

Using computer vision-inspired techniques for event classification on low-level data from the ATLAS detector.



Høgskulen
på Vestlandet

Aurora Grefsrud

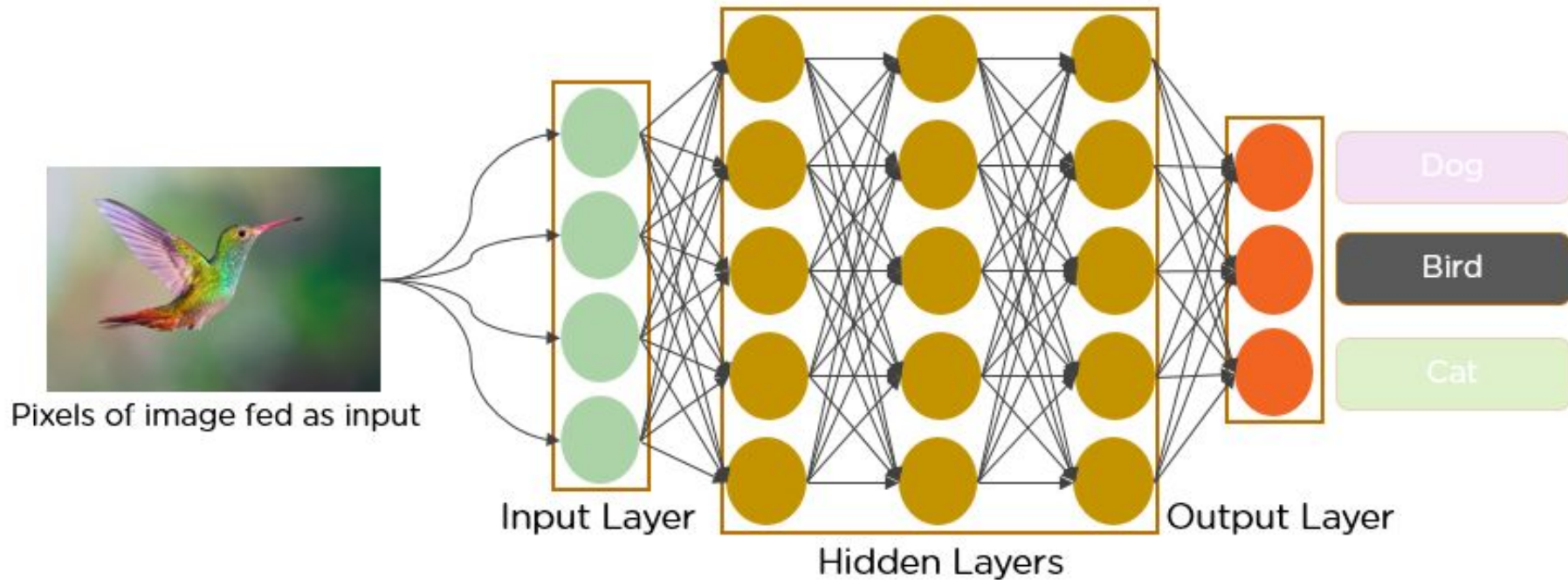
aurora.grefsrud@hvl.no



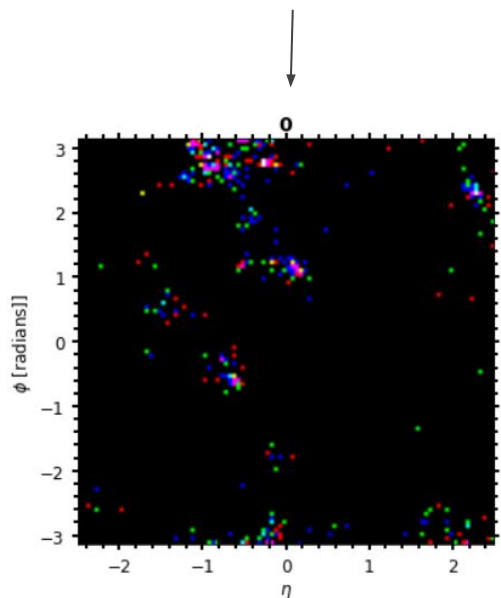
www.learningdarkmatter.com

What is my goal?

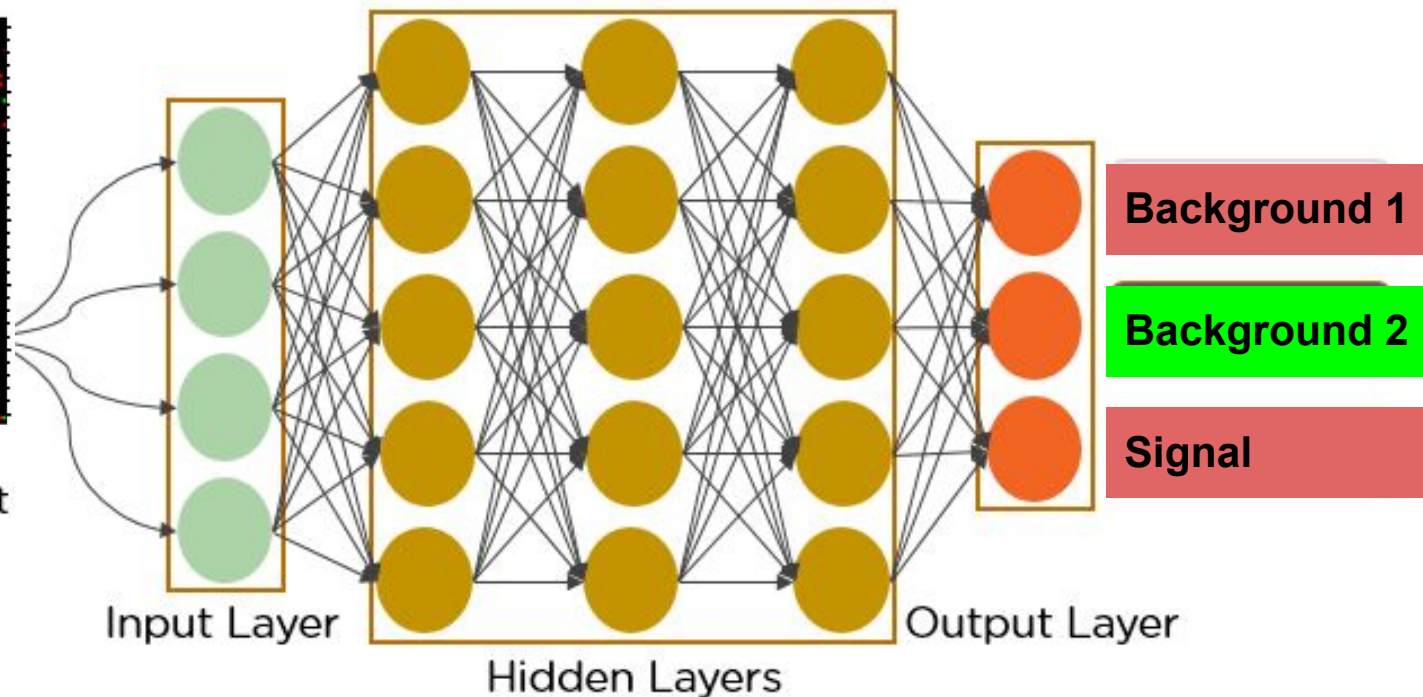
Apply ML computer vision techniques on LHC data.



Event image



Pixels of image fed as input



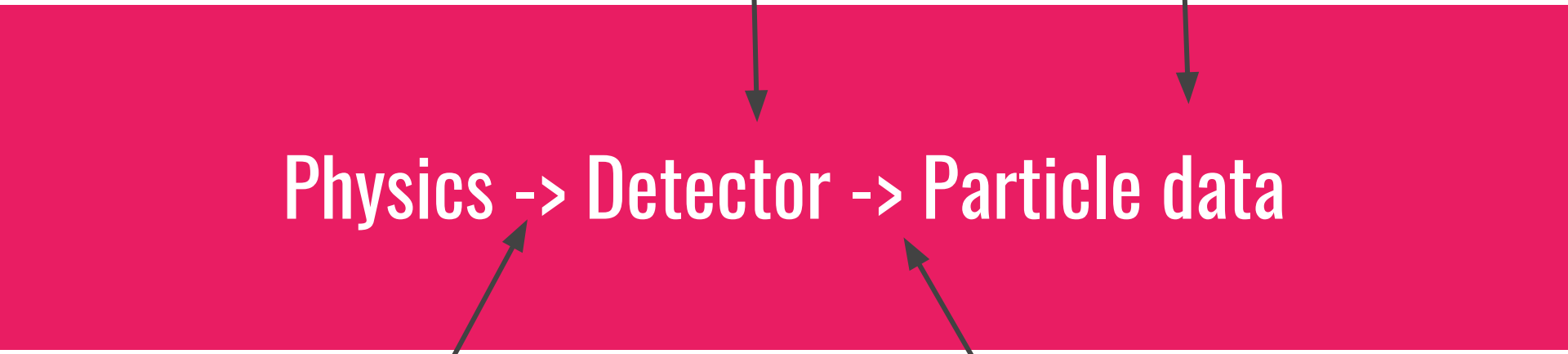
Low level data

High level data:
Traditional HEP
data analysis

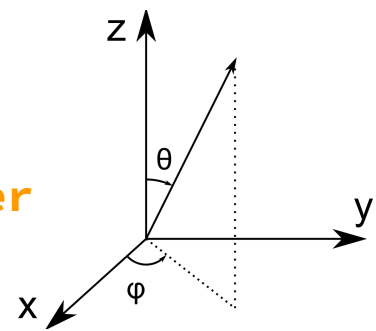
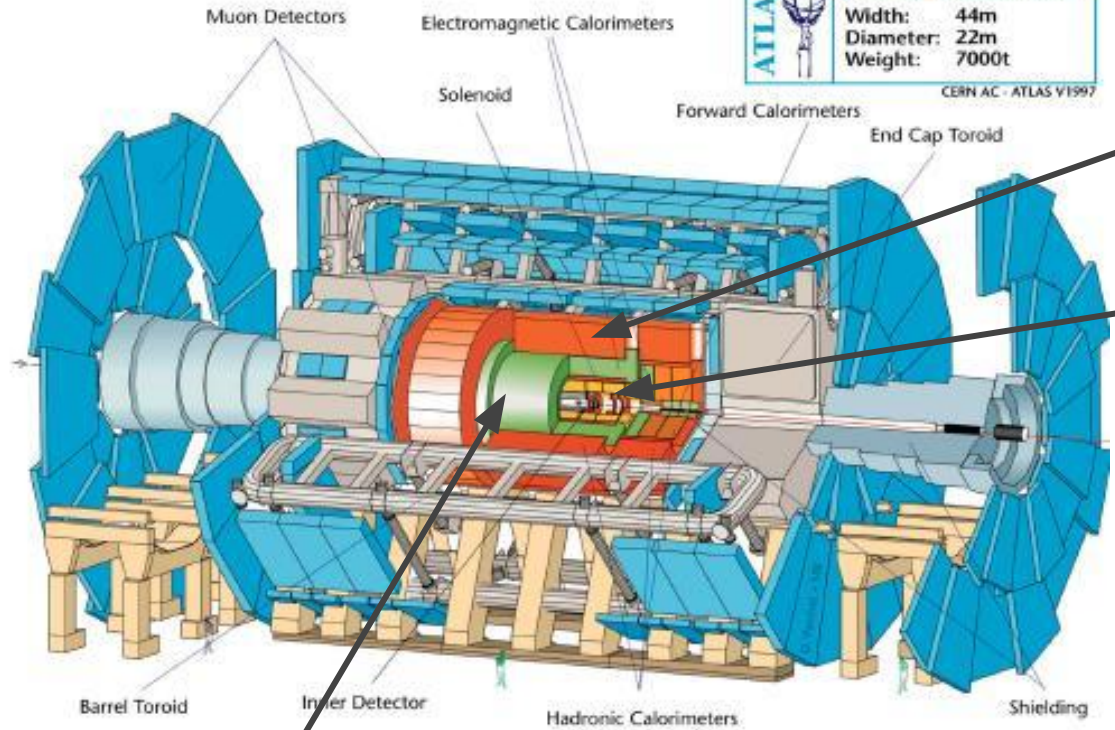
Physics -> Detector -> Particle data

Sensors

Particle reconstruction
algorithms

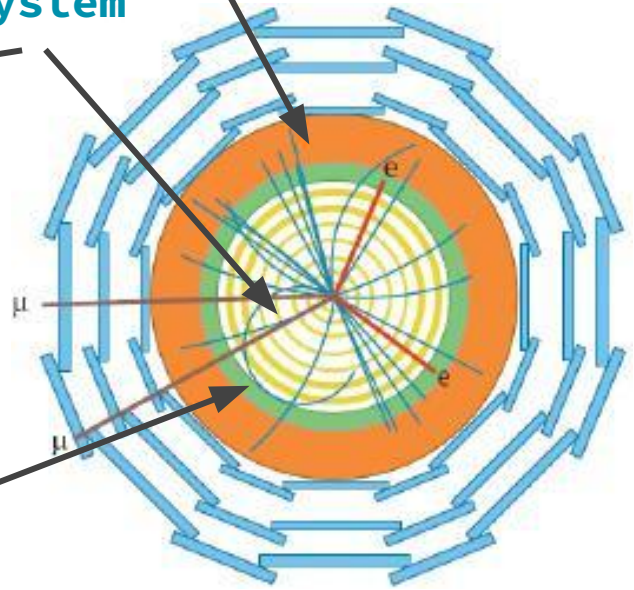


	Detector characteristics	
	Width:	44m
	Diameter:	22m
	Weight:	7000t
CERN AC - ATLAS V1997		

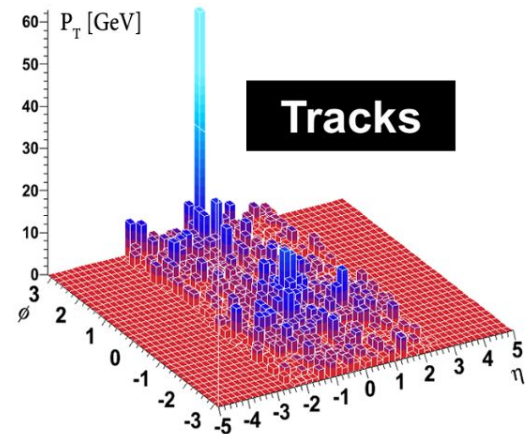
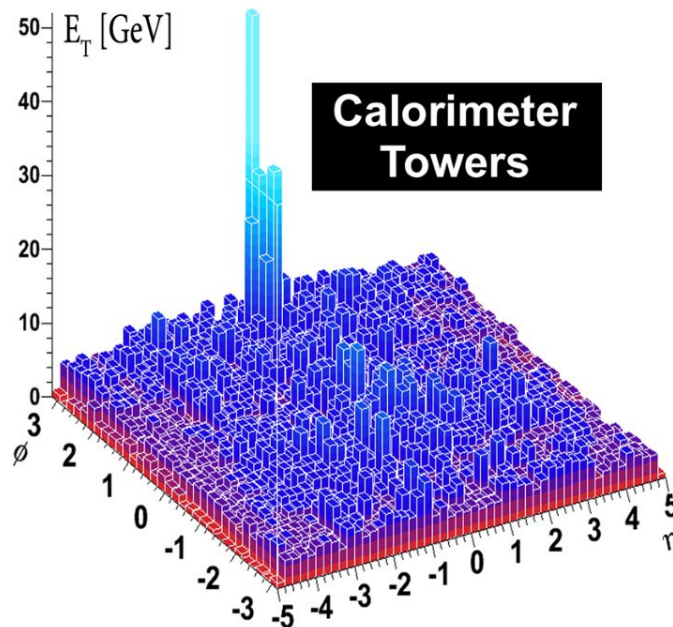
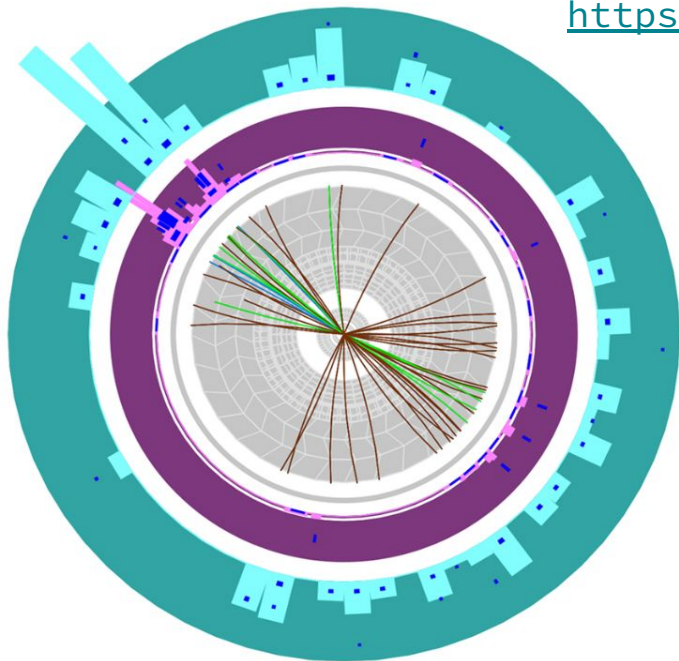


Hadronic calorimeter

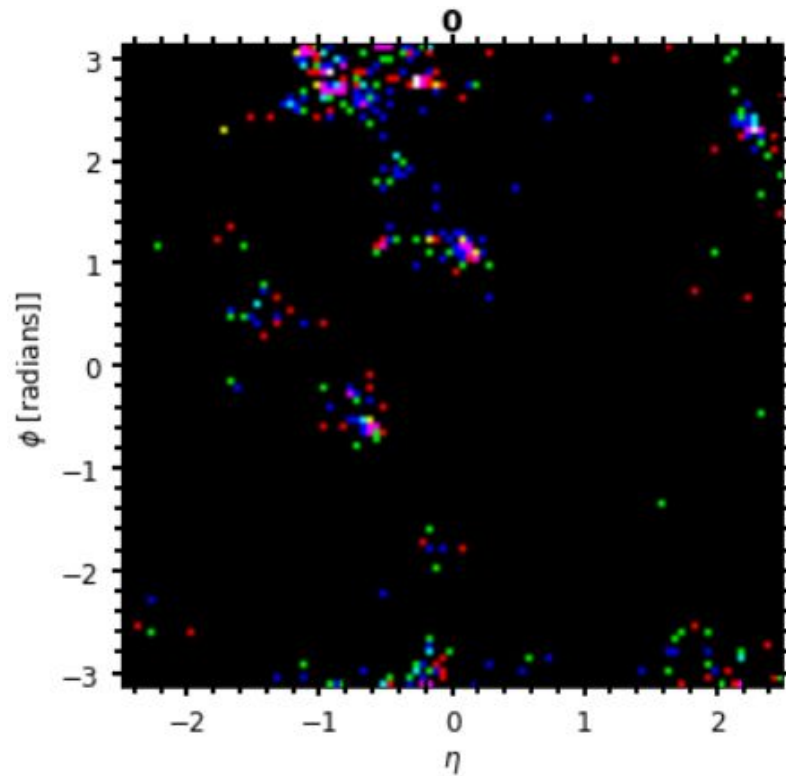
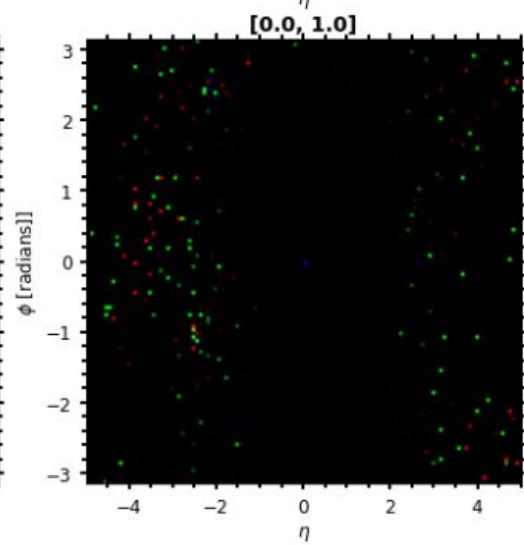
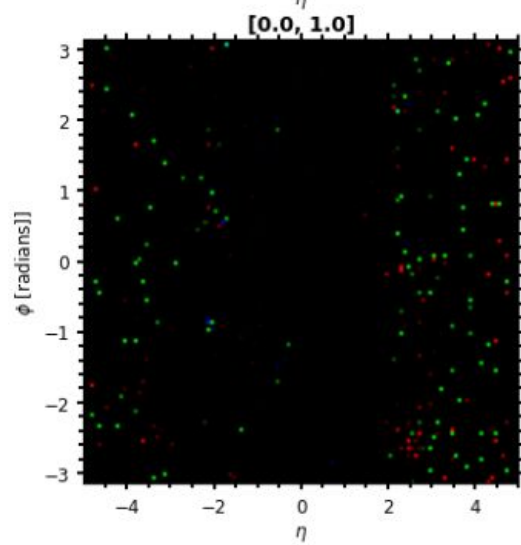
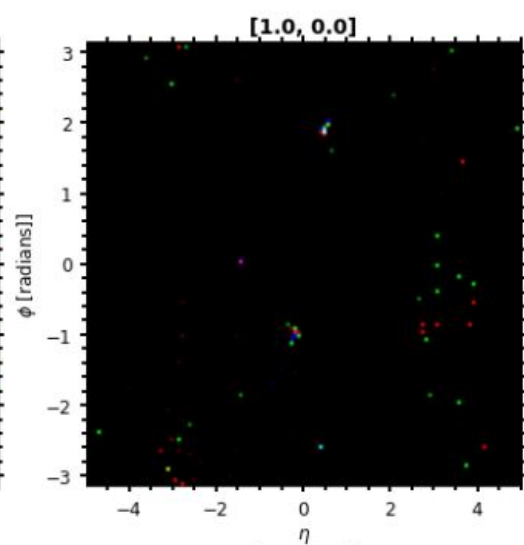
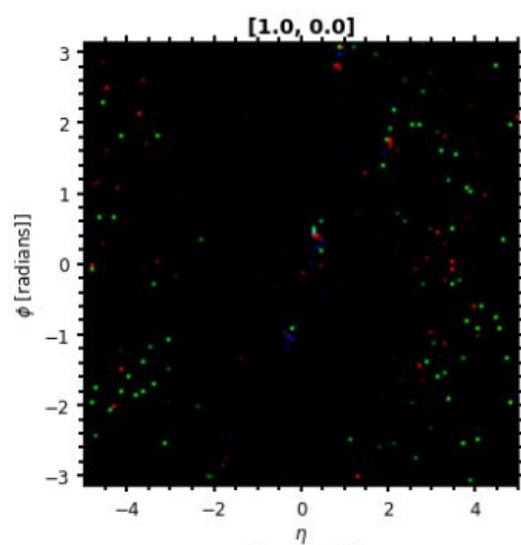
Tracking system



Electromagnetic calorimeter

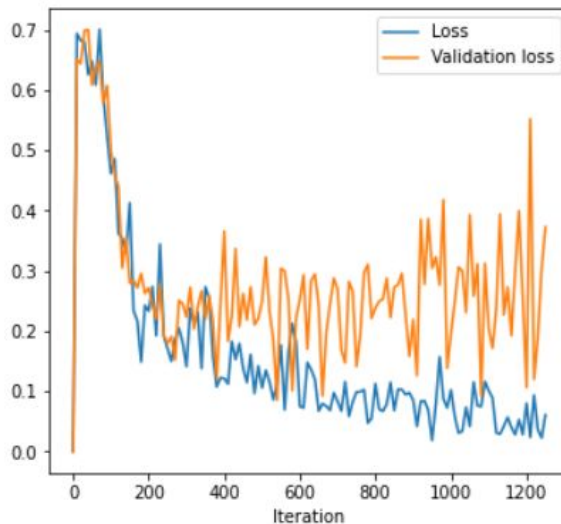
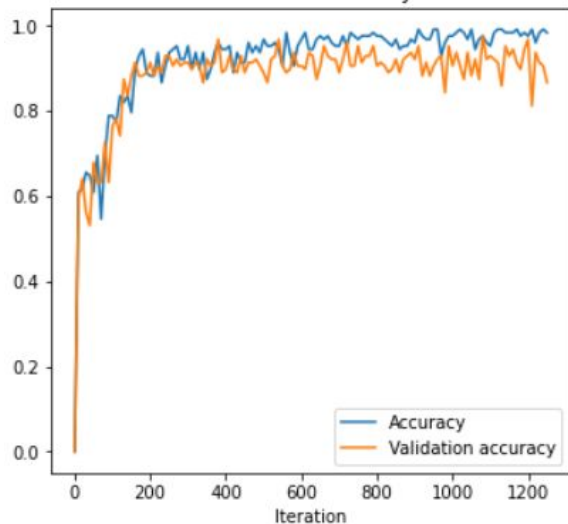


	1	2	3	4	5	6	7	8	9	10	11	12	...
Energy	53.1	31.2	30.6	23.9	18.1	10.0	5.6	5.3	5.3	5.1	4.9	4.8	...
η	-0.2	0.1	-0.1	0.1	0.2	0.0	3.8	2.4	2.9	-3.0	-1.8	2.8	...
ϕ	2.9	3.0	2.8	2.5	2.9	3.0	-1.8	-2.4	0.8	-0.3	0.1	1.8	...

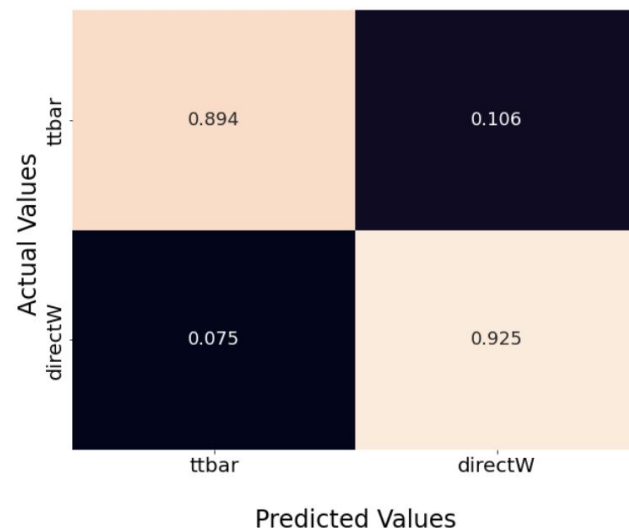


Some fast training using a simple CNN

Mean validation accuracy: 0.88



Accuracy: 91.0%



https://github.com/choisant/imcalML/blob/main/notebooks/re_snet.ipynb

If you are interested in this project, let's have a chat :)