

Jan Brandejs

Work Experience

- 05/2026 Postdoctoral **researcher in computer science**
 - Prof. Alfredo Buttari, *Institut de Recherche en Informatique de Toulouse*, CNRS.
 - o Scaling a GPU-based tensor engine for structured sparsity to exascale with StarPU.
- 04/2022 - Postdoctoral **researcher in computational science**/theoretical chemistry
- 04/2026 Prof. Trond Saue, *Laboratoire de Chimie et Physique Quantiques*, CNRS, Toulouse. I architected and developed a novel tensor toolchain for an Advanced ERC grant:
 - o Enabled automatic optimization of tensor expressions in Coupled cluster method.
 - o **Distributed memory tensor contractions on GPUs**, excellent weak scaling.
- 01/2021 - fellowship+mobility grant. Prof. Örs Legeza, *Wigner RCP*, Budapest, Hungary.
- 12/2021 o I implemented high-performance **Tree Tensor Network State** method, C++.
- 10/2018 - HPC **C++** developer, **MOLMPS** package, part of my PhD, *J. Heyrovsky Inst.* Prague.
- 12/2020 o The first **MPI parallelization** of DMRG for chemists efficient to over 100 nodes.
 - o One of the three core developers.
- 01/2015 - **Founding Software Developer**, *SignoSoft*, Prague. signosoft.com. Part-time.
- 12/2018 o Using Recurrent Neural Networks, I built the first machine learning-based car insurance recommender for VIG inc.
 - o I architected and developed a multiplatform PDF signing app. Angular+Java server.

Project Spotlight: Tensor Lib Architecture for Science & LLMs

- 02/2026 certificate o I was awarded the **Marie Curie Fellowship Seal of Excellence** with a 92% score.
- o I architected a novel HPC tensor library for both fundamental science and **Large Language Model** (LLM) applications, targeting optimization for **Grace-Hopper** architecture.
- o Group theory-based problem encapsulation, graph theory-based load balancing.

Leadership, Community & Service

- 11/2025 PC member Member of the **Programme Committee Algorithms & Performance**. Selecting contributions. **ISC High Performance 2026**. *Hamburg, Germany*.
- 09/2025 main organizer **2nd Toulouse Tensor Workshop**. *Toulouse, France*. I envagelized and negotatied community standard interfaces and benchmarks for operations on tensors with known structure.
- 05/2024 main organizer **CECAM Workshop on Tensor Contraction Library Standardization**. *Toulouse, France*. I co-founded and led the workshop. Now leading a standardization **working group**.
- 2023-2025 MaProLab: I established a project-based **Machine learning** course for **Talnet network**.
- 2022-present Pioneered a weekly online **python course** for children of Ukraine war refugees. *PeopleInNeed*.
- 2021-2024 **Teaching**: **Technical University** Liberec. Lecturer: Introduction to Quantum Mechanics.

2019–2021 International Young Physicist Tournament. [National team Supervisor](#) & prep [course organizer](#).

Training

- 01/2026 [CExA Kokkos Hackathon](#), *Maison de la Simulation, Paris-Saclay*.
- 07/2024 [Gray Scott school](#). **CUDA, SYCL, OpenACC, C++20**, Fortran 2018. *Toulouse*.
- 11/2023 [LUMI hackathon](#). GPU profiling-Omniperf, compiling **OpenMPI**. onsite, *Krakow*.
- 06 & 10/2023 [2 Frontier hackathons](#). **Profiling multi-GPU** ExaTENSOR with HPCToolkit. Debugging OpenMP+MPI code. I proved a bug in Cray MPICH: Meetings with HPE still ongoing.
- 11/2022 [TREX HPC Training 2022](#). **StarPU**. *CALMIP, University of Toulouse, France*.
- 06/2022 [Deep learning with TensorFlow](#). *iFORM BALMA, Toulouse, France*.
- 09/2019 [Fundamentals of Deep Learning for Computer Vision](#). NVIDIA Deep L. Institute
- 11/2018 [Advanced OpenMP Programming](#). *PRACE, Ostrava, Czechia*.
- 11/2017 [Tensor Network School 2017](#). *Ghent University, Belgium*.

Technical Skills

- HPC **C++, MPI, OpenMP**, tensor operations, Fortran, C, CUDA, Python (NumPy, SciPy), SYCL, Kokkos, MATLAB, polyglot programs.
- AI & Machine Learning TensorFlow; Computer Vision; scikit-learn, Pandas, Foundational knowledge of Generative AI & LLM architectures (Transformers)
- Systems & Tools EuroHPC-class systems (LUMI, Adastral, Frontier, Summit, Karolina); GPU Profiling & Optimization (Omniperf, HPCToolkit); Schedulers (Slurm), valgrind, gdb4hpc.
- Web Java, C#, SQL, Angular/TypeScript, Javascript, PHP, HTML, CSS
- Debugging Found and helped fixing bugs in: Cray-MPICH, cuTENSOR, Cyclops CTF.

Top Publications & Conferences

- 02/2026 *J. Brandejs, T. Saue, A. Gomes, L. Visscher, P. Bientinesi*: Report on the second Toulouse report Tensor Workshop; [arXiv \[cs.MS\]](#). Submitted Feb 5, 2026.
- 02/2026 *G. Fabbro, J. Brandejs, T. Saue*: The nuclear **electric quadrupole moment of ^{87}Sr** from highly accurate molecular relativistic calculations; [arXiv:2602.00855 \[physics.chem-ph\]](#).
- 01/2026 *Jan Brandejs, Niklas Hornblad, Edward F. Valeev, Alexander Heinecke, Jeff Hammond, Devin Matthews, Paolo Bientinesi*: Tensor Algebra Processing Primitives (TAPP): Towards a **Standard for Tensor Operations**; [arXiv:2601.07827 \[cs.MS\]](#) + [reference implementation](#).
- 10/2025 NVIDIA Atomistic Simulation Summit 2025. *Santa Clara, USA*.
- 07/2025 *J. Brandejs, J. Pototschnig, T. Saue*: Generating coupled cluster code for modern **distributed memory tensor software**; *JCTC*, vol. 21, 15, 7320–7334

- 06/2025 *P. Sehlstedt, J. Brandejs, P. Bientinesi, et al.*: **Software Landscape** for DMRG; paper [arXiv:2506.12629](https://arxiv.org/abs/2506.12629). Shortlisted in 'good reviews' by Prof. Tomotoshi Nishino.
- 06/2025 **Best poster prize**, talk, '**customer**' session: TAPP - the BLAS for tensors. Recognized for presenting novel techniques at [Reusable libraries in quantum chemistry 2025 conference](#). *Helsinki, Finland*; led a hands-on session for HPC developers, demonstrating a commitment to enabling the scientific software community.
- 11/2024 **Best poster nomination**. [SC24 conference](#). *Atlanta, GA, USA*.
- 10/2024 *J. Visnak, J. Brandejs, M. Mate, L. Visscher, et al.*: **DMRG-tailored coupled cluster method** in the 4c-relativistic domain; *JCTC*, vol. 20 (20), p.8862–8875
- 06/2024 **Generating coupled cluster code** for modern distributed memory tensor software. *JCS8 Theoretical Chemistry Symposium*. *Hokkaido University, Japan*.
- 10/2023 contributed talk, 7th Users' Conference, IT4Innovations (**PRACE**). *Ostrava, Czechia*.
- 01/2021 *J. Brabec, J. Brandejs, K. Kowalski, et al.*: **Massively parallel** quantum chemical density matrix renormalization group method; *JCC*, vol. 42, p. 534-544, 2021.
- 04/2020 *J. Lang, A. Antalík, L. Veis, J. Brandejs, et al.*: **Near-Linear Scaling** in DMRG-Based Tailored Coupled Clusters; *JCTC*, vol. 16 (5), p. 3028–3040, 2020.
- 05/2019 *J. Brandejs, et al.*: **Quantum information-based analysis** of electron-deficient bonds; *J. Chem. Phys.*, vol. 150, p 204117, 2019.

Education

- 10/2016 - **PhD** in Theoretical Physics, *Charles University, Prague, Czech Republic*. **Tensor Network**-based Methods for Strongly Correlated Molecular Quantum Mechanics.
- 03/2022
- 03/2020 - **Erasmus traineeship**. Topic: Relativistic DMRG in MATLAB and C++.
- 06/2020 *Wigner Research Center for Physics, Budapest, Hungary*. Group of Örs Legeza.
- 10/2014 - Theoretical Physics, *Charles University, Faculty of Mathematics and Physics*.
- 09/2016 master's degree. Optimizing quantum simulations and the DMRG method.
- 09/2015 - 12/2015 Master's exchange program. **McGill University, Montreal, Canada**.
- 10/2011 - General Physics, *Charles University, Faculty of Mathematics and Physics*.
- 06/2014 bachelor's degree. Topic: **Quantum computing** in manybody physics.

Languages

<i>Czech</i>	native	<i>French</i>	independent user (B2)
<i>English</i>	proficient user (C2)	<i>Italian</i>	pre-intermediate