

Denis Firsov



Personal data

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Brief Introduction

I am a postdoctoral researcher at the Computational Logic Center at the University of Iowa. I work on theory and applications of impredicative Curry-style type theory.

My PhD thesis, entitled “Certified algorithms for context-free languages”, was supervised by prof. Tarmo Uustalu and I defended it on 31st August 2016.

My interests include algorithms, functional programming, formal verification, static analysis, constructive mathematics, logics, and software design.

Education

2012–2016 **PhD, Computer science**, *Tallinn University of Technology*.
2010–2012 **MSc (Cum laude), Informatics**, *Tallinn University of Technology*.
2006–2010 **BSc, Software development**, *The Estonian Information Technology College*.
1994–2006 **Secondary education**, *Russian Gymnasium of Mustvee*.

Work Experience

2017–present **Postdoctoral researcher**, COMPUTATIONAL LOGIC CENTER AT UI, Iowa City.
2012–2016 **Lecturer**, ESTONIAN INFORMATION TECHNOLOGY COLLEGE, Tallinn.
2011–2016 **Junior researcher**, INSTITUTE OF CYBERNETICS AT TUT, Tallinn.
2010–2011 **Software architect**, ATTITUDE OÜ, Tallinn.
2009–2010 **Software developer**, MAJANDUSTARKVARA (ERPLY) OÜ, Tallinn.

Publications

- L. Diehl, D. Firsov, A. Stump. **Generic Zero-Cost Reuse for Dependent Types**
In Proc. ACM Program. Lang., ICFP '18 (St. Louis, Sept. 2018), (to appear).
- D. Firsov, R. Blair, A. Stump. **Efficient Mendler-Style Lambda-Encodings in Cedille.**
In Proc. of 9th International Conference on Interactive Theorem Proving, ITP '18 (Oxford, July 2018).
- D. Firsov, A. Stump. **Generic derivation of induction for impredicative encodings in Cedille.**
In Proc. of 7th ACM SIGPLAN Conf. on Certified Programs and Proofs, CPP '18 (Los Angeles, Jan. 2018), pp. 215-227, ACM, 2018.
- D. Firsov. **Certified algorithms for context-free grammars.**
PhD thesis, Institute of Cybernetics at TUT, 2016.
- D. Firsov, W. Jeltsch. **Purely functional incremental computing.**
In F. Castor, Y. D. Liu, eds., Proc. of 20th Brazilian Symp. on Prog. Lang., SBLP 2016 (Maringá, Brazil), v. 9889 of Lect. Notes in Comput. Sci., pp. 62-77, Springer, 2016.
- D. Firsov, T. Uustalu, N. Veltri. **Variations on Noetherianness.**
In R. Atkey, N. Krishnaswami, eds., Proc. of 6th Wksh. on Mathematically Structured Functional Programming, MSFP 2016 (Eindhoven, April 2016), v. 207 of Electron. Proc. in Theor. Comput. Sci., pp. 76-88. Open Publishing Assoc., 2016.
- D. Firsov, T. Uustalu. **Dependently typed programming with finite sets.**
In Proc. of 11th ACM SIGPLAN Wksh. on Generic Programming, WGP '15 (Vancouver, BC, Aug. 2015), pp. 33-44. ACM Press, 2015.
- D. Firsov, T. Uustalu. **Certified normalization of context-free grammars.**
In Proc. of 4th ACM SIGPLAN Conf. on Certified Programs and Proofs, CPP '15 (Mumbai, Jan. 2015), ACM Press, 2015
- D. Firsov, T. Uustalu. **Certified CYK parsing of context-free languages.**
J. of Log. and Algebr. Meth. in Program., v. 83, n. 5-6, pp. 459-468, 2014.
- D. Firsov, T. Uustalu. **Certified parsing of regular languages.**
In G. Gonthier, M. Norrish, eds., Proc. of 3rd Int. Conf. on Certified Programs and Proofs, CPP 2013 (Melbourne, Dec. 2013), v. 8307 of Lect. Notes in Comput. Sci., pp. 98-113. Springer, 2013.

Conferences/Talks/Workshops/Summerschools/Winterschools

- 6/07/18—14/07/18 **9th International Conference on Interactive Theorem Proving**, Oxford, UK
Talk: Efficient Mendler-Style Lambda-Encodings in Cedille
- 5/07/18 **Theory Lunch at TTÜ Software Lab**, Tallinn, Estonia
Talk: Generic Zero-Cost Reuse for Dependent Types
- 19/02/18—24/02/18 **Visiting the Reykjavik University**, Reykjavik, Iceland
Talk: Generic derivation of induction for impredicative encodings in Cedille
- 07/01/18—13/01/18 **The 7th ACM SIGPLAN International Conference on Certified Programs and Proofs (+ POPL + CoqPL)**, Los Angeles, CA, United States
Talk: Generic derivation of induction for impredicative encodings in Cedille
- 22/09/16—23/09/16 **XX Brazilian Symposium on Programming Languages**, Maringá, Brazil
Talk: Purely functional incremental computing

- 21/08/16–25/08/16 **15th Estonian Summer School on Computer Science**, Nelijärve, Estonia
Talk: Purely functional incremental computing
- 26/06/16–02/07/16 **Second International Summer School on Behavioural Types**, Limassol, Cyprus
- 01/04/16–09/04/16 **Sixth Workshop on Mathematically Structured Functional Programming (+ ETAPS)**, Eindhoven, Holland
Talk: Variations on Noetherianness
- 28/02/16–04/03/16 **21st Estonian Winter School in Computer Science**, Palmse, Estonia
- 29/01/16–31/01/16 **Theory Days at Käo**, Käo, Estonia
Talk: Noetherian sets
- 13/11/15–15/11/15 **Estonian-Finnish logic meeting**, Rakvere, Estonia
Talk: Dependently typed programming with finite sets
- 21/10/15–23/10/15 **27th Nordic Workshop on Programming Theory**, Reykjavik, Iceland
Talk: Acyclic attribute evaluation in dependently typed setting
- 02/10/15–04/10/15 **Theory Days at Jõeküla**, Jõeküla, Estonia
- 18/09/15–20/09/15 **Coinduction project working meeting**, Säärtsa, Estonia
Talk: Incremental Stable Sorting in Haskell
- 30/08/15–05/09/15 **11th ACM SIGPLAN Workshop on Generic Programming**, Vancouver, Canada
Talk: Dependently typed programming with finite sets
- 13/07/15–22/07/15 **Understanding Complexity and concurrency through topology of data**, Camerino, Italy
- 06/07/15–10/07/15 **Summer School on Generic and Effectful Programming**, Oxford, UK
- 01/03/15–06/03/15 **20th Estonian Winter School in Computer Science**, Palmse, Estonia
- 06/02/15–08/02/15 **Theory Days**, Rogosi, Estonia
Talk: Functional incremental computing
- 13/01/15–14/01/15 **The 4th ACM-SIGPLAN Conference on Certified Programs and Proofs**, Mumbai, India
Talk: Certified normalization of context-free grammars
- 05/12/14–06/12/14 **8th Annual Conference of the National Doctoral School in Information and Communication Technologies**, Rakvere, Estonia
Talk: Functional incremental computing
- 10/11/14–11/11/14 **Coinduction project working meeting**, Pillapalu, Estonia
- 02/10/14–05/10/14 **Joint Estonian-Latvian Theory Days at Ratnieki**, Ratnieki, Latvia
- 21/09/14–23/09/14 **Coinduction Meeting**, Kata, Estonia
- 16/05/14–18/05/14 **Theory Days**, Narva-Jõesuu, Estonia
- 20/04/14–27/04/14 **Midlands Graduate School 2014**, Nottingham, UK
- 02/03/14–07/03/14 **19th Estonian Winter School in Computer Science**, Palmse, Estonia
- 25/10/13–27/10/13 **Theory Days**, Saka, Estonia
Talk: Formalizing attribute grammars and circularity checking
- 17/10/13–18/10/13 **Rich Model Toolkit–Final COST Action Meeting**, Madrid, Spain
Talk: Certified attribute grammar validation

- 08/07/13–20/07/13 **Domain specific languages summer school 2013**, Cluj-Napoca, Romania
- 08/04/13–12/04/13 **Midlands Graduate School 2013**, Leicester, England
- 03/03/13–08/03/13 **18th Estonian Winter School in Computer Science**, Palmse, Estonia
- 01/02/13–03/02/13 **Theory Days**, Otepää, Estonia
Talk: Certified normalization of context-free grammars
- 20/01/13–21/01/13 **Workshop on Synthesis, Verification and Analysis of Rich Models**, Rome, Italy
Talk: Certified normalization of context-free grammars and CYK parsing
- 31/10/12–02/11/12 **24th Nordic Workshop on Programming Theory**, Bergen, Norway
Talk: Certified CYK parsing of context-free languages
- 03/10/12–09/10/12 **The XVI edition of the Agda Implementors' Meeting: Theory and implementation**, Copenhagen, Denmark
- 27/09/12–30/09/12 **Joint Estonian-Latvian Theory Days at Medzābaki**, Lilaste, Latvia
Talk: Certified parsing of context-free grammars
- 19/08/12–23/07/12 **11th Estonian Summer School on Computer Science**, Jäneda, Estonia
- 16/07/12–28/07/12 **Oregon Programming Languages Summer School**, Oregon, USA
- 26/02/12–02/03/12 **17th Estonian Winter School in Computer Science**, Palmse, Estonia
Talk: Certified parsing of regular languages
- 27/01/12–29/01/12 **Theory Days**, Kubija, Estonia
Talk: Certified parsing
- 07/10/11–09/10/11 **Theory Days**, Tõrve, Estonia

Organizing activity

I helped in organizing the following events: ETAPS 2012, EWSCS '12– EWSCS '16, NWPT '13, COST ARVI Tallinn meeting '15, Estonian-Finnish logic meeting '15, TYPES '15.

Peer Review

I reviewed papers for the following conferences and journals: ICALP, ICFP, JFR, LMCS, RTALCA, TYPES.

Students

Margit Ool (BSc), Jaan Elken (BSc), Liisa Suurkaev (BSc), Richard Blair (PhD student)

Background

My main interests include the following topics:

- algorithms
- semantics of programming languages
- constructive logic
- type theory
- compiler construction
- type systems
- functional programming
- machine learning

Programming Languages

functional Agda, Coq, Cedille, Haskell, ML

logical Curry, Prolog
OOP Java, C#
miscellaneous Python, SQL, L^AT_EX, C++

Languages

Russian **Mothertongue**
English **Fluent**
Estonian **Fluent**

Interests

- Piano
- Hiking
- Scuba diving
- Literature
- Sport
- Spearfishing