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Igor Lashkov

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SUMMARY: Research scientist with experience in machine learning, deep neural networks, intelligent transportation, and software engineering in Java, Kotlin, Python, PyTorch, TensorFlow, and Android.

EDUCATION

2014–2018 **St. Petersburg Federal Research Center of the Russian Academy of Sciences (SPC RAS), ITMO University,** St. Petersburg, Russia.
GPA: 4.45/5.0 Ph.D. in Computer Science, 2019.
Thesis title: "Development of models and algorithms for distributed system of prevention of traffic accidents based on monitoring driving behavior".

2008–2014 **ITMO University**, St. Petersburg, Russia
GPA: 4.87/5.0 *Department of Informational Technologies and Programming*
B.S. & M.S. in Computer Science (Summa Cum Laude)

WORK EXPERIENCE

University of Hawaii at Manoa, Honolulu, HI, USA **10/2021–Present**
Civil and Environmental Engineering, Research Assistant

- Develop theoretical models for connected vehicle system operations and validate these models using the real-time sensor data in the State of Hawaii.
- Publish and review research papers (Transportation Research Part C, Applied Sciences, TRB Meeting).

St. Petersburg Federal Research Center of the RAS, Russia **06/2016–10/2021**
Laboratory of Computer-Aided Integrated Systems, Research Assistant

- *Research interests:* computer vision, deep neural networks, intelligent transportation systems.
- Published (Scopus) and reviewed research papers, wrote grant proposals, planned and conducted experiments, presented scientific results to colleagues, and at Russian and international conferences.
- Reviewed manuscripts in Transportation Research Part C Journal, Intelligent Transportation Systems.
- Taught "Knowledge management" class for Master's students, ITMO University, 2018-2020.
- Developed a mobile Drive Safely assistant application for Android (*10,000+ installs*) providing actionable information to a driver on how to prevent a road accident. The assistant monitors driver behavior, recognizing drowsiness and distraction, in real-time in vehicle cabin using smartphone camera and sensors, driver profile, and user preferences. The application provides audible alerts and context-based recommendations for a driver to avoid possible traffic accident. Neural networks are employed to extract the driver's facial features (eye openness, head pose, mouth openness). Application is written in Java, Kotlin, C++ with OpenCV, TensorFlow.
- Assembled cross-platform module of driver assistant for dangerous state determination (Java, Kotlin, C++) packed in JAR file and adapted it for use in Android and embedded system-on-module Nvidia Jetson Nano.
- Developed cloud platform and API for processing driving statistics (driver profile, contextual information) using PHP, SQL, OAuth, REST, Postgres, Json, gzip. Improved compression of uploading driving statistics by 60%.

Yandex LLC, St. Petersburg, Russia **2013–2017**
Department of machine translation, Software Engineer

Developed mobile translator clients for Android (*10,000,000+ installs*) and Windows Phone for Translator Service at Yandex (it is the most popular search engine in Russia – "the Russian Google"):

- Implemented simultaneous full-text translation with dictionary information, predictive typing to replace the existing native suggestions, Android Wear support with speech-to-text function.
- Integrated on-device offline translation with downloadable language packages with JNI interfaces in Java.
- Allowed users to translate entire websites in the application utilizing the WebView component.
- Integrated clipboard translation via system contextual menu, text-to-speech for speaking translation, translation text from images, and native- and cloud-based voice recognition.
- Increased code coverage by 40% utilizing JUnit/Robolectric frameworks to test and SonarQube to inspect code quality.
- Gained experience working in a distributed team.

Arkhangelsk Regional Institute of Open Education, Russia **2010–2011**
IT department, Software Engineer

- Designed and developed training program for tutors from scratch using 1C-Bitrix CMS.

Northern (Arctic) Federal University, Arkhangelsk, Russia **2008–2009**
IT department, .NET Developer

- Developed and optimized SQL queries to manage activity of academic staff using MSSQL and C#.

JOURNAL PUBLICATIONS

1. **I. Lashkov**, R. Yuan, G. Zhang Edge-Computing-Facilitated Nighttime Vehicle Detection Investigations with CLAHE-Enhanced Images // IEEE Transactions on Intelligent Transportation Systems, 2023 (Q1).
2. **I. Lashkov, I.**, R. Yuan, G. Zhang, Edge-Computing-Empowered Vehicle Tracking and Speed Estimation Against Strong Image Vibrations Using Surveillance Monocular Camera. IEEE Transactions on Intelligent Transportation Systems, 2023 (Q1).
3. **I. Lashkov,** Detection of yawning in driver behavior based a convolutional neural network, Journal Scientific and Technical Of Information Technologies, Mechanics and Optics, 2022.
4. A. Kashevnik, **I. Lashkov**, A. Axyonov, D. Ivanko, D. Ryumin, A. Kolchin, A. Karpov Multimodal Corpus Design for Audio-Visual Speech Recognition in Vehicle Cabin // IEEE Access, 2021 (Q1).
5. A. Kashevnik, **I. Lashkov**, A. Ponomarev, N. Teslya, A. Gurtov, Cloud-Based Driver Monitoring System Using a Smartphone Mounted on a Vehicle Windshield // *IEEE Sensors Journal*, vol. 20(12), pp. 6700-6715, 2020, Q1.
6. A. Kashevnik, M. Kruglov, **I. Lashkov**, N. Teslya, P. Mikhailova, E. Ripachev, V. Malutin, N. Saveliev, I. Ryabchikov, Human Psychophysiological Activity Estimation Based on Smartphone Camera and Wearable Electronics, Future Internet, 2020.
7. A. Kashevnik, **I. Lashkov**, A. Gurtov. Methodology and Mobile Application for Driver Behavior Analysis and Accident Prevention // *IEEE Transactions on Intelligent Transportation Systems*, 2019, pp. 1-10 (Q1).
8. **I. Lashkov**, A. Kashevnik, A. Ronzhin. Ontology-based Personalisation for Online Driver Monitoring by Smartphone, Comptes rendus de l'Acade'mie bulgare des Sciences, vol. 72, no. 5, 2019, pp. 650-657.
9. **I. Lashkov**, A. Kashevnik, Determination of driver dangerous states using smartphone camera-based measurements while driving, Informatsionnye Tekhnologii i Vychslitel'nye Sistemy, 2019.
10. **I. Lashkov**, Smartphone-based approach to determining driving style with on-board sensors, Information and Control Systems, 2018.
11. **I. Lashkov**, Driver's Behavior Analysis with Smartphone Front Camera, Information and Control Systems, 2017.
12. **I. Lashkov,** A. Smirnov, Smartphone-based approach to advanced driver assistance system (ADAS) research and development, Journal Scientific and Technical Of Information Technologies, Mechanics and Optics, 2015.

CONFERENCE PUBLICATIONS

1. D. Ivanko, A. Kashevnik, D. Ryumin, A. Kitenko, A. Axyonov, **I. Lashkov**, A. Karpov, MIDriveSafely: Multimodal Interaction for Drive Safely, Proceedings of the 2022 International Conference on Multimodal Interaction, 2022.
2. D. Ivanko, D. Ryumin, A. Kashevnik, A. Axyonov, A. Kitenko, **I. Lashkov**, A. Karpov, DAVIS: Driver's Audio-Visual Speech Recognition, ISCA Annual Conference Interspeech, 2022.
3. **I. Lashkov**, A. Kashevnik, A Multimodal Approach to Psycho-Emotional State Detection of a Vehicle Driver, Intelligent Systems and Applications (IntelliSys) 2021 in Lecture Notes in Networks and Systems, 2021.
4. **I. Lashkov**, A. Kashevnik, Aggressive behavior detection based on driver heart rate and hand movement data, IEEE International Intelligent Transportation Systems Conference (ITSC), 2021.
5. **I. Lashkov**, A. Kashevnik, Human–Computer Interaction Interface for Driver Suspicious Action Analysis in Vehicle Cabin, Advances in Data Science and Information Engineering: Proceedings from ICDATA 2020 and IKE 2020, 2021.
6. A. Kashevnik, A. Ali, **I. Lashkov**, D. Zubok. Human Head Angle Detection Based on Image Analysis. In: Proceedings of the Future Technologies Conference, vol. 1, pp. 233-242, 2020.
7. **I. Lashkov**, A. Kashevnik, N. Shilov, Dangerous State Detection in Vehicle Cabin Based on Audiovisual Analysis with Smartphone Sensors. In: *Intelligent Systems and Applications.* vol. 1250, pp. 789-799, 2020.
8. A. Kashevnik, A. Ali, **I. Lashkov**, N. Shilov, Seat Belt Fastness Detection Based on Image Analysis from Vehicle In-Cabin Camera, 26th Conference of Open Innovations Association, Russia, 2020, pp. 143-150.
9. A. Kashevnik, N. Teslya, A. Ponomarev, **I. Lashkov**, A. Mayatin, V. Parfenov, Driver Monitoring Cloud Organisation Based on Smartphone Camera and Sensor Data, 17th International Conference on Information Technology–New Generations (ITNG 2020), 2020.
10. **I. Lashkov**, A. Kashevnik. Smartphone-Based Intelligent Driver Assistant: Context Model and Dangerous State Recognition Scheme. In: *IntelliSys 2019: Intelligent Systems and Applications*, vol. 1038, 2020, pp. 152-165.
11. **I. Lashkov**, A. Kashevnik, N. Shilov, V. Parfenov, A. Shabaev, Driver Dangerous State Detection Based on OpenCV & Dlib Libraries Using Mobile Video Processing, In: *2019 IEEE International Conference on Computational Science and Engineering (CSE)*, New York, NY, USA, 2019, pp. 74-79.

12. A. Kashevnik, I**. Lashkov**, Intelligent Driver Decision Support System in Vehicle Cabin: Reference Model for Dangerous Events Recognition and Learning, In: *2019 IEEE 15th International Conference on Control and Automation (ICCA)*, Edinburgh, United Kingdom, 2019, pp. 27-31.
13. A. Kashevnik, **I. Lashkov,** N. Teslya, Driver Intelligent Support System in Internet of Transportation Things: Smartphone-Based Approach. In: *IEEE Conference System of Systems Engineering*, USA, 2019, pp. 170-175.
14. A. Kashevnik, **I. Lashkov**, D. Ryumin, A. Karpov, Smartphone-Based Driver Support in Vehicle Cabin: Human-Computer Interaction Interface. In: Ronzhin A., Rigoll G., Meshcheryakov R. (eds) Interactive Collaborative Robotics. ICR 2019. Lecture Notes in Computer Science, vol. 11659, Springer, 2019, pp. 129-138.
15. A. Kashevnik, **I. Lashkov**. 2018. Decision Support System for Drivers and Passengers: Smartphone-Based Reference Model and Evaluation. In: *Proceedings of the 23rd Conference of Open Innovations Association FRUCT (FRUCT'23)*, Helsinki, Uusimaa, FIN, no. 22, pp. 166–171.
16. A. Kashevnik, A. Fedotov, **I. Lashkov.** Dangerous Situation Prediction and Driving Statistics Accumulation Using Smartphone, In: *International Conference on Intelligent Systems*, Portugal, 2018, pp. 521-527.
17. A. Fedotov, **I. Lashkov**, A. Kashevnik. Web-Service for Drive Safely System User Analysis: Architecture and Implementation. In: *Proceedings of the FRUCT'22*, Helsinki, Uusimaa, FIN, no. 6, pp. 40–47, 2018.
18. A. Kashevnik, D. Kalyazina, V. Parfenov, A. Shabaev, O. Baraniuc, **I. Lashkov**, M. Khegai, Ontology-Based Human-Robot Interaction: An Approach and Case Study on Adaptive Remote Control Interface, Interactive Collaborative Robotics: Third International Conference, 2018.
19. A. Kashevnik, **I. Lashkov**, V. Parfenov, N. Mustafin, O. Baraniuc. Context-Based Driver Support System Development: Methodology and Case Study. In: Proceedings of the FRUCT'21. Helsinki, 2017, pp. 162–171.
20. N. Hashimoto, T. Okuma, S. Miyakoshi, K. Tomita, O. Matsumoto, A. Smirnov, A. Kashevnik, **I. Lashkov**. Use cases for rider assistant mobile application evaluation using travelling simulator. In Proceedings of the 19th Conference of Open Innovations Association FRUCT (FRUCT'19), Helsinki, Uusimaa, FIN, pp. 47–53, 2016.
21. A. Smirnov, A. Kashevnik, **I. Lashkov.** Human-Smartphone Interaction for Dangerous Situation Detection and Recommendation Generation While Driving. Speech and Computer: 18th International Conference, Hungary, 2016, pp. 346-353.
22. A. Smirnov A., A. Kashevnik, N. Shilov, **I. Lashkov** Driver Assistant in Automotive Socio-cyberphysical System: Reference Model and Case Study In: VEHITS 2016 – 2nd International Conference on Vehicle Technology and Intelligent Transport Systems - 2016, pp. 104-111.
23. A. Smirnov, A. Kashevnik, **I. Lashkov**, O. Baraniuc, V. Parfenov. Smartphone-based identification of dangerous driving situations: Algorithms and implementation. In Proceedings of FRUCT '18, Helsinki, 2016, pp. 306–313.
24. **I. Lashkov**, A. Smirnov, A. Kashevnik, V. Parfenov Ontology-Based Approach and Implementation of ADAS System for Mobile Device Use While Driving. In: Klinov P., Mouromtsev D. (eds) Knowledge Engineering and Semantic Web. KESW 2015. Communications in Computer and Information Science, vol. 518, 2015, Springer.
25. A. Smirnov, A. Kashevnik, **I. Lashkov**, N. Hashimoto, A. Boyali. Smartphone-based two-wheeled self-balancing vehicles rider assistant. In Proceedings of FRUCT'17, Helsinki, FIN, pp. 201–209, 2015.
26. N. Hashimoto, K. Tomita, A. Boyli, O. Matsumoto, A. Smirnov, A. Kashevnik, **I. Lashkov**. Operational Evaluation of New Transportation Method for Smart City, SMART 2015: The Fourth International Conference on Smart Systems, Devices and Technologies, 2015.
27. A. Smirnov, **I. Lashkov**, "Drive Safely" – Driver Assistance Application for Android, Proc. 20th Conference of the Open Innovations Association FRUCT, 2017.

PATENTS

- Mobile service to prevent dangerous situation prevention and generate recommendations for a driver while driving using front-facing camera and smartphone sensors (Drive Safely) // A. Smirnov, A. Kashevnik, **I. Lashkov** # 2017614256 from April 10, 2017 (Rospatent).
- Driving dangerous state determination on public roads based on the use of monitoring situation inside the vehicle cabin. Inventor: SPIIRAS. Authors: **I. Lashkov**, A. Kashevnik, A. Smirnov, # RU2 703 341C1.
- Multimodal Corpus for Russian Audio-Visual Speech in Cars, #2020622063, 2020. Authors: **I. Lashkov**, A. Aksenov, D. Ruymin, D. Ivanko, A. Karpov, A. Kashevnik.

TECHNICAL SKILLS

- Programming languages: Java, Kotlin, Python, SQL, HTML/CSS.
- API / Software: Android SDK, Retrofit, Firebase, Crashlytics SDK, REST API, Google OAuth, Protégé, XML, Json, OWL, TeamCity, SonarQube, Gradle, Git, Sqlite, JUnit, Jupyter Notebook, TensorFlow, TPU, PyTorch.

GITHUB PROJECTS

- Kaggle competitions. I took part in different Kaggle competitions related to image analysis and got awarded for top competitions results with Gold, Silver and Bronze medals.
- HippoYD. Mouth Openness classifier build using the DNN model that predicts whether the human's mouth is opened or closed. Underneath, it uses Python and TensorFlow.
- TFProfiler. Platform to profile TensorFlow Lite models and measure its performance using FPS, model initialization time, model inference time, memory consumption on Android smartphone with different delegates.

ACHIEVEMENTS & AWARDS

2021–22	Kaggle – **Gold** medal in "Image Matching Challenge 2022", "Image Matching Challenge 2023", "RSNA-MICCAI Brain Tumor Radiogenomic Classification"; **Bronze** medal in "Happywhale - Whale and Dolphin Identification".
2019	**Winner** at the final stage of **Enel call** for innovative projects in Rome, Italy (selected **1 in 200**).
2019	**Travel Grant**, St. Petersburg Institute for Informatics and Automation.
2018	**Grant** of the program competition **UMNIK** (Member of the Youth Research and Innovation Competition) in St. Petersburg and Leningrad region.
2017,2018	**Best Demo** awards at 21th, 22th FRUCT Conference, and from Sensors journal.
2016,2017	**Diploma for the best report** in the IV,V All-russian Interacademic congress of young scientists held by ITMO University.
2016	**Scholarship** of Committee on Science and Higher Education of Russian Government, St. Petersburg.
2015	**Distinguished participant** in Microsoft Russia Summer School on "Machine learning and Intelligence" held at St. Petersburg.
2014	**1st place** in programming contest on the most original and best solution in Microsoft School on "Doing Research in the Cloud 2014" held at Moscow State University.