

Matthew Evans

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*decentralized data management • open science & software
materials discovery • ab initio calculations*

RESEARCH INTERESTS

My background in computational materials science has left me with an overarching interest in the application of machine learning, open source software & infrastructure, and data management practices to accelerate and enhance scientific workflows for discovery in the chemical and materials sciences.

EDUCATION

- 2016–2023 **PhD Physics**, (*submitted July 2023*), Theory of Condensed Matter Group, University of Cambridge
2015–2016 **MPhil Scientific Computing**, University of Cambridge, *Pass with distinction*
2011–2015 **MPhys Physics with Theoretical Physics**, University of Manchester, *First Class (Hons)*

SELECTED EXPERIENCE

- 2020– **Research Assistant** then **BEWARE Research Fellow** (2022 onwards)
Université catholique de Louvain and Matgenix, with Prof Gian-Marco Rignanese
- Co-creator and architect of [datalab](#), open source data management software for sample tracking and characterisation, lab management, and machine learning, deployed at several labs internationally.
 - High-throughput machine-learning accelerated workflows for materials discovery and design.
 - Leading development of the [OPTIMADE](#) API specification and associated software.
- 2021– **Visiting Researcher: Data management platforms for materials chemistry research**
University of Cambridge, with Prof Clare Grey FRS
- Developing bespoke data management platforms for materials chemistry and battery research.
 - Supervising contributions from a full-time software developer and providing user training.
- 2024– **Scientific Software Consultant and Director** (part-time)
[datalab industries Ltd.](#)
- Supporting the open source development of OPTIMADE and [datalab](#) via consultancy services.
 - Customisation and deployment of [datalab](#) for industrial R&D and academic labs.
- 2016–2020 **PhD student: Crystal structure prediction for next-generation energy storage**
University of Cambridge, with Dr Andrew Morris
- Computational materials discovery for conversion anodes for Li, Na and K-ion batteries.
 - Author of two open-source Python packages: database approaches for high-throughput calculations and materials design with [matador](#) and crystal structure prediction with [ilustrado](#).

COMPUTING

Languages	Python , Javascript, Vue.js, Fortran, C++	Tools	git , vim , Docker , Ansible , Terraform
Practices	Test-driven development , CI/CD , Cloud Automation , HPC	Expertise	Web APIs, databases, machine learning, high-throughput workflows

OTHER EXPERIENCE

- 2019 **Visiting Researcher: Machine learning for materials discovery**
Aalto University, with Profs Adam Foster & Patrick Rinke
- 2019 **Scientific Software Developer (Intern): Multi-objective optimisation**
Enthought Inc., Cambridge
- 2014, 2015 **UG research: Interactions of quantised vortices in superfluid helium**
University of Manchester, with Dr Paul Walmsley & Prof Andrei Golov
- 2013 **UG research: Hard sphere packing of nanotube-encapsulated fullerenes**
University of Nottingham, with Dr Ho-Kei Chan & Prof Elena Besley

SELECTED (AWARDS + HONOURS)

- 2022 BEWARE2 Fellowship from the Wallonia-Brussels Federation to fund 3 years of postdoctoral work (approx. €300,000).
- 2021 PI for “Interoperable data management for fundamental battery research”, BIG-MAP External Stakeholder Initiative, total funding €150,000 (personal allocation €50,000).

SELECTED (TEACHING + SERVICE)

- 2022–2024 Proposed and co-lead a MaRDA working group on metadata extractors for materials science.
- 2018– Reviewed manuscripts and data for *npj. Comp. Mater.* (x1), *Sci Data* (x1), *J. Phys.: Cond. Mat.* (x4), *Scientific Reports* (x1), *Digital Discovery* (x4), *Machine Learning: Science & Technology* (x2), and *Journal of Open Source Software* (x6)
- 2022– Organiser of the CECAM Workshop series *Machine-actionable Data Interoperability for Chemical Sciences* (MADICES, February 2022 and April 2024)
- 2019–2021 Demonstrator: Part II Computational Physics, 3x Part IB Intro to Computing, Cavendish Laboratory
- 2016–2018 Supervisor: 2x Part IB Electromagnetism, Dynamics and Thermodynamics, Selwyn College
- 2012–2015 Tutor: GCSE Maths & Key Stage 2 Programming for The Tutor Trust, Manchester

SELECTED RECENT PRESENTATIONS

- 2024 Invited talk (upcoming): *Decentralized materials research data management, curation and dissemination for accelerated discovery*, Democratizing AI in Materials Science — A Pathway to Broaden the Impact of Materials Research, MRS Fall Meeting, Boston, USA
- Contributed paper: *Optical materials discovery and design with federated databases and machine learning*, Faraday Discussions, University of Oxford, United Kingdom.
- Invited talk: *Federated, interoperable databases for accelerated materials discovery and design*, CECAM Flagship Workshop on MLIPs and Accessible Databases, Grenoble, France.
- 2023 Contributed talk: *Interoperable data management for fundamental battery research*, RSC Annual Advanced Battery Materials Symposium, Institute of Physics, United Kingdom.
- Invited talk: *Open Databases Integration for Materials Design* at the CECAM Flagship Workshop for FAIR and TRUE Soft Matter Simulations, Max Planck Institute for Polymer Research, Germany.
- Invited talk: *Open Databases Integration for Materials Design* at the Actively Learning Materials Science (AL4MS2023) workshop, Aalto University, Finland.

PUBLICATIONS

Underline indicates (joint) first authorship (reordered where appropriate). Full list available at <https://ml-evs.science/papers>.

18. **Evans, M. L.**, Rignanese, G.-M., Elbert, D. & Kraus, P. Datatractor: Metadata extractor interoperability in the chemical and materials sciences. (*submitted*), (2024).
17. **Evans, M. L.**, Eimre, K., Rignanese, G.-M. & Pizzi, G. optimade-maker: Automated generation of interoperable materials data APIs for enhanced discoverability. (*submitted*), (2024).
16. **Evans, M. L.**, Trinquet, V., Hargreaves, C. J., De Breuck, P.-P. & Rignanese, G.-M. Optical materials discovery and design with federated databases and machine learning. *Faraday Discussions*, (2024). DOI:[10.1039/D4FD00092G](https://doi.org/10.1039/D4FD00092G).
15. **Evans, M. L.**, Bergsma, J., Merkys, A., Andersen, C. W., *et al.* Development and application of the OPTIMADE API for materials data exchange and discovery. *Digital Discovery* **3**, (2024). DOI:[10.1039/D4DD00039K](https://doi.org/10.1039/D4DD00039K).
14. Rosen, A. S., Gallant, M., George, J., Riebesell, J., Sahasrabudhe, H., *et al.* Jobflow: Computational Workflows Made Simple. *Journal of Open Source Software* **9**, 5995, (2024) ISSN: 2475-9066. DOI:[10.21105/joss.05995](https://doi.org/10.21105/joss.05995). (2024).
13. Wang, Z., Gong, Y., **Evans, M. L.**, *et al.* Machine learning-accelerated discovery of A_2BC_2 ternary electrides with diverse anionic electron densities. *J. Amer. Chem. Soc.* **145**, 26412–26424, (2023). DOI:[10.1021/jacs.3c10538](https://doi.org/10.1021/jacs.3c10538).
12. Lertkiattrakul, M., **Evans, M. L.** & Cliffe, M. J. PASCAL Python: A Principal Axis Strain Calculator. *Journal of Open Source Software* **8**, 5556, (2023). DOI:[10.21105/joss.05556](https://doi.org/10.21105/joss.05556).
11. Jablonka, K. M., Ai, Q., Al-Feghali, A., Badhwar, S., Bocarsly, J. D., *et al.* 14 Examples of How LLMs Can Transform Materials Science and Chemistry: A Reflection on a Large Language Model Hackathon. *Digital Discovery*, (2023). DOI:[10/gswbnx](https://doi.org/10/gswbnx).
10. Ells, A. W., **Evans, M. L.**, Groh, M., Morris, A. J. & Marbella, L. E. Phase transformations and phase segregation during potassiation of Sn_xP_y anodes. *Chemistry of Materials*, (2022). DOI:[10/h69d](https://doi.org/10/h69d).
9. **Evans, M. L.**, Andersen, C. W., *et al.* optimade-python-tools: a Python library for serving and consuming materials data via OPTIMADE APIs. *Journal of Open Source Software* **6**, 3458, (2021). DOI:[10/gn3w9f](https://doi.org/10/gn3w9f).
8. **Evans, M. L.**, Andersen, C. W., Armiento, R., Blokhin, E., Conduit, G. J., *et al.* OPTIMADE, an API for exchanging materials data. *Scientific Data* **8**, 217, (2021). DOI:[10/gmnrxj](https://doi.org/10/gmnrxj).
7. Breuck, P.-P. D., **Evans, M. L.** & Rignanese, G.-M. Robust model benchmarking and bias-imbalance in data-driven materials science: a case study on MODNet. *J. Phys.: Cond. Mat.* **33**, 404002, (2021). DOI:[10/gpw93d](https://doi.org/10/gpw93d).
6. **Evans, M. L.** & Morris, A. J. matador: a Python library for analysing, curating and performing high-throughput density-functional theory calculations. *Journal of Open Source Software* **5**, 2563, (2020). DOI:[10/gmf4mv](https://doi.org/10/gmf4mv).
5. Harper, A. F., **Evans, M. L.** & Morris, A. J. Computational Investigation of Copper Phosphides as Conversion Anodes for Lithium-Ion Batteries. *Chemistry of Materials*, (2020). DOI:[10/gg5sx3](https://doi.org/10/gg5sx3).
4. Harper, A. F., **Evans, M. L.**, Darby, J. P., Karasulu, B., Koçer, C. P., Nelson, J. R. & Morris, A. J. Ab initio Structure Prediction Methods for Battery Materials : A review of recent computational efforts to predict the atomic level structure and bonding in materials for rechargeable batteries. *Johnson Matthey Technology Review* **64**, 103–118, (2020). DOI:[10/ggrmgf](https://doi.org/10/ggrmgf).
3. Mayo, M., Darby, J. P., **Evans, M. L.**, Nelson, J. R. & Morris, A. J. Correction to Structure Prediction of Li–Sn and Li–Sb Intermetallics for Lithium-Ion Batteries Anodes. *Chemistry of Materials*, (2018). DOI:[10/gf25zc](https://doi.org/10/gf25zc).
2. Marbella, L. E., **Evans, M. L.**, Groh, M. F., Nelson, J., Griffith, K. J., Morris, A. J. & Grey, C. P. Sodiation and Desodiation via Helical Phosphorus Intermediates in High-Capacity Anodes for Sodium-Ion Batteries. *Journal of the American Chemical Society* **140**, 7994–8004, (2018). DOI:[10/gdq6h4](https://doi.org/10/gdq6h4).
1. Zhu, T., **Evans, M. L.**, Brown, R. A., Walmsley, P. M. & Golov, A. I. Interactions between unidirectional quantized vortex rings. *Physical Review Fluids* **1**, 044502, (2016). DOI:[10/gf2529](https://doi.org/10/gf2529).