Vladimir Ulyantsev

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I am a PhD in computer science, associate professor and a head of Computer Technologies Laboratory (ITMO University), which now consists of 7 groups & 130 members. I have managed and participated in more than 10 R&D projects, co-authored more than 45 research papers, supervised more than 25 students (including ICPC champions).

Research interests: discrete optimization, machine learning, generative design, bioinformatics

Selected skills: research unit & project management, faculty work, funds attraction

Personal values: independence, ambition, logic, responsibility, social well-being

Hobbies: swimming, skiing, surfing, singing, texas holdem

Career overview

Born in 1990 in St. Petersburg, Russia. I have been keen on math and programming since early childhood. Started studying computer science and programming in ITMO University in 2007, also started my career with developing and organizing programming contests. I've developed more than 100 problems, coaching teams for ICPC championships in Russia, USA, Uzbekistan.

In 2010 started a research career on developing evolutionary and Boolean satisfiability (SAT) based methods for solving NP-hard problems. Defended a PhD thesis on automata synthesis using SAT and Constraint Satifaction Problem (CSP) solvers in 2015. In 2014 also started working in the area of bioinformatics, developing tools for metagenomic WGS analysis in collaboration with Research and Clinical Center of Physical-Chemical Medicine, Moscow.

In parallel with a research career, established as a leader and supervisor. Since 2012 participated in grant fundraising and project supervision. After defending a PhD thesis, in 2016 was appointed as the head of a joint ITMO-JetBrains Research lab (12 members). Since 2017 became the head of the Computer Technologies Lab, facilitated the expansion of the Lab from 10 members to 7 groups of a total of 130 members.

Work

ITMO University, Computer Technologies Laboratory
lab head — *Jul 2017–now*
decision making, strategic planning, resource management, fundraising, collaborations establishment

ITMO University, Information Technologies and Programming Faculty
associate professor — *Sep 2016–now*
supervising bachelor, master & PhD students, leading projects on computer science, machine learning & bioinformatics

JetBrains Research
head of optimization problems in software engineering group — *Jul 2016–Feb 2022*

ITMO University, Computer Technologies Laboratory
head of discrete optimization group — *Sep 2013–Jul 2019*

ITMO University, Computer Technologies Laboratory
researcher *Apr 2010–Dec 2015*

ITMO University, Information Technologies and Programming Faculty
programming contests development & organization *Mar 2008–Mar 2010*

Education

ITMO University **Saint Petersburg, Russia**
PhD in Computer Science *2013–2015*
Information Technologies and Programming Faculty, Computer Technologies Department
Topic: Finite-state machine synthesis using SAT and CSP solvers

ITMO University **Saint Petersburg, Russia**
Master's degree in Applied Mathematics and Informatics *2011–2013*
Information Technologies and Programming Faculty, Computer Technologies Department

ITMO University **Saint Petersburg, Russia**
Bachelor's degree in Applied Mathematics and Informatics *2007–2011*
Information Technologies and Programming Faculty, Computer Technologies Department

Software

MetaFast `https://github.com/ctlab/metafast`
developer, algorithms designer, team leader *2014–now*
METAgenome FAST analysis toolkit for feature extraction and calculating a number of statistics of metagenome sequences

MetaCherchant `https://github.com/ctlab/metacherchant`
team leader, algorithms designer *2016–now*
tool for analysing genomic environment of a nucleotide sequence within a metagenome

RECAST `https://github.com/ctlab/RECAST`
team leader, algorithms designer *2018–now*
pipeline for analysing metagenome time series and distinguish which reads of one metagenome sample are found in other samples

GADMA `https://github.com/ctlab/GADMA`
supervisor for optimization algorithms *2017–now*
tool for automatic inference of the joint demographic history of multiple populations from the genetic data

EFSM-tools `https://github.com/ctlab/EFSM-tools`
developer, algorithms designer, team leader *2010–2019*
toolset for finite-state machine (FSM) synthesis

Selected funded projects

RSCF grant `https://rscf.ru/en/project/21-71-00051/`
principal investigator *2021–2023*
Feature extraction for de Bruijn graphs of groups of metagenomic samples and whole-genome metagenome datasets classification using machine learning

RSCF grant `https://rscf.ru/en/project/18-71-00150/`
principal investigator *2018–2020*
Evolution strategies for hard SAT-instances decomposition with application to cryptographic functions inversion

RFBR A-grant 18-07-01285
principal investigator *2018–2020*
Machine learning methods for synthesizing finite-state models of control systems with regard of temporal properties and timestamps based on propositional encoding

Joint ITMO-Aalto project 14.587.21.0032
senior researcher *2018–2020*
Development of methods, tools and technologies for design, verification and testing of reliable cyber-physical systems

RFBR PhD grant 14-07-31337
PhD student *2014–2015*
Automated reliable software synthesis from test examples and temporal constraints using automata-based programming

Notable supervised students

2021: Artem Ivanov (MS)

2020: Ilya Zakirzyanov (PhD), Artem Pavlenko (MS), Darya Zvyagintseva (BS)

2019: Artem Ivanov (BS), Roman Melnikov (BS)

2018: Ekaterina Noskova (MS), Artem Pavleko (BS)

2017: Ilya Zakirzyanov (MS), Vyacheslav Moklev (BS), Ilya Kachalsky (BS)

2016: Artem Vasilyev (MS)

2015: Ilya Zakirzyanov (BS), Mikhail Melnik (BS)

Selected bioinformatics papers

1. *Olekhnovich E, Ivanov A, Ulyantsev V, Ilina E.* Separation of donor and recipient microbial diversity allows determination of taxonomic and functional features of gut microbiota Restructuring following Fecal Transplantation. **mSystems**, 2021. 10.1128/mSystems.00811-21
2. *Noskova E, Ulyantsev V, Koepfli K-P, O'Brien S, Dobrynin P.* GADMA: Genetic Algorithm for inferring Demographic history of Multiple populations from Allele frequency spectrum data. **GigaScience**, 2020. 10.1093/gigascience/giaa005
3. *Zhernakova D et al.* Genome-wide sequence analyses of ethnic populations across Russia. **Genomics**, 2020. 10.1016/j.ygeno.2019.03.007
4. *Olekhnovich E, Vasilyev A, Ulyantsev V, Kostryukova E, Tyakht A.* MetaCherchant: analyzing genomic context of antibiotic resistance genes in gut microbiota. **Bioinformatics**, 2018. 10.1093/bioinformatics/btx681
5. *Dubinkina V, Ischenko D, Ulyantsev V, Tyakht A, Alexeev D.* Assessment of k-mer spectrum applicability for metagenomic dissimilarity analysis **BMC bioinformatics**, 2016. 10.1186/s12859-015-0875-7
6. *Ulyantsev V, Kazakov S, Dubinkina V, Tyakht A, Alexeev D.* MetaFast: fast reference-free graph-based comparison of shotgun metagenomic data. **Bioinformatics**, 2016. 10.1093/bioinformatics/btw312

Selected computer science papers

1. *Zvyagintseva D, Sigurdsson H, Kozin V, Iorsh I, Shelykh I, Ulyantsev V, Kyriienko O.* Machine learning of phase transitions in nonlinear polariton lattices. **Communications Physics**, 2022. 10.1038/s42005-021-00755-5
2. *Semenov A, Chivilikhin D, Pavlenko A, Otpuschennikov I, Ulyantsev V, Ignatiev A.* Evaluating the hardness of SAT instances using evolutionary optimization algorithms. **CP 2021**. 10.4230/LIPIcs.CP.2021.47
3. *Chivilikhin D, Zakirzyanov I, Ulyantsev V.* BeBoSy: Behavior Examples meet Bounded Synthesis. **IEEE Access**, 2021. 10.1109/ACCESS.2021.3057823
4. *Zakirzyanov I, Morgado A, Ignatiev A, Ulyantsev V, Marques-Silva J.* Efficient Symmetry Breaking for SAT-Based Minimum DFA Inference. **LATA 2019**. 10.1007/978-3-030-13435-8_12
5. *Pavlenko A, Buzdalov M, Ulyantsev V.* Fitness comparison by statistical testing in construction of SAT-based guess-and-determine cryptographic attacks. **GECCO 2019**. 10.1145/3321707.3321847
6. *Chivilikhin D, Ulyantsev V, Shalyto A, Vyatkin V.* Function block finite-state model identification using SAT and CSP solvers. **IEEE Transactions on Industrial Informatics**, 2019. 10.1109/TII.2019.2891614
7. *Ulyantsev V, Buzhinsky I, Shalyto A.* Exact finite-state machine identification from scenarios and temporal properties. **International Journal on Software Tools for Technology Transfer**, 2018. 10.1007/s10009-016-0442-1
8. *Zakirzyanov I, Shalyto A, Ulyantsev V.* Finding all minimum-size DFA consistent with given examples: SAT-based approach. **SEFM 2017**. 10.1007/978-3-319-74781-1_9
9. *Ulyantsev V, Zakirzyanov I, Shalyto A.* BFS-based symmetry breaking predicates for DFA identification. **LATA 2015**. 10.1007/978-3-319-15579-1_48

Achievements & activities

- Programme committee member of AAAI'2021, AINL '2016 '2017 and SNR'2017
- In 2020 together with Artem Ivanov won both tracks of PMI Metagenomics Diagnosis for Inflammatory Bowel Disease Challenge (MEDIC) (`https://www.pmiscience.com/whats-new/winners-of-sbv-improver-machine-learning-diagnostic-challenge-announced`)
- Delivered scientific and popular science lectures on various open stages, a small collection available here: `https://ulyantsev.com/talks/`
- In 2019 took part in a standup show, joking on scientific mindset
- Starting 2018 actively serving in ITMO University' councils, doing my best to evolve internal university policies
- In 2009 have been coaching ICPC team of A.F. Mozhaysky's Military-Space Academy, that was the only time their team managed to get to semifinal