Marek Pecha *September 19, 1989*

marek.pecha.89@seznam.cz
https://www.linkedin.com/in/marek-pecha-528870b5/

Experience

Ullmanna, s.r.o.   OPAVA, CZECH REPUBLIC (remote)
AI & Software developer   *2024 – until now*

Institute of Geonics of the Czech Academy of Sciences   OSTRAVA, CZECH REPUBLIC
Department of applied mathematics and computer science   *2023 – until now*
Team Lead in the project Machine Learning for Natural Hazards. Within the Strategy AV 21, I am leading a small team focused on applying machine learning techniques for the classification of earthquakes.
Department of applied mathematics and computer science   *2018 – until now*
Member of the PERMON team led by associate professor David Horák. I am continuing with research on machine learning and its application, primarily in natural hazards (wildfires).

VŠB - Technical University of Ostrava   OSTRAVA, CZECH REPUBLIC
Faculty of Mechanical engineering, Junior researcher   *2020, September – 2021, March*
Member of a team led by the professor Petr Novák. A research focusing on an optimal control for robot manipulators.

VŠB - Technical University of Ostrava   OSTRAVA, CZECH REPUBLIC
IT4Innovations, Research assistant   *2016 – 2018*
Member of the PERMON team led by associate professor David Horák. Research mainly focus on mathematical aspects of machine learning.
IT4Innovations, R&D support staff   *2014 – 2016*
Member of the PERMON team led by associate professor David Horák. Research interests mainly include problems related to image processing.
Department of Computer Science, R&D support staff   *2012 – 2014*
Involved in the FORCOA.net project – evaluating and ranking social networks. Cooperation with the associate professors Miloš Kudělka and Jan Platoš.

PEKOS, s.r.o   OSTRAVA, CZECH REPUBLIC
Web developer   *2009 – 2010*

Education

VŠB – Technical University of Ostrava   OSTRAVA, CZECH REPUBLIC
PhD student in Applied Mathematics   *2016 – until now*
Doctoral thesis topic: *Solvers and their implementation for the machine learning problems.*

Principal supervisor: doc. David Horák, PhD (VŠB-TU Ostrava)
Co-supervisor: Dr. Richard Tran Mills (Argonne National Laboratory, USA)

VŠB – Technical University of Ostrava   OSTRAVA, CZECH REPUBLIC
Master degree in Applied Mathematics   *2014 – 2016*
Diploma thesis: *Image segmentation techniques in the HPC environment and their applications.*

VŠB – Technical University of Ostrava   OSTRAVA, CZECH REPUBLIC
Bachelor degree in Applied Mathematics   *2010 – 2014*
Bachelor thesis: *Image segmentation by making use of spectral clustering* (written in Czech).

Skills

- Mainly focus on applying machine learning for image processing and timeseries data

- Deep learning using TensorFlow and PyTorch

- Standard machine learning models combined with feature engineering

- Proficient in C/C++ and Python

- GDAL, ObsPy, OpenCV, PETSc, RAPIDS, scikit-learn, XGBoost

- Dask

- MPI

- Docker

Languages

Czech (*mother language*) and English.

Internships

- **2023**

  - **Argonne National Laboratory (USA, Illinois, Lemont)**

    Host: Dr Richard Tran Mills
    Department: Laboratory for Applied Mathematics, Numerical Software, and Statistics (LANS) at Department of Computing, Environment and Life Sciences (CELS)
    (2 weeks)

- **2019**

  - **Institute for Parallel Processing Institute (BG, Sofia)**

    Host: Prof. Svetozar Margenov and Dr. Stanislav Harizanov
    Department: Department of Scientific Computations
    (2 weeks)

  - **Università degli Studi di Napoli Federico II (IT, Naples)**

    Host: Prof. Gerado Toraldo
    Department: Dipartimento di Matematica e Applicazioni "Renato Caccioppoli"
    (3 weeks)

- **2018**

  - **The University of Edinburgh (UK, Edinburgh)**

    Hosts: Dr. Hall and Prof. Gondzio
    Departments: School of Mathematics and Edinburgh Parallel Computing Centre
    (3 months)

Invited talks

- **2023**

  - **Argonne National Laboratory (USA, Illinois, Lemont)**

    Topic: *Wildfires Identification in Alaska using Satellite Images and Machine Learning*.
    This talk was given at the LANS seminar series. Additional information available online on the LANS webpages https://www.anl.gov/event/wildfires-identification-in-alaska-using-satellite-images.

Supervising of students

- **Classification of Seismic Events Using Recurrent Neural Networks**

  Supervising bachelor thesis.
  Student: Bohdan Rieznikov
  Expected year of submission: 2024

- **Algorithms used for classifying visual signals using methods for extracting significant features**

  Co-supervising diploma thesis.
  The thesis was awarded by the dean of Faculty of Electrical Engineering and Computer Science, VŠB-TUO.

  Supervisor: Ing. Lukáš Pospíšil, PhD
  Student: Bc. Vojtěch Dorňák
  Year of submission: 2021

- **Image feature extraction applied in classification techniques**

  Co-supervising bachelor thesis.
  The thesis was awarded by the dean of Faculty of Electrical Engineering and Computer Science, VŠB-TUO.

  Supervisor: doc. Ing. Martin Čermák, PhD
  Student: Vojtěch Dorňák
  Year of submission: 2019

- **Using of cluster analysis for data segmentation**

  Supervising of Petr Stádník the secondary school student, $2019 - 2020$.

  Places at the czech science competition for high school students (the SOČ competition):

    - The 1st place at school competition
    - The 1st place at regional competition (category Computer science)
    - 14th place at national competition (category Computer science)

- **Modelling biochemical activities of compounds employing supervised learning**

  Supervising of Martin Biroščák the secondary school student, $2018 - 2020$.

  Places at the czech science competition for high school students (the SOČ competition):

    - The 2nd place at school competition
    - The 1st place at regional competition (category Mathematics)
    - 8th place at national competition (category Mathematics)

Awards

- **2020**

    - The best PhD student of the Department of Applied Mathematics
    - The FEECS dean's award for achieved results during PhD studies

- **2019**

    - The best presentation award at Workshop of PhD students
      (Institute of Geonics of the Czech Academic of Sciences)

- **2018**

    - The best PhD student of the Department of Applied Mathematics
    - The best paper award at conference AETA 2018

- **2017**

    - The best PhD student of the Department of Applied Mathematics
    - The best poster award at conference HPCSE 2017

- **2016**

    - The FEECS dean's award for diploma thesis

Software projects

- **PermonSVM** – HPC implementation of a maximal margin classifier based on the PERMON and PETSc frameworks. I am a principal contributor.
  GitHub repository: https://github.com/permon/permonsvm

- **Retina vessels segmentation** – vessel segmentation from retinal images using a transfer learning based on a UNet with VGG16 backbone. A medical application in cooperation with Faculty Hospital in Ostrava.
  GitHub repository: https://github.com/mpecha/RetinaVesselSeg_tf

- **Natural hazards project** - a project focused on applying machine learning for natural hazards analysis. It is primary pointed to wildfires and earthquakes.
  The project is not currently public available.

Media

- An article in the Akademik magazine (VŠB-TU Ostrava) where I described our approaches to machine learning implemented in a natural hazard project. (written in Czech)
  https://www.fei.vsb.cz/cs/o-fakulte/novinky/detail-aktuality/?reportId=45579

- An interview in the Universitas magazine. (written in Czech)
  https://www.universitas.cz/osobnosti/11322-strojove-uceni-pomaha-lokalizovat...