

FM 61: Industry III: The Future of High Performance Computing (Presentations plus Panel Discussion)

Session organized by the Working Group on Industry and Business (AIW) of German Physical Society, starting with three short presentations, followed by a 90 minute panel discussion on the future of high performance computing.

Time: Wednesday 16:30–18:30

Location: Aula

FM 61.1 Wed 16:30 Aula

The future of computing: Technical background and reasoning for a future memory-driven computing architecture & The Machine research project — ●MARTIN BRENECKE — Hewlett Packard Enterprise

Data explosion, exponentially parallel mass data processing, NP hard problems and the end of Moore's Law require new concepts for the future of standardized and open computing infrastructures. Leaving the von-Neumann-model behind, a different architecture is required to build future computing devices of any size and scale. Using a memory-centric computing model instead, with a non-proprietary photonics-enabled bus, enables the effective usage of specialized units like ASICs, FPGAs or upcoming technologies like commoditized quantum computing devices within standardized and commonly acquirable infrastructures. Get a view into industry research on memory-driven computing, the research project The Machine, the prototyping with the German Center of Neurodegenerative Diseases (DZNE) and the current state of technology development from Hewlett-Packard Labs.

FM 61.2 Wed 16:40 Aula

Quantum and quantum-inspired algorithm for Finance, Insurance and Energy — ●MARKUS BRAUN — JoS QUANTUM, Frankfurt am Main, Germany

Many problems in finance, insurance and energy can be condensed to mathematical problems that cannot be solved exactly. Solutions can often only be approximated by applying heuristics to the numerical

models. JoS QUANTUM brings quantum and quantum-inspired algorithms to finance, insurance and energy to tackle computational bottlenecks. Quantum or quantum-inspired algorithms can achieve better performance than classical algorithms, by giving correct results with a lower complexity in the expected number of steps. This talk gives (i) an overview of possible business cases for quantum algorithms in finance, insurance and energy, (ii) a small introduction of JoS QUANTUM and the developed software grundzustand and (iii) the current limitations as expectations for the future of quantum computing in finance, insurance and energy.

FM 61.3 Wed 16:50 Aula

Using quantum computers to simulate molecules and solids — ●MICHAEL MARTHALER — HQS Quantum Simulations

Quantum computers offer tantalizing possibilities, but are currently strongly limited by their intrinsic sensitivity to errors. We discuss the prospects of using a near term processor containing 50 to 100 qubits to perform ab-initio simulations of materials. At present, the overhead for quantum error correction is so large that it cannot be implemented for near term quantum computers. This means applications have to be planned with the limitations imposed by errors in mind. Material simulations seem to be the most promising near term applications. We discuss how simulations would be performed on quantum computers and how this relates to existing methods in quantum chemistry.

Panel discussion