Curriculum vitae
Danil Annenkov

danil.v.annenkov@gmail.com
Google Scholar: https://scholar.google.com/citations?user=JjtxzfkAAAAJ
ORCHID: https://orcid.org/0000-0001-8278-3069
ResearchGate: https://www.researchgate.net/profile/Danil_Annenkov
Personal page: dannenkov.me

PERSONAL INFORMATION

Birth date: 16.11.1981. Marital status: married, wife Anna Annenkova. Children: daughter Arina.

EDUCATION

PhD, University of Copenhagen, DIKU 2014 - 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

ACADEMIC POSITIONS

(positions outside of Denmark are marked with "*")

Postdoc, Aarhus University, Denmark	Since December, 2018
Postdoc, INRIA Nantes, **France***	February, 2018 - November, 2018
Research Assistant, University of Copenhagen, Denmark	November, 2017 - January 2018
PhD Fellow, University of Copenhagen, Denmark	November, 2014 - October, 2017
Research Assistant**,** Irkutsk State Technical University, **Russia***	2002 - 2006

INTERNATIONAL COLLABORATION

INRIA, France

During my postdoc, I have been working with Nicolas Tabareau (INRIA Nantes) on application of typed meta-programming techniques. Currently, I am part of the MetaCoq development team and collaborate remotely with Matthieu Sozeau (INRIA Paris) on use cases and features of MetaCoq.

University of Nottingham, UK

School of Computer Science, Functional Programming Laboratory
During my academic visit (Sep. 2016 - Dec. 2016) I worked with Paolo Capriotti and Nicolai Kraus. Collaboration continued after I returned back to the University of Copenhagen and resulted in the submission of a paper and a presentation at a workshop.

Institute for System Dynamics and Control Theory, Irkutsk, Russia
Before starting my PhD at the University of Copenhagen, I worked with Evgeny Cherkashin on model-driven architecture and domain-specific languages and contributed to a number of publications on software generation and domain-specific languages (see list of publications).

PUBLICATIONS AND PREPRINTS

Journals

1. Martin Elsman, Troels Henriksen, Danil Annenkov, Cosmin Oancea. “Static Interpretation of Higher-Order Modules in Futhark”. In: Proceedings of the ACM on Programming Languages, Volume 2 Issue **ICFP**, September 2018.
2. Annenkov, D.V., “Simulation modelling and studies of the securities market”. Bulletin of the Irkutsk State Technical University, vol. 27, #3 (in Russian), 2006.

Conference proceedings

3. Danil Annenkov, Jakob Botch Nielsen, Bas Spitters. “ConCert: A Smart Contract Certification Framework in Coq”**.** In: The 9th ACM SIGPLAN International Conference on Certified Programs and Proofs (**CPP’20**).
4. Danil Annenkov, Martin Elsman. “Certified Compilation of Financial Contracts”, In: Proceedings of the 20th International Symposium on Principles and Practice of Declarative Programming (**PPDP’18**).
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”. In: *Proceedings of the 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.

Workshops

7. Danil Annenkov, Mikkel Milo, Jakob Botsch Nielsen, and Bas Spitters. “Verifying, testing and running smart contracts in ConCert”. Extended abstract. The Coq workshop 2020.
8. Danil Annenkov, Bas Spitters. “Deep and Shallow Embeddings in Coq”. Extended abstract. 25th International Conference on Types for Proofs and Programs 2019 (TYPES’19).
9. Danil Annenkov, Paolo Capriotti, Nicolai Kraus. “Formalisations Using Two-Level Type Theory”. Extended abstract. Workshop on Homotopy Type Theory/ Univalent Foundations 2017.

10. Danil Annenkov and Martin Elsman. “Towards Certified Compilation of Financial Contracts”. Extended abstract. In: *Proceedings of the 28th Nordic Workshop on Programming Theory (NWPT’16)*, 2016.
11. Danil Annenkov. “Domain-specific languages as a foundation of the approach to software development”*. In: Proceedings of “Vinerovskie chteniya”*, pp. 142-146 (in Russian), 2013.
12. 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.
13. Annenkov, D.V., Petukhov, P.A., Torbeeva, A.S. “Modeling the organization and functioning of the securities market”. *In : Proceedings of “Vinerovskie chteniya”*, pp. 35-40, 2005.

Preprints

14. Danil Annenkov, Jakob Botch Nielsen, Bas Spitters. “ConCert: A Smart Contract Certification Framework in Coq”**.** CPP2020 version with appendices. 2020. arXiv e-print: https://arxiv.org/abs/1907.10674
15. Danil Annenkov, Paolo Capriotti, Nicolai Kraus. “Two-Level Type Theory and Applications”. *Submitted* to Mathematical Structures in Computer Science. 2019. arXiv e-print: http://arxiv.org/abs/1705.03307

TALKS

Public talks

1. A lecture on smart contracts on the association of computer scientists (Datalogforeningen) meeting. https://www.datalogforeningen.dk/stormoede-2019-indbydelse/, Aarhus, 2019.
2. Towards Safer Smart Contract Languages. Digital Innovation Festival, Aarhus, 2019.

Teaching-related talks

3. A guest lecture and an exercise session on smart contract languages for the “Language-Based Security” course at Aarhus University (with Bas Spitters).

Selected scientific talks

4. Verification of functional smart contracts in Coq. Logic and Semantics group seminar, Aarhus University, 2019.
5. Formal verification of Oak/Acorn Smart Contracts. Concordium Summer Congress 2019, Aarhus.
6. Deep and Shallow Embeddings in Coq. TYPES’19, Oslo, 2019.
7. The Call-by-Name Forcing Translation in Template Coq, Aarhus University, 2018.
8. Nominal Techniques in Coq. HIPERFIT Workshop 2018, University of Copenhagen, November 2017.
9. Reasoning Techniques for a Module System Formalisation in Coq, IMDEA Software Institute, Madrid, 2017.

10. Towards Certified Compilation of Financial Contracts. Nordic Workshop on Programming Theory (NWPT'16). Aalborg, DK. November, 2016.
11. Verifying the generation of payoff-language expressions. HIPERFIT Workshop, Copenhagen, 2016.
12. Domain-specific Languages as a Foundation of an Approach to Software Development. "Vinerovskie chteniya", Irkutsk State Technical University, Russia, 2013.

GRADUATE LEVEL COURSES (DURING PhD STUDIES)

1. Semantics and Types.
   Lecturer: Andrzej Filinski, Associate Professor at the 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

I have attended the following summer schools and seminars:

1. Type theory seminar at the 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.

TEACHING

See detailed information in the teaching statement.

Supervision of student projects (bachelor's and master's level) 2018-2020
Aarhus University, Department of Computer Science
Teaching assistant, co-teacher (during PhD studies) 2015-2017

University of Copenhagen, DIKU.
Co-teacher: Advanced Java.
Teaching assistant: Advanced Computer Systems
Co-supervision of bachelor's projects

Part-time Lecturer September, 2010 - 2012
Irkutsk State Technical University, Faculty of Cybernetics
Courses: Web Programming, Technology of Programming.

Teacher July, 2010 - March, 2011
International Education Centre Aptech-ISTU

- Java Programming Language course.

Teacher September, 2002 - 2007
Irkutsk State Technical University, Faculty of Cybernetics

FACULTY ACTIVITIES

Organising the Logic and Semantics Group seminar (with Lars Birkedal)	2019-2020
Censor at the "Functional programming" course exam, Aarhus University	2019
External examiner for master's projects, Irkutsk State Technical University	2014
Organizing committee member of the annual regional programming contest	2003 - 2005
Organizing committee member of the conference "Vinerovskie chteniya"	2004

PROFESSIONAL EXPERIENCE

Founder of a 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.

Programmer 2004 - 2005
Railroad Clinical Hospital, Irkutsk, Russia
Deployment of a medical information system

OPEN-SOURCE PROJECTS

1. **ConCert**

   A framework for smart contract verification in Coq. Includes:

   - embedding of the functional programming language λsmart into Coq;
   - a backend for converting Acorn programs to λsmart
   - a formalization of execution layers of modern blockchains in Coq
   - examples of verification of functional correctness and safety properties of some smart contracts.

   Project repository: https://github.com/AU-COBRA/ConCert

2. **Forcing translation in Template Coq**

   Implementation of the CBN forcing translation using typed meta-programing facilities of Template Coq. Based on the OCaml forcing translation plugin (by Jaber, Pédrot, Sozeau, Lewertowski and Tabareau). Current implementation uses the version of Coq supporting definitinal proof-irrelevance (by Gaëtan Gilbert).
   Project repository: https://github.com/CoqHott/template-coq-forcing/tree/sprop
3. **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).
   Project repository: https://github.com/annenkov/two-level
4. **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 the Coq proof assistant.
   Project repository: https://github.com/annenkov/contracts
5. **Simply-Typed Lambda-calculus in Coq**
   The projects includes:
   - The proof of normalization of the Call-by-Value Simply-Typed Lambda Calculus (STLC) using Tait's method in Coq.
   - Implementation of nominal sets with applications to STLC (nominal set of lambda terms, definition of alpha-equivalence, proof of equivariance of the typing relation)

   Project repository: https://github.com/annenkov/stlcnorm
6. **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.
   Project repository: https://github.com/HIPERFIT/prototype
7. **Stratego-SLL**
   An interpreter and minimal positive supercompiler for first-order functional language (M_0 language from the Morten Sørensen's Master Thesis) written in Stratego transformation language (part of the Spoofax language workbench).
   Project repository: https://github.com/annenkov/stratego-sll
8. **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.
   Project repository: https://github.com/annenkov/unmix
9. **Entity Model DSL**
   Simple textual DSL for modelling entities with Python code generation.
   Project repository: https://github.com/annenkov/entity-model
10. **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.
Project repository: https://github.com/annenkov/haskell-bio

REFERENCES

Martin Elsman (PhD supervisor)
Associate Professor, University of Copenhagen
Email: mael@di.ku.dk

Nicolas Tabareau (previous postdoc adviser)
Senior Researcher, INRIA
Email: nicolas.tabareau@inria.fr

Bas Spitters (current postdoc adviser)
Associate Professor, Aarhus University
Email: spitters@cs.au.dk

Marcos António Vaz Salles (reference on teaching)
Associate Professor, University of Copenhagen
Email: msalles@gmail.com