Ivan Ogloblin — Curriculum Vitae

Education

Saint-Petersburg State University **Sept 2019 - July 2023**
Bachelor of Science in Computer Science and Software Engineering

Pontifical Catholic University of Rio de Janeiro **Sept 2022 - July 2024**
Masters degree in Mathematics

Related Coursework:

- C++
- Kotlin
- Python
- Haskell
- Scala
- Algorithms
- Parallel programming
- Math logic
- Machine learning
- Unix
- Operating system
- Algebra
- Mathematical Analysis
- Random Process Theory
- Discrete Mathematics
- Statistics
- C#
- Data Bases
- Quantum Computing
- Quantum Information
- JavaScript
- HTML and CSS
- Networks
- Quantum mechanics

Programming Experience

Yandex Developer Intern **July - Sept 2021**

Worked in two teams on backend C++/Python/SQL. Developed support system for training scripts to work with an optimized structure for storing variable logs. Wrote tests for components that were used to prepare data for a neural network that makes recommendations. Got acquainted with the concepts of services and levers. Dove into the intricacies of communication between services and systems for transmitting information with errors for debugging.

Huawei Assistant Engineer, Developer **October 2021 - January 2022**

Worked on backend C#/.netASP/EntityFramework/Autofac + frontend 3js/react/VR. Developed system of package communication with no delay, that alternates between http and signalR requests.
Did research work on handwriting recognition using convolutional network under "Human Computer Interactions". Got familiar with CNN, RNN and LSTM structures.

Developer Projects

Archiver **2019**

C++ Used Huffman algorithm in implementation for data compression and decompression (github)

Vacanter **2019**

The Vacanter is a mobile application for matching employers with potential employees. I provided database and backend system for the application using postgreSQL, python, Datagrip. (github)

ML-projects **2019**

I included implementation of Ant-colony and Genetic algorithms for "Travelling Salesman Problem". Also contains realization of K-means, SVM, Clustering and neural network algorithms. (github)

Achievements

ICPC **2020**

- 41 Place, Northwestern Russia Regional Contest St.Petersburg, October 26, 2019
- Honorable Mention, Northwestern Russia Regional Contest St.Petersburg, 14 November, 2020

Open olympiad **2018**

- Top 60 out of 1100 in "Open olympiad in Mathematics" 2018 and 2016
- Top 174 out of 1404 in "Open olympiad in Mathematics" 2017
- Top 109 out of 1103 in "Open olympiad in Physics" 2018

International scientific school conference "XVIII Kolmogorov Readings" **2019**

- I took third place in the discipline of computer science and mathematical modeling

Programming skills

- C++, Python, C#, C, Java, JavaScript, HTML, CSS, Kotlin, Haskell, Scala, SQL, Lean
- ASPnet, EntityFramework, Microsoft SQL Express, React, three.js, postgreSQL
- Git, Linux, Unity3D, SVN, Blender(3d modeling), protobuff, Shiny, Docker

Quantum computing experience

Undergraduate Thesis **2022-2023**

As my thesis I did research on optimal schemes of entangling transformations in linear quantum optics using genetic algorithm. New schemes were obtained for finding the maximum entangled state, as well as for implementing gates equivalent to CX. Although it was not possible to improve the probability of operation, it was hypothesized that in the schemes in the KLM protocol it is impossible to find a scheme that implements the transformation, which would not be a perfect entangler, or at least not equivalent to CX. You can see presentation in this repository.

Quantum Algorithms for VRP and VRPTW Problems **2021**

I did a semester project on the topic "Quantum Algorithms for VRP and VRPTW (Vehicle Routing Problem with Time Windows) Problems" with application to the real case problems of building the routes for drilling machines for oil production in collaboration with GazpromNeft – one of Russia's major oil companies. I was directly assigned the task of studying current best practices for solving logistics problems on classical computers. The next step was to study current results on solving this problem by quantum and quantum-inspired algorithms. As with many optimization problems, it turned out to be possible to reduce this problem to QUBO (quadratic unconstrained binary optimization) and solve it using quantum optimization algorithms such as VQE and QAOA. Then I was to develop a simple solver for the multi-traveling salesman problem for small-scale problems (toy problem, up to 7 qubit). It can run locally on a simulator with Qiskit. During this work, I perfectly understood the intricacies of launching and testing quantum algorithms using simulators at IBM Cloud system and how to look for quantum-inspired algorithms and test their applicability.
(unfortunately I cannot share any code because of the privacy regulations of GazpromNeft)

Study of the Effect of Noise on Efficient Quantum Search Algorithms **2022**

Semester project on the topic "Study of the Effect of Noise on Efficient Quantum Search Algorithms" under the supervision of Sergei Borisovich. In this project I was to implement improved quantum search algorithms for unstructured DB. They are based on the Grover's algorithm and are described in this article. The results of testing algorithms for a problem of no more than five qubits are shown. My task was to dig further into the limits of quantum search algorithms. First, I implemented improved search algorithms. Secondly, I created an environment for testing algorithms with different noise models and different numbers of qubits. Finally, I conducted a set of experiments and explored the impact of noise on variations of the algorithm. In my experiments I used thermal relaxation noise model and coupling map from a real device: "Melbourne". As a result I understood how to run such experiments in order to obtain estimates of the noise parameters for feasible operation of the algorithm. You can find details in this presentation or in this repository.

Courses **2021-2022**

Almost all of these topics were understood by the book
"Quantum Computation and Quantum Information" Michael A. Nielsen, Isaac L. Chuang

- Course on introduction to quantum computations: Grover's algorithm, Deutsch–Jozsa algorithm, quantum permutations, quantum Fourier Transform, quantum search, Q-RAM, Shor's algorithm.
- Course on quantum information: density operator, noise in quantum systems, closeness of quantum states, quantum correction codes and their realization, classical and quantum entropy, bandwidth of quantum channels, transmission of quantum information over a noisy quantum channel, quantum cryptography.
- Additional seminar with the 'GazpromNeft' team: Phase estimation algorithm, QAOA algorithm, QAA algorithm, VQE algorithm, quantum search as quantum simulation, black box algorithm limits, speed up of NP-complete problems, quantum search optimality, quantum search in unstructured database, physical realization of quantum computer: harmonic oscillator, optical photon quantum computers, optical cavity quantum electrodynamics

Qiskit Global Summer School 2022 - Quantum Excellence **2022**

I participated and excelled at Qiskit Global Summer School 2022 which was dedicated to quantum simulations. The main task was to find new ways to simulate hamiltonian for a particular physical system. I successfully solved it and earned a badge on Credly.

Quantum Computing and Quantum Information via NMR **2022**

I participated and excelled at the 6th Advanced School of Experimental Physics of CBPF (Brazilian Center for Physics Research) and earned a certificate. I had experience operating a real NMR device and running experiments with encoding and entangling two qubits.

Languages

Russian (Native), English (Upper-Intermediate), Portuguese (Speaking)

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