory and Practice of Static Analysis 2025. January 2025.

2. **FTfJP'19** Julia Belyakova. *Decidable Tag-Based Semantic Subtyping for Nominal Types, Tuples, and Unions*. Proceedings of the 21st Workshop on Formal Techniques for Java-like Programs, DOI 10.1145/3340672.3341115. July 2019, p. 3:1–3:11.
[project page] [preprint]

3. **FTfJP'17** Julia Belyakova. *Generic Approach to Certified Static Checking of Module-like Constructs*. Proceedings of the 19th Workshop on Formal Techniques for Java-like Programs, DOI 10.1145/3103111.3104045. June 2017, p. 5:1–5:2. [preprint]

OTHER PROCEEDINGS

1. Stanislav Mikhalkovich, Julia Belyakova. *Concept Parameters as a Mechanism of Development of the Language Support for Generic Programming in C#*. J. Modern Information Technologies and IT in Education, ISSN 2411-1473, No 11(2).
Moscow, Russia, 2015, p. 205–213. [project page] [e-print (in Russian)]

2. Julia Belyakova, Stanislav Mikhalkovich. *Support for Generic Programming in Modern Object-Oriented Languages. Part 2. A Review of the Modern Solutions*. Transactions of Scientific School of I. B. Simonenko. Issue 2, ISBN 978-5-9275-1607-0.
Rostov-on-Don, Russia, 2015, p. 78–92. [project page] [e-print (in Russian)]

3. Julia Belyakova, Stanislav Mikhalkovich. *Support for Generic Programming in Modern Object-Oriented Languages. Part 1. An Analysis of the Problems*. Transactions of Scientific School of I. B. Simonenko. Issue 2, ISBN 978-5-9275-1607-0.
Rostov-on-Don, Russia, 2015, p. 63–77. [project page] [e-print (in Russian)]

4. Stanislav Mikhalkovich, Julia Belyakova. *Web Development Environment PascalABC.NET and Its Usage in Education*. Transactions of Scientific School of I. B. Simonenko. Rostov-on-Don, Russia, 2010, p. 172–178. [project page (in Russian)] [e-print (in Russian)]

SERVICE

ORGANIZING COMMITTEES

ECOOP 2020 diversity chair, ECOOP Doctoral Symposium 2019 co-chair, ECOOP/ISSTA Doctoral Symposium 2018 co-chair, PLC 2017 (A.L. Fuksman Conference on Programming Languages and Compilers) co-organizer, website co-master.

PROGRAM COMMITTEES

OOPSLA 2025, Scheme 2024, TyDe 2024, ARRAY 2024, OOPSLA 2021 (external review committee), ICCQ 2021, TyDe 2019, ECOOP DS 2017.

ARTIFACT EVALUATION COMMITTEES

CAV 2021, PLDI 2020, ECOOP 2019.

UNIVERSITY SERVICE

- Co-organizer of Khoury Graduate Student Association at Khoury College, Northeastern University (2019–2023)

MISCELLANEOUS

- ZED talks co-organizer at PRL, Khoury College, Northeastern University (2021-2022)
- Reading group and PL-junior seminar co-organizer at PRL, Khoury College, Northeastern University (2020)
- Student volunteer: ECOOP 2019, SPLASH 2018, ICFP 2018, ECOOP/ISSTA 2018, ECOOP 2017, ECOOP 2016

MENTORING

- Rachit Kumar — 2025
  PhD, Purdue University
- Yongwei Yuan — 2024–2025
  PhD, Purdue University
- Jack Gelinas — 2020
  B.S., Northeastern University

TEACHING

KHOURY NEU

In 2020, I worked as a teaching assistant (TA) at the Khoury College of Computer Sciences.

Software Development (undergraduate) — Fall 2020
section head TA (code reviews, office hours, grading, meta grading) [coursepage]

Principles of Programming Languages (undergraduate) — Spring 2020
TA (office hours, grading) (also gave a lecture on the Julia language) [coursepage]

MMCS SFEDU

In 2012–2016, I was teaching at the I. I. Vorovich Institute for Mathematics, Mechanics and Computer Science.

Theory of Programming Languages (undergraduate) — Spring 2016
Lectures, labs, seminars (it was a new course I designed from scratch)
[YouTube playlist of videos (in Russian)]

> Introduction to the theory of programming languages: judgments, operational semantics, type systems, propositions as types. Programming assignments: interpreters, type checkers, and a simple compiler (all in Standard ML).

C++ Programming Language (undergraduate) — Fall 2016
Labs

Design Patterns (undergraduate) — 2014–2016
Labs, seminars (I designed all programming assignments)

Programming Languages (undergraduate) — 2014–2016
Labs, seminars

Computer Architecture (undergraduate) — 2014–2016
Labs

Introduction to Programming (undergraduate) — 2012–2016
Labs, seminars (in 2014–2016, I redesigned some programming assignments)

TALKS

CONFERENCE/WORKSHOP PRESENTATIONS

1. LambdaConf 2024: Multi-disciplinary Developer Conference, Estes Park, CO, USA, May 6, 2024.
   Julia: Practical Restrictions For A Scientific-Computing Language [slides] [video]

2. OOPSLA 2020: Conference on Object-Oriented Programming Systems, Languages, and Applications (Online), Session T6-B, Nov 17, 2020.
   World Age in Julia: Optimizing Method Dispatch in the Presence of Eval
   [project page] [preprint] [slides] [video]

3. IEEE Visualization Conference 2020 (Online) Short Papers, Session Systems/Libraries/Algorithms, Oct 28, 2020.
   Just TYPEical: Visualizing Common Function Type Signatures in R
   [project page] [preprint] [video]

4. FTfJP 2019: Formal Techniques for Java-like Programs (London, United Kingdom), ECOOP Series, Jul 15, 2019.
   Decidable Tag-Based Semantic Subtyping for Nominal Types, Tuples, and Unions
   [preprint] [slides]

5. FTfJP 2017: Formal Techniques for Java-like Programs (Barcelona, Spain), ECOOP Series, Jun 20, 2017.
   Generic Approach to Certified Static Checking of Module-like Constructs [preprint] [slides]

6. A. L. Fuksman Conference on Programming Languages and Compilers 2017 (Rostov-on-Don, Russia), Session 1-3, Apr 4, 2017.
   Implementation of Certified Interpreter for an Extension of Simply Typed Lambda Calculus with Concept Parameters [e-print (in Russian)] [slides (in Russian)]

7. XX Brazilian Symposium on Programming Languages 2016 (Maringa, Brazil), Session 5, Sep 23, 2016.
   Language Support for Generic Programming in Object-Oriented Languages: Peculiarities, Drawbacks, Ways of Improvement [preprint] [slides]

8. ECOOP 2016 Doctoral Symposium (Rome, Italy), Session 2, Jul 17, 2016.
   Concept Parameters as a New Mechanism of Generic Programming for C# Language
   [proposal] [slides]

9. META 2016: Fifth International Valentin Turchin Workshop on Metacomputation (Pereslavl-Zalessky, Russia), Session 3, Jun 28, 2016.
   Language Support for Generic Programming in Object-Oriented Languages: Design Challenges [e-print] [slides]

10. SYRCoSE: Spring/Summer Young Researchers Colloquium on Software Engineering 2015 (Samara, Russia), Programming Technologies Section, May 28, 2015.
    Pitfalls of C# Generics and Their Solution Using Concepts
    [e-print in ACM format] [slides]

SEMINAR TALKS

1. PurPL Seminar (Principles of Programming and Verification), Purdue University (West Lafayette, IN, USA), Aug 30, 2024.
   Decidable Subtyping of Existential Types for Julia (PLDI'24) [slides]

2. PurPL Seminar (Principles of Programming and Verification), Purdue University (West Lafayette, IN, USA), Nov 30, 2023.
   Julia: Practical Restrictions for a Scientific-Computing Language [slides]

3. POPV Seminar (Principles of Programming and Verification), Online in Boston University (Boston, MA, USA), Oct 12, 2021.
   Julia: Language Design and Users Working Together [slides]

4. BCC (Boston Computation Club), Online (Boston, MA, USA), Oct 9, 2021.
   Types in Programming Languages Research vs Types in Julia [slides] [video]

5. NEPLS 2017 (New England Programming Languages and Systems Symposium Series), Olsen Hall, UMass Lowell (Lowell, MA, USA), Jun 2, 2017.
   Generic Coq Library for Certified Static Checking of Module-like Language Constructs [slides]

6. Programming Language Seminar, College of Computer and Information Science, Northeastern University (Boston, MA, USA), Feb 3, 2017.
   Comparative Study of Generic Programming Features in Object-Oriented Languages [slides]

7. Seminar of Programming Languages and Tools Lab, JetBrains Research (Saint Petersburg, Russia), Oct 24, 2016.
   Generic Programming Approaches and Tools in Object-Oriented Languages: Peculiarities, Drawbacks, Alternatives [slides (in Russian)]

8. OPLSS 2015 (Oregon Programming Languages Summer School), University of Oregon, (Eugene, Oregon, USA), Participant Talks, 23.06.2015.
   Pitfalls of C# Generics: How Can We Do Better? [slides]

9. Institute for System Programming of the Russian Academy of Sciences (Moscow, Russia), System Programming Department seminar, 21.01.2015.
   Motivation and design of Concepts with subtype constraints for C# language [slides (in Russian)]

10. I. I. Vorovich Institute of Mathematics, Mechanics and Computer Science (Rostov-on-Don, Russia), Foundations of Programming Languages seminar, 01.04.2013.
    Praconcepts: long path from birth to rebirth, part I [slides (in Russian)]

11. I. I. Vorovich Institute of Mathematics, Mechanics and Computer Science (Rostov-on-Don, Russia), Foundations of Programming Languages seminar, 22.04.2013.
    Praconcepts: long path from birth to rebirth, part II [slides (in Russian)]

MISCELLANEOUS

1. Podlodka Podcast (in Russian), Episode #230, Aug 24, 2021.
   Julia [podcast episode (in Russian)]

AWARDS

Letter of gratitude for the talk 2014
Southern Federal University, Rostov-on-Don, Russia
Student session during the annual "Week of Science". Title: *Extended Constraints on .NET Generics Type Parameters* [slides (in Russian)]

Diploma for study and research achievements 2011
Southern Federal University, Rostov-on-Don, Russia

Finalist of the all-Russian student research competition "Telematics 2010: Telecommunications, Web-Technologies and Supercomputing" 2010
University of Information Technologies, Mechanics and Optics, Saint Petersburg, Russia
Project: *Web Development Environment PascalABC.NET*

Diploma for the best talk 2010
Southern Federal University, Rostov-on-Don, Russia
Student Session during the annual "Week of Science". Title: *Web Environment for Programming PascalABC.NET* [slides (in Russian)]

GRANTS AND SCHOLARSHIPS

Graduate fellowship 2018
Khoury College, Northeastern University

Travel grant 2016
PLMW POPL 2016

Travel grant 2016
OPLSS 2015

Academic mobility stimulation scholarship 2015
Southern Federal University, Rostov-on-Don, Russia

Increased state academic scholarship Feb 2014–June 2014
Southern Federal University, Rostov-on-Don, Russia

President's scholarship Sep 2011–June 2012
Southern Federal University, Rostov-on-Don, Russia

Governor's scholarship Feb 2011–June 2011
Southern Federal University, Rostov-on-Don, Russia

NATURAL LANGUAGES

Russian	Native speaker
English	Advanced (CAE Certificate, Grade C [190/210], 2015)
Spanish	Beginner

TECHNICAL SKILLS

PROGRAMMING LANGUAGES

Experienced with	Julia, C#, Coq, LaTeX, HTML, CSS
Familiar with	bash, OCaml, Haskell, Python, x86 Assembly, SML
Used in the past	JavaScript, Java, C++, C, Pascal
Shallowly familiar with	Scala, Agda, Racket

OPERATING SYSTEMS

Comfortable with	GNU/Linux
Used in the past	Windows, macOS

ENVIRONMENTS

Experienced with	Git
Familiar with	Emacs, Make