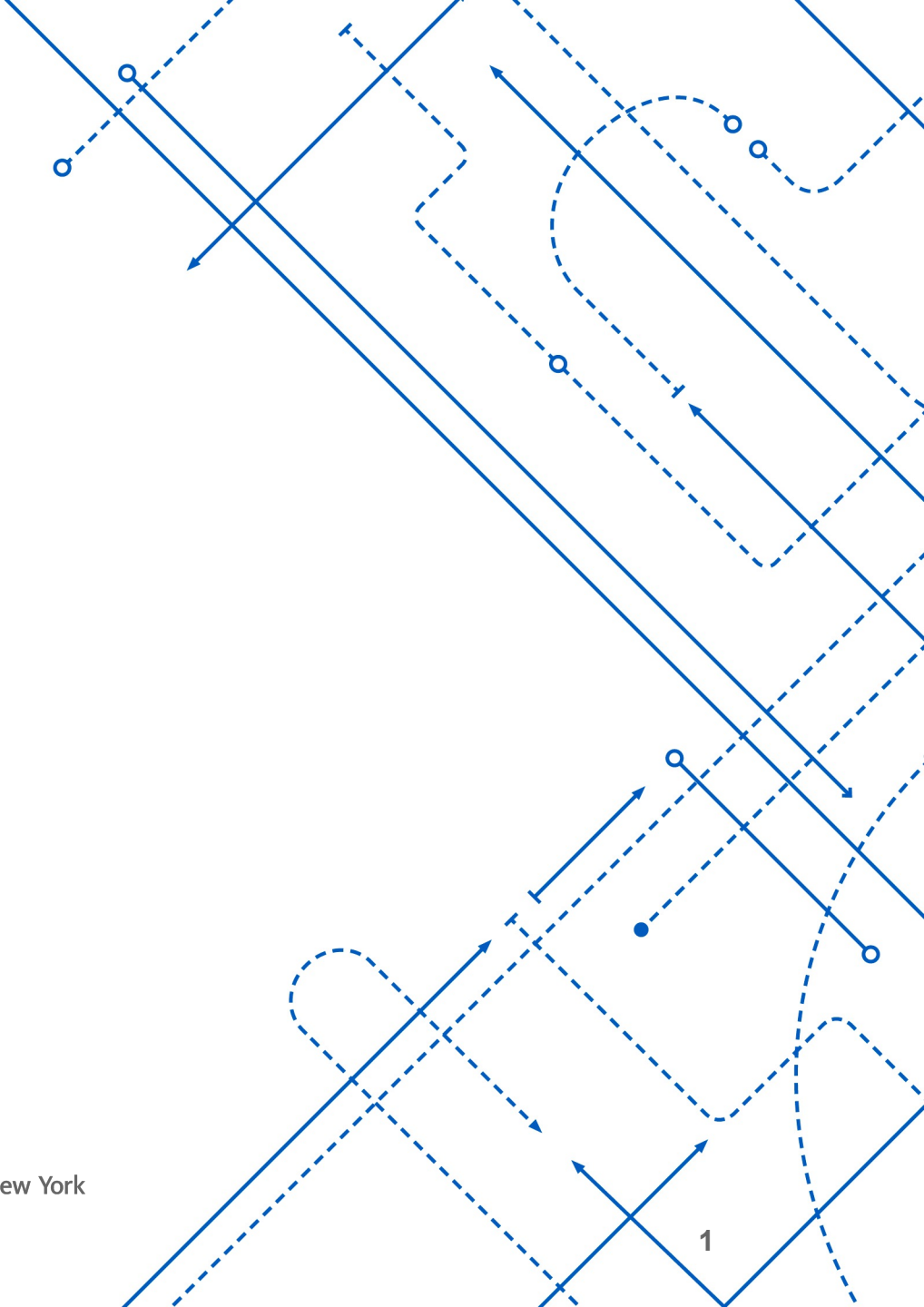


# FASTJET TUTORIAL

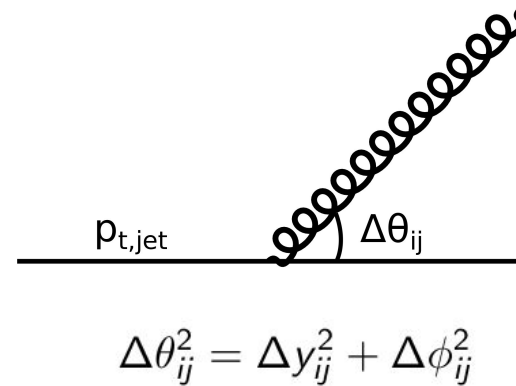
Salvatore Rappoccio



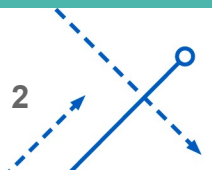
## Jet definitions: the kT family of algorithms

- Recursively cluster partons with smallest distance between them

$$d_{ij} = \min(p_{t,i}^{2p}, p_{t,j}^{2p}) \frac{\Delta\theta_{ij}^2}{R^2}$$



- Stops (roughly) when  $d_{ij} \gtrsim (p_{t,i})^{2p}$



# What is fastjet? <http://fastjet.fr>

## Dispelling the $N^3$ myth of the kT jet finder

READ THIS PAPER

- Phys.Lett. B641 (2006) 57-61 (Cacciari and Salam)
- Implements sequential clustering algorithms
- Utilizes algebraic geometry to reduce time from  $N^3$  to  $N^2$  or  $N \ln(N)$ 
  - Instead of looking at all neighbors, looks at closest in the distance metric

Read these papers too:

[The Anti-k\(t\) jet clustering algorithm.](#)

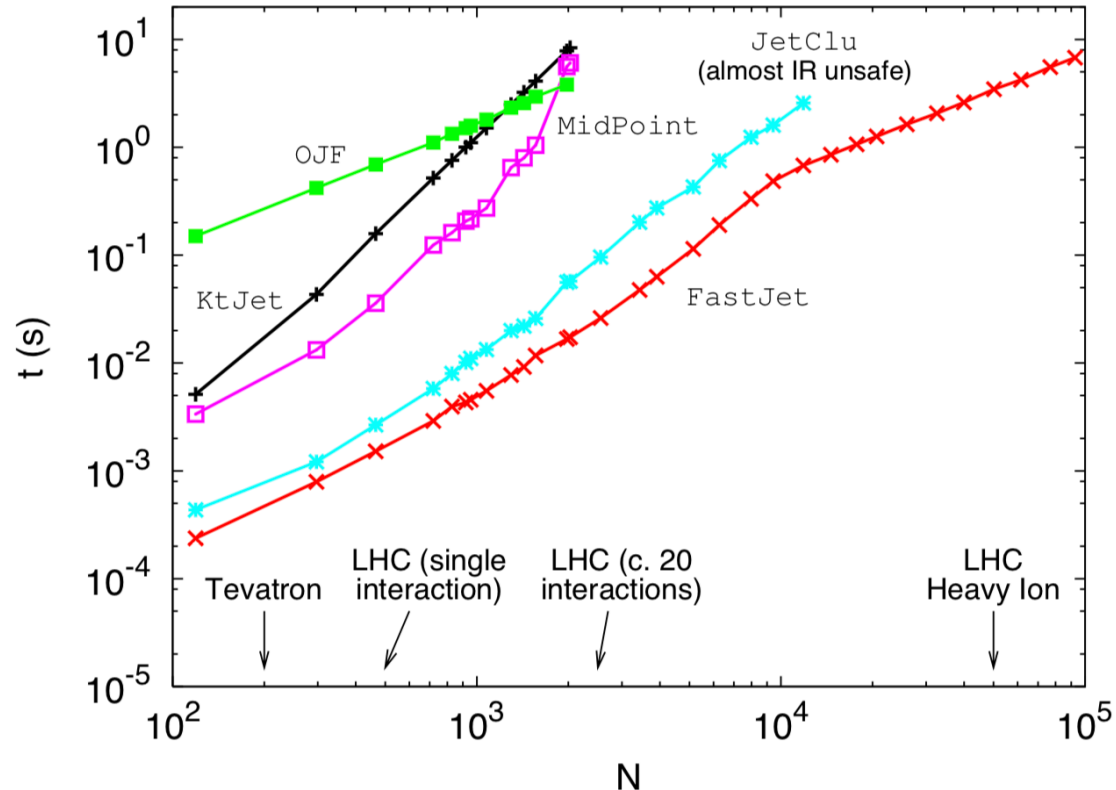
Cacciari, Salam, Soyez.

[The Catchment Area of Jets.](#)

Cacciari, Salam, Soyez.

[Pileup subtraction using jet areas.](#)

Cacciari, Salam.

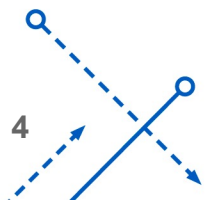


# What is fjcontrib? <http://fastjet.hepforge.org/contrib/>

- 3rd party extensions of fastjet

Package	Version
ClusteringVetoPlugin	1.0.0
ConstituentSubtractor	1.2.7
EnergyCorrelator	1.3.1
FlavorCone	1.0.0
GenericSubtractor	1.3.1
JetCleanser	1.0.1
JetFFMoments	1.0.0
JetsWithoutJets	1.0.0
Nsubjettiness	2.2.5
QCDAwarePlugin	1.0.0
RecursiveTools	2.0.0-beta2
ScJet	1.1.0
SoftKiller	1.0.0
SubjetCounting	1.0.1
ValenciaPlugin	2.0.0
VariableR	1.2.1

mMDT/soft drop →



# How to use them?

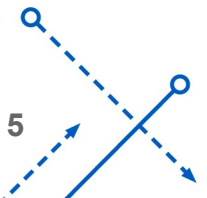
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- **Baseline instructions:**

- <http://fastjet.fr/quickstart.html>
- <http://fastjet.hepforge.org/contrib/>

- **Our docker image:**

- github: <https://github.com/rappoccio/fastjet-tutorial>
- Docker: <https://hub.docker.com/r/srappoccio/fastjet-tutorial/>



# Exercises

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- **Clustering with fastjet (C++)**
- **Clustering with fastjet and areas (C++)**
- **Grooming with fastjet-contrib (soft drop/ mmdt) (C++)**
- **Clustering and grooming MC events with PYTHIA8 (C++)**
- **Clustering with fastjet (python — new feature in 3.3.0!)**
- **Note: No fj-contrib in python yet!**

