



LUNDS
UNIVERSITET

Hej! ^ _ ^

Nathan Simpson
Caterina Doglioni
Else Lytken (in spirit)



Lund University

- Founded in 1666
- 42000 students, 7500 staff
- Faculty of science: 1900 students, 330 PhD students and 700 employees
- Physics: 350 scientists
- Experimental particle physics: ATLAS and ALICE group (see next slide for ATLAS)
 - Joining a new experiment: a Light Dark Matter eXperiment(LDMX)
- Theoretical particle physics:
home of the Pythia event generator
 - Newly hired assistant professors:
Madgraph and Sherpa
- Hosted 2016 edition of MLHEP summer school
- AIML@LU interdisciplinary effort in ML: <http://aiml.lu.se>





The Lund-ATLAS group

6 “seniors” (Else Lytken, Caterina Doglioni, Ruth Poettgen, Torsten Akesson, Vincent Hedberg, Oxana Smirnova) involved in BSM searches (dark matter/new physics with Higgs), operations (jet trigger and TRT), upgrade (ITK), computing

6 ATLAS PhD students + Nathan:

- Eric Corrigan and Eva Hansen (jets and dark matter), Eleni Skorda (TRT and dark matter), Trine Poulsen (jets and new physics with top quarks), Katja Mankinen (TRT and BSM with Higgs), Caterina Marcon (computing, jets and dark matter)

4 postdocs:

- Kristian Gregersen (BSM with Higgs, dark matter), Will Kalderon (trigger-level analysis and jets, dark matter), Geoffrey Mullier (ITK/LDMX), Lene Kristian Bryngemark (LDMX/dark sectors)

Local training of INSIGHTS interest:

- COMPUTE graduate school: <http://cbbp.thep.lu.se/compute/index.php>
- Yearly particle physics school (recent topics: dark matter, GEANT4)



The Lund-ATLAS group

Equal Opportunities Officer in INSIGHTS (1 year rotation)

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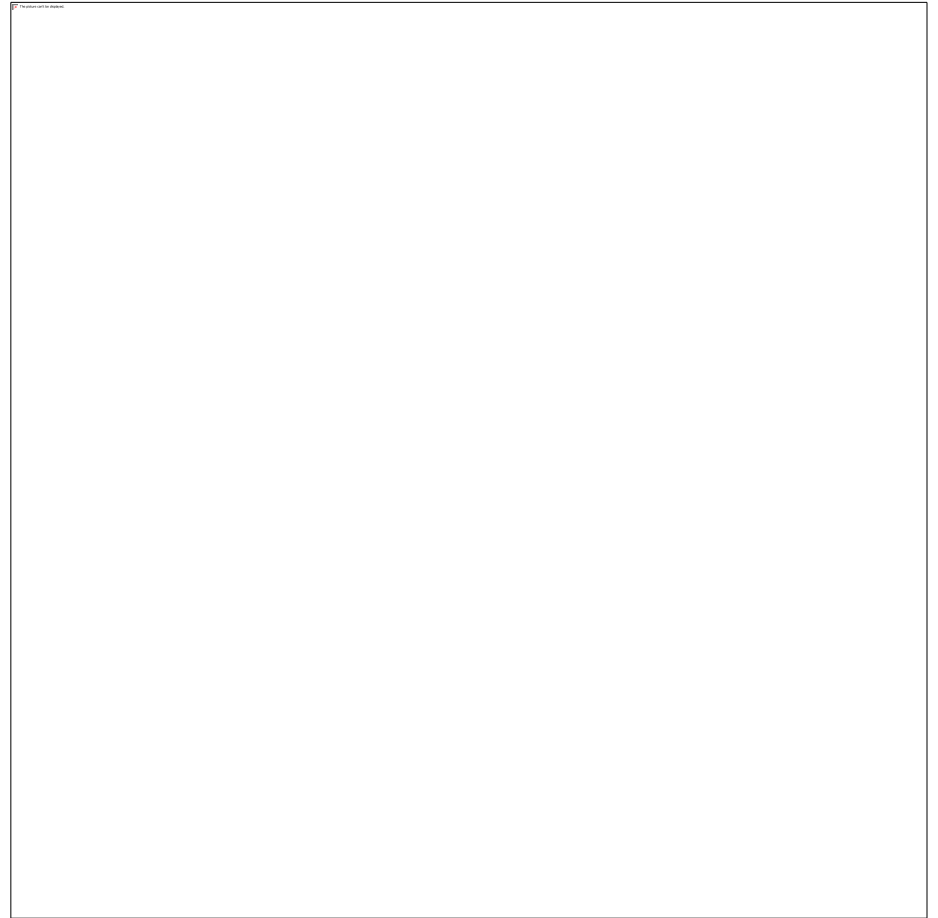
Lund, Sverige

- Everyone drinks coffee all the time
- Pretty
- Cold
- Yes, alcohol is expensive



nathan.exe

- tall
- weird hair
- loves Nintendo
- did some stats under the guise of physics
- from the “North” of England





SUNDAY AT 12:49 · 🌐

For those with some difficulty understanding where the North of England is

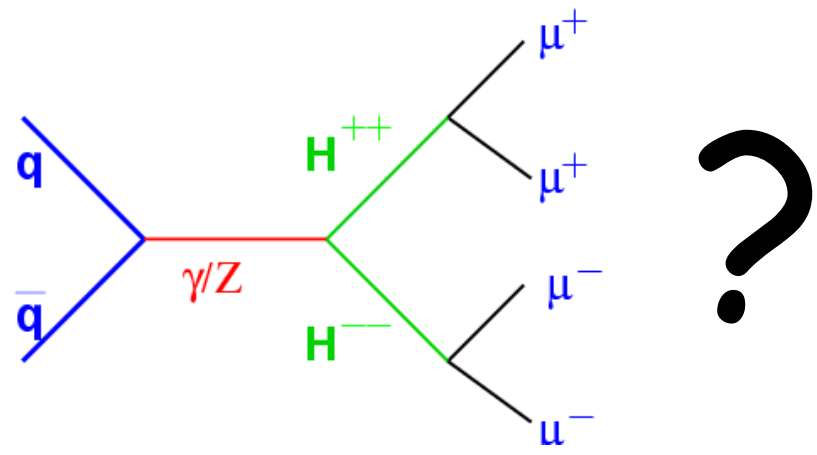


Me!



New HORIZON

- Exotic doubly charged searches!
- ML useful in selection -- for instance, hadronic taus (BDTs need update!)
- Statistical tools to carry out analyses
- Secondments: CERN/Pangea



My favourite ML
application:

Supervised
learning to
generate
original recipes

Sheet Pepper

low fat, bbq, bbq, cannings, soup

3 tablespoon butter

1 tablespoon sugar

1 tablespoon sugar

Combine sugar and sugar and sprinkle with the sugar. Place a desired pan, and let stand 1 minute. Add the salt and pepper. Add beef and turkey and sides of cake of butter. Bring to a boil, bake at 350 degrees F. Retep the bottom of pan in a large rack.

Combine the chocolate cheese and the cheese and serve with quarters. Remove from pan and add to strainers and simmer until the sauce forms the clear some eggs and so the finger large soup comes out cleandrated with masil cooking lengthwise and the well some of the beef and the steamed sauce. It is the measure of board with a sloth bone. Serve warm. Sprinkle with dry salt, then add the shallots and salt and pepper. Sprinkle with salt, and pepper. Stir until potatoes are softened. Remove from heat; cover and simmer 2 minutes. Whisk in the milk and butter. Add to bisquins. Stir to make uncooked and serve, up to 2 cups. Pour into 1 cup soup. Add 1 tbsp. cabbage

Pre-INSIGHTS work

@



The University of Manchester

The Matrix Element Method

$$\mathcal{Z}(k|H) \propto \int \text{transfer functions} \times \mathcal{M}(H) \times \text{PDFs} \times dk$$

The (Bayesian) Matrix Element Method

$$\mathcal{Z}(k|H) \propto \int \text{transfer functions} \times \mathcal{M}(H) \times \text{PDFs} \times dk$$

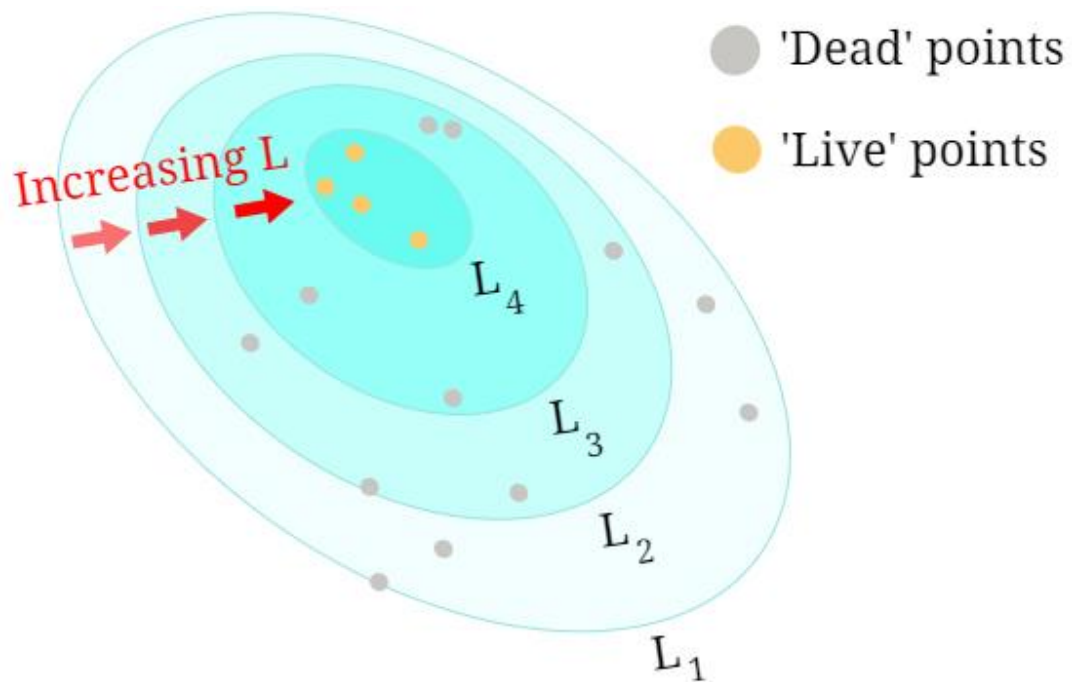
Evidence

Likelihood

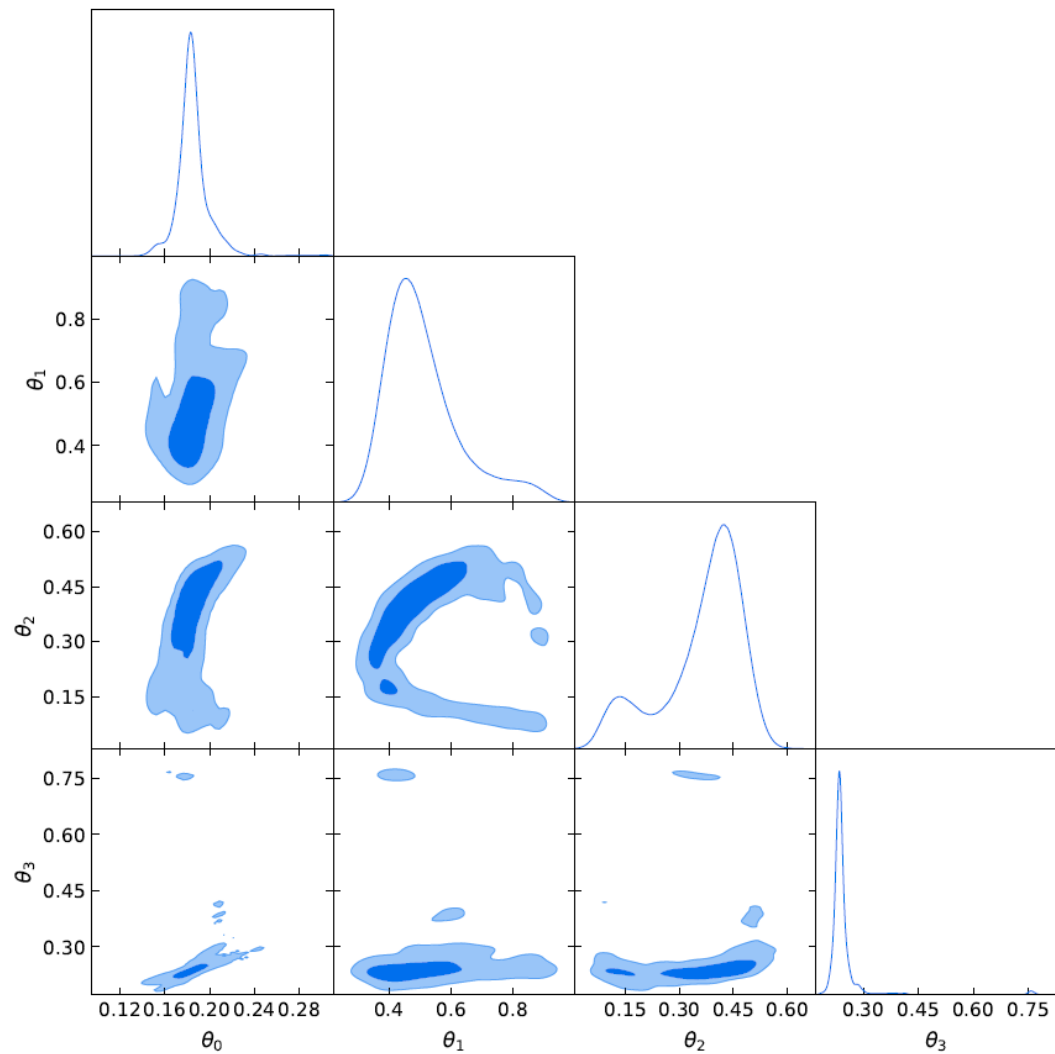
Prior

Joint probability of data and truth

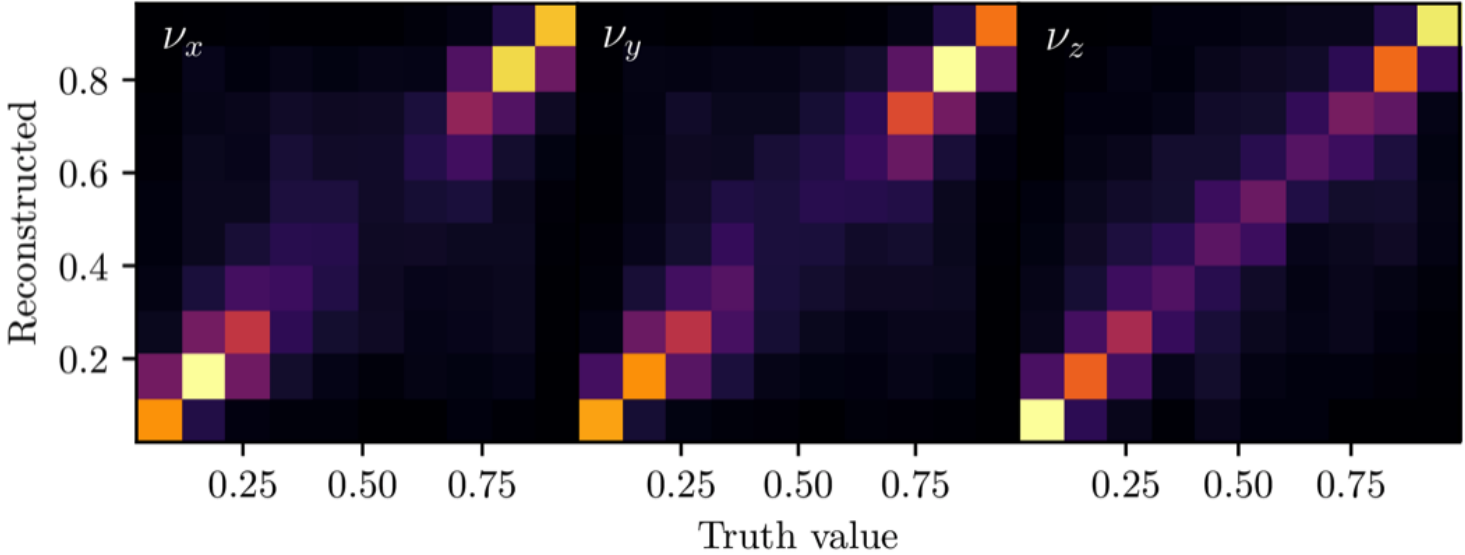
Courtroom MCMC (with evidence)



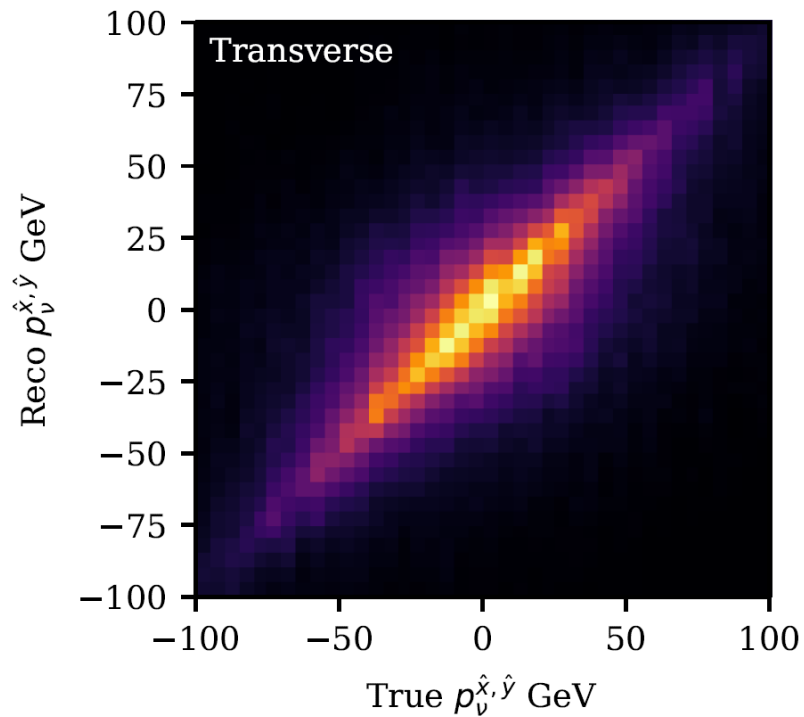
Results



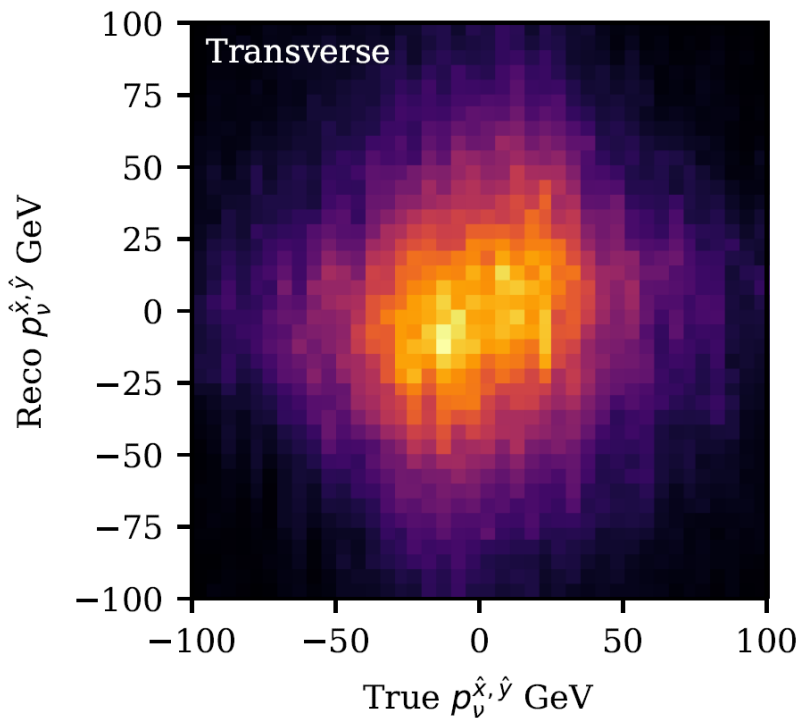
Results



Results



Clean events



ATLAS events

Thanks for listening!

Tack så mycket!