

- Quantum physics
  - Interpretable deep learning
  - Ultracold molecules
  - Quantum simulations
- Impact:** 16 scientific publications with 270+ citations, 2 funded research proposals, 7 awards, 4 invited talks, 15+ contributed talks, 2 discussion panels, 15+ posters, and 30+ invited seminars. My Google Scholar profile is [here](#).

## EDUCATION AND POSTDOCTORAL EXPERIENCE

- Research fellow**, Center of Computational Quantum Physics, Flatiron Institute, New York **Oct 2022 — now**
- Ph.D. in Physics (with honours)**, University of Warsaw & ICFO - The Photonic Sciences, Barcelona, co-tutelle **Oct 2017 — Sept 2022**  
Supervised by Prof. Michał Tomza & Prof. Maciej Lewenstein.  
Interpretable machine learning for physical problems & Quantum simulations with ultracold molecules.
- M.Sc. in Chemistry (with honours)**, University of Warsaw, specialty: Theoretical quantum chemistry **Oct 2015 — Jun 2017**  
Supervised by Prof. Michał Tomza & Prof. Grzegorz Chałasiński. On two trapped ultracold molecules.
- B.Sc. in Chemistry**, University of Warsaw, specialty: Theoretical quantum chemistry **Oct 2012 — Jun 2015**  
Supervised by Prof. Michał Tomza. On controlling Feshbach resonances with non-resonant laser field.
- B.Sc. in Biotechnology**, University of Warsaw, specialty: Molecular Biology **Oct 2012 — Jun 2015**  
Supervised by Prof. Jan Fronk. On genetic mechanisms diversifying the proteome.

## RESEARCH

- Artificial intelligence for quantum experiments**, Flatiron Institute, Columbia University, & Université Paris-Saclay **Oct 2022 — now**
- Development of the graph search algorithm to find viable laser cooling schemes for ultracold molecules (collaboration with Prof. Sebastian Will's group). Results presented within a **talk** at the APS March Meeting 2023 and a **preprint** submitted to Phys. Rev. X
  - Learning disordered positions of tweezer arrays in experiments with Rydberg atoms. Preliminary results presented, e.g., within an **invited talk** at the Joint ICTP-WE Heraeus School and Conference on Frontiers at the Intersection of Quantum Simulation and ML
  - Learning order parameters from projective measurements. Preliminary results presented, e.g., within an **invited talk** at the "ML and quantum physics" workshop at TU Wien and a **talk** at the ML for Quantum Many-Body Physics at the Perimeter Institute, Canada
- Interpretable neural networks in physics**, ICFO, Universität Hamburg, & University of Warsaw **Jan 2019 — now**
- Hessian-based toolbox to interpret and increase reliability of neural networks trained to recognize quantum phases in simulated and experimental topological data (collaboration with Univ. of Hamburg)
  - Attribution techniques to improve generalization of neural networks with Kacper Cybiński (**co-supervision of the BSc thesis**)
  - Part of the grants *Preludium* and *Etiuda* awarded by Polish National Science Centre
  - Results presented in three **publications**, in eight **talks**, e.g., on ML in PL Conference 2019 and 2021, CMD 2020, AMLD EPFL 2021, and nine **seminars** including Harvard University, University of Toronto, and Max-Planck-Institute for Quantum Optics in Garching
- Quantum simulations with ultracold molecular systems**, University of Warsaw & ICFO **Jun 2016 — now**
- Study of two and more ultracold molecules in traps, their magnetic properties, and quench dynamics
  - Results presented in the **MSc. thesis**, two **publications**, two **talks** on 61st Meeting of Polish Chemical Society (Cracow, Poland) and Quantum Optics X in Toruń and **posters**, e.g., on 26th ICAP (Barcelona, Spain), ITAMP workshop (Cambridge, USA), Les Houches School on Ultracold Fermions (France), and two **seminars** in Warsaw.

## ORGANIZATIONAL AND TEACHING EXPERIENCE

- Coordinator** of the Summer School: Machine Learning in Quantum Physics and Chemistry **Feb 2021 — Sept 2021**  
University of Warsaw <https://ml2021.ckc.uw.edu.pl/>
- Organization of the two-week summer school with lectures, specialized talks, and tutorials
  - Responsible for contacting the lecturers and participants, forming the scientific program, preparing 10-hour tutorials accompanying the school, and supervising the finances and documentation related to the project.
- Teaching assistant** of the Machine Learning course **2019 — 2022**  
University of Warsaw **3 winter semesters**
- Highly rated by students (4.94/5.00) and praised especially for the clarity of explanations.
  - Preparing the majority of the course programming syllabus (Jupyter notebooks available on GitHub): decision trees, spam with Bayes classifier, support vector machines, neural networks.

## SKILLS

<b>Physics</b>	ultracold physics, molecules, quantum simulations
<b>Machine learning</b>	deep learning, interpretability, unsupervised techniques, basics of neural quantum states
<b>Programming and numerics</b>	Python, C++, exact diagonalization, Neo4j and Cypher, basics of tensor networks
<b>Languages</b>	Polish (native), English (C2), French (B1), German (A2)

## SELECTED PUBLICATIONS

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1. Cybiński, K., Płodzień, M., Tomza, M., Lewenstein, M., Dauphin, A. & Dawid, A. *Characterizing out-of-distribution generalization of neural networks: the disordered Su-Schrieffer-Heeger model*. arXiv:2406.10012. 2024.
2. Vysogorets, A., Dawid, A. & Kempe, J. *Deconstructing the Goldilocks zone of neural network initialization*. In International Conference on Machine Learning (ICML). arXiv:2402.03579. 2024.
3. Dawid, A., et al. *Machine learning in quantum sciences* in press (Cambridge University Press, 2024).
4. Dawid, A., et al. *Automated detection of laser cooling schemes for ultracold molecules*. arXiv:2311.08381. 2023.
5. Sabanayagam, M., Behrens, F., Adomaityte, U. & Dawid, A. *Unveiling the Hessian's connection to the decision boundary*. In NeurIPS 2023 Workshop on Mathematics of Modern Machine Learning. arXiv:2306.07104. 2023.
6. Dawid, A. & LeCun, Y. *Introduction to latent variable energy-based models: A path towards autonomous machine intelligence*. Accepted in JSTAT. arXiv:2306.02572. 2023.
7. Suchorowski, M., Dawid, A. & Tomza, M. Two highly magnetic atoms in a one-dimensional trap. *Phys. Rev. A* **24**, 015001 (2022).
8. Sroczynska, M., Dawid, A., Tomza, M., Calarco, T., Idziaszek, Z. & Jachymski, K. Controlling the dynamics of ultracold polar molecules in optical tweezers. *New J. Phys.* **24**, 015001 (2022).
9. Dawid, A., Huembeli, P., Tomza, M., Lewenstein, M. & Dauphin, A. Hessian-based toolbox for reliable and interpretable machine learning in physics. *Mach. Learn.: Sci. Technol.* **3**, 015002 (2022).
10. Käming\*, N., Dawid\*, A., Kottmann\*, K., Lewenstein, M., Sengstock, K., Dauphin, A. & Weitenberg, C. Unsupervised machine learning of topological phase transitions from experimental data. *Mach. Learn.: Sci. Technol.* **2**, 035037 (2021).
11. Dawid, A. & Tomza, M. Magnetic properties and quench dynamics of two interacting ultracold molecules. *Phys. Chem. Chem. Phys.* **22**, 28140–28153 (2020).
12. Dawid, A. et al. Phase Detection with Neural Networks: Interpreting the Black Box. *New J. Phys.* **22**, 115001 (2020).
13. Dawid, A., Lewenstein, M. & Tomza, M. Two ultracold interacting molecules in a one-dimensional harmonic trap. *Phys. Rev. A* **97**. (Editors' Suggestion), 063618 (2018).

## SELECTED AWARDS & GRANTS

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- Invitation to **the 73rd Lindau Nobel Laureate Meeting 2024** as one of seven young Polish physicists (+ talk at the NextGenScience)
- Second award in the Polish Physical Society contest for **the best Ph.D. thesis in physics** defended in Poland in 2022
- **START 2022** fellowship of the Foundation for Polish Science for the best young scientists under thirty
- **Etiuda 8** grant no. 2020/36/T/ST2/00588 (National Science Centre, Poland), 132 688 PLN ( $\approx$ €30 000), Jan 2021 - Sept 2022, “*Quantum many-body physics with ultracold atoms and molecules: exact dynamics and machine learning*”
- **Preludium 17** grant no. 2019/33/N/ST2/03123 (National Science Centre, Poland), 69 600 PLN ( $\approx$  €15 000), Feb 2020 - Jan 2022, “*Can an artificial neural network teach us quantum physics?*”
- **Polish Chemical Society's prize** of Prof. Jacek Rychlewski for the best Master's thesis in quantum chemistry or using quantum chemistry methods in different areas of science in the academic year 2016/2017
- **Scholarships of Polish Minister of Science and Higher Education** for outstanding academic achievements in the academic years 2015/2016 and 2016/2017

## SELECTED INVITED AND CONTRIBUTED TALKS AND SEMINARS

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<b>Invited talk</b> , Deep Learning & Philosophy (DeLPhi) conference, Graz, Austria <i>Quantum physics &amp; machine learning.</i>	<b>16-18 Sept 2024</b>
<b>Invited talk</b> , Joint ICTP-WE Heraeus School on the Intersection of Quantum Simulation and ML, Trieste, Italy <i>Classical machine learning for quantum simulations: detection of phases, order parameters, and Hamiltonians.</i>	<b>15-19 April 2024</b>
<b>Invited talk</b> , Machine Learning and Quantum Physics Workshop, TU Wien Atominstutit & IQOQI, Obergurgl, Austria <i>Intepretable machine learning of phases of matter.</i>	<b>25-31 March 2024</b>
<b>Talk</b> , 792. WE-Heraeus-Seminar on Applications of Ultracold Rydberg Gases, Physikzentrum Bad Honnef, Germany <i>Towards learning interactions between Rydberg atoms from experimental snapshots.</i>	<b>23-28 July 2023</b>
<b>Invited talk</b> , American Physical Society March Meeting, Chicago, USA <i>Towards interpretable and reliable machines learning physics.</i>	<b>14-18 March 2022</b>
<b>Talk</b> , Quantum Optics X, Toruń, Poland <i>Magnetic and electric properties of ultracold molecular systems of increasing complexity.</i>	<b>6-10 Sept 2021</b>
<b>Talk</b> , ML in PL Conference, Warsaw, Poland <i>Can a learning machine teach us quantum physics?</i>	<b>22-24 Nov 2019</b>
<b>Talk</b> , 61st PTChem 2018, Kraków, Poland <i>Two interacting ultracold molecules in a one-dimensional harmonic trap.</i>	<b>17-21 Sept 2018</b>

**Seminars** at the Perimeter Institute Quantum Intelligence Lab (PIQuIL), Canada, Harvard University, Columbia University, Cornell University, University of Toronto, Max Planck Institute of Quantum Optics, Germany, University of British Columbia, JILA, Okinawa Institute of Science and Technology, Japan, University of Warsaw, Jagiellonian University, Poland, and more.