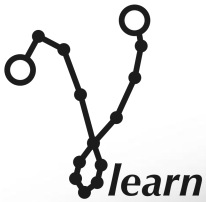


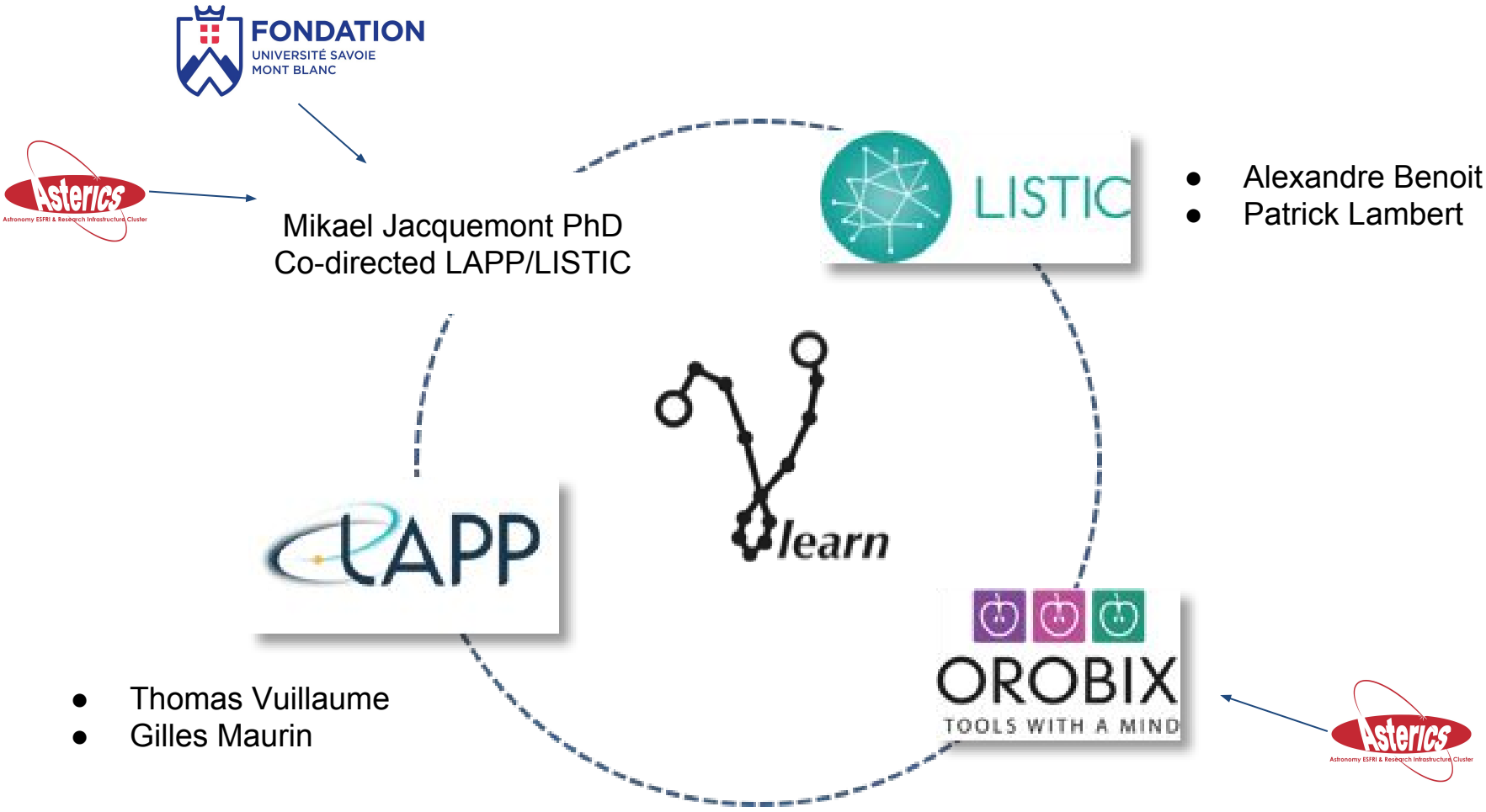
GammaLearn

Mikaël Jacquemont, Thomas Vuillaume

15/01/2018

The GammaLearn project

- carried by LAPP
- two partners involved


FONDATION
UNIVERSITÉ SAVOIE
MONT BLANC
Asterics
Astronomy ESFRI & Research Infrastructure Cluster
Mikael Jacquemont PhD
Co-directed LAPP/LISTIC
LISTIC
Alexandre Benoit
Patrick Lambert
LAPP
learn
Thomas Vuillaume
Gilles Maurin
OROBIX
TOOLS WITH A MIND
Asterics
Astronomy ESFRI & Research Infrastructure Cluster

GammaLearn : Exploring Deep Learning for IACT image processing

Goals:

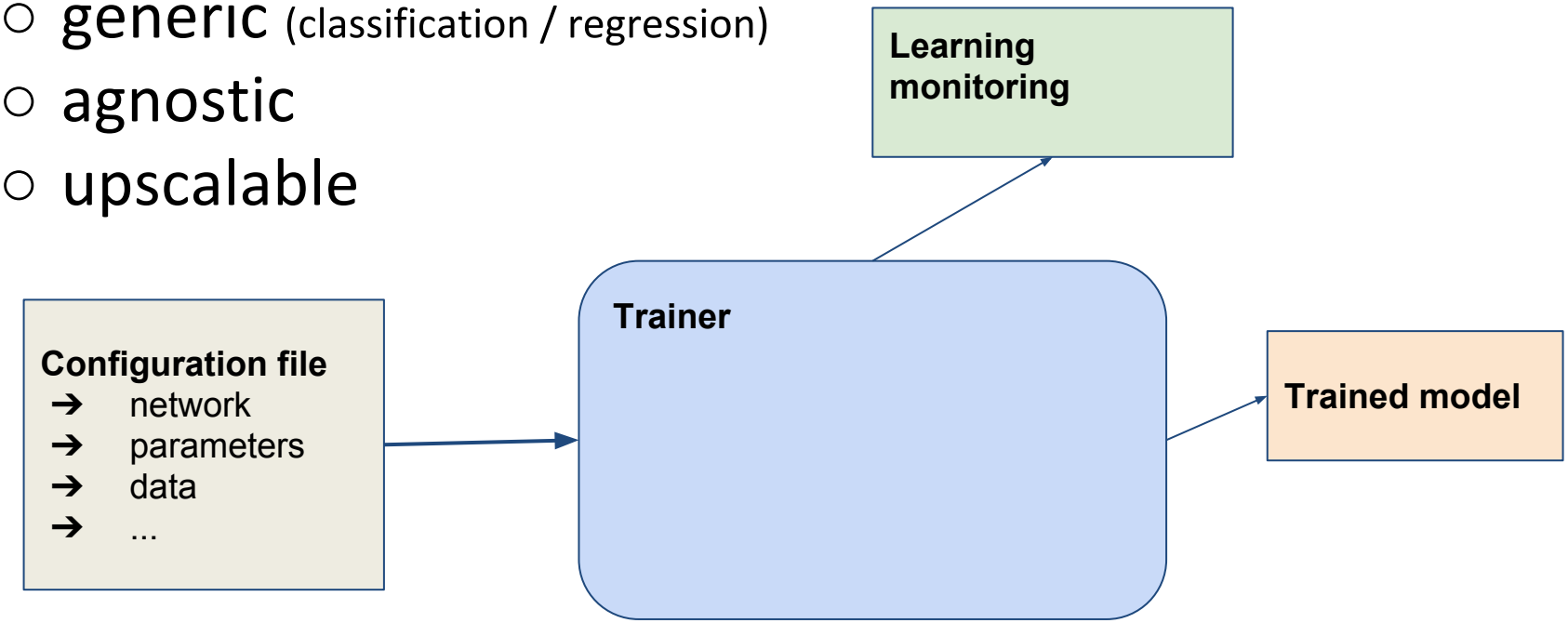
- Event selection
  - on-site : Data reduction
  - off-site : Sensitivity
- Energy and direction regression

Data

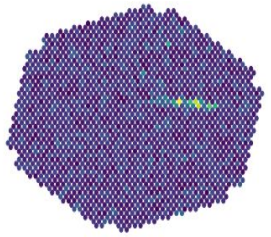
- LaPalma Simulations
  - Diffuse gamma
  - Protons
- HDF5
  - multi-os, stable, reliable
  - big data
  - common format in the CTA Deep Learning group
  - Converter : HiPeCTA format to HDF5

Deep Learning

- Workflow being developed
  - generic (classification / regression)
  - agnostic
  - upscalable



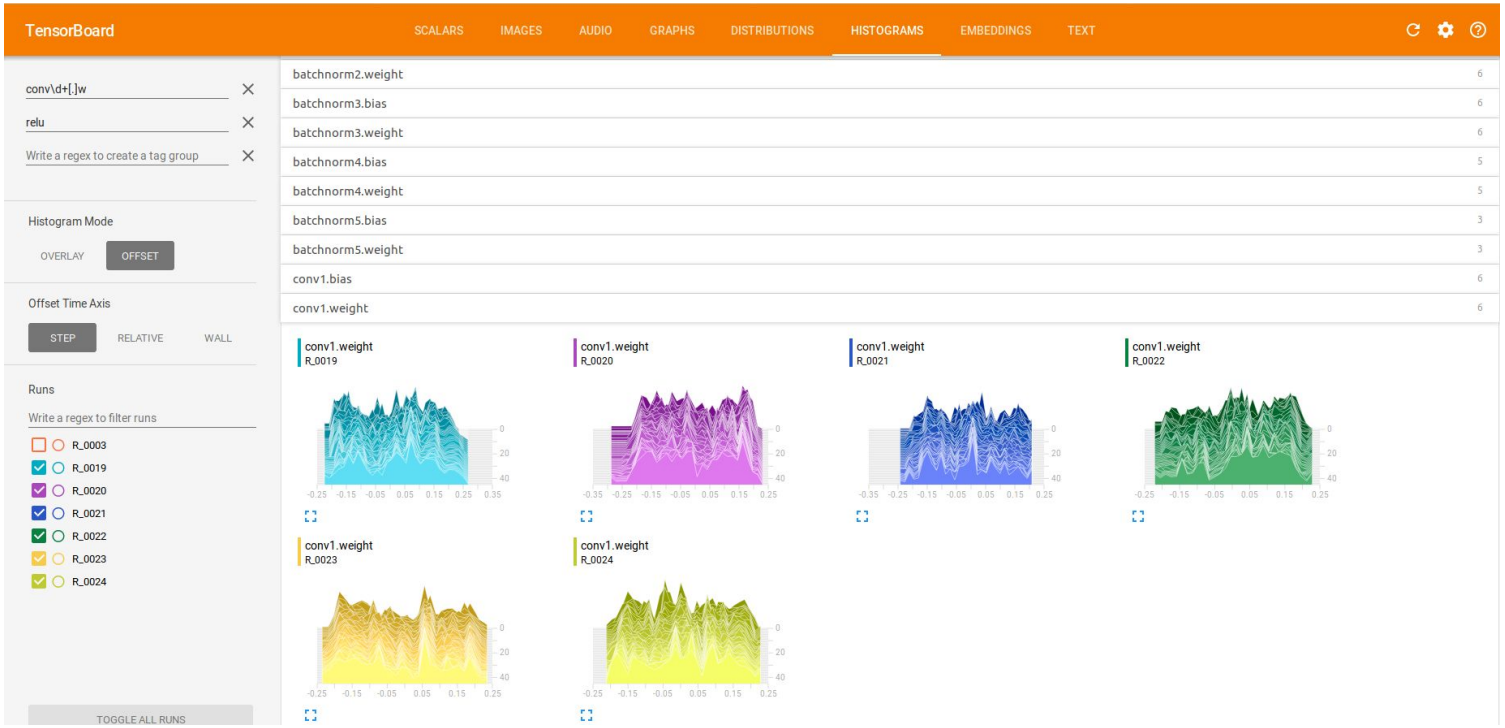
Deep Learning



- Tools
  - PyTorch + indexed convolution and pooling
    - cons
      - lack of maturity (vs Tenserflow)
      - not for production (but tools to export graphs)
      - visualisation tools not included
    - pros
      - ease of use and learn
      - research and prototyping oriented
      - dynamic graphs
      - support of our partner (Orobix)

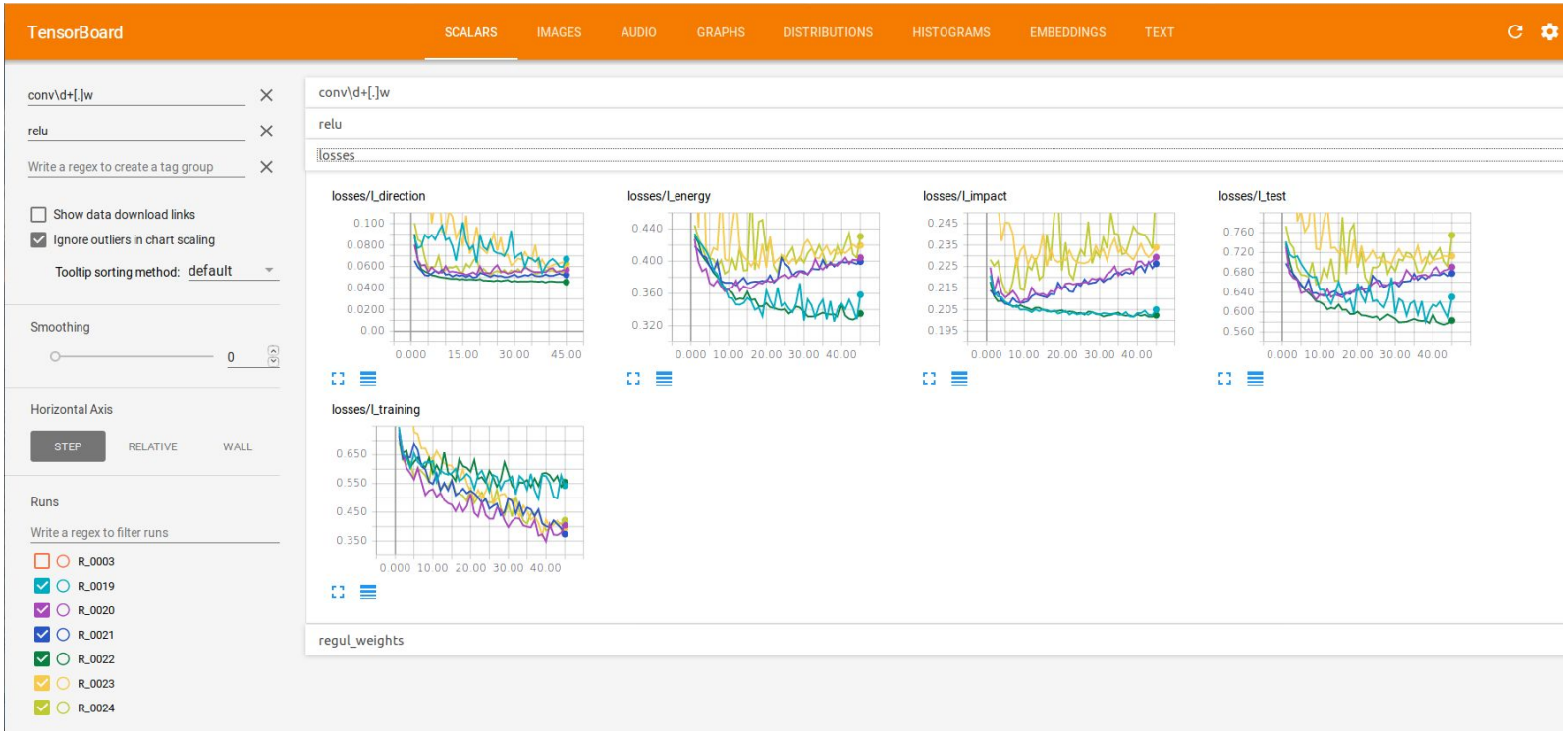
Deep Learning

- Tools
  - Tensorboard (realtime learning monitoring)



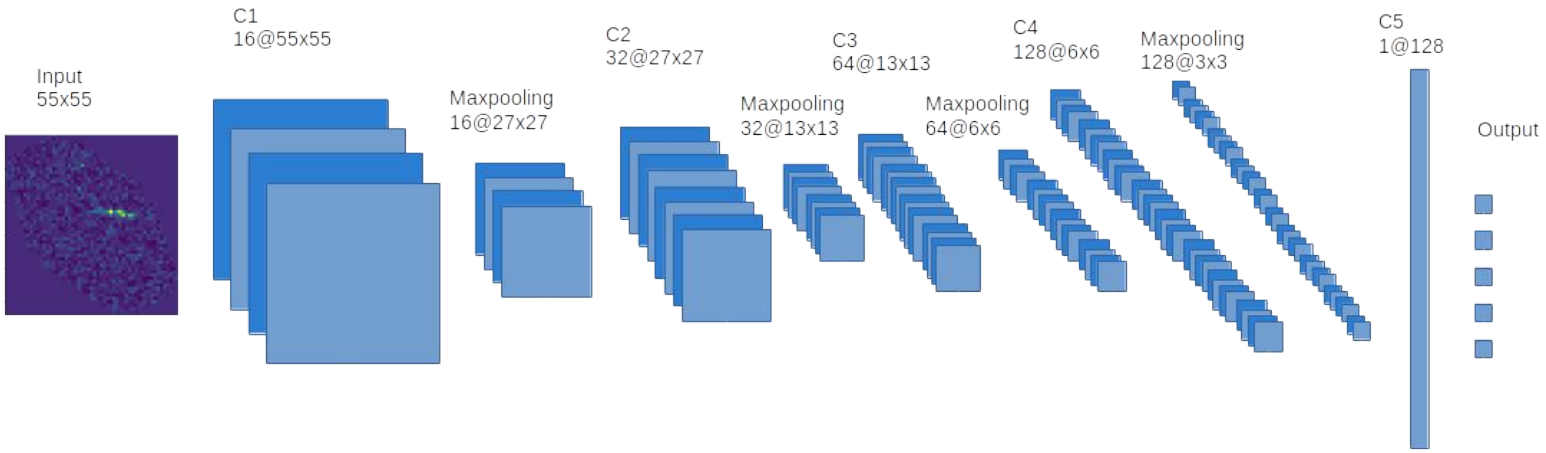
Deep Learning

- Tools
  - Tensorboard



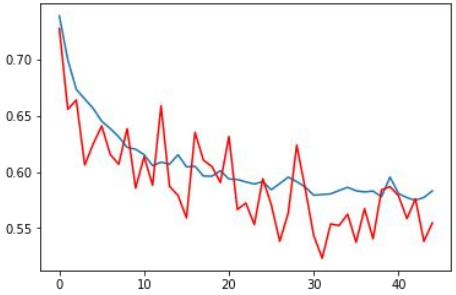
Deep Learning

- Reconstruction
  - 1st phase : baseline selection
  - 3 architectures (classical convolutions)



→ **~ 30 experiments (simple workflow)**

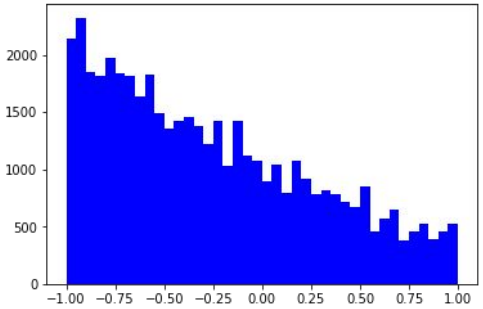
Deep Learning

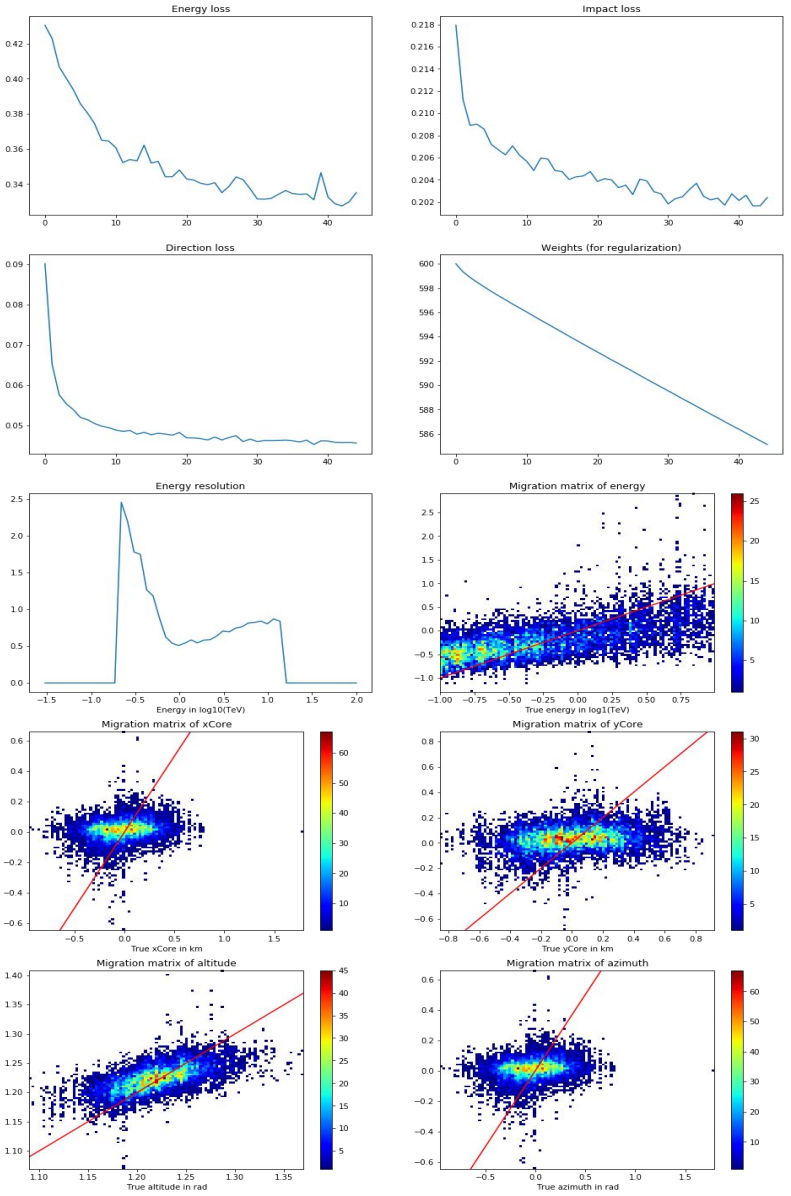


- Experiment example

LSTNet51

- 45k / 10k images (LST)
- γ diffuse
- SGD + momentum + nag
- L2 regularization
- E filtering
- loss L1





Next steps

- Multitask model
- Telescope info
- Baseline choice
- Investigate more complex models
- Add stereoscopy
- Design of experiment