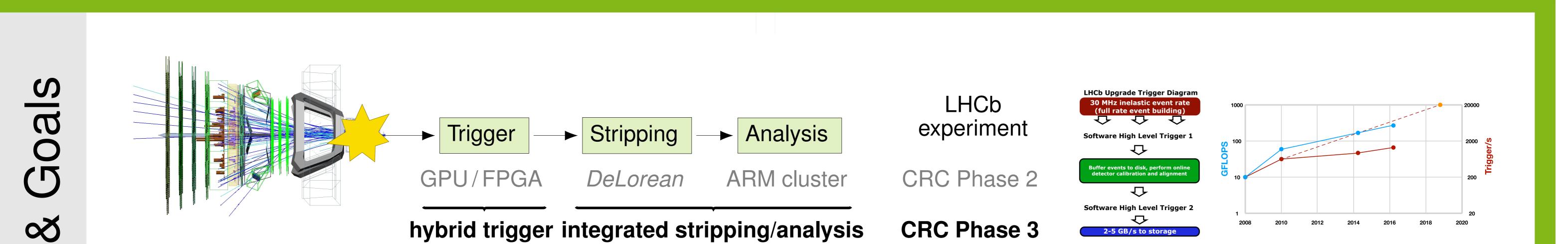


SFB 876 Providing Information by Resource-**Constrained Data Analysis**



Project C5 Real-Time Analysis and Storage of High-Volume Data in Particle Physics

Prof. Dr. Bernhard Spaan, Prof. Dr. Jens Teubner



Goals of Track 2

- Development of an intelligent, hybrid Trigger
- Evaluate the possibility to derive trigger decisions based on raw data
- Exploit heterogeneity to boost algorithm/performance

Additional Challenges

- Trigger performance does not scale according to Moore's Law
- Strict and high bandwidth requirement

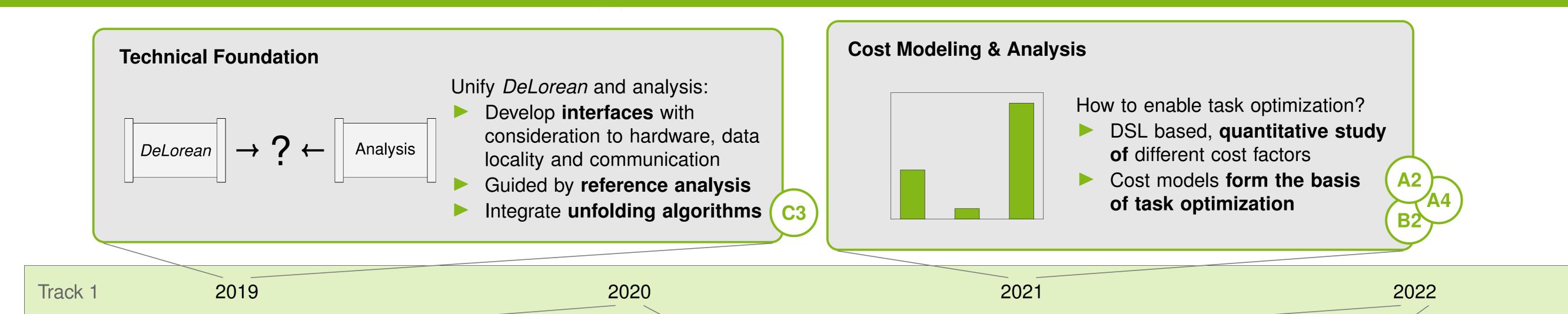
Common Goals

- Generalization of concepts of Phase 2
- Fullfill production performance constraints
- Ensure correctness by reference analysis
- Solution that can be used in practice

Goals of Track 1

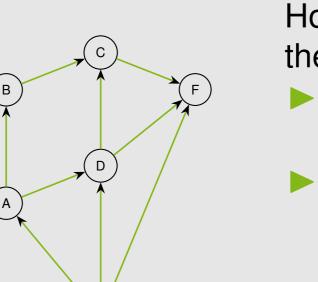
Integrated pipeline for *DeLorean* & Analysis

- Resource-aware and user-friendly control of the system
- Exploit heterogeneity in a large scale



Researc Planned

Task Representation



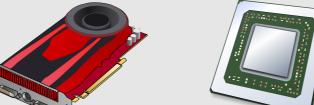
How to express (analysis) tasks in the language of physics?

- Reference analysis \rightarrow general analysis use cases
- Develop **Domain-Specific** Language (DSL) to represent analysis tasks
- Enable automatic reasoning/optimization

Heterogeneous Hardware

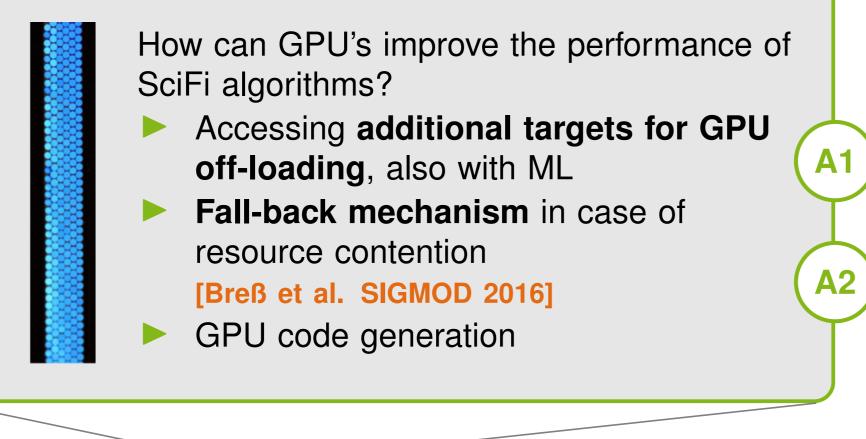
Embrace heterogeneous hardware:

Heterogeneity adresses hardware scaling issues ...



- ... but requires **specific** adaptation of system components, task representation and models
- Consideration over many nodes

Hybrid SciFi



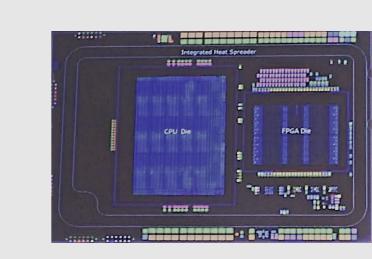
2019

Generalisation

How to exploit hybrid hardware by applying domain knowledge?

- SciFi tracking \rightarrow general tracking
- **On-demand processing** of RICH information to reduce latency

Hard-Software Co-Design



How can dynamic resource allocation increase performance?

A1

C3

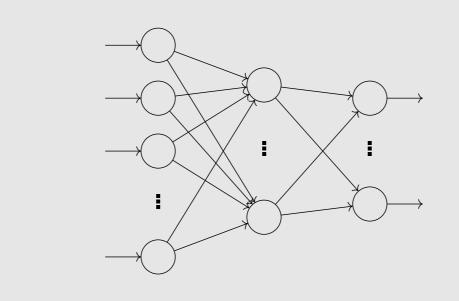
- Design and utilize **FPGA-based algorithms**
- Development of **dynamic** algorithm-placement strategies

Track 2

2021

2022

Trigger Decision based on Raw Data



2020

Can heuristics replace full fledged reconstruction?

- Learn to filter & reject events (without reconstruction)
- Investigate machine learning (approaches



