# Julia Belyakova

Curriculum Vitae Sep 13, 2022

Current position PhD Candidate at Northeastern University (Boston, MA, USA) julbinb@gmail.com (preferred), belyakova.y@northeastern.edu

Homepage https://julbinb.github.io

#### RESEARCH INTERESTS

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

#### **EDUCATION**

# PhD in Computer Science

2018-present

Khoury College of Computer Sciences (Programming Research Laboratory)

Northeastern University, Boston, MA, USA

Academic/Research advisor: Professor Jan Vitek

#### 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

[paper (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 [paper (in Russian)] [slides (in Russian)]

#### **EMPLOYMENT**

Research Scientist Sep 2017–Jul 2018

Programming Languages Laboratory, Faculty of Information Technology Czech Technical University in Prague, Prague, Czech Republic

Research Scientist 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

#### PEER-REVIEWED CONFERENCE/JOURNAL PUBLICATIONS

1. **OOPSLA'21** Artem Pelenitsyn, <u>Julia Belyakova</u>, 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]

2. 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]

3. VIS'20 Cameron Moy, <u>Julia Belyakova</u>, 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]

4. OOPSLA'18 Francesco Zappa Nardelli, <u>Julia Belyakova</u>, 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]

- 5. **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)]
- 6. 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]
- 7. 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]

8. 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]

9. 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. 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]

2. 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**

- 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. <u>Julia Belyakova</u>, 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. <u>Julia Belyakova</u>, Stanislav Mikhalkovich. Support for Generic Programming in Modern <u>Object-Oriented Languages</u>. 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, <u>Julia Belyakova</u>. 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 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**

• Jack Gelinas B.S., Northeastern University 2020

# **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)  Principles of Programming Languages (undergraduate)	[coursepage] 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)  Labs	Fall 2016
Design Patterns (undergraduate)  Labs, seminars (I designed all programming assignments)	2014-2016
Programming Languages (undergraduate)  Labs, seminars	2014-2016
$ \begin{array}{c} \textbf{Computer Architecture} \ (\text{undergraduate}) \\ Labs \end{array} $	2014-2016
Introduction to Programming (undergraduate)  Labs, seminars (in 2014–2016, I redesigned some programming assignments)	2012–2016

#### **TALKS**

#### CONFERENCE/WORKSHOP PRESENTATIONS

- 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]
- 2. IEEE Visualization Conference 2020 (Online) Short Papers, Session Systems/Libraries/Algorithms, Oct 28, 2020.

- 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
- Decidable Tag-Based Semantic Subtyping for Nominal Types, Tuples, and Unions [preprint] [slides]
- 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]

- 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)]
- 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]

- 7. 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]
- 8. 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]
- 9. 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

- 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]
- 2. BCC (Boston Computation Club), Online (Boston, MA, USA), Oct 9, 2021.

  Types in Programming Languages Research vs Types in Julia [slides] [video]
- 3. 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]
- 4. 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]
- 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)]
- 6. 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]
- 7. 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)]
- 8. 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)]
- 9. 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

2018

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		
Graduate lenowship		

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, Coq, C#, LATEX, HTML, CSS Familiar with bash, Haskell, Python, x86 Assembly, SML

Used in the past JavaScript, Java, C++, C, Pascal

Shallowly familiar with Scala, Agda, Racket

# **OPERATING SYSTEMS**

 $\begin{array}{ll} {\it Comfortable \ with} & {\it GNU/Linux} \\ {\it Used \ in \ the \ past} & {\it Windows, \ macOS} \end{array}$ 

# **ENVIRONMENTS**

Experienced with Git

 $Familiar\ with \hspace{1.5cm} Emacs,\, Make$