

## Danil Annenkov

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## EDUCATION

PhD (in progress), University of Copenhagen, DIKU

November, 2014 - October, 2017

Graduated with distinction from Irkutsk State Technical University,  
Faculty of Cybernetics, Department of Automated Systems (5 of 5 years)  
(equivalent to a master's degree)

July, 2002

## RESEARCH INTERESTS

Formal semantics of programming languages, functional programming, certified programming, type theory, homotopy type theory, applications of category theory in programming language research.

## PUBLICATIONS

1. Danil Annenkov, Paolo Capriotti, Nicolai Kraus. Two-Level Type Theory and Applications. Submitted to ACM Transactions on Computational Logic (TOCL), May 2017.  
[ arXiv e-print: <https://arxiv.org/abs/1705.03307> ].
2. Danil Annenkov and Martin Elsman. Towards Certified Compilation of Financial Contracts. In *Proceedings of the 28th Nordic Workshop on Programming Theory (NWPT'16)*. Aalborg, DK. November 2016.  
[ <http://dannenkov.me/papers/NWPTPayoffLang.pdf> ]
3. Annenkov, D.V. , Cherkashin, E.A., Generation technique for Django MVC web framework using the Stratego transformation language. *36th International Convention on Information and Communication Technology, Electronics and Microelectronics (MIPRO)*, IEEE, pp. 1084-1087, 2013.
4. Annenkov, D.V., Domain-specific languages as a foundation of the approach to software development. *Proceedings of conference with international participation "Vinerovskie chteniya"*, pp. 142-146 (in Russian), 2013.
5. Evgeny A. Cherkashin , Polina V. Belykh, Danil V. Annenkov, Christina K. Paskal A Document Content Logical Layer Induction on the Base of Ontologies and Processing Changes. *Proceedings of International Conference on Applied Internet and Information Technologies*, University of Novi Sad Technical Faculty «Mihailo Pupin», Zrenjanin, Serbia, 2013. C. 252-257.
6. Cherkashin, E.A., Paramonov, V.V., Fedorov, R.K., Terehin, I.N., Pozdnyak, E.I., Annenkov, D.V., Information Systems Framework Synthesis on the Base of a Logical Approach. *Proceedings of International Conference on Applied Internet and Information Technologies*, October 26, Serbia, Zrenjanin. pp. 239-244, 2012.
7. Annenkov, D.V., Simulation and research of the securities market. *Bulletin of the Irkutsk State Technical University*, vol. 27, #3, pp. 68-71 (in Russian), 2006.

8. Annenkov, D.V., Petukhov, P.A., Torbeeva, A.S., Modeling the organization and functioning of the securities market, *Proceedings of conference "Vinerovskie chteniya"*, pp. 35-40, 2005.

## PRESENTATIONS

1. *Towards Certified Compilation of Financial Contracts. Nordic Workshop on Programming Theory (NWPT'16)*. Aalborg, DK. November, 2016.
2. *Verifying the generation of payoff-language expressions*. HIPERFIT Workshop, Copenhagen, 2016
3. *Domain-specific languages as a foundation of an approach to the software development*. Conference with international participation "Vinerovskie chteniya", Irkutsk State Technical University, Russia, 2013
4. Annenkov, D.V., *Simulation as a set of methods and tools for analysis and synthesis of various systems (on the example of the securities market)*. Conference with international participation "Vinerovskie chteniya", Irkutsk State Technical University, Russia, 2005.

## GRADUATE LEVEL COURSES

1. Semantics and Types.  
Lecturer: Andrzej Filinski, Associate Professor at Department of Computer Science, University of Copenhagen.
2. Static Program Analysis and Language-based Security.  
Lecturer: Thomas Jensen, Directeur de recherche INRIA, Rennes.

## SUMMER SCHOOLS, SEMINARS

1. Type theory seminar at IT University of Copenhagen organised by Rasmus Møgelberg, February - May 2017.  
Reading papers and discussing such topics as categorical models of type theory, type theory with guarded recursion, homotopy type theory. I contributed with a talk on definitions of equivalence in homotopy type theory.
2. Midlands Graduate School in the Foundations of Computing Science 2017, University of Leicester, Leicester, UK.  
Following "Advanced Courses": higher-category theory, graphical linear algebra, coalgebras and Infinite Data Structures
3. Blockchain Summer School 2016, IT University of Copenhagen, Copenhagen, Denmark.  
Introduction to blockchain technology, distributed ledgers with hand-on experience with the Ethereum platform and Solidity smart contract programming language.
4. Midlands Graduate School in the Foundations of Computing Science 2016, University of Birmingham, Birmingham, UK.  
Following "Basic Courses": type theory, category theory, denotational semantics.
5. Oregon Programming Language Summer School 2015, University of Oregon, Eugene, US.
6. Reading group on data-parallel programming languages, 2015 -2016.  
Discussion of papers related to type systems, cost semantics, implementation and application of data-parallel programming languages.

## ACADEMIC/TEACHING EXPERIENCE

### Teaching assistant, co-teacher

2015-2017

University of Copenhagen, DIKU.

Courses:

Advanced Java (concurrency, java generics, testing, RPC over HTTP, working with databases)

Advanced Computer Systems (concurrency control - serializability, two-phase locking; database recovery protocols, consensus protocols in distributed systems).

Co-supervision of Bachelor's projects

### Part-time Lecturer

September, 2010 - 2012

Irkutsk State Technical University, Faculty of Cybernetics

Taught the following courses: Web Programming, Technology of Programming.

### Teacher

July, 2010 - March, 2011

International Education Centre Aptech-ISTU

- Java Programming Language (ACCP Russia, semester 2) course.

### Graduate Assistant

September, 2002 - 2007

Irkutsk State Technical University, Faculty of Cybernetics

- Courses taught: Algorithmic Programming Languages, Organization of Databases, Operating Systems.
- Developed new curriculum of "Technology of Programming" course.

### Graduate Research Assistant

September, 2002 - 2007

Irkutsk State Technical University, Faculty of Cybernetics

- Stochastic modelling of financial time series.
- Development of tools for generation of random numbers with given properties.

## FACULTY ACTIVITIES

Organizing committee member of the annual regional programming contest

2003 - 2005

Organizing committee member of the conference "Vinerovskie chteniya"

2004

## PROFESSIONAL EXPERIENCE

### Founder of Software Development Company

2009 - 2014

Web-based enterprise solutions

(CRM, Service Department Information System, e-Commerce)

### Python/Javascript Developer

September 2013 - January 2014

Exploriana Inc.

Member of guidemore.com development team.

Guidemore.com is a internet service for creation travel guides for mobile devices.

### Programmer

2004 - 2005

Railroad Clinical Hospital, Irkutsk, Russia

Deployment of a medical information system

## SKILLS

10+ years of programming experience (both industry and academic).

### Programming languages

Java, Python, Javascript, Scala, Haskell, Racket (Lisp dialect), Stratego/XT.

### **Proof assistants**

Coq, Lean, Agda (some experience)

### **Markup languages**

XML, HTML, Markdown, reStructuredText

### **Version control systems**

Svn, Git, Mercurial

### **Team Leadership**

Led team of developers (3-4 persons).

## **LANGUAGES**

Russian - native

English - advanced, IELTS score 7.0 in 2014.

## **PROJECTS**

### **1. Two-level type theory**

An implementation of two-level type theory in the Lean proof assistant. Two-level type theory is a version of Martin-Löf type theory (MLTT), which consists of two fragments: the fibrant fragment (Homotopy Type Theory) and the strict fragment (MLTT with uniqueness of identity proofs).

<https://github.com/annenkov/two-level>

### **2. Contract DSL**

Some extensions of the original Contract DSL (Patrick Bahr, Jost Berthold, Martin Elsman. Certified Symbolic Management of Financial Multi-Party Contracts, ICFP'2015) and compilation to the intermediate Payoff language implemented in Coq proof assistant.

<https://github.com/annenkov/contracts>

### **3. The HIPERFIT Portfolio Management Prototype**

Web-based system that integrates the Contract DSL and the HIPERFIT parallel pricing engine (FINPAR). The system is written in Haskell and features automatic web-form generation on base of Haskell data types along with OpenCL code generation for payoff functions.

<https://github.com/HIPERFIT/prototype>

### **4. Stratego-SLL**

An interpreter and minimal positive supercompiler for first-order functional language ( $M_0$  language from Morten Sørensen's Master Thesis) written in Stratego transformation language (Spoofax language workbench).

<https://github.com/annenkov/stratego-sll>

### **5. Unmix project ported to Racket**

Unmix was originally developed by Sergei A. Romanenko (Keldysh Institute of Applied Mathematics, Russian Academy of Sciences, Moscow, Russia)

Unmix is a program specializer (based on partial evaluation) for a subset of Scheme.

<https://github.com/annenkov/unmix>

### **6. Entity Model DSL**

Simple textual DSL for modelling entities with Python code generation.

[https://bitbucket.org/ib\\_soft/entity-model/](https://bitbucket.org/ib_soft/entity-model/)

#### 7. **Some bioinformatics algorithms in Haskell**

Implementation of brute-force Regulatory Motifs Finding algorithm (formulated as a Median String problem) with two branch-and-bound strategies.

[https://bitbucket.org/ib\\_soft/haskell-samples](https://bitbucket.org/ib_soft/haskell-samples)

## REFERENCES

### **Martin Elsman (PhD supervisor)**

Associate Professor at the Department of Computer Science, University of Copenhagen

Email: [mael@di.ku.dk](mailto:mael@di.ku.dk)

### **Paolo Capriotti**

Postdoc at the Functional Programming Laboratory, University of Nottingham

Email: [paolo@capriotti.io](mailto:paolo@capriotti.io)

### **Fritz Henglein**

Professor at the Department of Computer Science, University of Copenhagen

Email: [henglein@diku.dk](mailto:henglein@diku.dk)