# JuliaHEP WG Meeting

JuliaHEP WG

- The JuliaHEP **HSF working group** created after CHEP 2023 to channel community efforts to evaluate and introduce Julia language in HEP
- The kick-off for the working group was the Workshop in Erlangen
  - See next slides
- We plan to have monthly topical meetings like this one
  - Indico category
- Everyone is welcome to join the community and participate, contribute, to the organised meetings
  - In particular, propose or volunteer for topics to be presented
- The JuliaHEP organisation website is http://www.juliahep.org
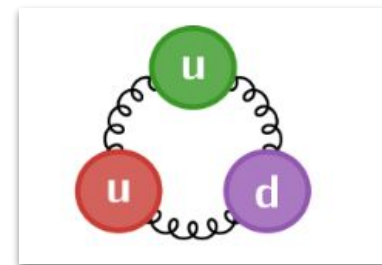
JuliaHEP Workshop

- First [JuliaHEP workshop](#) organised in Erlangen, Germany
  - 4 full days (6 to 9 of November)
  - 20 people in person + ~30 people remote
  - An agenda composed of tutorials, keynote presentations, long and short presentations
  - Contributions from key Julia developers (including one of the language founders, Stefan Karpinski)
  - Plenty of time for discussions

- The videos will be published to the HSF YouTube channel: https://www.youtube.com/@HEPSoftwareFoundation
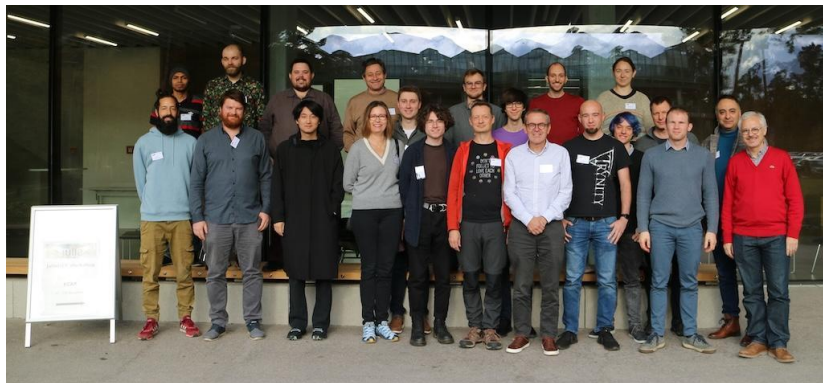
Workshop Outcome

- The last session of the WS was devoted to discuss what developments are missing that would help the adoption of Julia by the HEP community
- It is obvious that we **need to interoperate with existing software**
    - Examples: ROOT, Minuit, FastJet, Geant4, Pythia8, other MC generators, etc
    - Essential to write RNTuples
    - Improve WrapIt (templates), automate wrapper generation, etc.
- Packages needed for **Data Analysis**
    - Writing RNTuple (Arrow.jl is already available)
    - Reading HepMC3 (JuliaHEP/LHEF is already available)
    - Reading top level histograms and interoperation with FHist.jl or a better one
    - Statistical standards (maybe HS3 as starting point). HistFactory support
- General **HEP libraries and interfaces**
    - LorentzVector interfaces, PDG data, HEP plotting recipes (Makie.jl, Plots.jl, RecipesBase.jl)

Workshop Outcome (2)

- **ML in HEP**
  - AD applications: differentiable particle simulation (for parameter optimization), maybe Geant4 (stand alone implementation, source code pending)
  - Differentiable Histograms (maybe hard, also unclear benefit right now)
  - Julia ML frameworks (e.g. MLJ.jl and Flux.jl) seem to be ready to be used in HEP. Need to develop examples/tutorials to show this

- **HPC in HEP**
  - Very good tooling for single node. Multi-node seems complicated. Need to check ClusterManagers.jl, RemoteREPL.jl, etc.
  - For GPUs, is CUDA.jl, AMDGPU.jl, oneAPI.jl, etc. Ready? Need to develop tutorials
  - More training

Workshop Outcome (3)

- Workflows in Julia
  - Is there a Snakemake equivalent in Julia?
  - Is there a xyzpy equivalent?
- Documentation and Training
  - Agreed to **develop more tutorials** on the JuliaHEP website and HSF website
  - The idea of developing the **JuliaHEP primer**
- What Next?
  - **Monthly JuliaHEP** community meeting with topical agendas
  - Next workshop at CERN end of September 2024