PETROULA KARACOSTA

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PROFESSIONAL EXPERIENCE

Academic Research Staff Member Nov. 2023 - Present
X-Ray and Neutron Science Group, Niels Bohr Institute, University of Copenhagen (KU)

- Carrying out neutron scattering simulations using McStas and McStasScript. Investigating machine learning applications on neutron scattering simulation results.
- Managing the NNSP-SwedNess Neutron School's e-learning platform. Ensuring software and data resource availability, optimizing lecturer support, revising educational content and learning materials to enhance student engagement and learning outcomes.

Student Assistant (Part-time) Jan. 2023 - Oct. 2023
Department of Science Education, Faculty of Science, University of Copenhagen (KU)

- Carrying out simulations of neutron scattering instruments and experiments using McStas and McStasScript.
- Creating simulations and educational resources for the EU funded "Accelerated Teaching" MOOC module, "Race to Space".

Data entry, processing and analysis (Part-time) Apr. 2019 - Mar. 2023
M.Sc. "Health and Environmental Factors" programme,
School of Medicine, Aristotle University of Thessaloniki (AUTh)

- Data processing, manipulation, cleaning, visualisation and storage. Compiling and delivering reports.
- Problem solving and optimising with programming. Identifying and delivering the most appropriate solutions.

SKILLS

Skills Python, C, C++, SQL, MATLAB, LaTeX, Microsoft Office, Wolfram Mathematica, OriginLab
Languages **English**: Fully Proficient, **Greek**: Native Language, **German**: Relatively Fluent

EDUCATION

M.Sc. in Physics, University of Copenhagen (KU) Sept. 2021 - Oct. 2023
Computational Physics Specialisation

Oxford Machine Learning Summer School (OxML 2023), University of Oxford May - July 2023
Organised by AI for Global Goals, in collaboration with CIFAR and the University of Oxford's Deep Medicine Programme

- Modules: Fundamentals, Cases, Finance and NLP track

B.Sc. in Physics, Aristotle University of Thessaloniki (AUTh) July 2020

CONFERENCES AND MEETINGS

16th International Conference on Meteorology, Climatology and Atmospheric Physics (COMECAP 2023), Athens, Greece 25-29 Sept. 2023
Oral contribution: "Innovative Polygon Trend Analysis (IPTA): A Case Study for Precipitation in Thessaloniki during the Last 50 Years (1971–2020)"

DanScatt Annual Meeting 2023, Aalborg, Denmark 1-2 June 2023
Poster contribution: "Simulations of background scattering from a 15 T magnet"

Niels Bohr Institute Master Student Symposium 2023, Copenhagen, Denmark 31 March 2023
Best Poster Award: "Simulations of background scattering from a 15 T magnet"

European Conference on Neutron Scattering (ECNS) 2023, Garching, Germany 20-23 March 2023
Poster contribution: "Simulations of background scattering from a 15 T magnet"

ACADEMIC PROJECTS

Using McStas Union components to simulate a magnet sample environment and predicting background with Machine Learning. November 2022 - October 2023
Master's Thesis, University of Copenhagen. Supervisors: Dr. Kim Lefmann, Dr. Mads Bertelsen

- Simulation of a 15 T magnet sample environment and production of 25000 powder diffraction simulation results.
- Statistical analysis and exploration of simulation results database.
- Development, training and testing of Random Forest and Gradient Boosting ensemble algorithms for background prediction.

Creating a Chess AI Using CNNs and Stockfish. May - June 2022
Group project for the course *"Applied Machine Learning"* at the University of Copenhagen.

- Data sets of 150000 random full length game moves and 100000 random 20 move length game moves, evaluated by stockfish.
- Building and optimisation of the main CNN and Mini-Max Algorithm.

Supervised and unsupervised learning on a high dimensional structured data set. May 2022
Project for the course *"Applied Machine Learning"* at the University of Copenhagen. Final Score: 92/100

- Classification and Regression on high dimensional 162500/160650 (train/test) data with neural network and decision tree algorithms, as well as Clustering.
- Hyperparameter optimization and variable selection (permutation importance).

Comparative analysis between rapid evaluation algorithm and finite difference approximation solution for the Pennes bioheat equation. June 2020
Bachelor's Thesis, AUTh. Supervisor: Prof. Dr. Theodoros Samaras

- Simulation of energy deposition on cancerous tissues under thermal exposure.
- Finite difference approximation of the Pennes equation vs rapid evaluation algorithm for temperature increase comparison.

PUBLICATIONS

Papadopoulos, T., Karacosta, P., Kavadas, D., Sidiropoulos, E., Karamitsos, A. and Siogka, A., 2023. *Environmental Education and Health Education in Secondary Education*, Aristotle Biomedical Journal, 5(2).

Psefteli, M., Kavvadas, D., Karacosta, P., Cheristanidis, S., Dimitriadou, I. and Papamitsou, T., 2022. *Air Quality Index study in the area of Thessaloniki: A valuable public health tool*, Archives of Hellenic Medicine/Arheia Ellenikes Iatrikes, 39(6).

Papagiorgis P.,...,P. Karacosta,...and G. Itskos , 2019. *Robust Hydrophobic and Hydrophilic Polymer Fibers Sensitized by Inorganic and Hybrid Lead Halide Perovskite Nanocrystal Emitters*, Frontiers in Chemistry, section Nanoscience, Vol 7, 2019.

Pakalidou, N. and Karacosta, P., 2018. *Study of very long-period extreme precipitation records in Thessaloniki, Greece*, Atmospheric Research, 208, pp.106-115.

Pakalidou N. and P. Karacosta, 2017. *Study of very long-period extreme precipitation records in Thessaloniki, Greece*, Perspectives on Atmospheric Science pp. 537-543, Springer Atmospheric Research 2017.

Pakalidou N. and P. Karacosta, 2016. *A 85-year-period study of extreme precipitation records in Thessaloniki (Greece)*, Acta Geobalcanica, Volume 2(2), pp. 85-92