Jet Reconstruction with Julia

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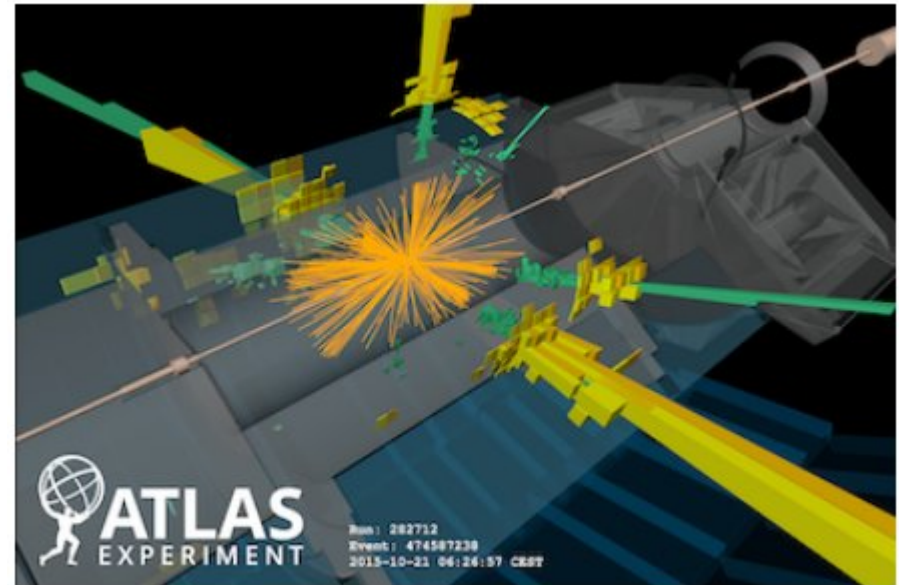*National University of*
Kyiv

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Graeme A Stewart
CERN

Jet Reconstruction

In hadron colliders, there are cascades of secondary particles, which are captured in the calorimeters. These particle cascades are called jets.
The task is to reconstruct energies of the primary particles by clustering.
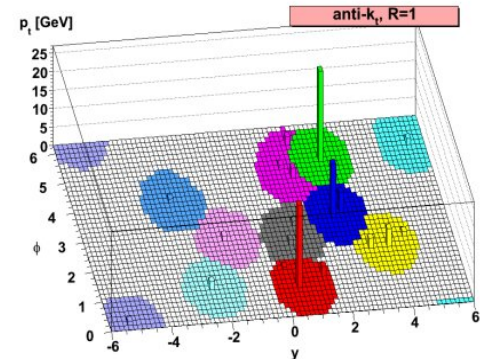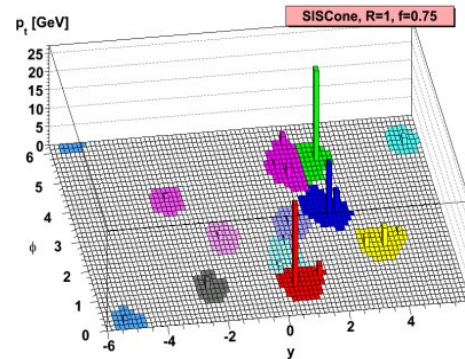

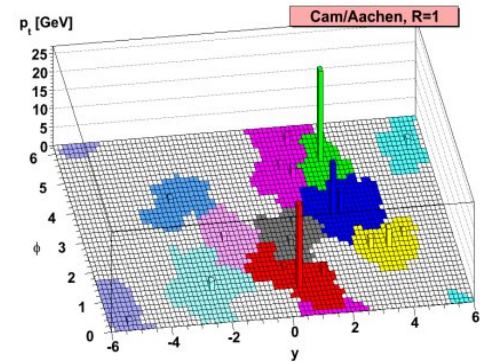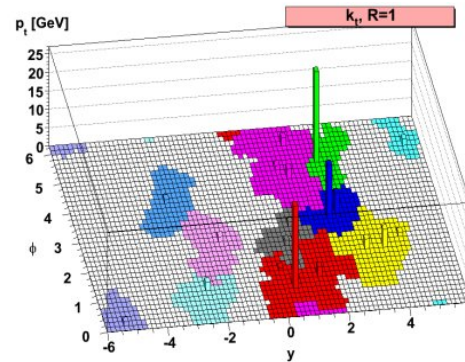ATLAS Event Display with multiple jets, © ATLAS

The Anti-Kt Algorithm

- Algorithm defines the jets
- Anti-Kt is IRC-safe and mostly produces jets of conic shapes
- Iterative process involving computing distances

$$d_{ij} = \min(k_{ti}^{2p}, k_{tj}^{2p})\frac{\Delta_{ij}^2}{R^2} \,,$$

$$d_{iB} = k_{ti}^{2p} \,,$$
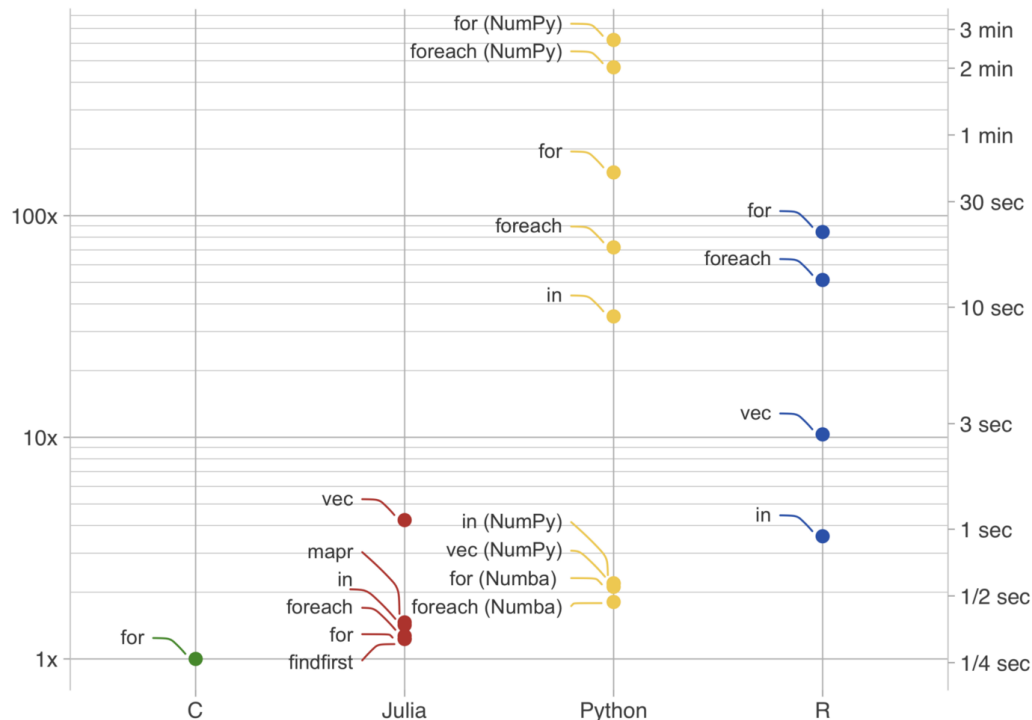
$$\Delta_{ij}^2 = (y_i - y_j)^2 + (\phi_i - \phi_j)^2$$

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Why Julia

- Python & C++ → Julia
- Simple and efficient
- Perfect for Physics and Mathematics

(towardsdatascience.com/r-vs-python-vs-julia-90456a2bcbab)

Goals & Status

Goals:
- Anti-Kt in Julia
- Efficient jet reconstruction with native Julia methods and no porting
- Usable Julia package (with support for custom structures and algorithms)
- Comparison to FastJet (the C++ golden standard)