Anton Karazeev

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EDUCATION

Master of Science <u>Moscow Institute of Physics and Technology</u> September 2019 — July 2021 (expected)

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

<u>Bachelor of Science</u> <u>Moscow Institute of Physics and</u> September 2014 — July 2019 <u>Technology</u>

- 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

- SimulaQron framework for Quantum Internet.
- Supervisor Prof. dr. S. D. C. Wehner.
- Delft University of Technology.

ML Engineer Intern 3-shake August — September 2019

Tokyo, Japan (remotely)

• R&D audience extension.

Machine Learning Researcher <u>Laboratory for Digital Business</u> March 2019 — Present

Moscow, Russia

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

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 <u>Russian Railways</u>.
- 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 <u>a series of seminars</u> 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 <u>Reinforcement Learning</u> and theoretical assignments for the course of <u>Natural Language Processing</u> with the number of 100+ enrolled students each.

Research Assistant

<u>Laboratory of Functional analysis</u> 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 <u>SciLK</u> 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 <u>Sberbank Data Science Journey</u> which is based on <u>SQuAD</u>.
- 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 my friend from EPFL we have 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
- My 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 <u>rll.berkeley.edu/deeprlcourse/</u>
<u>Practical assignments</u>

Deep Learning in Natural Language Processing

March — December 2017

course at MIPT, based on <u>cs224n.stanford.edu</u> <u>Practical assignments</u>

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:

May 21 - 25, 2018

Application to IBM Quantum Experience"

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 Quantum Computing February 1 — March 16, 2018 Skoltech

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

"Summer school on Bayesian <u>DeepBayes Summer School</u> August 26 — 30, 2017

Methods in Deep Learning"

"Big Data in Bioinformatics"

<u>Bioinformatics Summer School</u>

July 31 — August 5, 2017

• Participated in a hackathon during the school. Project.

"Natural Language Processing" <u>DeepHack Lab</u> September — December 2016 course (based on cs224d.stanford.edu)

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

"Supercomputer technologies for Igor Morozov (<u>IHED RAS</u>) September — December 2015 atomistic modelling" course

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

MOOCs

- Improving Neural Networks: Hyperparameter tuning, Regularization and Optimization by deeplearning.ai (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

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

• (expected)

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 <u>Junction</u> 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

- 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

- <u>LegalEngine</u> website/<u>telegram chat-bot</u>/email notification system, "qqmbr" team member, challenge by <u>Castrén & Snellman</u>
- 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 <u>LauzHack</u>

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. <u>Devpost</u>.
- Python, IBM Watson API, Telegram API

Phystechpark, Moscow

mABBYYlity

October 7 — 8, 2017

- 4th place, "App in the Restaurant" iOS application, <u>Demo</u>, <u>Presentation</u>
- 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 <u>Vokaturi</u> 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 <u>Mus musculus</u> organism. Datasets from Gene Expression Omnibus were used. <u>Project.</u>

ITMO, Saint Petersburg

BioHack

March 3 - 5, 2017

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

Wanha Satama, Helsinki

Junction

November 25 - 27, 2016

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