

SHADRIN SERGEY SERGEEVITCH

Research profile (portfolio) of potential research supervisor of post-graduate track participants in the Open Doors: Russian Scholarship Project

UNIVERSITY	MOSCOW POLYTECHNIC UNIVERSITY (Moscow Polytech)
Level of English proficiency	Advanced
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	• R&D project “Open automobile platform for research and testing of autonomous vehicles technologies”, MADI, Ministry of Science and Education of the Russian Federation, 2015-2017. • Research and development work “Development of autonomous driving system for Chevrolet Cruz”, MADI, OOO “Energo”, 2017. • R&D project “Development of autonomous driving system for GAZ Eva for the participation in “Zimniy Gorod” (“Winter City”) technological competition, OOO “BaseTrack”, 2018-2019. • R&D project “Development of autonomous driving system for Mercedes Actros 1845, OOO “BaseTrack”, 2020-2022. • R&D work “Development of floor-mounted clamp-truck autonomous driving system for tires factory”, “ITMO” advanced engineering school, PAO “Nizhnekamskmashina”, 2023-2024. • R&D project "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. • R&D project "Development of a scientific and methodological framework for synthesizing optimal solutions for the energy-efficient operation of semi-trailer trucks on federal roads of the Russian Federation, taking into account remote monitoring and forecasting of performance characteristics in relation to the road network," MADI, Ministry of Education and Science of the Russian Federation, 2024-2025. • R&D project "Development of a methodological framework for the development of advanced power steering systems for trajectory control of highly automated vehicles and transport and technological systems," Moscow Polytechnic University and PJSC KAMAZ, Russian Science Foundation (RSF), 2026-2027.
List of the topics offered for the prospective scientific research	• Development of methods for improving the energy efficiency of motor vehicles (design, software, inter-object interaction, integration into ecosystems). • Development of driver assistance systems and assistants based on generative artificial intelligence systems. • Development of integrated control systems for autonomous ground vehicles across various economic sectors (agricultural and municipal equipment, freight transportation, passenger transportation, warehouse equipment). • Development of requirements, virtual and field test methods for sensor equipment and software for the autonomous vehicles in connection to the intellectual transportation environment.

- Development of methods and algorithms for acoustic data fusion in connection to the intellectual transportation system.
- Development of an improved sensor setup for autonomous vehicle perception systems.
- Development of vehicle predictive diagnostics and technical condition monitoring based on telemetry data and digital terrain maps.
- Development of integrated solutions for the precise location of vehicles in complex urban environments (including those affected by spoofing and jamming of satellite navigation).



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

Field of research

2.02.03 **Robotics**

5.07.03 **Transportation**

2.02.01 **Automation & control systems**

2.02.05 **Engineering, electrical & electronic**

1.02.02 **Computer science, artificial intelligence**

1.02.01 **Computer science, information systems**

1.02.04 **Computer science, interdisciplinary applications**

1.02.05 **Computer science, software engineering**

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 100 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 100 scientific articles (VAK / Supreme Attestation Commission of the Russian Federation, RSCI, Scopus, WoS), the author of 28 intellectual property objects (Rospatent / Russian Federal Service for Intellectual Property) - for example, relevant to the proposed project:

- Speed hump/bump recognition software for ADAS integration.
- 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

The educational process is supported by a wide range of laboratory rigs for modern automotive systems, experimental vehicles of various types, sensor systems, modern computers and software for designing and simulating vehicle dynamics, and test sites. Most of the work is carried out in cooperation with automakers (KAMAZ, NAMI), as well as with financial support from the Ministry of Education and Science, the Russian Science Foundation, and the Ministry of Industry and Trade. International contracts are also in place.

Advisor's specific requirements

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

Main publications

The total number of publications in journals indexed by Web of Science, Scopus, and RSCI over the past five years is 53, including 18 Russian-language publications (RSCI) and 35 English-language publications indexed by Scopus and/or WoS.

Most significant publications over the past five years:

1. Petin, V.V.; Keller, A.V.; Shadrin, S.S.; Makarova, D.A.; Furletov, Y.M. Development of a Methodology Used to Predict the Wheel–Surface Friction Coefficient in Challenging Climatic Conditions. *Future Transp.* 2025, 5, 129.
<https://doi.org/10.3390/futuretransp5040129>
Q2 (Engineering)
2. “Equalizing Leaf Spring Vehicle Suspension Synthesis Technologies Based on Modern Mathematical Simulation Modeling”, / Roman O. Maksimov, Mikhail M. Zhileykin, Andrey V. Keller, Sergey S. Shadrin, Daria A. Makarova, Yuri M. Furletov // *Rep Mech Eng* , vol. 6, no. 1, pp. 91–101, Jun. 2025, doi: 10.31181/rme454
Q1 (Mechanical Engineering)
3. Klimov, A.V.; Antonyan, A.V.; Keller, A.V.; Shadrin, S.S.; Makarova, D.A.; Furletov, Y.M. Anti-Slip Control System with Self-Oscillation Suppression Function for the Electromechanical Drive of Wheeled Vehicles. *World Electr. Veh. J.* 2025, 16, 84.
<https://doi.org/10.3390/wevj16020084>
Q2 (Automotive Engineering)
4. Antonyan, A.; Klimov, A.; Buchkin, A.; Keller, A.; Shadrin, S.; Makarova, D.; Furletov, Y. Developing an Algorithm Limiting the Longitudinal Acceleration of an Electric Vehicle. *Vehicles* 2025, 7, 7.
<https://doi.org/10.3390/vehicles7010007>
Q2 (Automotive Engineering)
5. Zavatsky, A. M., Keller, A. V., Shadrin, S. S., Makarova, D. A., & Furletov, Y. M. (2024). Automatic determination of directional stability parameters of an electric vehicle with a two-motor scheme as part of the torque distribution controller. *Vehicle System Dynamics*, 1–21.
<https://doi.org/10.1080/00423114.2024.2415076>
Q1 (Automotive Engineering)
6. Klimov, A.V.; Ospanbekov, B.K.; Antonyan, A.V.; Anisimov, V.R.; Dvoeglazov, E.A.; Novgorodov, D.A.; Keller, A.V.; Shadrin, S.S.;

- Makarova, D.A.; Ershov, V.S.; et al. Detecting Wheel Slip to Suppress Self-Excited Oscillations in Braking Mode. *World Electr. Veh. J.* 2024, 15, 340.
<https://doi.org/10.3390/wevj15080340>
 Q2 (Automotive Engineering)
7. 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>
 Q2 (Automotive Engineering)
8. 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 (Engineering)
9. Advanced Engineering Schools: Transfer of Competencies and Innovations in the Interests of Regional and Sectoral Development / A.V. Keller, G.N. Suvorov, S.S. Shadrin, I.A. Korshunov, N.N. Shirkova // *Vysshee Obrazovanie v Rossii = Higher Education in Russia*. 2025. vol.34. no.2. pp. 9-30. DOI: 10.31992/0869-3617-2025-34-02-9-30 (In Russ., abstract in Eng.). Q1 (Philosophy), Q2 (Sociology and Political Science), Q3 (Education)
10. 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, doi: 10.1109/IEEECONF56737.2023.10092162.

Results of intellectual activity

Over the past 5 years, 8 Results of intellectual activity have been registered (Rospatent)

The most significant over the past 5 years are as follows:

1. Shadrin S.S., Nevzorov D.V., Alekseev V.A. Program for the integration unit of a driver assistant for monitoring actions and informing about optimal vehicle control schemes: Certificate of State Registration for a computer program No. 2021661312, Russian Federation; filed June 28, 2021; published July 8, 2021.
2. Shadrin S.S. Program for setting up monitoring zones for automotive radars and collision avoidance: Certificate of State Registration for a computer program No. 2021680547, Russian Federation; filed December 13, 2021; published December 13, 2021.
3. Shadrin S.S., Makarova D.A., Keller A.V., Furletov Yu.M. Program for sound analysis of the road scene around a car: Certificate of state registration for a computer program No. 2024611702, Russian Federation; declared 29.12.2023; published 24.01.2024.
4. Shadrin S.S., Kudrin A.B. Program for energy-efficient speed control of an unmanned vehicle in an urban environment: Certificate of state registration for a computer program No. 2024691944, Russian Federation; declared 11.12.2024; published 25.12.2024.
5. Shadrin S.S., Furletov Yu.M., Keller A.V., Makarova D.A. Program for generating scenarios and conducting virtual tests of highly automated and unmanned vehicles: Certificate of state registration for the database No. 2025610693, Russian Federation; declared 11.12.2024; published 13.01.2025.