



Expertise Gaining & Maintaining

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- Input for discussion -

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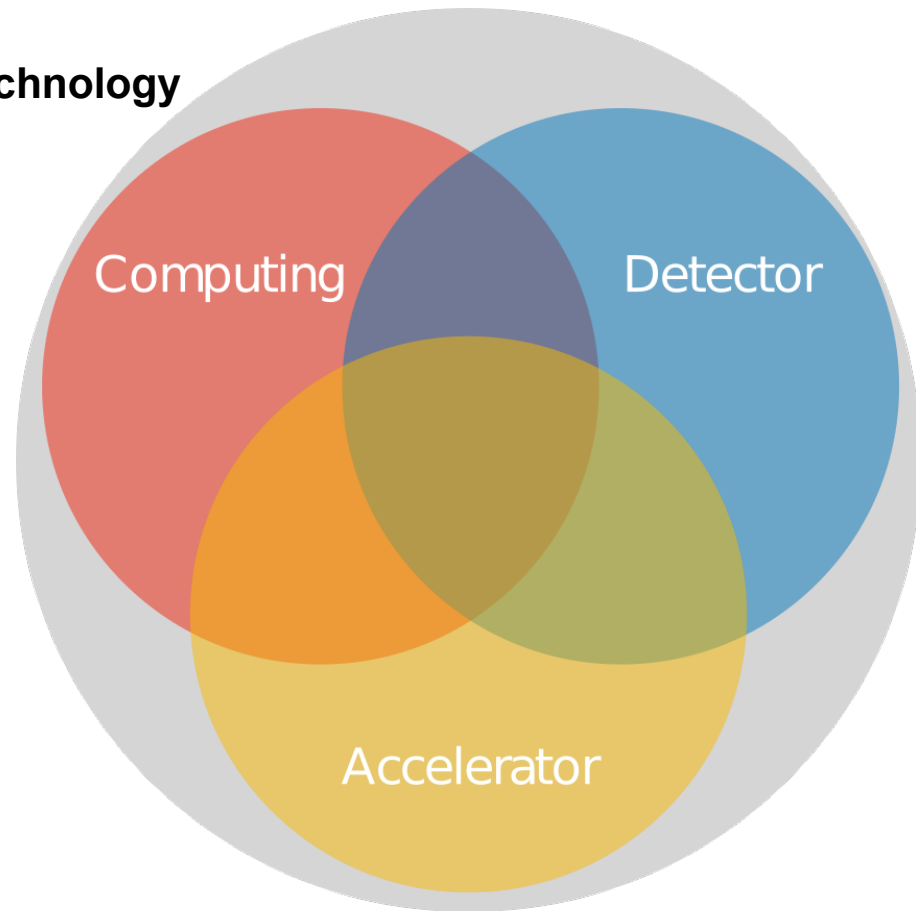
Enabling Sciences for HEP, Astrophysics ..

Progress in (exp.) HEP & Astrophysics depends on technology

- More powerful accelerators
- Fast and precise detectors
- Modern computing and software tools
- Rapidly developing fields

Computing in HEP

- Advanced algorithms for analysis
- Large scale systems for processing
- Real time applications for DAQ & trigger



Gaining Expertise

Relevant fields

- General coding skills
 - C++ still very relevant for experiment frame works, simulation, reconstruction and online applications
 - Python is popular for later (almost interactive) analysis and many Machine Learning approaches
 - Other languages with for web services or special tasks: Go, Java, FORTRAN :-) ...
- Programming technologies for accelerators and dedicated hardware
- Recent IT technologies: virtualization, containers, general Unix/Linux admin tools
- Knowledge about Grid middleware

Teaching and Training

- What (basics) can we teach already during studying?
- Constant evolution of (most existing) training programs and schools for relevant technology

Relation to neighboring sciences and companies

- Faculties of computer science or maths
 - Have scientists or students from neighboring fields participating in our projects
- There could be companies willing to collaborate

Maintaining Expertise: Projects

Attractive projects

- Modern technology
 - Applicable also outside the project (even beyond HEP, Hadron- or Astrophysics, e.g. private sector)
- Larger group of people
 - Exchange of experience
 - Cross training
- Important and visible inside the collaborations or research communities

Sustained projects

- Like a detector software and software services require maintenance, operations and support
- Opportunities for long-term funding
- Institutional knowledge

Maintaining Expertise: Recognition

Recognize computing and software as *scientific* contributions

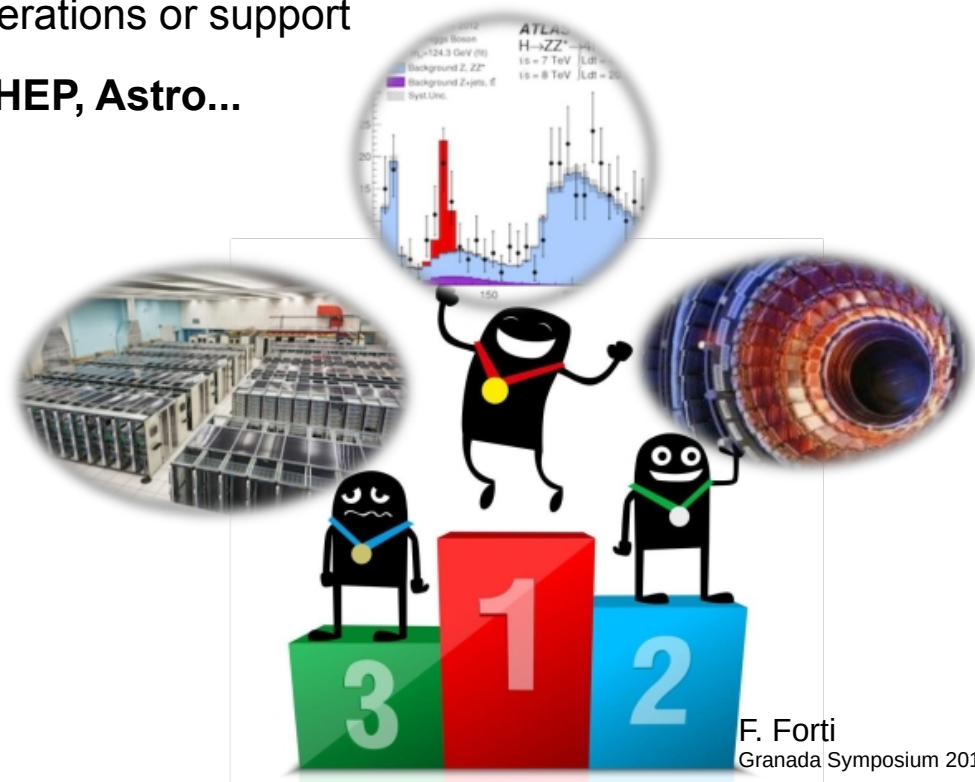
- Applies for development and responsibilities for operations or support

Career perspectives for computing and software in HEP, Astro...

- Permanent positions / tenure track
 - Professorships
 - Staff positions
- Proposed ErUM tenure track program

Learning from detector area

- There are such positions



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Granada Symposium 2019