US HFCC meeting



Using AI agents for tasks

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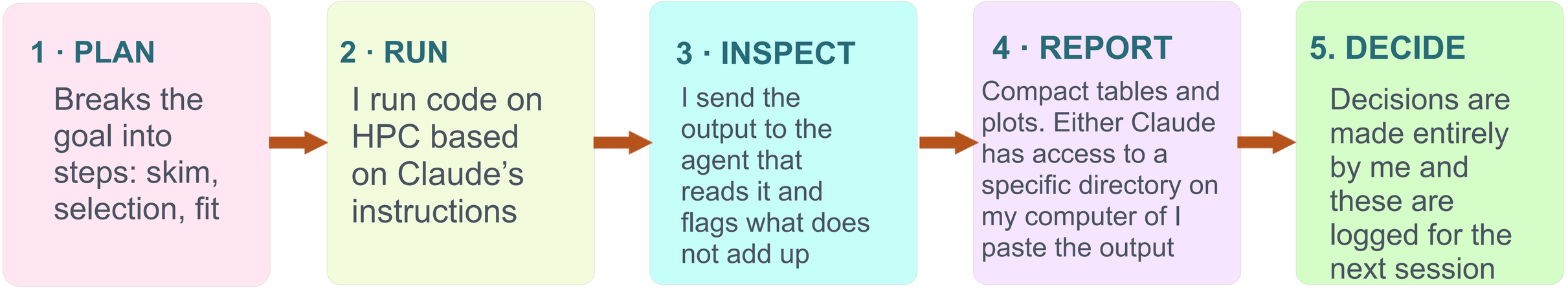
The model that works for me

- Tackle varied tasks:
  - Designing a workflow to merge two different pieces of software (WarpX and bilevel optimization)
  - Running Monte Carlo generators with different configurations (different processes, different EFT operators)
    - Running parton showering and Delphes in the pipeline
- Run analysis code (can vary greatly based on the physics that I am after) on the output files
- Often produce csv files that are then analyzed on my computer by AI-agents
- Production jobs typically run on HPCs
- Environment conflicts are rarely ever handled by me (NERSC documentation of modules is excellent)
  - I use Claude (simply because I have access to frontier models through their MAX plan)
  - Claude runs on my computer
  - Typically I run code while I design workflows and analysis code with Claude
- All of the workflow and projected outcome designed as a markdown file for Claude

The model that works for me



- For running MC generators (Madgraph_aMC@NLO), if I want to double check a particular syntax (very specific to a model or a process), Claude runs the generator in its cloud space and checks the physics before suggesting a change in syntax
  - No reliance on any previous documentation! Code is documentation!

A few changes to a traditional workflow

Fail fast

Start with pilot samples and see where they are insufficient

Internal analysis records

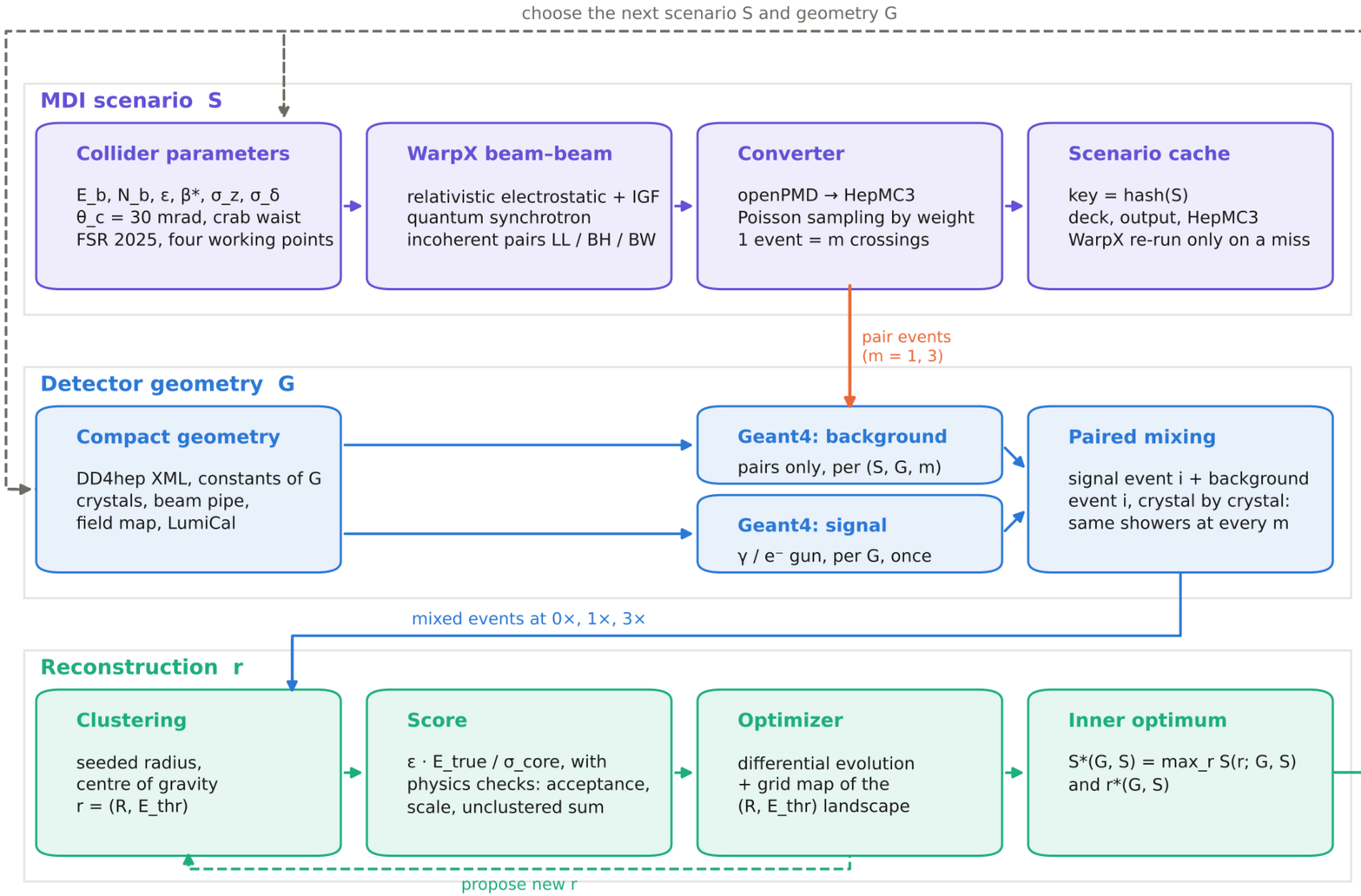
Maintained by Claude, can often be handover for long context windows

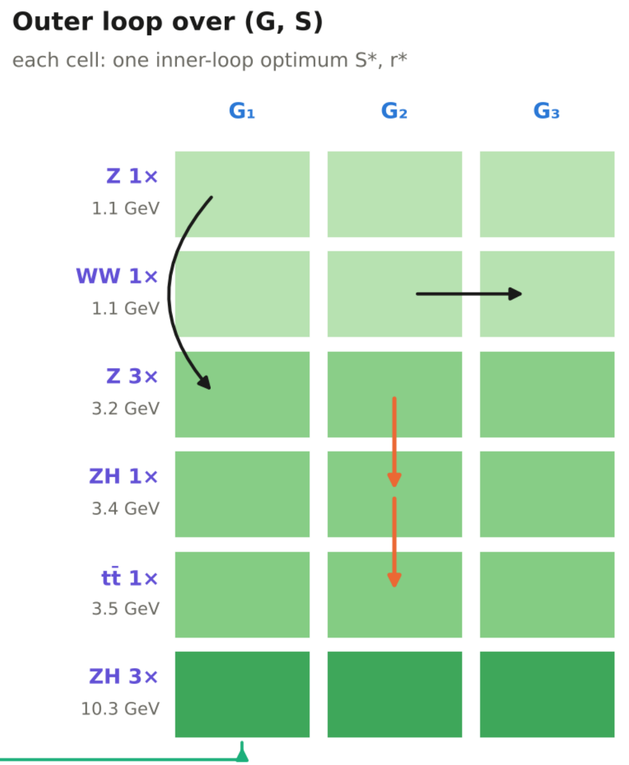
Prevent any unnecessary optimization

Stop overenthusiastic agents even if optimization is technically correct

- Key is the build the agents' memory: the agent is a second reader with a perfect memory for tables, plots and the cross-references
- Get around any kind of stochastic issues with output by saving code
  - Use this code in a new session
    - Extends to code for Feynman diagrams, event displays, even blender based 4K videos

An example workflow





warm starts: r* carried from a solved cell

black: next background level or geometry

orange: same background energy in the crystals

rows ordered by that energy, not by √s