

## EDUCATION

**Moscow Institute Of Physics And Technology**, *Weighted GPA: 9.43/10; top 5% of the university*  
*Bachelor of Science, Applied Mathematics & Computer Science* 08.2016 — 08.2020

**Relevant courses:** Bayesian statistics, applied statistics, optimization, machine learning, deep learning, stochastic processes, algorithms and data structures, concurrent programming, distributed programming

## RESEARCH EXPERIENCE

**Research Internship, Computational Biology, DKFZ/EMBL Heidelberg**, 01.07.2019 — 01.01.2020

**Supervisors:** Dr Oliver Stegle (group leader); Dr Hana Susak, Dr Nicola Casiraghi, Dr Yuanhua Huang

- Under supervision of Dr Yuanhua Huang (EMBL-EBI, Cambridge), I designed and implemented **XClone**, graphical Bayesian model capable of integrating single-cell genomes, transcriptomes, ATAC-seq, mitochondrial DNA. It's a modification of **Cardelino** model, a tool for clonal structure inference from scRNA-seq, but based on CNV and other sources of allele specificity observed in multiple modalities. We used variational inference to ensure that our model scales to the state-of-the-art datasets. We also implemented a method for sampling realistic cells from expression profiles obtained from G&T data.
- Under supervision of Dr Casiraghi, I worked with nuclei, PDX and G&T datasets coming from the patient with medulloblastoma — brain cancer in children. I had hands-on experience with 10x Genomics software stack, in particular with Cell Ranger and its **CNV-kit**. We used Nanopore-seq for accurate read phasing and significantly reduced sparsity of scRNA-seq dataset by aggregating allele-specific expression information over SNPs sharing same CNV state and covered by particular haplotype block.
- Under supervision of Dr Susak, I worked on a method for inferring clonal tumour tree structure from scDNA/scATAC. We came up with a modification of Levenstein distance based on genomic rearrangements. We constructed a minimal spanning tree with cells as nodes and defined clones as clusters in that tree.
- At the same time, I've done a lot of data preparation myself in Python and C++. Given size and complexity of single-cell datasets, I had to written highly optimized code capable of making the most out of the resources of the dedicated HPC cluster. I also learned about the best practices of reproducible research (snakemake pipelines, environment isolation) and applied those in my projects.

**Mutual analysis of interaction networks and quantitative trait loci for yeast**, 2018-present:

«Modern Combinatorics and Network Science» Lab of Prof A. Raigorodsky, MIPT.

**Supervisor:** Yuri Pritykin, PhD (Princeton), Research Scholar at MKSCC

Detailed project description is available [on GitHub](#).

- Implemented different approaches to QTL mapping in yeast, from **basic** to **state-of-the-art**
- Integrated PPINs into QTL analysis. Implemented statistical tests using **igraph** package.
- Carried out GWAS on NGS expression data. Learned how to tackle domain-specific difficulties arising from large-scale hypothesis testing using FDR-correction techniques (especially **qvalue**).
- Learned how to write fast and memory-efficient scientific code using numpy, scipy and pandas.
- Practiced parallel programming, interprocess communication and data persistency in Python.
- Utilized MIPT supercomputing capabilities, learned how to use SLURM.
- Worked with GeneOntology and KEGG API and related Python/R tools.

## HONORS

- **Abramov Scholarship For Academic Excellence** 2nd term — 6th term  
Earned by top 10% students by cumulative GPA in their academic program in academic terms 2-6.
- **Russian Government Scholarship For International Students** 2016 — 2020  
Was selected to become one of 3 Ukrainians to receive the full-coverage scholarship to study CS at the best Russian universities and got enrolled to MIPT directly, without entrance examination.
- **Governor of the Moscow Region Scholarship For Academic Excellence** Autumn 2017  
Awarded termly to excellent students for promising achievements in scientific activities.
- **Future Biotech Winter Retreat "Genome function, editing and therapy"** Winter 2019  
Became one of 70 young researchers selected to participate in top biotech winter school in Russia sponsored by companies like AstraZeneca, Biocad, GE Healthcare etc.

- **Summer School in Bioinformatics** by Russian Bioinformatics Institute *Summer 2017*  
Became one of 50 CS majors selected to participate. Was a member of a hackathon-winning team.
- **Moscow International Workshops in Competitive Programming** *Autumn 2016, Spring 2017*  
Two-times participant of the leading Russian competitive programming bootcamp.
- **ACM ICPC Moscow Subregional Contest (1/4 World Finals)** *Autumn 2017*  
Our team ranked 17 among 301 participating teams and 7th at home university.
- **All-Ukrainian Chemistry Olympiad** — double awardee, triple winner of regional stage
- **All-Ukrainian Tournament of Young Chemists** — 2nd place

## TEACHING EXPERIENCE

- **TA at «Theory and practice of concurrent programming» course at MIPT** *Spring term 2019*  
My responsibilities included weekly code reviews on GitLab and knowledge assessment sessions.
- **TA at «Mathematical statistics» and «Applied statistics» courses at MIPT** *Fall term 2019*  
Authored learning materials for a primer on scientific computing for data scientists: [see on GitHub \(WIP\)](#).  
Topics included: environment setup, Jupyter ecosystem, efficient Python programming (JIT, Cython, data persistence, parallel and distributed computing), advanced visualizations ([IPyWidgets](#), [bokeh](#), [bqplot](#)), reproducible workflows ([SnakeMake](#), [pachyderm](#)), cloud services ([Google Colab](#), [Amazon AWS](#)). Also was responsible for code base maintenance and student knowledge evaluation.
- **TA at «Algorithms and data structures» course at MIPT** *Fall term 2019*  
Weekly code reviews on GitLab (code style, correctness).

## REFERENCES

**Dr Oliver Stegle**, group leader at EMBL, EMBL-EBI and DKFZ  
**Dr Yuri Pritykin** (thesis supervisor), research scholar at MSKCC  
**Federal Prof. Andrei Raygorodsky**, head of department at MIPT

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