Anton Karazeev
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EDUCATION

Master of Science — **Moscow Institute of Physics and Technology** — **September 2019 — July 2021 (expected)**

- M.Sc. in Computer Science and Physics, Department of Innovation and High Technologies
- Applied Mathematics and Physics

Bachelor of Science — **Moscow Institute of Physics and Technology** — **September 2014 — July 2019**

- B.Sc. in Computer Science and Physics, Department of Innovation and High Technologies
- Coursework for the state qualification exam in Physics at MIPT: "Molecular Dynamics" [Code]
- Intermediate Coursework: "Advanced Parser for Biomedical Texts" [Poster at MCCMB'17]
- Undergraduate Coursework: "Development of a mechanism for anomaly detection" [Presentation] [Code]

EXPERIENCE

Quantum Software Engineer Intern — **QuTech** — **September 2019 — Present**, Delft, Netherlands

- Delft University of Technology.
- Professor Stephanie Wehner Group, development of Quantum Internet.
- Participated in development of an embedded firmware for Hercules LaunchPad microcontroller platform to control quantum physical setup via connected ADwin-Pro (to implement Physical Layer as described in "A Link Layer Protocol for Quantum Networks").
- Participated in organization of Quantum Internet Hackathon which was held in six nodes across Europe: Delft, Dublin, Geneva, Padua, Paris or Sarajevo. Repository.
- Developed a Reinforcement Learning based system to control setup of lasers during the experiments with NV-center in diamonds.

Machine Learning Researcher — **Laboratory for Digital Business** — **March 2019 — Present**, Moscow, Russia (remotely)

- Responsible for research on Anomalies and Outliers Detection.
- Found and fixed a bug concerning model based on Generative Adversarial Active Learning (GAAL) in PyOD toolkit for outlier detection.
- Developed a system for anomaly detection. Used Flask and SQLAlchemy frameworks.

ML Engineer Intern — **3-shake** — **August — September 2019**, Tokyo, Japan (remotely)

- R&D audience extension.
- Analysis of Japanese text data with Natural Language Processing.

Machine Learning Researcher — **OCRV** — **July — August 2019**, Sochi, Russia

- Laboratory of Artificial Intelligence and Neural Networks.
- Employee Turnover Prediction. EDA and implementation of ML systems in different fields of interest of Russian Railways.
- Responsible for Natural Language Processing, processing of legal documents.

Machine Learning Researcher — **ChatFirst** — **September 2018 — April 2019**, Moscow, Russia

- Implementing different deep learning models to improve performance of chatbots, reading papers on related topics.
- Responsible for Natural Language Processing.
- Used BERT model to improve performance of production system in multiple aspects. Fine-tuned the model for downstream tasks.

Quantum ML Researcher **Russian Quantum Center** **January 2018 — March 2019**
Moscow, Russia

- Responsible for Quantum Computing, Machine Learning.
- Developed a series of seminars concerning Quantum Computing. They include jupyter notebooks with basics of linear algebra, quantum mechanics and also work with QISKit (IBM), pyQuil (Rigetti) and Q# (Microsoft) was demonstrated.
- Supervised research student's bachelor degree diploma “Precision-Guaranteed Single-Qubit Process Tomography”.
- Became a member of IBM Qiskit on GitHub.
- “Revealing quantum chaos with machine learning” — arXiv preprint.

Teaching Assistant **Laboratory of Neural Networks and Deep Learning** **March — December 2017**
Moscow, Russia

- Responsible for preparing practical and theoretical assignments for the course of Reinforcement Learning and theoretical assignments for the course of Natural Language Processing with the number of 100+ enrolled students each.

Research Assistant **Laboratory of Functional analysis of the Genome** **June 2016 — December 2017**
Moscow, Russia

- Research on protein function analysis.
- Text mining, Natural language processing, Keyword extraction, Machine learning algorithms. As an intermediate result the new method of keywords extraction using Information Theory proposed (ResearchGate).
- Participated in development of NLP package SciLK which was designed specifically for text-mining in natural sciences like biology and chemistry.

Data Scientist Intern **Sberbank-Technology** **August — October 2017**
Moscow, Russia

- Responsible for Natural Language Processing projects.
- Participated in preparing the datasets and building baselines for competition Sberbank Data Science Journey which is based on SQuAD.
- Developed an analogue of Amazon Mechanical Turk to improve experience of colleagues who evaluated the quality of collected datasets (Python, Flask).

ML Engineer Intern **HiQE Group** **March — June 2017**
Saint-Petersburg, Russia (remotely)

- Negotiated with IBM engineers and applied some of the IBM Watson’s services in tasks of signal processing.
- Audio signal processing using machine learning methods. The system of baby cry recognition was built.

TECHNICAL EXPERIENCE

Projects

- **Service for Reading** (2019). Service has a web interface and an application for Android. It helps to read texts in foreign languages and easily add unknown words to the wordlist to further studying.
- **Quantum Computing Bot** (2018). Monitoring the load of IBM Q processors from IBM Quantum Experience. Bot is already available inside QISKit workspace in Slack (soon it will be uploaded here: https://github.com/Qiskit/qiskit-bot). And it's available on Telegram: https://t.me/QuantumComputingBot.
- **Quantum Keypad** (2018). This keypad allows to easily compose quantum circuits of different kinds. Besides keypad itself, Quantum Keypad consists of a power bank and Raspberry Pi Zero W. As a simulator I used QISKit package for Python. Inspired by Model Q.
- **Reverse Engineering in Dispersion Engineering** (2018). With a student at EPFL we developed a project on Dispersion Engineering. Our model predicts parameters of resonator system's simulation.
- **Frontopolar** (2017). Applied Reinforcement Learning for Stock Trading. State-of-the-art results were reached. Different approaches were tested including Q-learning and Recurrent Reinforcement Learning.

Contributed to Open source

- **PyOD** - PR #108
- **QISKit** - PR #366
- **pyQuil** - PR #371
- **SimulaQron** - PR#90
- **Gensim** - fixed issue #671
- **yandexdataschool/Practical_RL** - PR #12
- **Projects on GitHub**

SKILLS

- **AI:** Machine Learning, Deep Learning, Natural Language Processing, Computer Vision, Reinforcement Learning, System Deployment
- **Programming languages:** Python, C/C++, bash, R, SQL; experienced with JavaScript, HTML and CSS
- **Python libraries:** numpy, scikit-learn, pandas; **for NLP:** NLTK, Gensim; **for Deep Learning:** PyTorch, TensorFlow; **for Quantum Computing:** QISKit, pyQuil, Q#; **for Web:** Flask; **for databases:** peewee, SQLAlchemy
- **DevOps:** containers (Docker), cloud computing (AWS, GCP), code testing, source control (git)
- **Russian:** native, **English:** fluent, **German:** basics (A2)
- Experimented with RaspberryPi and Arduino. Projects
- Founded "MIPT Deep Learning Club" to discuss and share ideas on deep learning topics. Led a few seminars on topics such as "Introduction to bayesian methods"
- Experienced with **3D modeling** (FreeCAD, Blender) and **3D printing** (Ultimaker Cura, Ender 3)

TEACHING

Programming Existing Quantum Computers — **May 8, 2018**
Cryptography course at Yandex School of Data Analysis

Deep Reinforcement Learning — **October — December 2017**
course at MIPT, based on rll.berkeley.edu/deeprlcourse/
Practical assignments

Deep Learning in Natural Language Processing — **March — December 2017**
course at MIPT, based on cs224n.stanford.edu
Practical assignments

PUBLICATIONS

"Revealing Quantum Chaos with Machine Learning" — **February 2019**
arXiv preprint

"Neural Network Quantum State Tomography" — **July 30 — August 3, 2018**
Superconducting Quantum Technologies (SQT)
Poster (based on https://github.com/RQC-QApp/NNQST)

"Precision-guaranteed quantum process tomography: Application to IBM Quantum Experience" **May 21 — 25, 2018**
Central European Workshop on Quantum Optics (CEWQO)
Poster

"Generative Adversarial Networks (GANs): Engine and Applications" **August 2017**
Medium Story

"Advanced Parser for Biomedical Texts" **July 27 — 30, 2017**
Moscow Conference on Computational Molecular Biology (MCCMB)
Poster, Thesis

ADDITIONAL EDUCATION

"Quantum Computing" course at Skoltech **Quantum Computing** **February 1 — March 16, 2018**

- Final Project - Quantum walks and Variational algorithm for 3- and 4-level systems.

"Summer school on Bayesian Methods in Deep Learning" **DeepBayes Summer School** **August 26 — 30, 2017**

"Big Data in Bioinformatics" **Bioinformatics Summer School** **July 31 — August 5, 2017**

- Participated in a hackathon during the school. Project.

"Natural Language Processing" course (based on cs224d.stanford.edu) **DeepHack Lab** **September — December 2016**

- Accepted a proposal to become a Teaching Assistant after the end of the course.

"Supercomputer technologies for atomistic modelling" course **Igor Morozov (IHED RAS)** **September — December 2015**

- Final Project - Molecular Dynamics is a program written in C using OpenMP framework for parallel computing. Used VMD for visualisation.

MOOCs
- **Sequence Models** by deeplearning.ai (2019)
- **Convolutional Neural Networks** by deeplearning.ai (2019)
- **Improving Neural Networks: Hyperparameter tuning, Regularization and Optimization** by deeplearning.ai (2019)
- **Full Stack Deep Learning** (2019)
- **Neural Networks and Deep Learning** by deeplearning.ai (2019)
- **Mathematics and Python for Data Analysis** by MIPT & Yandex (2017)
- **Molecular Biology and Genetics** by Bioinformatics Institute (2016)
- **Neural Networks** by Bioinformatics Institute (2016)

HACKATHONS

EPFL, Lausanne **LauzHack** **November 16 — 17, 2019**

- Challenge by SOPHiA Genetics, "Pathogen Identification Service"
- Project, Devpost
- Python, Biopython, BLAST, Voilà

CERN, Geneva **Quantum Futures Hackathon** **October 19 — 21, 2019**

- "QML-QEC", Presentation
- Developed an alternative approach for quantum error mitigation of noisy quantum hardware, inspired by variational algorithms such as QVECTOR
- Python, Qiskit, Project

Kraftwerk Accelerator, Bremen **Hackathon Bremen** **September 20 — 22, 2019**

- Won in nomination Best Implementation
- Technologies used: Arduino UNO, Fusion 360 (for 3D modeling) and Node.js (for representing values received from device)

Kasárne/Kulturpark, Košice **Hack Kosice** **March 30 — 31, 2019**

- Efficient and Faster Care challenge
- Implemented healthcare system using Zebra wristband printer and QR code scanner to identify patients easily
- Reduced the amount of time needed to register a new patient
- Presentation

Aalto University, Helsinki **Junction** **November 23 — 25, 2018**

- Applications with Bluetooth Mesh challenge
- Worked with Zephyr RTOS and reel board that has built-in Bluetooth transceiver
- Developed simple Industrial Internet of Things (IIoT) project which demonstrates the advantage of Bluetooth Mesh network

Tochka Kipeniya, Moscow **Space Apps Challenge** **October 20 — 21, 2018**

- Firefighter Bot for Telegram
- Implemented during Space Apps 2018 Challenge using data from NASA including Active Fire Data by NASA
- Python, python-telegram-bot
- Presentation

Volkshotel, Amsterdam **Quantum Internet Hackathon** **October 13 — 14, 2018**

- Worked with framework for Quantum Internet called SimulaQron
- Contributed to the SimulaQron project on GitHub
- Implemented quantum leader-election algorithm

Skoltech, Moscow **Quantum Hackathon** **May 18, 2018**

- 1st place
- There were problems on (1) quantum process tomography and (2) solving 3-SAT problem with QAOA
- Python, Quantum Information Toolkit (QIT)

Aalto University, Helsinki **Junction** **November 24 — 26, 2017**

- LegalEngine - website/telegram chat-bot/email notification system, "qqmbr" team member, challenge by Castrén & Snellman
- Our solution makes the client-attorney interaction easier with the use of telegram chat-bot and email notifications, the attorney's work and billing more transparent to the client
- Python, Flask library, html, css

EPFL, Lausanne **LauzHack** **November 11 — 12, 2017**

- 1st place in challenge by SGS, "NN:Nerds" team member, Presentation
- Solution allows quick access to the main concepts found in documents
- Responsible for development of telegram-bot and processing documents using IBM Watson service for Natural Language Understanding. Devpost
- Python, IBM Watson API, Telegram API

Phystechpark, Moscow **mABBYYlity** **October 7 — 8, 2017**

- 4th place, “App in the Restaurant” iOS application, Demo, Presentation
- App allows to recognise entities from restaurant menus using smartphone’s camera and translates them. ABBYY Real-Time Recognition SDK, ABBYY Lingvo API and Spoonacular API were used.
- Python, Flask library

Skolkovo Moscow School of Management, Moscow **Neurocampus** **September 22 — 24, 2017**

- 2nd place, @SenseOfSpeech_bot telegram-bot, Presentation
- Solution allows to extract emotions from user’s recorded speech. Also it helps to train selected emotion with samples from TED talks
- Speech Emotion Recognition (SER) module by Vokaturi was used as a core for telegram-bot based system to help users improve speech during performances.
- Python, Telegram API

MIPT, Moscow **Bioinformatics Summer School** **August 3 — 4, 2017**

- “Prediction of Experimental Metadata from Gene Expression”
- Used Machine learning algorithms to predict phenotype by gene expression. Distinguish with high accuracy samples of male and female tissues of Mus musculus organism. Datasets from Gene Expression Omnibus were used. Project

ITMO, Saint Petersburg **BioHack** **March 3 — 5, 2017**

- Text Mining, parsing the records from PubMed and UMLS
- Analysis of research trends of chemical compounds and diseases during period of 1990-2015 using parsed information from PubMed database. Project
- Python

Wanha Satama, Helsinki **Junction** **November 25 — 27, 2016**

- Used a python wrapper around the Twitter API and Topic Modeling of tweets (gensim)