

# Julia Belyakova

*Curriculum Vitae*

Dec 18, 2024

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

## RESEARCH INTERESTS

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Programming languages design and semantics, type systems, compilers, software correctness, theorem proving, generic programming, human aspects of programming languages, CS education, software engineering.

## EDUCATION

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**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

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**Post-Doctoral Research Associate** Sep 2023–present

*Purdue University Programming Languages Group*

*Purdue University*, West Lafayette, IN, USA

**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 Angstrom-SFEDU*, Rostov-on-Don, Russia

## PUBLICATIONS

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### 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 TODO Issue **POPL**, DOI [0.1145/3704886](#). ACM New York, 2025, p. TODO. [\[extended version\]](#)
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 Gelin, 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

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### 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](#)

## ADVISING

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- Jack Gelinás 2020  
B.S., Northeastern University

## TEACHING

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### 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

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### 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

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<b>Letter of gratitude for the talk</b>	2014
Southern Federal University, Rostov-on-Don, Russia	
Student session during the annual “Week of Science”. Title: <i>Extended Constraints on .NET Generics Type Parameters</i> <a href="#">[slides (in Russian)]</a>	
<b>Diploma for study and research achievements</b>	2011
Southern Federal University, Rostov-on-Don, Russia	
<b>Finalist of the all-Russian student research competition “Telematics 2010: Telecommunications, Web-Technologies and Supercomputing”</b>	2010
University of Information Technologies, Mechanics and Optics, Saint Petersburg, Russia	
Project: <i>Web Development Environment PascalABC.NET</i>	
<b>Diploma for the best talk</b>	2010
Southern Federal University, Rostov-on-Don, Russia	
Student Session during the annual “Week of Science”. Title: <i>Web Environment for Programming PascalABC.NET</i> <a href="#">[slides (in Russian)]</a>	

## GRANTS AND SCHOLARSHIPS

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<b>Graduate fellowship</b>	2018
Khoury College, Northeastern University	
<b>Travel grant</b>	2016
<a href="#">PLMW POPL 2016</a>	
<b>Travel grant</b>	2016
<a href="#">OPLSS 2015</a>	

<b>Academic mobility stimulation scholarship</b>	2015
Southern Federal University, Rostov-on-Don, Russia	
<b>Increased state academic scholarship</b>	Feb 2014–June 2014
Southern Federal University, Rostov-on-Don, Russia	
<b>President’s scholarship</b>	Sep 2011–June 2012
Southern Federal University, Rostov-on-Don, Russia	
<b>Governor’s scholarship</b>	Feb 2011–June 2011
Southern Federal University, Rostov-on-Don, Russia	

## NATURAL LANGUAGES

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

## TECHNICAL SKILLS

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### PROGRAMMING LANGUAGES

<i>Experienced with</i>	Julia, Coq, L <sup>A</sup> T <sub>E</sub> X, HTML, CSS
<i>Familiar with</i>	bash, OCaml, Haskell, Python, x86 Assembly, SML
<i>Used in the past</i>	C#, JavaScript, Java, C++, C, Pascal
<i>Shallowly familiar with</i>	Scala, Agda, Racket

### OPERATING SYSTEMS

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

### ENVIRONMENTS

<i>Experienced with</i>	Git
<i>Familiar with</i>	Emacs, Make