# Motivation Letter

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"Tinkoff-Start" student program from "Tinkoff bank"

Members of the selection committee,

I'm writing to express my interest in "Tinkoff-Start" student program from "Tinkoff bank".

Thanks to swift progress of my Bachelors, Masters and Phd degree. It is glaring that studying and doing research are endeavors I would like to engage in even more. While studying for my BSc in electronics and nanoelectronics in Chuvash State University, I got a lot of practical (three years in a job) and theoretical (analog and digital electronics) experience in electrical engineering field. After my Bachelors, I pursued a Master's degree in Robotics field at Skoltech, where I graduated with an academic excellence this summer. Now I am a first year postgraduate student of computer science at Innopolis University and continue doing robot navigation.

During my Master's research experience at Skolkovo Institute of Science and Technology and Carnegie Mellon University (USA), I was fascinated by the beauty of reasoning about robotic tasks, such as large-scale localization and navigation for mobile robot. Despite the remarkable progress of object, scene, and action recognition in SLAM achieved by deep learning and ML algorithms, enabling artificial intelligent systems to generalize into unseen environments is still quite a challenging problem. Reasoning about the relationships between multiple objects –beyond recognizing them –, is the key to gain a deeper understanding of the data and generalize deep learning methods to unseen cases. As such, this research has advanced various domains, such as image retrieval, image captioning, and object detection. I am most interested in how reasoning can guide robotics tasks such as semantic navigation, which include computer vision knowledge and **I am applying for such amazing "Tinkoff-Start" program from "Tinkoff bank" to extend my research pursuits into this field.**

Through my Master's academic coursework and research projects at Skolkovo Institute of Science and Technology, I have exercised my electronics-hardware, deep and machine learning skills and developed a deep understanding of robotic field. Inside the classroom, I have learned content knowledge in robotics, energy and computer science, which has been valuable assets to my research. For example, in my first year of study, I studied robot kinematics, dynamics, control, design, simulation, motion planning, and AI in Robotics and Experimental data processing classes. Having excelled in the classes, I was propelled to apply this knowledge to my first research projects. I was a part of the 2019 Skoltech Eurobot team «ReSET» by leading electronics people with the guidance of Prof.Dzmitry Tsetserukou. I developed from scratch the control system of the pneumatic manipulator of autonomous mobile robots, printed circuit board (PCB) for connecting STM32 microcontroller and peripherals: maxon motors, dynamixels, proximity sensors and stepper. As a result of this work, my team received the highest results on the robotics course and got the Best Design Award. ReSET Skoltech team won the Russian stage of Eurobot 2019 competition, and **2nd place in the world finals** with over 200 international teams held in June 2019, in Kremlin-Bicêtre, France.

During my summer 2019 internship at Skoltech, I did research with quadruped mobile robot. My main tasks were to make a motion planning analysis with climbing stairs of quadruped-legged mobile robot.

The results of this work were written in "LocoGear: Locomotion Analysis of Robotic Landing Gear for Multicopters" and accepted for publication in an **IEEE Journal on Miniaturization for Air and Space Systems**.

Initiative and excellent academic and research performance allowed me to win an Academic mobility grant competition of Skoltech and passed interview to visit **Robotics Institute at Carnegie Mellon University(USA)** at Prof.Howie Choset (Nobel Prize winner in Robotics (Joseph F. Engelberger Award)) Biorobotics lab for six-month research.

During my research in **SLAM team** in Robotics Institute(Biorobotics laboratory) at Carnegie Mellon University under Prof.Howie Choset's supervision, I proposed a novel lightweight 3D place recognition method in 3D-lidar based SLAM algorithm, SeqSphereVLAD, which is capable of recognizing places from a previous trajectory regardless of the viewpoint and the temporary observation differences. The results of my research work has been accepted for publication in **IEEE/ESJ IROS 2020** conference, where I have to present my research work in Las Vegas (USA) in October 2020 remotely. Also, Howie Choset invited me to do paid summer-internship(2021) research in the best Robotics laboratory in the world. Now I am continue working remotely with SLAM team from CMU on TIE and TR-O journal papers, respectively. This is what makes me interested in doing science now and in the future.

I am most exciting to work in the field of Computer Vision as a part of ML field to self-driving cars and mobile robotics implementation for "Tinkoff-bank", because it appeals to me. I am very excited about this filed as a machine learning part of this educational program. First of all, why I want to take part at this program is because, I am glad to be finally able to get real experience in complex ML system, to get on the edge of the field, to find a new applications for my ideas. I absolutely believe that the knowledge I gained during my studies at the university, as well as via self-education, online courses and my past working experience is enough to carry on with the problems I will face throughout my work at educational ML program from "Tinkoff-bank". I want to implement my knowledge and skills on semantic navigation, robotic perception and scene understanding for mobile robots and self-driving cars for "Tinkoff-bank", as it closely relates to my research interest. My experiences in both machine learning, deep learning and robotics make me a good fit for this program. ML program from "Tinkoff-bank" will be a perfect place for me to pursue my skils and start building robots for "Tinkoff-bank".

Thank you for consideration my application.

Sincerely,
Anton Egorov