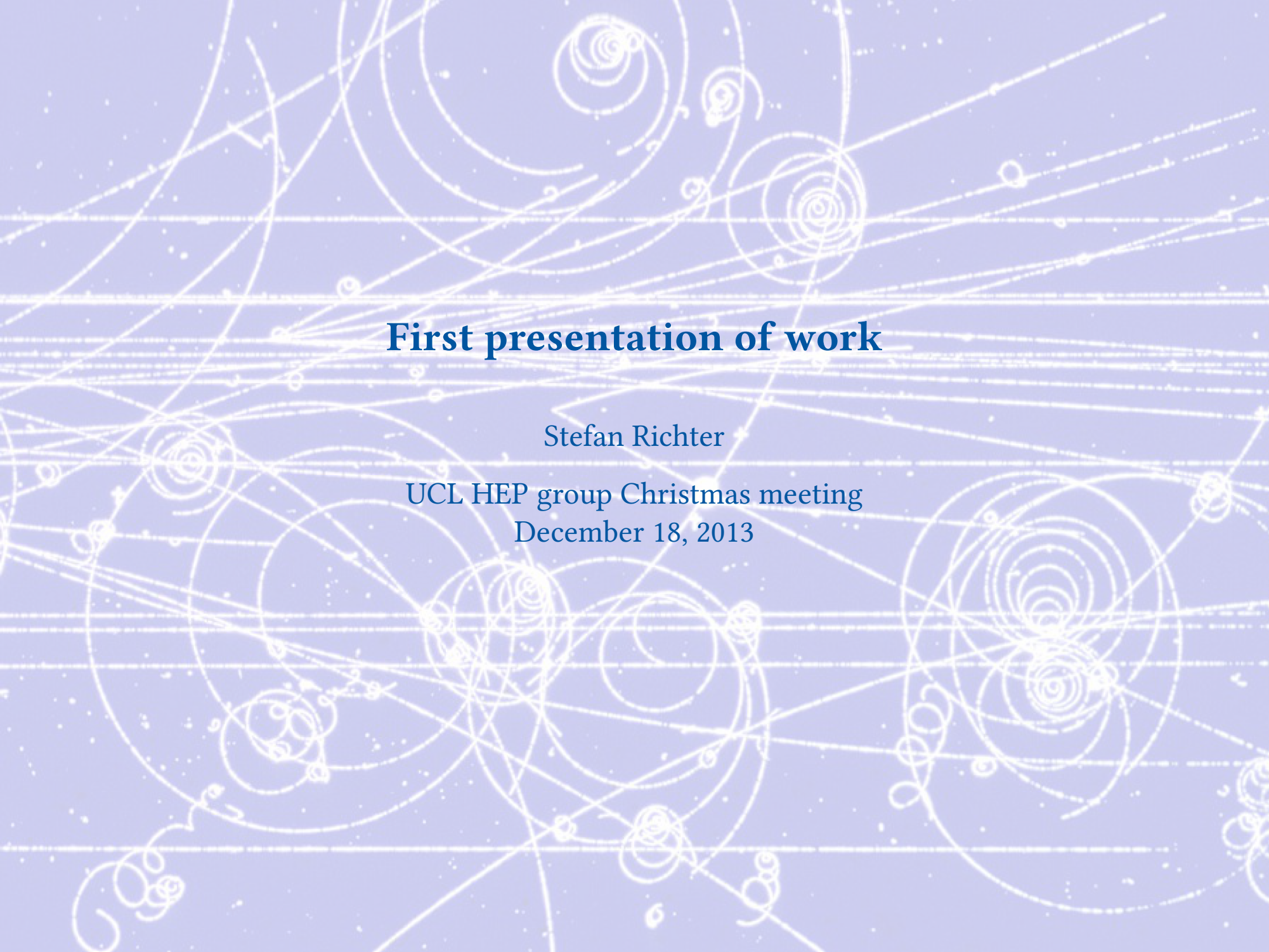


First presentation of work

Stefan Richter

UCL HEP group Christmas meeting
December 18, 2013

	Theory	Experiment
Collaboration	MCnet	ATLAS
Supervisor	Keith Hamilton (2^{nd})	Emily Nurse (1^{st})

Today's talk is about…

1. ATLAS authorship task
2. $gg \to H$ cross section calculation
3. Bonus

ATLAS authorship task: improve modelling of $t\bar{t}$ events (1/3)

Interest in $t\bar{t}$ events

Background to new physics (Higgs bosons, SUSY, …)
Searches for new top quark decays (to charged Higgs bosons, …)
…

Simulation challenging

Top quark mass non-negligible → additional mass scale
Many coloured particles in final state
Many possible production channels at higher orders
$t\bar{t} \to b\bar{b}W^+W^-$; two W bosons → many possible final states

ATLAS authorship task: improve modelling of $t\bar{t}$ events (2/3)

Disagreement between simulation and experimental data observed

In particular: too many jets in simulation

Goals

1. Disagreement within theory uncertainties?
2. Nature of problem: wrong/imprecise theory, technical, human, mixture?
3. Improve modelling, create configuration scripts for users

Generators: PoWHEG + Pythia 6/8

PoWHEG	Next-to-leading order matrix element generation
Pythia 6/8	Everything else: parton shower, underlying event, …

Custom settings / own plugins → generate events → compare to ATLAS data (Rivet)

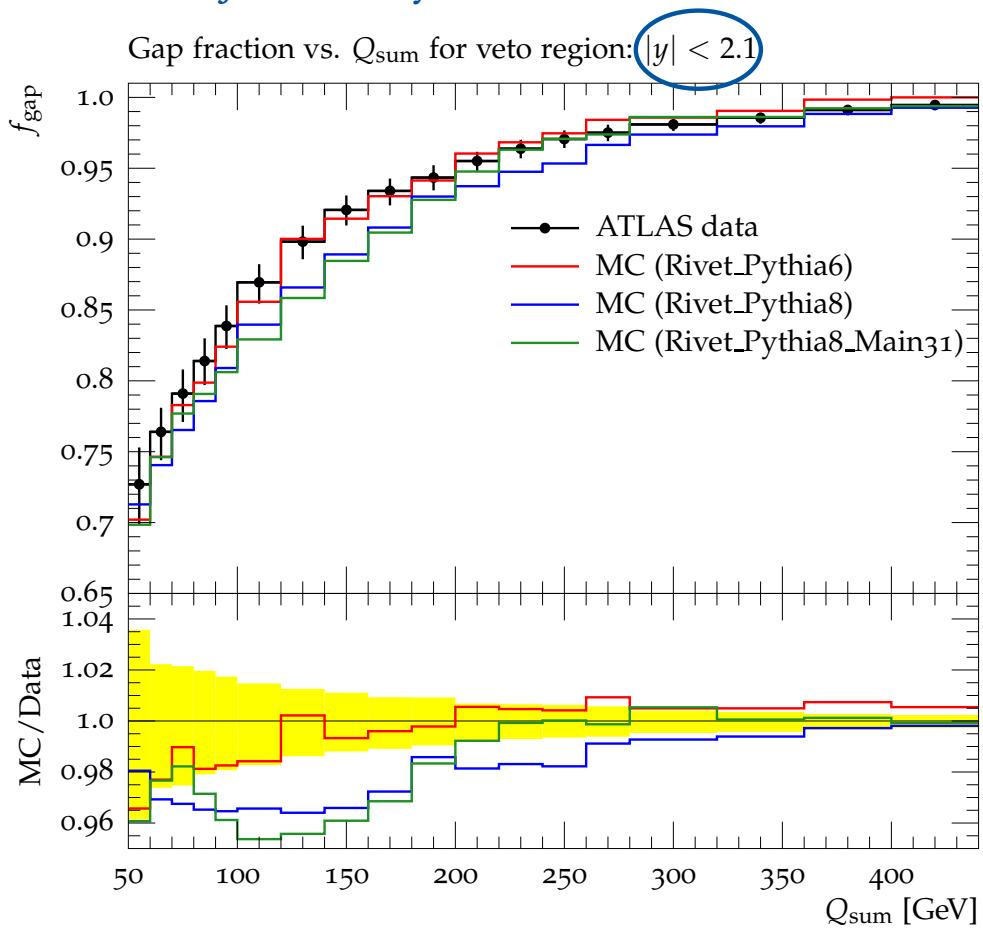
Supervisor: James Monk

ATLAS authorship task: improve modelling of $t\bar{t}$ events (3/3)

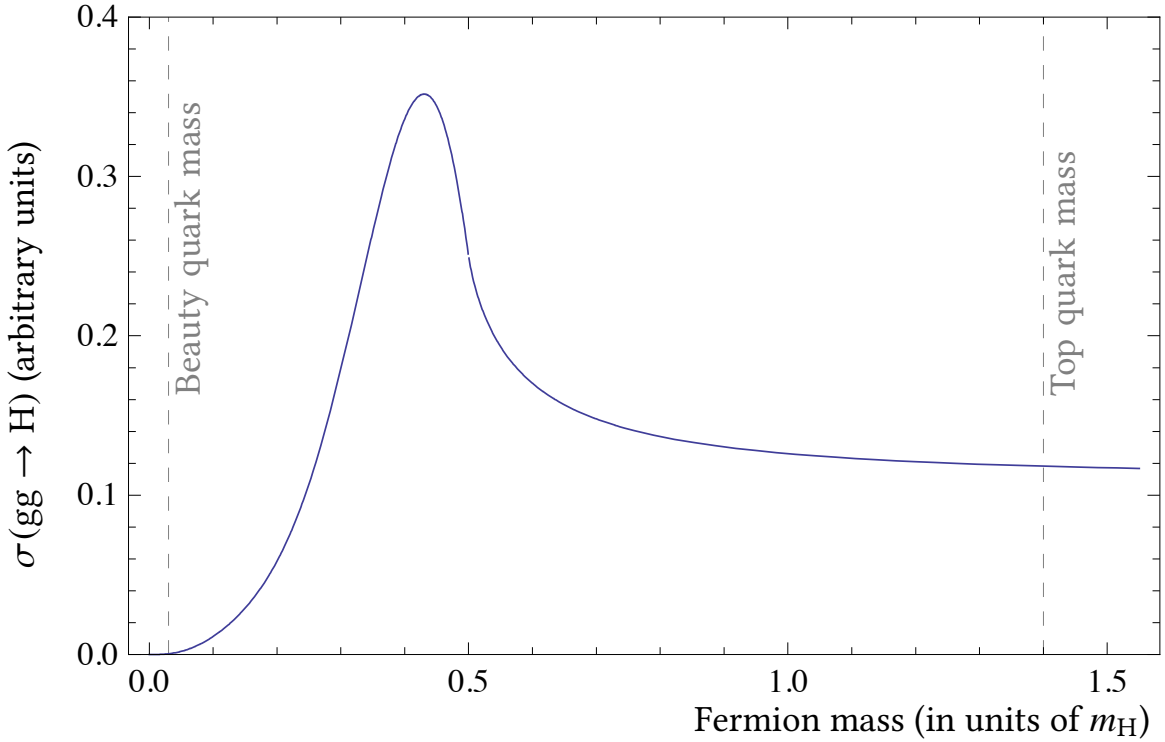
Take the scalar sum of the transverse momenta of all central jets ($|y| < |y_{\text{cut}}|$) in the event: $\sum_i |p_{\perp,i}|$

Veto event if $\sum_i |p_{\perp,i}| > Q_{\text{sum}}$

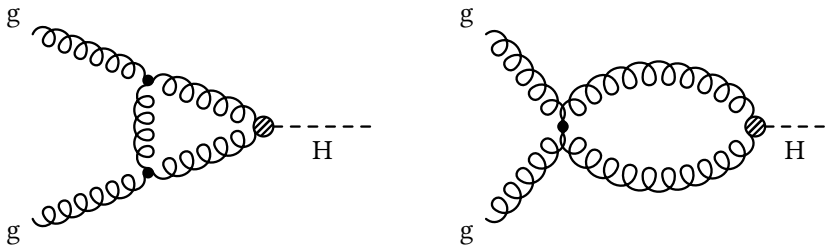
Gap fraction: fraction of events that pass the central jet veto
→ a measure of the central jet activity in the event



gg → H cross section calculation



→ const. (!!!)



+ real gluon emission diagrams

Bonus


toy Monte Carlo
on-shell
JVF
expected limit
ABCD method
tracker
plateau
collinear safety
rapidity gap
fiducial volume
template
PoWHEG method
LIPS
resummation
secondary vertex
b2b
invariant mass
light flavour
calorimeter
FSR
minimum-bias event
TMVA
ΔR
Brazil plot
b-tagging
cut
phase space
beamspot
anti-k_T
prompt muon
underlying event
calo tower
inclusive cross section
crossing angle
tag-and-probe
clustering
MPI
efficiency
planarity
semi-leptonic
bootstrapping
pileup
event weight
scale factor
run
RF cavity
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HEPman

A command-line based HEP dictionary

`https://gitorious.org/hepman`

Usage

```
> hepman pileup
Multiple interactions between...
```

How it works

XML-formatted entries → SQLite database.
Main program `hepman` searches database semi-intelligently and prints output.

Launch in a few weeks with ~50 entries!

Thank you!

Questions?