MICHAŁ BATSCH

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Portfolio
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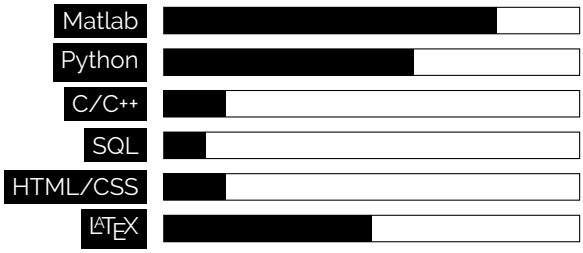
ABOUT ME

I am a research scientist with over ten years of experience in scientific programming and computations including image and signal processing, machine learning and neural networks. As a problem-solving-oriented person with the ability to understand complicated mathematical models and a strong mechanical engineering background, I am ready to dive into a data-driven world as a data scientist/data analyst.



TOOLS

- NumPy
- Pandas
- Matplotlib
- OpenCV
- Scipy
- Scikit-learn
- Tensorflow
- Keras
- sqlite3

SKILLS

- scientific computations
- signal and image processing
- machine learning
- neural networks
- research planning and carrying
- interdisciplinary team leading
- mechanical engineering
- mathematical modelling
- differential geometry

PROFESSIONAL EXPERIENCE

2013 – now
Research scientist — **Rzeszow University of Technology**
Scientific computations and programming, signal and image processing, machine learning, research in mechanical engineering, teaching machine design, geometry, kinematics, and computer-aided design.

2015 – 2020
part time
Lead design engineer — **EL–Automatyka**
Design for production automation, 3D CAD modelling, developing the constructional solutions, drafting.

SELECTED R&D PROJECTS

2022–2023
Mechatronic engineer — **FortiFruits**
Project no. POPW.01.01.02-18-0116/21 entitled *Introduction of product innovation to the market - soft fruit extracts with increased antioxidant content for the production of dietary supplements, food, and pharmaceutical industries*

2022
Image processing specialist — **University of Rzeszów**
Grant no. N3_063, PCI-1GRA.5133.40.2021.ADZ entitled *Development of an innovative method for examining the visual field and mobility of the cervical spine, using virtual reality technology*

2022
Scientific internship — **SZEL–TECH**
Project no. RPPK.01.02.00-18-0002/20 entitled *Development and implementation of technology for producing aircraft assemblies with an integral thin-walled structure*

2020 – 2022
R&D team leader – Mechatronic engineer — **LIMET**
Project no. POIR.01.01.01-00-0630/19 entitled *Research on the development of a predictive system for diagnostics and processing of seals in brake, fuel, and gas installations*

2020–2021
Project manager — **Rzeszow University of Technology**
Project no. POIR.02.03.02-18-0114/19 entitled *Development of an optimal technical and functional design of an innovative type of mobile elevating work platform for modernization and construction of bridge structures as a result of research and development work*

2016 – 2017
Gear analysis expert — **Inżynieria Rzeszów**
Project no. POIR.01.01.01-00-0286/15-00 entitled *Designing an innovative type of a scraper with an integrated planetary drive for new or modernized sedimentation tanks*

2014 – 2015 **Researcher** **Rzeszow University of Technology**
Project no. POIG.01.01.02-00-015/08-00 entitled *Modern Material Technologies in Aerospace Industry*

2013 **Design engineer** **Rzeszow University of Technology**
Project no. INNOTECH-K2/IN2/39/182334/NCBR/13 entitled *Development and implementation of plastic forming technology with resistance heating of aircraft engine components made of difficult-to-deform nickel-iron superalloys*

2010 – 2012 **Design engineer** **Rzeszow University of Technology**
Project no. OR00011611 entitled *UAV for terrain surveillance*

EDUCATION

2015 **Doctor of Engineering** **Rzeszow University of Technology**
Construction and Exploitation of Machines

2013 **Master of Science** **Rzeszow University of Technology**
Mechanics and Machine Building (specialty: mechanical drives)

2012 **Bachelor of Engineering** **Rzeszow University of Technology**
Automation and Robotics (specialty: computer science in robotics)

SELECTED PROJECTS

Gear fault detection by unsupervised deep learning of autoencoder
</> Python, TensorFlow, Scikit-learn, NumPy, Scipy, Pandas Read more

Vibration excitation in gearboxes due to surface deviations
</> Python, NumPy, Scipy, Matlab, Differential geometry, Optimization Toolbox Read more

The method of prediction of tooth profile deviations in gear honing
</> Matlab, Differential geometry, Optimization Toolbox Read more

Vision-based control of small educational double SCARA robot
</> Python, OpenCV, TensorFlow, Scikit-learn, NumPy, Scipy, C, RaspberryPI, Matlab, Automatic code gen. Read more

Image processing algorithm for evaluation of the roundness of small objects
</> Matlab, Image processing toolbox, Optimization Toolbox Read more

What is the optimal shape of sofa?
</> Matlab, Differential geometry, Optimization Toolbox Read more

SELECTED SCIENTIFIC PUBLICATIONS

Gear Fault Detection Method Based on Convex Hull Clustering of Autoencoder's Latent Space
Michał Batsch, Bartłomiej Kiczek 2024 Applied Sciences, 14(12) doi 10.3390/app14125282

Helical Bevel Novikov Gears
Michał Batsch 2022 Novikov/Conformal Gearing ed. by S.P. Radzevich, Springer doi 10.1007/978-3-031-10019-2

A Numerical Approach for Analysing the Moving Sofa Problem
Michał Batsch 2022 Symmetry, 14(7) doi 10.3390/sym14071409

Image processing algorithm to assess the roundness of blanks for the production of copper seals for brake, fuel and gas installations
Michał Batsch, Waldemar Witkowski, Dawid Wydrzyński 2021 Mechanik, 7 doi 10.17814/mechanik.2021.7.10

Mathematical model and tooth contact analysis of convexo-concave helical bevel Novikov gear mesh
Michał Batsch 2020 Mechanism and Machine Theory, 149 doi 10.1016/j.mechmachtheory.2020.103842

A novel method of obtaining honing tool profile for machining gears with profile modifications
Michał Batsch 2020 ASME Journal of Manufacturing Science and Engineering, 142(9) doi 10.1115/1.4047351

Measurement and mathematical model of convexo-concave Novikov gear mesh
Michał Batsch, Tadeusz Markowski, Stanisław Legutko, Grzegorz Królczyk 2018 Measurement, 125
doi 10.1016/j.measurement.2018.04.095

LANGUAGES

- Polish - native
- **English** - C1 level

AWARDS

- third degree award of the Committee on Mechanics of the Polish Academy of Sciences
- six awards from the Head of the RUT

INTERESTS

- motorcycles
- music
- skiing
- microcontrollers