Research profile of the potential research supervisor assigned for the post-graduate track under the International Olympiad "Global Universities" Association Open Doors for master and post-graduate applicants

UNIVERSITY	**MOSCOW POLYTECHNIC UNIVERSITY (Moscow Polytech)**
Level of English proficiency	Fluent (C1)
Educational program and field of the educational program for which the applicant will be accepted	2.9.5 Exploitation of transportation vehicles (Vehicle Operation Engineering) 2.5.11 Land transport and technological means and complexes (Land Vehicles)
List of research projects of the potential supervisor (participation/leadership)	1. Research and development work "Automated operation system for GAZ-322132", MADI, 2012. 2. Research and development work "Open automobile platform for research and testing of autonomous vehicles technologies", MADI, Ministry of Science and Education of the Russian Federation, 2015-2017. 3. Research and development work "Development of autonomous driving system for Chevrolet Cruz", MADI, OOO "Energo", 2017. 4. Research and development work "Development of autonomous driving system for GAZ Eva for the participation in "Zimniy Gorod" ("Winter City) technological competition, OOO "BaseTrack", 2018-2019. 5. Research and development work "Development of autonomous driving system for Mercedes Actros 1845, OOO "BaseTrack", 2020-2022. 6. Research and development work "Development of floor-mounted clamp-truck autonomous driving system for tires factory", "ITMO" advanced engineering school, PAO "Nizhnekamskmashina", 2023-2024. 7. Research and development work "Developing a mathematical model of chassis operation (transmission, running gear, controlling mechanisms) in static and dynamic condition based on the digital twin of the passenger car platform", Moscow Polytechnic University, Ministry of Science and Higher Education of the Russian Federation, 2023-2025.
List of the topics offered for the prospective research	1. Development of methods and algorithms for noisy sound signal filtering. 2. Development of requirements, virtual and field test methods for sensor equipment and software for the autonomous vehicles in connection to the intellectual transportation environment. 3. Development of methods and algorithms for acoustic data fusion in connection to the intellectual transportation system. 4. Development of an improved sensor setup for autonomous vehicle perception systems. 5. Development of vehicle predictive diagnostics and technical condition monitoring based on audio data. 6. Application of acoustic signal processing algorithms to smart city systems (V2X).

Research supervisor:
Shadrin Sergey Sergeevitch,
Doctor of Technical Sciences,
Bauman Moscow State Technical University.

2.02. AC - Automation & Control Systems
2.02. ES - Computer science, hardware & architecture (Informatics – architecture)
2.02. RB – Robotics
2.02. IQ - Engineering, electrical engineering & electronics
1.02. EP - Computer science, artificial intelligence
1.02. EV - Computer science, interdisciplinary applications
1.02. EW - Computer science, software engineering
1.03. AA – Acoustics

Supervisor's research interests

The main area of research interests of the team leader S.S. Shadrin are automated control systems, highly automated and unmanned vehicles, in particular, the development and optimisation of the workflow of their key systems and units, and methods for increasing their reliability and safety.

S.S. Shadrin worked on the development of a software and hardware complex for autonomous transportation vehicle control based on the previously developed track movement (project head, Innovation Promotion Foundation, project № 44707).

S.S. Shadrin developed a software and hardware complex for monitoring actions and informing a truck driver about optimal vehicle control schemes in real time based on high-precision data from the geoinformation environment, vehicle characteristics and traffic environment (project head, Innovation Promotion Foundation, project № 63409).

S.S. Shadrin led the development of the unmanned electric minibus Gazelle Next EVA, commissioned by the national auto industry (GAZ Group), and was the leader of the BaseTracK team, a finalist in the "Zimniy Gorod" (Winter City) technology competition in the framework of the national technology initiative (RVC, Skolkovo, Autonet).

In 2022 S.S. Shadrin developed and certified at NAMI the first Russian unmanned truck (ATC category N3 - a truck tractor with a semi-trailer) according to Government Decree No. 1415 and carried out trial operation on public roads, performing unmanned cargo transportation on federal highways.

S.S. Shadrin has carried out research work and has experience in managing it. He has more than 30 publications in scientific journals, including those indexed by Scopus, corresponding to the focus of the Olympiad and proposed for project implementation. S.S. Shadrin is the author of more than 70 scientific articles (VAK / Supreme Attestation Commission of the Russian Federation, RSCI, Scopus, WoS), the author of 17 intellectual property objects (Rospatent / Russian Federal Service for Intellectual Property) - for example, relevant to the proposed project:

- Program for automated processing and analysis of automotive radar data.
- Implementation of a data exchange protocol between the software and hardware complex for autonomous vehicle control (PAK AUTS) and the user interface.
- Program of the driver assistant computer unit for monitoring actions and informing about optimal vehicle control schemes.
- Program for controlling an experimental autonomous wheeled vehicle.

Research highlights
Use of unique equipment, interaction with researchers and research centers around the world, financial support of graduates, etc.

Advisor's specific requirements
Preferably: Python, C++, ML, Matlab, driver's license.

Main publications

Publications (Web of Science, Scopus, RSCI) in the last five years.

1. S. S. Shadrin, A. M. Ivanov, D. A. Makarova and Y. M. Furletov, "Autonomous Vehicles Safety Provision Before and During Operation on Public Roads," 2023 Systems of Signals Generating and Processing in the Field of on Board Communications, Moscow, Russian Federation, 2023, pp. 1-6.
2. S.S. Shadrin, D.A. Makarova. The Concept of Highly Automated Vehicles Safety Monitoring in Operation Using Virtual Testing Procedures // 2022 Systems of Signals Generating and Processing in the Field of on Board Communications, SOSG 2022 – Conference Proceedings, 2022.
3. Zavatsky, A.M.; Keller, A.V.; Shadrin, S.S.; Makarova, D.A.; Furletov, Y.M. Development of an Electric All-Wheel-Drive Simulation Model Used to Test Torque Distribution Algorithms. Energies 2023, 16, 7144. https://doi.org/10.3390/en16207144 (Q1)
4. Klimov, A.V.; Ospanbekov, B.K.; Keller, A.V.; Shadrin, S.S.; Makarova, D.A.; Furletov, Y.M. Research into the Peculiarities of the Individual Traction Drive Nonlinear System Oscillatory Processes. World Electr. Veh. J. 2023, 14, 316. https://doi.org/10.3390/wevj14110316
5. Y. M. Furletov, A. M. Ivanov, S. S. Shadrin and M. A. Toporkov, "Sound Source Direction of Arrival Estimation for Autonomous Driving Applications," 2022 Intelligent Technologies and Electronic Devices in Vehicle and Road Transport Complex (TIRVED), Moscow, Russian Federation, 2022, pp. 1-5, doi: 10.1109/TIRVED56496.2022.9965523.

Results of intellectual activity

1. № 2015614464 Simulation program for the motion dynamics of a two-link road-train (tracktor with a semi-trailer) [Text] / Ivanov Andrei Mikhailovich, Solntsev Alexander Nikolaevich, Shadrin Sergey Sergeevich official registration of the program for computing machines submitted on 04.03.2015 ; published 20.04.2015.
2. № 2018663397 Program for automated processing and analysis of the results of dynamic tests of vehicles [Text] / Shadrin Sergey Sergeevich, Ivanov Andrei Mikhailovich. State registration certificate for a computer program submitted on 02.10.2018 ; published on 26.10.2018.
3. № 2019663583 A program for simulating the motion dynamics of an autonomous wheeled vehicle. [Text] / Shadrin Sergey Sergeevich, Ivanov Andrei Mikhailovich. State registration certificate for the ECM pro submitted on 08.10.2019 ; published on 18.10.2019.
4. № 2021680546 Program for automated processing of vehicle telemetry data \\ Shadrin S.S, Ivanov A.M.. State registration certificate State certificate of registration for the ECM submitted on 13.12.2021; published on 13.12.2021.