

## PROJECT PARTNER SEARCH FORM

- I offer my expertise to participate as a Partner in a Horizon Europe Project
- I am planning to coordinate a project and I am looking for Project Partners

### TOPICS OF INTEREST

- HORIZON-CL4-2024-HUMAN-01-07 - [Collaborative intelligence – combining the best of machine and human \(AI Data and Robotics Partnership\) \(RIA\)](#)
- HORIZON-CL4-2024-HUMAN-01-06 - [Explainable and Robust AI \(AI Data and Robotics Partnership\) \(RIA\)](#)
- HORIZON-CL4-2024-DATA-01-01 - [AI-driven data operations and compliance technologies \(AI, data and robotics partnership\) \(IA\)](#)
- HORIZON-CL4-2024-DIGITAL-EMERGING-01-04 - [Industrial leadership in AI, Data and Robotics boosting competitiveness and the green transition \(AI Data and Robotics Partnership\) \(IA\)](#)

### PARTNER INFORMATION

## Specific skills / technologies: Expertise brought to the project by the people / department that will do the work

**MLgroup** is a research group working at the Slovak University of Technology in Bratislava in Slovakia. We offer our rich experience in **Machine Learning research** curated to the needs of the public and our specific partners, with multiple notable cooperations:

- In 2020 we created a [collaborative workspace with the National Bank of Slovakia](#) on multiple research topics, including financial data prediction and analysis of publicly accessible information of financial institutions.
- In cooperation with **Eye Clinic, Faculty of Medicine, Slovak Health University in Bratislava, Antolská SZU / Ophthalmology Department and Hospital in Malacky** we have developed systems for eye diseases diagnostics on digital images of the retinal background.
- In cooperation with the **Second Department of Neurology, Medical School of Comenius University and University Hospital in Bratislava**, we have developed an application used for clinical assessment during the finger-tapping test (FTT).

We have experience with creating and curating databases for ML research, and we have multiple ML datasets that we can offer:

- Over half a million articles scraped from Slovak online newspapers from multiple sources spanning from 2017 to 2023 (upon request, methodology [described here](#)).
- A [database of American Sign Alphabet \(ASL\)](#) static gestures containing 26 alphabetic and 9 numeric characters stored as color, infrared and depth images (34,125 images in total).
- In collaboration with the Department of Electronics and Informatics, Vrije Universiteit Brussel, we created a detailed list of existing datasets containing images of human eyes ([more than 150 datasets available](#)).
- Fundus images for diabetic retinopathy segmentation annotated by a medical professional (upon request, methodology described here).

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We have also led and successfully finished multiple project within national grant schemes (6 x VEGA, 1 x KEGA, 1x APVV) and our team members have previous experience with Horizon projects ([HBB-NEXT project](#) (FP7-ICT-2011-7-287848) and [H2020 Newton project](#) – (ICT-20 2015))

We are interested in multiple research areas, including:

- **use of AI in medicine:** we have been working on deploying AI in diagnoses of [retinal damage](#), [different cognitive disorders](#) and differential diagnosis of Parkinson's disease and dystonic tremor.
- **use of AI in time-series and sequential analysis:** financial analysis and text sentiment within [INOLab workspace](#), sound event classification
- **neural networks theory and application:** [The potentiality of increasing the robustness of CNN](#) for image classification using the concept of fixed filters in CNN architectures, [Algebraic Zero Error Training Method for Neural Networks Achieving Least Upper Bounds on Neurons and Layers](#)
- **use of AI in robotics and industry:** Human Computer Interaction, robotic welding workplace, [realistic pencil drawing](#), vehicle speed detection, violence detection
- **use of AI in biometrics:** iris recognition ([our overview of existing datasets](#)), face recognition (face detection using GANs, face quality assessment, [siamese networks training](#)), voice and [speech recognition](#), kinship recognition, genre and authorship classification
- **pattern recognition in image and sound:** speaker and speech recognition, speech emotion recognition, detection and classification of events in audio signals

### **Description of the Legal Entity**

[Slovak University of Technology in Bratislava \(STUBA\)](#) is a leading technical university in Slovakia with a long history continuing a legacy of the 270-year-old Mining Academy in Banská Štiavnica, where the foundations of vocational and practical learning were established. STUBA offers education in technical fields and involves students in research in natural sciences, computer sciences, construction, architecture, materials technologies, chemistry and food technologies and in 2022 university had around 10000 students.

At present, the STU consists of [seven faculties](#) based in Bratislava and Trnava. All the faculties provide a study in accredited study programmes within the complex system of a bachelor, master and PhD. study. Faculties realise credit system compatible with the European credit transfer system enabling mutual mobility of students within European Union member countries and a larger European space. In the area of scientific and research activities the STU successfully joins European Union programmes.

### **Faculty of Electrical Engineering and Information Technology (FEI STUBA)**

The beginnings of FEI STUBA are dating back to the year 1941 (in 2021 we celebrated 80th anniversary of education of engineers in the field of electrical engineering, informatics and information technologies). Employment rate of our faculty graduates comes up to 100% every year.

FEI STUBA offers **8 Bc. study programmes** (Applied Informatics, Automotive Mechatronics, Electrical Engineering, Electrical Power Engineering, Electronics, Information and Communication Technologies, Nuclear and Physical Engineering, Robotics and Cybernetics), **9 MSc. study programmes** (Applied Electrical Engineering, Applied Informatics, Applied Mechatronics and Electromobility, Electrical Power Engineering, Electronics and Photonics, Multimedia Information and Communication Technologies, Nuclear and Physical Engineering, Space Engineering, Robotics and Cybernetics), and **10 PhD. study programmes** (Applied Informatics, Electrical Power Engineering, Electronics and Photonics, Measurement Technology, Mechatronic Systems, Nuclear Power Engineering, Physical Engineering, Robotics and Cybernetics, Space Engineering, Telecommunications)

**FEI STUBA in numbers** (year 2022): 18.4 million EUR budget, cca 2300 students, 286 teaching and research staff, 85 domestic research projects, 35 international research projects (24 H2020 projects), [10 institutes](#), many [high-tech & innovative laboratories](#).

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| <input type="checkbox"/> Industry /SME               | <input type="checkbox"/> NGO                  | <input type="checkbox"/> Other: <i>Please specify</i> |

### Description of the (Research) Team

**MLgroup** is a research group working at the Slovak University of Technology in Bratislava in Slovakia. It has been active in machine learning research since 2008 and primarily focuses on artificial intelligence, machine learning, medicine, biometrics and digital cultures. The team comprises 15 researchers, post-docs and doctoral students, led by prof. M. Oravec and prof. J. Pavlovičová.

**Miloš Oravec**, professor ([ORCID](#) / [ResearchGate](#) / [Google Scholar](#)) was born in Bratislava, Slovakia. He received the MSc. degree in telecommunication engineering, PhD. degree in applied informatics, and prof. degree in cybernetics from Faculty of Electrical Engineering and Information Technology, Slovak University of Technology (FEI STU), Bratislava, Slovakia in 1990, 2002, and 2014, respectively. He was the dean of the FEI STU and head of the Scientific Council of the Faculty from 2015 to 2023. He is with the Institute of Computer Science and Mathematics of Slovak University of Technology, Slovakia. His research interests include artificial intelligence, machine learning and neural networks, biometrics, data analysis and prediction, signal processing, communication networks, and medical cybernetics. He is active in [Machine Learning Group \(MLgroup\)](#) at FEI STU in Bratislava.

**Jarmila Pavlovičová**, professor ([ORCID](#) / [Research Gate](#) / [Google Scholar](#)) at the Institute of Robotics and Cybernetics, Faculty of Electrical Engineering and Information Technology, Slovak University of Technology (FEI STU) in Bratislava, Slovakia. She received her MSc. and PhD. degrees in Telecommunications from Slovak University of Technology in Bratislava. Her research interests include artificial intelligence, digital signal and image processing, computer vision and pattern recognition with applications mainly in biomedicine. She is active in Machine Learning Group (MLgroup) at FEI STU in Bratislava.

**Juraj Kačur**, associated professor ([ORCID](#) / [Research Gate](#) / [Google Scholar](#)) AI, speech and voice recognition, neural networks theory

**Radoslav Vargic**, associated professor ([ORCID](#) / [Research Gate](#) / [Google Scholar](#)), AI, neural networks, time-frequency analysis, signal and image processing with emphasis on wavelets and multimedia processing, eye tracking and Brain Computer Interaction (BCI).

**Slavomír Kajan**, assistant professor, ([ORCID](#) / [Research Gate](#) / [Google Scholar](#)), neural networks, object detection and classification, human computer interaction, AI in medicine

**Ľuboš Omelina**, researcher, ([ORCID](#) / [Research Gate](#) / [Google Scholar](#)), AI, biometrics, iris recognition, serious games

**Dominik Sopiak**, researcher, ([ORCID](#) / [Research Gate](#) / [Google Scholar](#)), image and video processing and recognition, machine learning, biometrics, deep learning

**Veronika Kurilová**, researcher, ([ORCID](#) / [Research Gate](#) / [Google Scholar](#)), AI, neural networks, classification, detection and segmentation in ophthalmology, mobile applications in medicine

**Jozef Goga**, researcher, ([ORCID](#) / [Research Gate](#) / [Google Scholar](#)), AI, neural networks, classification, detection and segmentation, robotic system programming

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**Zuzana Rábeková**, assistant professor, ([ORCID](#) / [Research Gate](#) / Google Scholar), image processing, Natural Language Processing (NLP) in media sector

**Boris Puterka**, PhD. student, ([ORCID](#) / [Research Gate](#) / Google Scholar), speech and voice emotions recognition

**Vanesa Andicsová**, PhD. student, ([ORCID](#) / [Research Gate](#) / Google Scholar), Natural Language Processing, machine learning in financial sector

**Dominik Pružinský**, PhD. student, ([ORCID](#) / [Research Gate](#) / Google Scholar), biometrics, kinship recognition

**Péter Mácsik**, PhD. student, ([ORCID](#) / [Research Gate](#) / Google Scholar), AI, neural networks, classification, detection and segmentation in ophthalmology

**Ondrej Straka**, PhD. student, ([ORCID](#) / [Research Gate](#) / Google Scholar), AI, neural networks, classification, detection and segmentation in ophthalmology

#### **Expertise of the Team Leader**

**Miloš Oravec** ([ORCID](#) / [ResearchGate](#) / [Google Scholar](#)) is a professor at Faculty of Electrical Engineering and Information Technology, Slovak University of Technology (FEI STU), Bratislava, Slovakia. He is with the Institute of Computer Science and Mathematics. His research interests include artificial intelligence, machine learning and neural networks, biometrics, data analysis and prediction, signal processing, communication networks, and medical cybernetics. He is active in [Machine Learning Group \(MLgroup\)](#) on FEI STU in Bratislava.

He spent several research stays abroad, e.g. RWTH Aachen, Germany, Politecnico di Torino, Italy, Universitat Politècnica de Catalunya, Barcelona, Spain. He acts as the reviewer for several scientific journals, e.g. IEEE Transactions on Vehicular Technology ISSN 0018-9545, IEE Proceedings on Science, Measurement and Technology ISSN 1751-8822, Sensors ISSN 1424-8220, Radioengineering (Czech Republic, ISSN 1210-2512), Journal of Electrical Engineering (Slovakia, ISSN 1335-3632), Acta Electrotechnica et Informatica (Slovakia, ISSN 1335-8243). He also acts as the editor for Open Computer Science.

He led or was involved in several international and national research projects, e.g. H2020 Newton project (ICT-20 2015, Networked Labs for Training in Sciences and Technologies for Information and Communication), HBB-NEXT project (Next-Generation Hybrid Broadcast Broadband, project of 7th Frame Program FP7-ICT-2011-7-287848), several grants of the Slovak scientific grant agencies VEGA and APVV.

He was the dean of the FEI STU and head of the Scientific Council of the Faculty from 2015 to 2023, as well as the member of several scientific councils of faculties of Slovak University of Technology, University of Žilina, and Technical University of Košice.

He is a guarantor of study programs Applied Informatics in doctoral and master degree of study, as well as the chairman of the Committee of doctoral studies at the Slovak Technical University Bratislava in the field of study of Informatics.

He also acts as the member of the Working Group for the Digital Transformation of the Slovak Republic established by the Ministry of Investments, Regional Development and Informatization and is the member of the Board of Directors of the Center for Artificial Intelligence (a non-profit interest association of legal entities), which covers the National Artificial Intelligence Platform – AISlovakIA.

#### **Potential role in the project**

Research

Training

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Dissemination

Other: ***Please specify***

e.g. project leader, scientific coordinator, workpackage leader, product development expertise.

Already experience as a	Coordinator	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
	Partner	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
	Expert Evaluator	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO
<b>CONTACT DETAILS</b>			

<b>Contact Person:</b> Miloš Oravec
<b>Organization:</b> Faculty of Electrical Engineering and Information Technology, Slovak University of Technology on Bratislava (FEI STUBA)
<b>City:</b> Bratislava
<b>Country:</b> Slovakia
<b>Phone:</b> +421 917 94 94 81
<b>Email:</b> <a href="mailto:milos.oravec@stuba.sk">milos.oravec@stuba.sk</a>
<b>Organization Website:</b> <a href="https://www.fei.stuba.sk/english.html">https://www.fei.stuba.sk/english.html</a>
<b>Contact Person Webpage:</b> <a href="https://uim.fei.stuba.sk/en/pracovnici/milos-oravec/">https://uim.fei.stuba.sk/en/pracovnici/milos-oravec/</a>

Date: 19/07/2023

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