Marek Sokol

Github: github.com/sokolmarek
Linkedin: linkedin.com/in/sokolmarek
ORCID: [0000-0001-5795-7581](0000-0001-5795-7581)

Email: marek.sokol@cvut.cz
Web: www.mareksokol.cz

EDUCATION

- **Faculty of Biomedical Engineering, CTU** — Kladno, Czech Republic
  Doctorate Degree - Biomedical Engineering (In Progress) — 2023 -

- **Faculty of Biomedical Engineering, CTU** — Kladno, Czech Republic
  Master's Degree - Biomedical Engineering — 2021 - 2023

- **Faculty of Biomedical Engineering, CTU** — Kladno, Czech Republic
  Bachelor's Degree - Biomedical Technology — 2018 - 2021

SKILLS SUMMARY

- **Programming**: Python, R, C#/Cpp, MATLAB, Julia, Typescript, Javascript, PHP, SQL
- **Skills**: Machine Learning, Statistical Modeling, Digital Signal and Image Processing, Quantum Computing
- **Competencies**: Multidisciplinary R&D, Grant Writing, Project Management, Adaptability
- **Languages**: English (B2/C1), German (A2)

EXPERIENCE

- **Health Technology for Space Applications Research Group (HETESPA)** — Presential
  Research Scientist — 2022 - Present
  - **Hardware development**:
  - **Software development**:
  - **Data science**:

- **Laboratory of Biomechanics and Assistive Technologies (BAT)** — Presential
  Research scientist — 2020 - Present
  - **Digital signal and image processing**:
  - **Software development**:
  - **Machine Learning**:
  - **Statistical modeling**:

- **National Institute of Mental Health (NIMH)** — Presential/Remote
  Software Engineer in Centre for Virtual Reality in Mental Health and Neuroscience — 2021 - 2024
  - **Data analysis**: processing and analysis of biological data in the context of neurophysiological influences.
  - **Software development**: development of AI software for data collection, processing, and analysis

- **University of Defence, Faculty of Military Technology** — Presential/Remote
  Software Engineer in Department of Military Robotics — January 2022 - December 2022
  - **UGV Prototyping**: development of an autonomous robotic system for UGV support

- **Military University Hospital Prague** — Presential
  Biomedical technician (Internship) — June 2020
  - **Work with medical equipment**: familiarisation and work with medical technology within different departments.
  - **Assistance with daily tasks**: assisting with tasks such as installation, maintenance, repair or calibration of medical equipment or components.

- **MediClinic a.s.** — Presential/Remote
  Full-stack developer — 2018 - 2019
  - **Web application development**: creation of an analytical web application.
  - **Server administration**: mail server, Microsoft server/IIS administration and LDAP configuration.
  - **Intranet development**: creation of custom template and extensions for Joomla content management system.
  - **Creation of database procedures**: design and creation of database procedures for Microsoft Power BI.
  - **SSO implementation**: creation and implementation of single sign-on for corporate domain accounts.

- **Freelance** — Remote
  Freelance Full-stack Developer — 2014-2017
  - **Web application development**: Frontend/Backend
  - **UI/UX Design**:

Achievements

- **Dissertation as a Part of an ESA Research Project Selected for ISS Experimentation (European Space Agency (ESA) / Czech Technical University in Prague)**: Selected as part of an ESA-funded research project to develop and validate biomedical technologies under microgravity conditions. Dissertation work will be partially conducted as an International Space Station (ISS) experiment. (Oct 2025 – Oct 2027)

- **Member of the Scientific Antarctic Expedition**: Stay at the Czech Antarctic Scientific Station (J. G. Mendel Station, James Ross Island, Antarctica), conducting research on the impact of extreme environments on the human body and biomedical technology (Jan - Mar 2025)

- **Honorable Mention for the paper "Multimodal Emotion Recognition through a Hybrid CNN-GCN Model Integrating Neuroimaging and Physiological Data"**: 6th International Conference on Biomedical and Health Informatics - National Cheng Kung University (NCKU), Tainan, Taiwan (Oct 2024)

- **Award for the best contribution in the section Assistive Technologies, Applications of Artificial Intelligence and its Use (Feedback System for Exposure Therapy Control in Virtual Reality)**: Conference Modern Procedures in Distance Care and Rehabilitation Medicine - Medical House, Czech Medical Society of Jan Evangelista Purkyně in Prague (Sep 2023)

Scientific research projects (Grants)
that I have worked on or am still working on as a team member

- **Innovative Wearable Muscle and Movement Monitoring System for Astronauts (AstroMoWe) - Selected experiment to be deployed at ISS**: Provider: Ministry of transport and European Space Agency (2025 - 2027)

- **Quantum computing methods for automated detection of dicentric chromosomes in biological dosimetry**: Provider: QIC - Quantum Innovation Center (2025 - 2027)

- **Hybrid quantum-classical methods for analyzing multimodal biosignals in extreme conditions**: Provider: QIC - Quantum Innovation Center (2025 - 2027)

- **A smart platform based on physiological data monitoring and biofeedback in VR for patient rehabilitation (TQ16000045)**: Provider: Technology Agency of the Czech Republic (2025 - 2027)

- **An innovative approach to injury prevention in demanding professions: Biomechanical and electrophysiological assessment using artificial intelligence (LUAIZ24059)**: Provider: Ministry of Education, Youth and Sport (2024 - 2027)

- **Portable modular MoCap system for recording and evaluating the condition of members of the armed forces and first responders (TA CR DELTA TM05000017)**: Provider: Technology Agency of the Czech Republic (2024 - 2026)

- **Methodology for rapid contactless and non-destructive detection of gunshot residues (OPSEC VK01010037)**: Provider: Ministry of Interior (2023 - 2025)

- **Innovative system of virtual reality and simulated model cases of security character facilitating training and treatment of police officers in risky situations (OPSEC VK01020196)**: Provider: Ministry of Interior (2023 - 2025)

- **Progressive ballistic armor for armed forces (TA CR TREND MIHRIL II. FW06010271)**: Provider: Technology Agency of the Czech Republic (2023 - 2025)

- **Smart system for wearable protective equipment enabling telemonitoring and planning of police and military interventions (OPSEC VK01020078)**: Provider: Ministry of Interior (2023 - 2026)

- **Methodology of fast non-contact and non-destructive detection of gunshot residue (OPSEC VK01010037)**: Provider: Ministry of Interior (2023 - 2025)

- **Development of the platform for maintaining and monitoring the physical conditions in isolated, confined and extreme environments (TA CR DELTA TM04000062)**: Technology Agency of the Czech Republic (2023-2025)

- **Monitoring the position of IRS members even during an intervention in large buildings using elements of artificial intelligence**: Provider: Ministry of Interior (2022 - 2025)

- **Application of body surface potential mapping (BSPM) in patients with re-synchronization therapy (Internal student grant competition of CTU in Prague)**: Evaluation of ECG manifestations of the ventricular depolarization process using BSPM and finding depolarization parameters adequate to optimize re-synchronization therapy in patients with heart failure. (2022-2024)

- **Smart Mobility for children with disabilities – therapy, lifestyle and leisure (TA CR TREND FW04020071)**: Design and integration of autonomous electric motors and sensory system in strollers for handicapped children. Provider: Technology Agency of the Czech Republic (2022-2024)

- **An instrument to examine the influence of personality characteristics and external factors on team dynamics during a long-term stay in an ICE environment (TA CR ETA TL05000228)**: Provider: Technology Agency of the Czech Republic (2021 - 2023)

- **Design of wearable sensor systems in assistive technologies for members of the IRS with regard to cost optimization (Internal student grant competition)**: Design, development and application of new wearable systems for the determination of evaluation parameters of complex biomedical and physical data. (2022)

- **Exposure to stressful situations in a virtual city environment (TA CR ÉTA TL03000223)**: Creation of a therapeutic software VRETcity situated in a complex virtual city environment for the purpose of exposure therapy, focused on specific phobias related to situations typical for the city environment. Provider: Technology Agency of the Czech Republic (2020-2023)

PUBLICATIONS

1. SOKOL, Marek; HOLUŠA, Jakub; VOLF, Petr, et al. Antarctic expedition at J. G. Mendel Station: An operational and scientific overview and its potential as a space analog environment. *Acta Astronautica*. 2026, vol. 239, pp. 239–255. ISSN 0094-5765. Available from DOI: 10.1016/j.actaastro.2025.11.023.

3. SOKOL, Marek; HEJDA, Jan; VOLF, Petr, et al. Efficient cognitive load decoding using causal spatiotemporal patterns from multimodal physiological signals. *Computers in Biology and Medicine*. 2025, vol. 197, p. 111063. ISSN 0010-4825. Available from DOI: 10.1016/j.compbiomed.2025.111063.

5. SOKOL, Marek; VOLF, Petr; HEJDA, Jan, et al. QTS2D: Quantum-based image encoding of time series. *SoftwareX*. 2025, vol. 31, p. 102327. ISSN 2352-7110. Available from DOI: 10.1016/j.softx.2025.102327.

9. SOKOL, Marek; VOLF, Petr; HEJDA, Jan, et al. DIANA: An underwater analog space mission. *Acta Astronautica*. 2025, vol. 226, pp. 349–360. ISSN 0094-5765. Available from DOI: 10.1016/j.actaastro.2024.10.044.

10. SOKOL, Marek; HEJDA, Jan; VOLF, Petr, et al. Multimodal Emotion Recognition Through a Hybrid CNN-GCN Model Integrating Neuroimaging and Physiological Data. In: *International Conference on Biomedical and Health Informatics 2024*. Cham: Springer Nature Switzerland, 2025, pp. 399–405. ISBN 978-3-031-86323-3. Available from DOI: 10.1007/978-3-031-86323-3_47.

2. KRIVANEK, Vaclav; VOLF, Petr; SOKOL, Marek, et al. A Low-Cost Measurement System for Gait Biomechanics in Military Gear. In: *2025 Communication and Information Technologies (KIT)*. IEEE, 2025, pp. 1–7. Available from DOI: 10.1109/kit67756.2025.11205457.

4. HEJDA, Jan; KUTÍLEK, Patrik; VOLF, Petr, et al. Facial Expression Analysis from NIR Image for SAR and SBAR. In: *2025 International Conference on Applied Electronics (AE)*. IEEE, 2025, pp. 1–6. Available from DOI: 10.1109/ae66163.2025.11197805.

6. HEJDA, Jan; KUTÍLEK, Patrik; VOLF, Petr, et al. Software for Image Analysis in Gunshot Residue Examination. In: *2025 International Conference on Military Technologies (ICMT)*. IEEE, 2025, pp. 1–5. Available from DOI: 10.1109/icmt65201.2025.11061318.

7. HEJDA, Jan; FISCHER, Arielle G.; LEOVÁ, Lýdie, et al. Design of a Multimodal Biomechanical System for Predicting Stress Fractures in High-Risk Occupations. In: *2025 International Conference on Applied Electronics (AE)*. IEEE, 2025, pp. 1–6. Available from DOI: 10.1109/ae66163.2025.11197756.

8. LEOVÁ, Lýdie; MOLEK, Martin; VOLF, Petr, et al. Monitoring of First Responders Biomedical Data During Training with Innovative Virtual Reality Technologies. *Big Data and Cognitive Computing*. 2025, vol. 9, no. 10, p. 251. ISSN 2504-2289. Available from DOI: 10.3390/bdcc9100251.

11. VOLF, Petr; HEJDA, Jan; SOKOL, Marek, et al. RGB-D Motion Capture System for Monitoring Health Conditions of Employees in Physically Demanding Professions. In: *International Conference on Biomedical and Health Informatics 2024*. Cham: Springer Nature Switzerland, 2025, pp. 38–44. ISBN 978-3-031-86323-3. Available from DOI: 10.1007/978-3-031-86323-3_4.

12. KUTILEK, Patrik; HÝBL, Ján; VOLF, Petr, et al. *Telemedicínský systém pro analogové mise a vesmírné aplikace: Aktuální stav a budoucnost vývoje*. Vysoké učení technické v Brně, Fakulta elektrotechniky a komunikačních technologií, 2023. Available from DOI: 10.13164/trendybmi.2023.145.

13. HEJDA, Jan; KUTILEK, Patrik; VOLF, Petr, et al. Wearable System for Monitoring the Physical Conditions in Isolated, Confined and Extreme Environments. In: *2024 21st International Conference on Mechatronics - Mechatronika (ME)*. 2024, pp. 1–4. Available from DOI: 10.1109/ME61309.2024.10789688.

14. RÁCKOVÁ, Lucie; LISSOUBA, Alexandra; VERMA, Maneesh Kumar, et al. *Overview of Multilayered Data Monitoring in the APICES Space Analogue Mission*. International Astronautical Federation (IAF), 2024. Available from DOI: 10.52202/078355-0035.

15. LEOVÁ, Lýdie; KUTÍLEK, Patrik; HÝBL, Ján, et al. Measuring the Acceleration of Bulletproof Vests: Testing and Biomedical Limits. In: *2024 International Conference on Applied Electronics (AE)*. 2024, pp. 1–6. Available from DOI: 10.1109/AE61743.2024.10710207.

16. LEOVÁ, Lýdie; VOLF, Petr; SOKOL, Marek, et al. Appropriate Placement of Electrodes for ECG Measurements in Military and Police Force. In: *2024 International Conference on Applied Electronics (AE)*. 2024, pp. 1–4. Available from DOI: 10.1109/AE61743.2024.10710307.

17. ČUBANOVÁ, Slavka; KOTOLOVÁ, Veronika; HÝBL, Jan, et al. Posturální stabilita stoje členů IZS využívajících balistické vesty. In: *Proceedings of Trendy v biomedicínském inženýrství*. Brno University of Technology, Faculty of Electrical Engineering and Communication, 2023, pp. 196–201. Available from DOI: 10.13164/trendybmi.2023.196.

18. KARAVAEV, Aleksei; HEJDA, Jan; KUTILEK, Patrik, et al. TinyDecisionTreeClassifier: Embedded C++ library for training and applying decision trees on the edge. *SoftwareX*. 2024, vol. 27. ISSN 2352-7110. Available from DOI: 10.1016/j.softx.2024.101778.

19. VOLF, Petr; HSU, Wei-Chun; HEJDA, Jan, et al. Use of Nonlinear Analysis Methods for Visual Evaluation and Graphical Representation of Bilateral Jump Landing Tasks. In: *2023 IEEE 5th Eurasia Conference on Biomedical Engineering, Healthcare and Sustainability (ECBIOS)*. 2023, pp. 75–78. Available from DOI: 10.1109/ECBIOS57802.2023.10218598.

20. HEJDA, Jan; SUGIARTO, Tommy; VOLF, Petr, et al. Use of Nonlinear Analysis Methods for Evaluating IMU Data of Bilateral Jump Landing Tasks. In: *2023 IEEE 5th Eurasia Conference on Biomedical Engineering, Healthcare and Sustainability (ECBIOS)*. 2023, pp. 71–74. Available from DOI: 10.1109/ECBIOS57802.2023.10218375.

21. LEOVÁ, Lýdie; ČUBANOVÁ, Slávka; HEJDA, Jan, et al. IMU and Software for Recording and Evaluating the Movement of the Firearm and Shooter During Shooting. In: *2022 20th International Conference on Mechatronics - Mechatronika (ME)*. 2022, pp. 1–5. Available from DOI: 10.1109/ME54704.2022.9983176.

22. DURIČ, Tadej; HEJDA, Jan; VOLF, Petr, et al. Assessing Postural Stability in Gastrointestinal Endoscopic Procedures with a Belt-like Endoscope Holder Using a MoCap Camera System. *Journal of Personalized Medicine*. 2024, vol. 14, no. 12, p. 1132. ISSN 2075-4426. Available from DOI: 10.3390/jpm14121132.

23. HEJDA, Jan; VOLF, Petr; SOKOL, Marek, et al. Spinal Curvature Estimation Using Low-Cost Portable Sensors. In: LIN, Kang-Ping; MAGJAREVIĆ, Ratko; CARVALHO, Paulo de (eds.). *International Conference on Biomedical and Health Informatics 2024*. Cham: Springer Nature Switzerland, 2025, pp. 32–37. ISBN 978-3-031-86323-3. Available from DOI: [10.1007/978-3-031-86323-3_3](https://doi.org/10.1007/978-3-031-86323-3_3).

Courses & Certificates

- **Medical Neuroscience** – **Duke University (Coursera, May 2024)**: Neuroanatomy, Neural Signaling, Sensory Systems, Movement and Motor Control, Complex Brain Functions, etc.
- **Advanced Data Analytics** – **Google (Coursera, Mar 2024)**: Statistical analysis, Python, Regression models, Machine learning, etc.
- **Computational Neuroscience** – **University of Washington (Coursera, Feb 2024)**: Neurobiology, Neural encoding and decoding, Information theory, Neural coding, Computing in Carbon, Computing with networks, Networks neural plasticity, Supervision and Rewards
- **Machine Learning Specialization** – **Stanford University & DeepLearning.ai (Coursera, Feb 2024)**: Supervised Machine Learning: Regression and Classification, Advanced Learning Algorithms, Unsupervised Learning, Recommenders, Reinforcement Learning
- **Executive Space Course** - **Medicines in Space - Oxford, UK (Nov 2023)**: Lectures: Space Environment, Humans in Space, Medical Care During Missions, Medication Supplies, Metabolism in Space, Aging in Space, Genetics, Omics for Precision Medical Care, AR & VR in Health Applications, participation in a hands-on Payload Design Workshop, etc.

Teaching

- **Probability and statistics**: Institution: Faculty of Biomedical Engineering, CTU in Prague (2024 - Present)

- **Selected statistical methods**: Institution: Faculty of Biomedical Engineering, CTU in Prague (2024 - Present)

- **Fundamentals of Information Technology**: Institution: Faculty of Biomedical Engineering, CTU in Prague (2023 - Present)