MC Developers Perspective

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MCWG kickoff
2024-11-14

Outline

- The Monte Carlo Event Generator Developer community
- Recent developments
- MCWG expectations

The MCEG Community

Developing a generator used to be the job of one person (± 2)

Typically a theoretician trying out ideas for pheno models

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The real game changer came with three consecutive (almost) MSCA doctoral network grants and the formation of MCnet.

MCnet MSCA network outcomes

- PhD studentships ($\sim$ 25)
- Network meetings ($\sim$ 25)
- MCnet summer schools (17)
- Short-term students ($\lesssim$ 100)

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Becoming a Community

MCnet post-MSCA funding

The MCnet *Collaboration* still exists

- Now an *Open* collaboration
  (no longer limited to the grant beneficiaries)
- Still organising Summer Schools
  (CERN 2024, Possibly Scotland 2025)
- New short-term studentship program
  (funding from LPCC and the NextGen Trigger project)
- We now have a sibling in the US
  (Monte Carlo General Education Network — MCgen)

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LPCC/MCnet short-term students

MCEG-related limited-time projects for PhD students (experimental, theory, or software)

- Anyone can suggest a project
- MCnet evaluates the proposals
- LPCC (MLM) decides if they can be be funded
- MCnet announces and selects students

The first round of *shorties*:

- Collective effects in Pythia using GPUs (Lund)
- Q/G discrimination (Manchester/Krakow)
- LO$\rightarrow$NLO reweighting (Lund)
- Efficient SM calculations (UCL/Monash)
- CVolver and Hadronisation (Graz/Manchester)

Will soon be announced on www.montecarlonet.org

Also MCgen will have shorties

Home Schools Fellows Contact

MCgen

Monte Carlo General Education Network

Github

About

Particle and nuclear physics (PNP) are fundamentally probabilistic due to quantum mechanics, and rely on complex Monte-Carlo (MC)-based simulators to make stochastic predictions for nearly all aspects of experimental design and data interpretation. In fact, most branches of science and engineering rely heavily on MC simulations for solving difficult problems, from modeling traffic flow to predicting weather patterns; in the rapidly emerging fields of machine learning and quantum computing, MC methods are essential. Progress in these areas requires developing, validating, and deploying novel and efficient MC algorithms. However, many algorithm curricula focus on deterministic methods, with MC techniques covered only in passing, leading to a gap between knowledge and required skills for junior researchers. The goal of MCgen program is to fill this knowledge gap by training graduate students and junior postdoctoral researchers in the development of MC models with traineeships and schools focused on real-world PNP problems.

We were inspired in part by the highly successful MCnet in Europe.

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MCgen

mcgenednet.github.io

What do we expect from the MCWG

- Improved communication
  Experiments $\leftrightarrow$ Theory $\leftrightarrow$ Software.
- Projects, workshops and task forces
- Sustainability, policies, standardisation

Communication

- Improve turn-around in release cycles
- What do experiments need, what can MCEGs offer?
- What do generators need, what can experiments provide ?
- Profiling, code analysis, monitoring
- ...

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* = implement in Rivet

Projects/workshops

- Acceleration
- Machine learning
- Multiweights/biasing
- Tuning (mcplots)
- NLL/EW/BSM showers, M&M
- Primary particle definitions (in Rivet)
- UPCs
- Colour reconnections
- ...

Sustainability/Interfaces

- Sustainability of the generation tool chain ($\rightarrow$ HSF)
- Making gitlab.cern usable for MCEGs (CI/CD)
- Standardisation/interfaces: HepMC3, LHEF, ...
- Policies, white papers,
- Point of contact between MCEGs and CERN

Thank you!