

TA2/IAL

Overview

Florian Bernlochner & Stefan Krieg



TA2 - Computational Physics & Innovative Algorithms Lab

- **Mission: Addresses major computational challenges in CmF**

- Lattice QCD simulations at exascale
- Higher-order perturbative calculations
- Large-scale experimental data analysis (HL-LHC, Belle II), **etc.**

- **Core methods & developments**

- Advanced Monte Carlo (multi-level MCMC, fast MC event generation, lattice)
- Machine Learning for simulation, tracking, PID, and holistic event interpretation
- Tensor Networks, Quantum Computing, and Algorithms for lattice gauge theory
- Computer algebra for higher-loop Feynman integrals, etc.

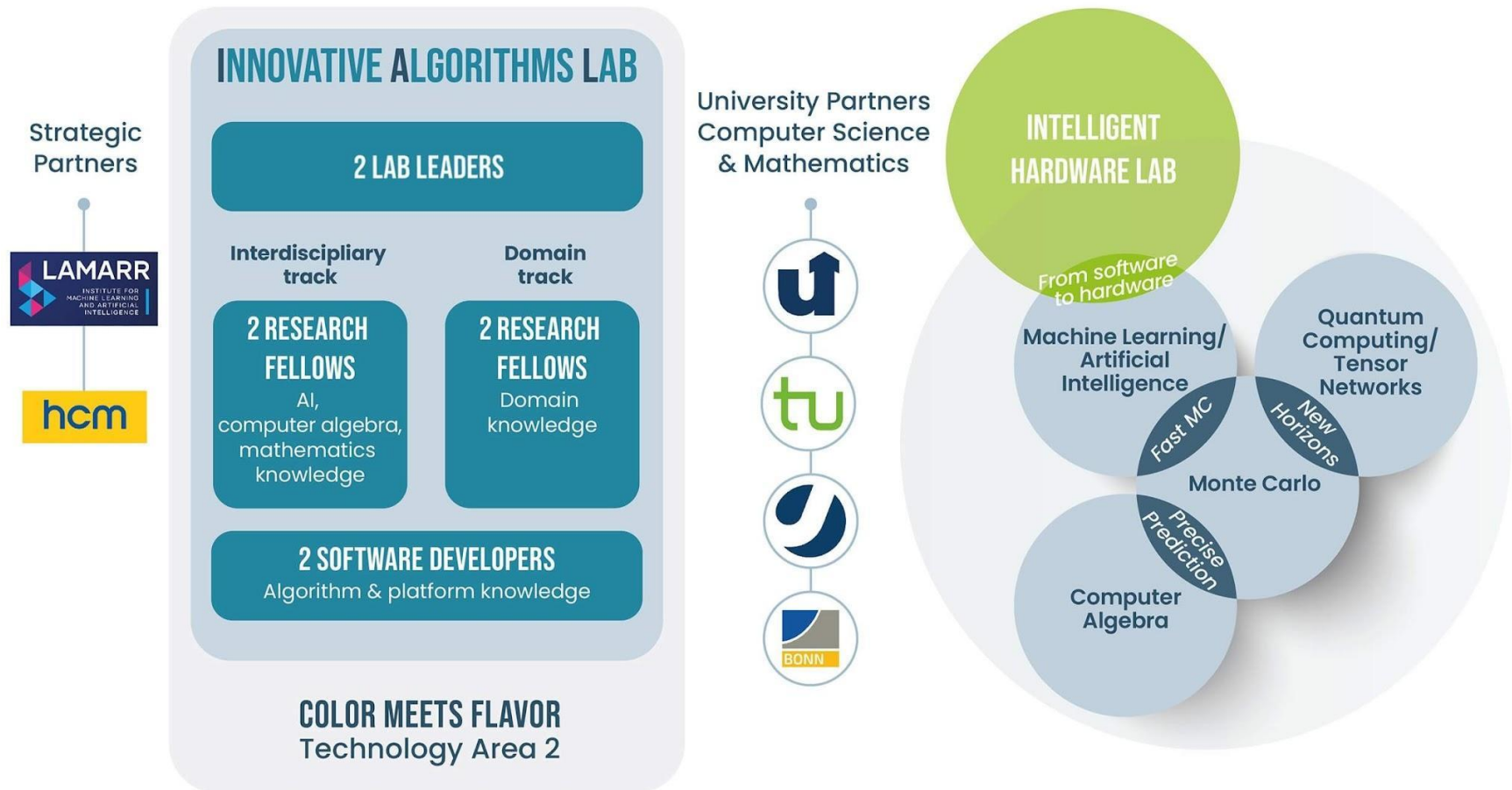
- **Goals**

- Break computational bottlenecks in RA1-RA4
- Develop fast, scalable algorithms for simulation & inference
- Create shared infrastructure for SMEFT/global fits, etc.

- **Resources**

- W3 Professorship “Computational Physics”
- 4 IAL Fellows + software support
- ~500 k€/year total funding incl. personnel

IAL figure (adapted)



+ 25k €/a Budget for the lab

Fellow Staging Scheme

2(+1)* year scheme

	2026													
	Q12	Q34	Q12	Q34	Q12	Q34	Q12	Q34	Q12	Q34	Q12	Q34	Q12	Q34
Fellow 1	1													
Fellow 2	2													
Fellow 3			3											
Fellow 4			4											
Fellow 5	5													
Fellow 1 CmF2														
Fellow 2 CmF2														
FTE	2		4		4		4		4		4		4	

*the +1 is not shown, but would imply that we would postpone the hiring of e.g. one or more fellows

Fellow candidates

Distribution

- HEPex: 19
- HEPlat: 2
- HEPth: 1
- ML/CS: 2
- Astro: 1

Ideal outcome: 1 HEPex, 1 HEPlat/-th (w. NuMeriQS), 1 ML/CS

Very strong candidates (@ first review): 1 HEPex, 1 HEPlat, 1 HEPth, 1 ML/CS

Conveners will approach further PI to settle on a short list of 4-6 candidates for interviews

Computing and ML

Computing

- FZJ has promised dedicated resources, which have to yet be allocated
- A CmF project will be created with resources on CPU/GPU etc.
- CmF users will have to create a “judoor” account (judoor.fz-juelich.de)
- Afterwards they will be able to request access

ML frontier models, Software Licences and API access

- Plan: obtain licenses from OpenAI (GPT 5.6 Sol etc.) and Anthropic (Fable etc.) for both user software (“seats”) **and** API access
- Start with small setup (5-10 licenses, increase if demand is large)
- Initially funded from IAL budget
- FZJ data protection and security officers & legal dept. have signed off **today!**
- Blablador (<https://blablador.fz-juelich.de>) will host **large** open models soon
- KI:connect.nrw for all NRW universities - no API yet

Further topics

RSE / Software developer / Technician

- Not yet decided: funding in Bonn
- Positions in Dortmund hinge on new professorships

PUNCH4NFDI 2.0

- Consortium successfully extended
- 4 FTE @ Bonn; 3 FTE @ FZJ
- Development of RDM solutions for HEP (ex+th+lat) & Astro
- Attach to IAL?

Lecture week & events

- Start Winter 2026/2027
- Hinges on critical mass