Anna Ochab-Marcinek, Ph.D.
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A researcher with over 10 years programming experience looking for new opportunities in IT.

## Skills

- Particularly experienced in: Python, optimization using machine learning libraries (Tensorflow, PyTorch), image analysis, C++, Unix/Linux shell scripting, Git, Jira, Jupyter, Maple.
- Has knowledge of: Machine learning, unit testing, mySQL, HTML, CSS, JavaScript, PHP, C, Fortran, Mathematica, Matlab.
- Has been exposed to: R, Arduino C++ programming.

## Experience

**Researcher** Jan 2024 – Present
*Dioscuri Centre for Physics and Chemistry of Bacteria, Institute of Physical Chemistry, Polish Academy of Sciences, Warsaw, Poland.*

- Developed the software (Python) for automated detection and analysis of bacterial clusters in microscopic 3-D images.
- Developed the methods for deconvolution of the point spread function from the microscopic 3-D image using non-traditional machine learning (optimization by differentiable rendering).

**Member of the COVID-19 Interdisciplinary Advisory Team attached to the President of the Polish Academy of Sciences.** Jun 2020 – Dec 2022

- Made statistical analyses (Python) of epidemiological data from various public data bases.

Habilitation in Chemistry Sep 2018
*Institute of Physical Chemistry, Polish Academy of Sciences, Warsaw, Poland.*

**Principal Investigator** Jan 2013 – Dec 2023
*Biophysical Chemistry Group, Institute of Physical Chemistry, Polish Academy of Sciences, Warsaw, Poland.*

- Modelled stochastic gene expression and the evolution of gene regulation (C++, Python).

**Postdoctoral researcher** Apr 2009 – Dec 2012
*Department of Soft Condensed Matter, Institute of Physical Chemistry, Polish Academy of Sciences, Warsaw, Poland.*

- Studied the influence of the depletion layer effect on the diffusion of nanoparticles in a crowded environment.

**Postdoctoral researcher** Oct 2007 – Sep 2008
*Department of Theoretical Physics, University of Augsburg, Augsburg, Germany.*

- Modelled stochastic resonant effects in neuronal signal propagation (C++, Fortran).

**Assistant Professor** Oct 2006 – Sep 2009
*Department of Statistical Physics, M. Smoluchowski Institute of Physics, Jagiellonian University, Krakow, Poland.*

- Modelled stochastic gene expression, cell cycle delays induced by ionizing radiation, and stochastic resonant effects in models of tumor growth (C++).

## Projects

**Automated detection and analysis of bacterial clusters in microscopic images** | *Python (PyTorch, TensorFlow, Scipy, Skimage, Numpy, Pandas), C++* Sep 2023 – Present

- I developed the software for automated detection and analysis of numbers, sizes, orientations of individual bacteria within bacterial clusters in microscopic 3-D images using the libraries for optimization (Scipy) and image analysis (Skimage).
- I developed the methods for deconvolution of the point spread function (PSF) from the microscopic 3-D image of a known probe. To find the PSF, I applied non-traditional machine learning (optimization by differentiable rendering) with PyTorch and Tensorflow.

**Simulation of gene expression evolution in a fitness landscape as Levy Flights**: fitnesslandscapestudent | *C++, Python, Jupyter* Oct 2022 – May 2023

- A research project for stochastic modelling of gene expression evolution (aom branch is my initial individual work, master branch is the further collaboration with my student).
- Uses my C++ interface for 2D bilinear interpolation with GSL, described in the next point.

**C++ interface for 2D bilinear interpolation with GNU Scientific Library (GSL)**: interpolation2dcpp | *C++, C* May 2022 – Jun 2022

- The original GSL interpolation routines are in C.
- I created the C++ interface for 2D bilinear interpolation from GSL to be able to use it in an object-oriented manner.

**Statistical analyses of epidemiological data**: govpl | *Python, Jupyter* Jun 2020 – Dec 2022

- My analyses done within the previous personal project (described in the next point) attracted enough attention that I was invited to participate in the COVID-19 Interdisciplinary Advisory Team under the President of the Polish Academy of Sciences.
- While working in the Team, I made statistical analyses of epidemiological data from various public data bases.
- I co-authored 27 position papers, which were widely picked up by the media.
- Because of my work within the Team, the Polish Press Agency published an interview with me about the caveats of interpreting epidemiological models: "Dr. Ochab-Marcinek: it is difficult to predict the course of epidemics using computer simulations" (in Polish).

**Epidemiological data analysis during the early stages of the COVID-19 pandemic**: COVID-19-MZ_GOV_PL | *Python, Jupyter* Mar 2020 – Jun 2020

- I identified a need in Polish society for a project that would provide the missing information on COVID-19 epidemiology.
- At that time, the Ministry of Health did not publish data in a human-readable format, only numbers on bitmaps published on Twitter. Although Michał Rogalski's spreadsheet project appeared, it was missing some data categories and some types of graphs at the time. The only source for the missing data categories were the bitmaps on the Twitter account of the Ministry of Health.
- I used web scraping, image filtering of decorative backgrounds, and OCR to collect the data.
- I calculated various statistics and published the graphs with my comments on the IPC PAS website (archived) and on Facebook.

- The project was unique in that it included plots and analytical comments that were not available elsewhere. These analyses attracted enough attention that I was invited to participate in the COVID-19 Interdisciplinary Advisory Team under the President of the Polish Academy of Sciences.

**Various programming projects for research** | *C++, Python* 2002 - 2023

- Stochastic gene expression modelling (individually)
- Stochastic cancer growth modelling (individually)
- Stochastic cell population growth modelling (in collaboration with my students)

## Education

Jagiellonian University – Ph.D. in Physics Sep 2006
Jagiellonian University – M.Sc. in Physics Jun 2002

## Ability to cooperate in a project team

- I pay a lot of attention to code quality, including proper documentation and commenting so that the code is easy for others to understand. As a C++ backgrounder, I favour explicit typing and the use of static type checking in Python.
- I use Git on a daily basis, as well as the Jira issue reporting system.
- I use Confluence daily standup templates to track my progress and improve my ability to estimate how much time a given task may take.
- In my current research group, I initiated the idea and organise weekly meetings of those members who are doing computational and coding projects to share knowledge, communicate our progress and discuss what might be blocking it.
- In the past I have been both a member and leader of research groups: I have been principal investigator on 4 grants and contractor on 4 grants. I have also received 1 travel grant for a collaborative research visit abroad. I have supervised students (PhD, MSc, internships), including the supervision of programming projects.

## Teaching

- In my experience of teaching and supervising students, apart from courses related to physics and biophysics, I have also taught courses related to computer science at the Jagiellonian University:
  - Theoretical fundamentals of computer science (algorithms and data structures).
  - Programming II (C++).
  - Introductory numerical methods.

## Languages

- English: Currently spoken on a daily basis at work in the multi-national environment of the Dioscuri Centre. 2002: Cambridge Certificate in Advanced English.
- German (intermediate)
- Russian (intermediate)
- Polish (mother tongue)