

# Computer project @LAL

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NPAC - 2019

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## 2 projects:

- Calorimeter simulation and reconstruction
- Search for gravitational waves

## Practical information:

- Location: building 203
- Dates: Mar. 11-15, Mar. 18-19
- Schedule: 9h → 12h and 13h → 17h
- Up to 8 pairs of students
- Oral examination (Tuesday morning): 20 min



# Calorimeter simulation & reconstruction

## Monte-Carlo simulation

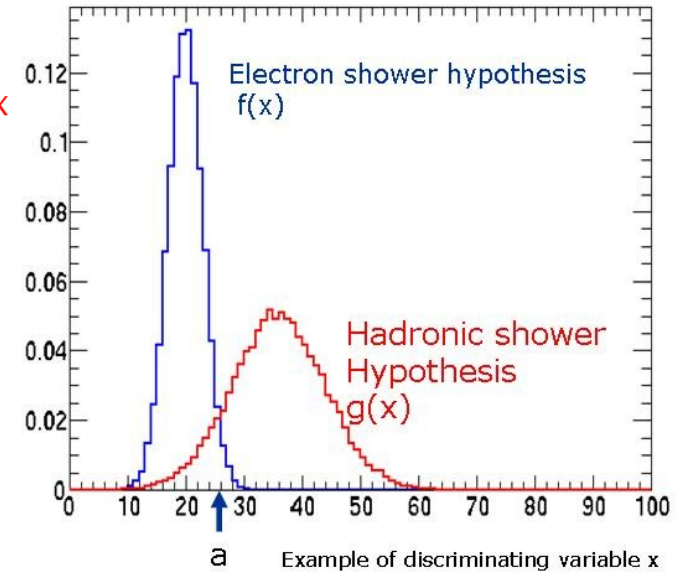
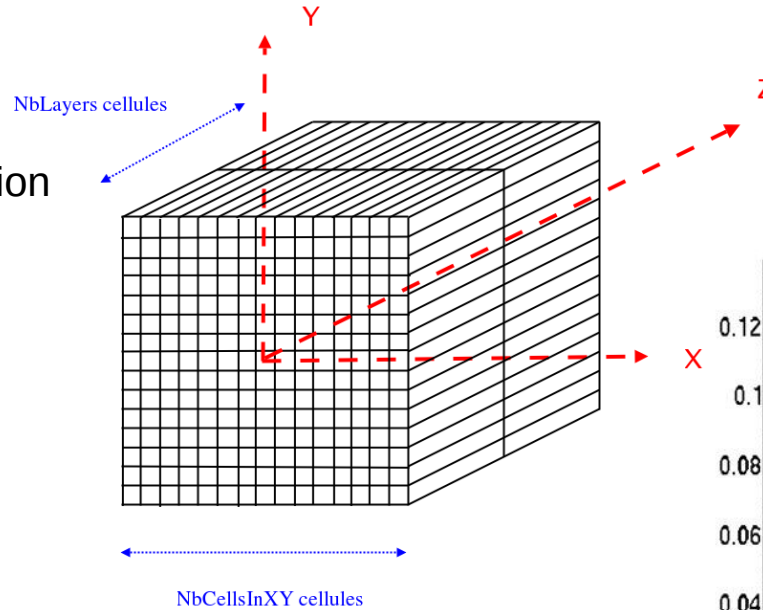
- Simplified calorimeter description
- Electron and hadron showers

## Reconstruction

- Particle reconstruction
- Detector characterization

## Data analysis

- Electron/hadron discrimination



# Search for gravitational waves

- **Spectrogram of a gravitational-wave signal**
  - use of real LIGO data around the GW150914 signal
  - signal analysis (Fourier transform, whitening, noise characterization)
  - build spectrogram and use of visualization tools
- **Coincidence analysis and background estimation**
  - multiple detector analysis
  - background estimation using the time-slide technique
  - event significance and detection
- Language: C++ or python
- External libraries: root (toolbox, visualization), FFTW (Fourier transforms)

