Towards automating SFX analysis at LCLS/LCLS-II

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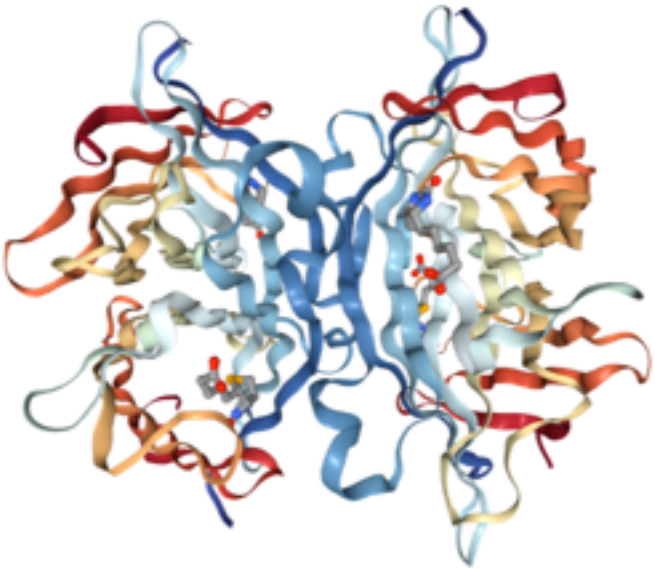
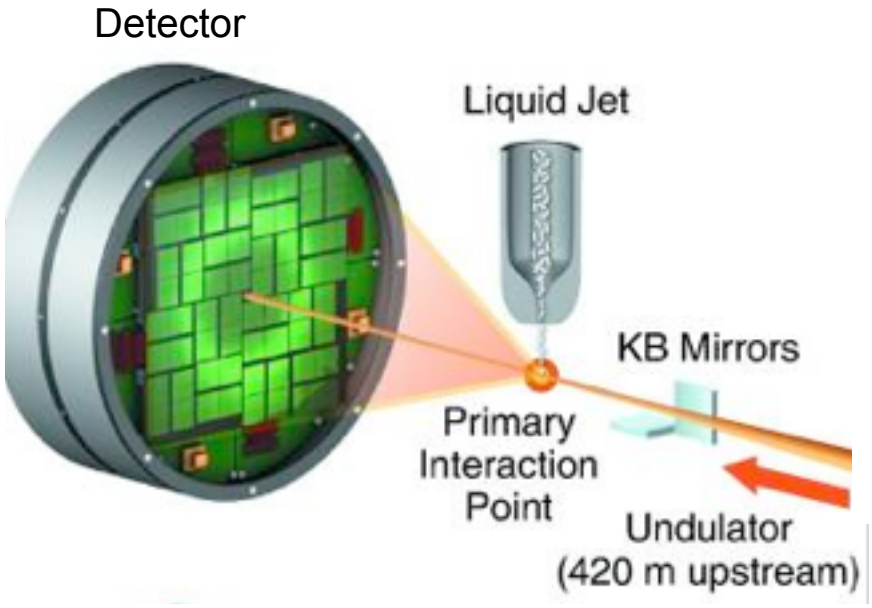
U.S. DEPARTMENT OF ENERGY
Office of Science

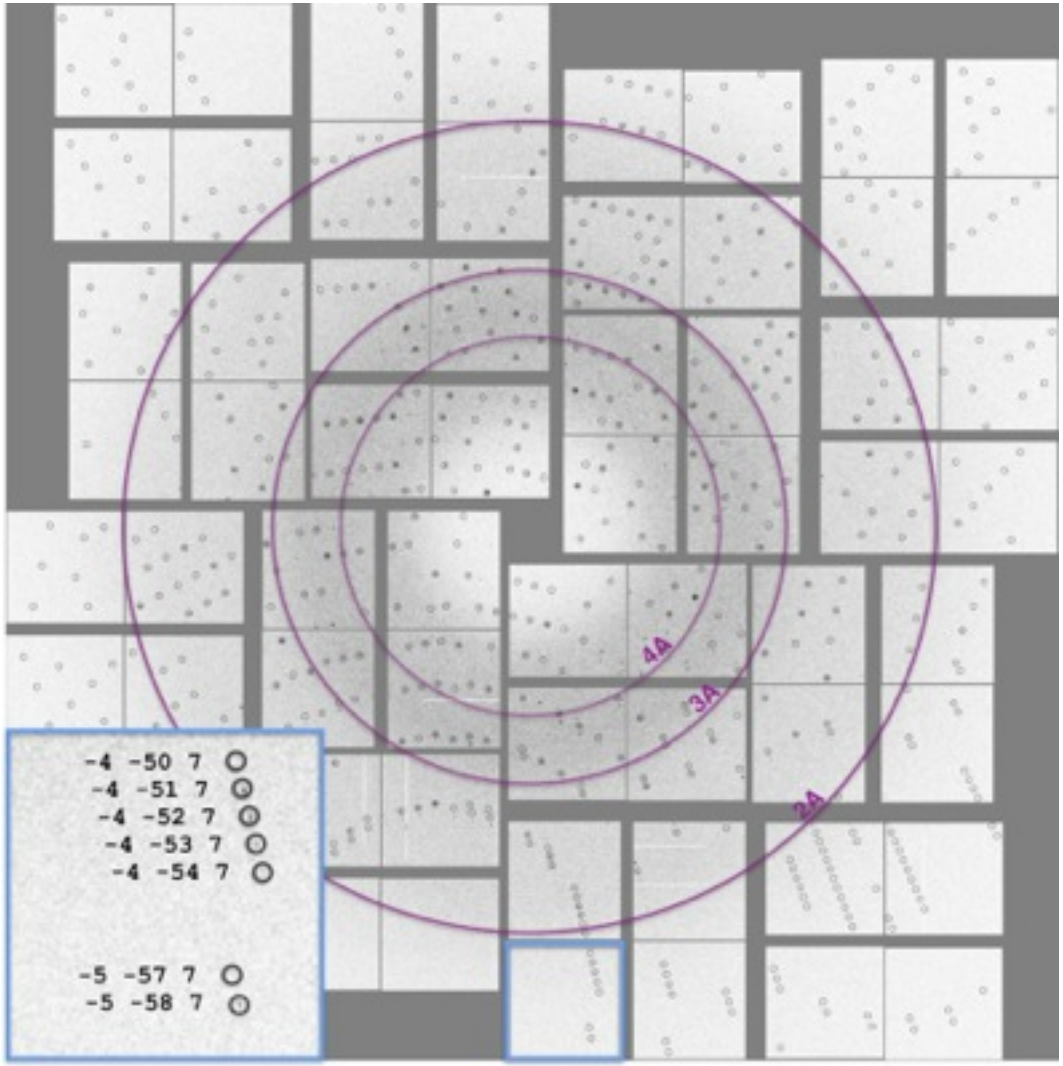
SLAC NATIONAL ACCELERATOR LABORATORY

Serial Femtosecond Crystallography (SFX) Setup





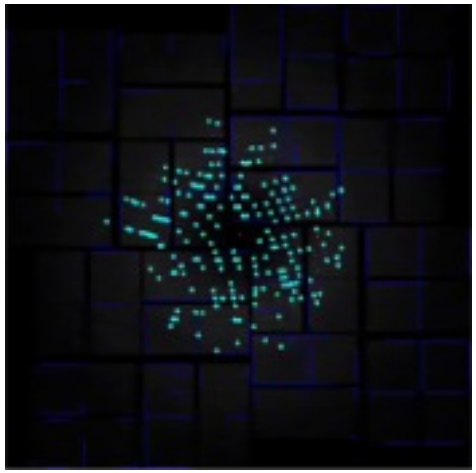
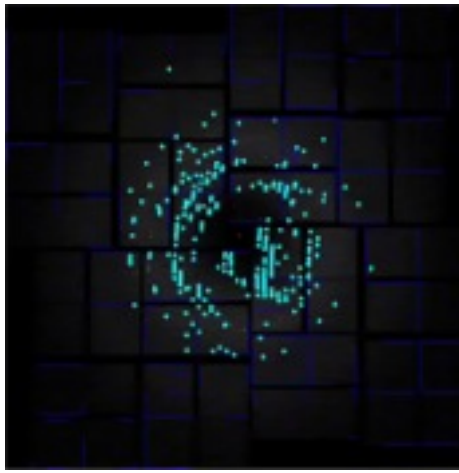
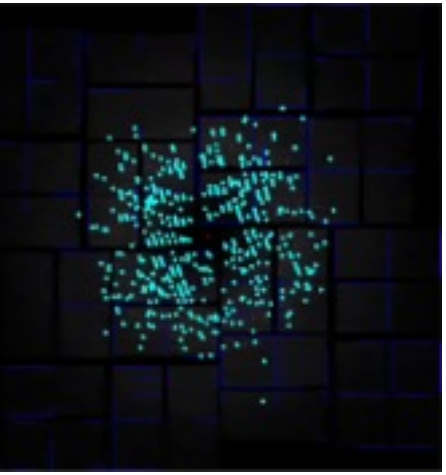
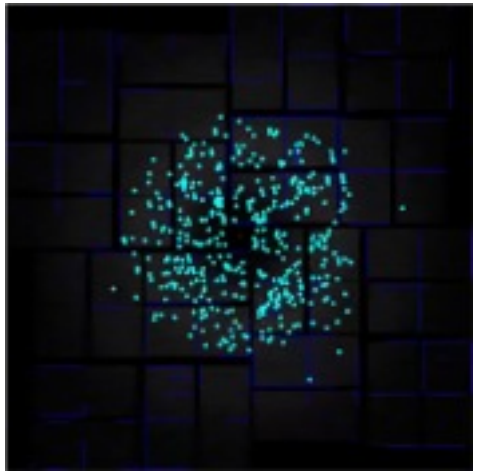
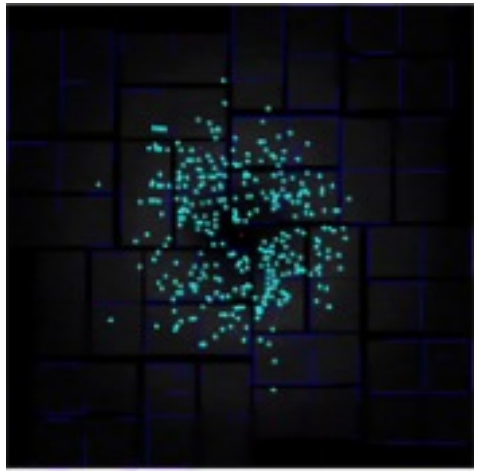
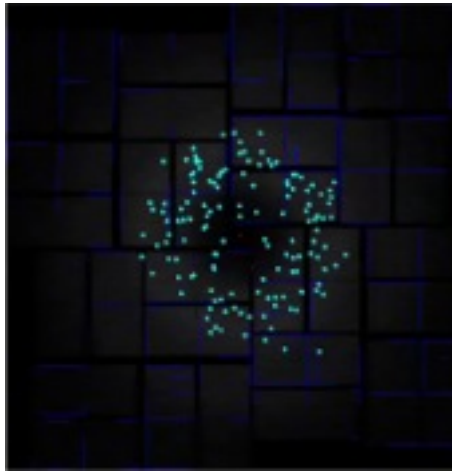
1 million pulses / sec


4A
3A
2A
-4 -50 7
-4 -51 7
-4 -52 7
-4 -53 7
-4 -54 7
-5 -57 7
-5 -58 7

Serial Crystallography

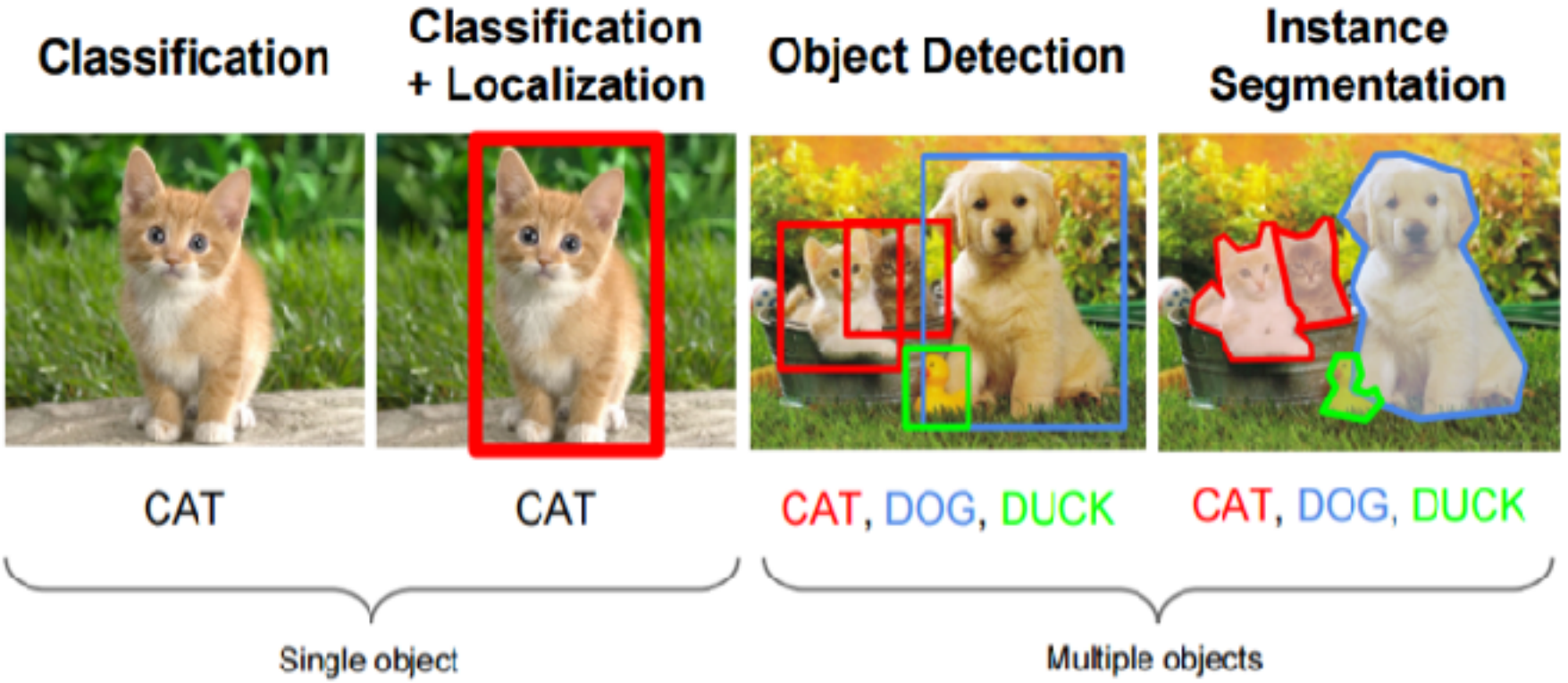
SLAC



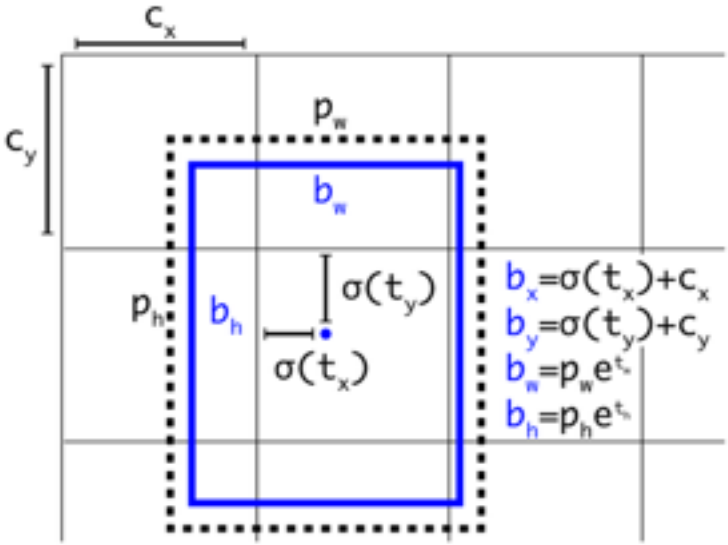
Classification vs Detection

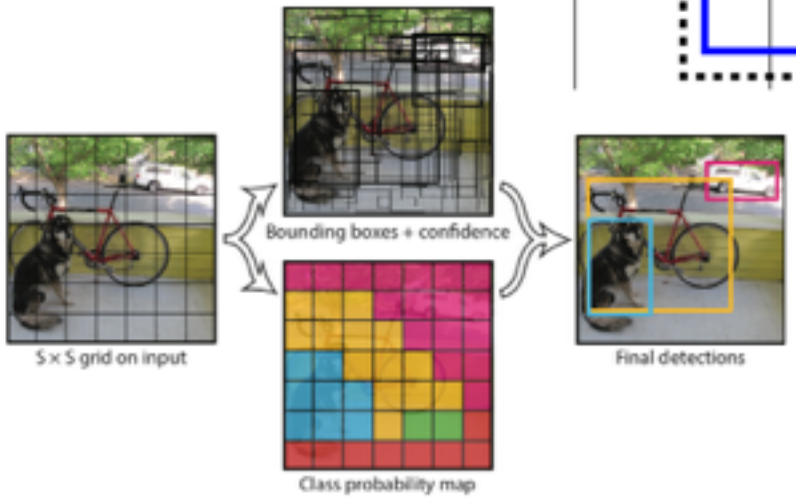
Computer Vision Tasks



Source: http://cs231n.stanford.edu/

YOLO: object detection

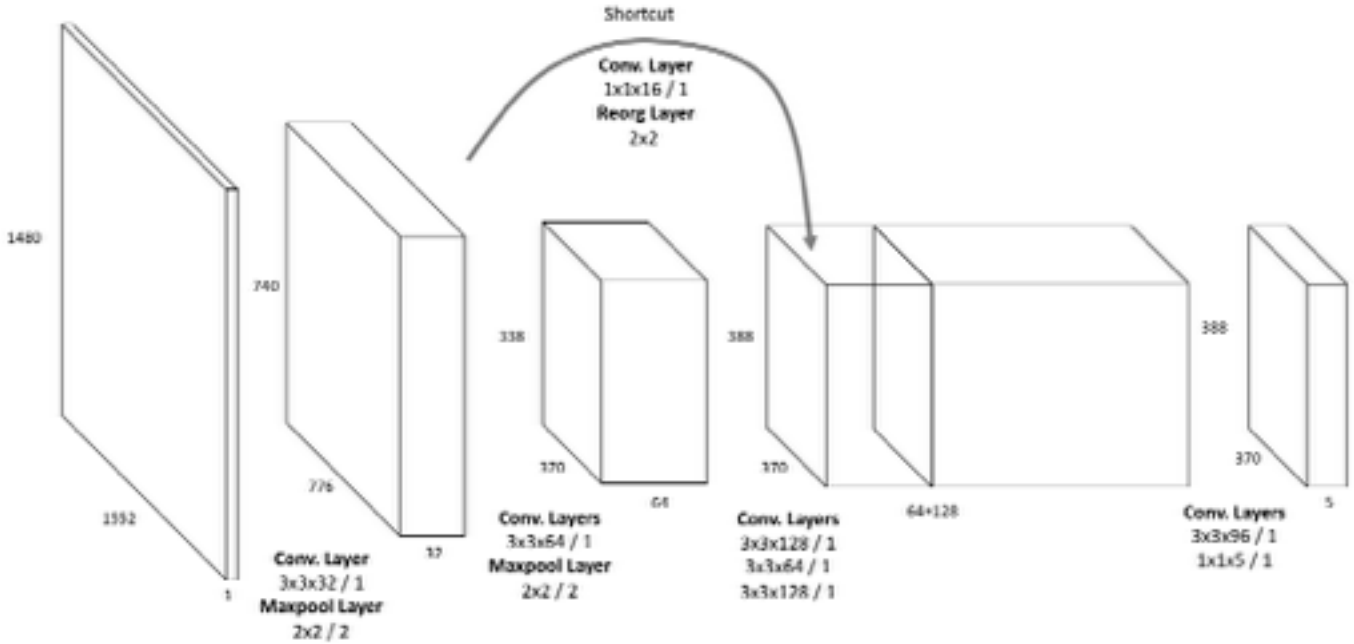




J. Redmon, S. Divvala, R. Girshick, A. Farhadi, *arXiv:1506.02640 (*2015).
J. Redmon, A. Farhadi, *arXiv:1612.08242*, (2016).
J. Redmon, A.Farhadi, arXiv:1804.02767 (2018).

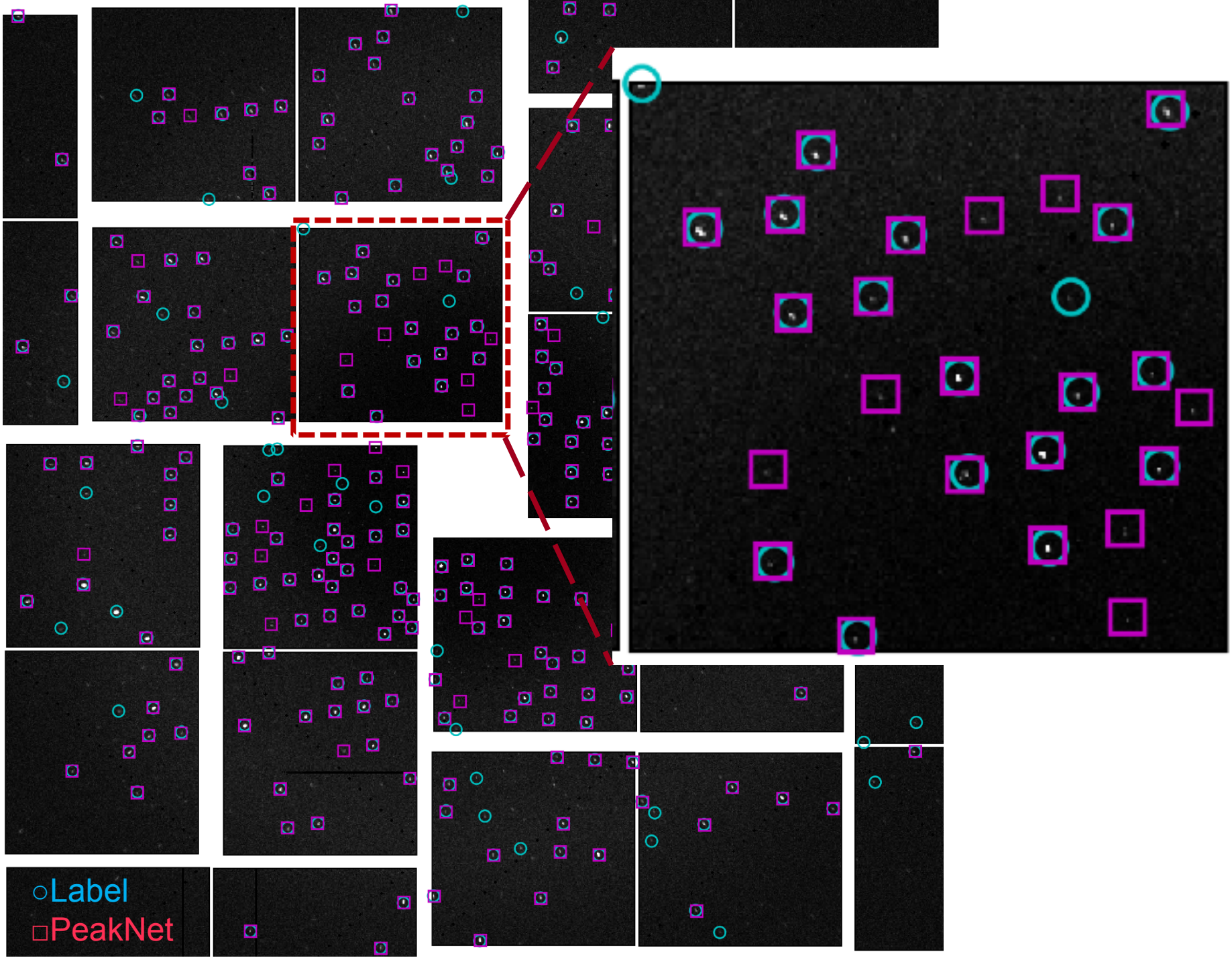
PeakNet: faster, stronger

- Less filters => faster
- Less conv. layers => faster
- Less maxpool layers => more accurate



Why 5 channels?

- (x,y,w,h): 4
- Score: 1


○Label
□PeakNet

Antfarm

- Multi-GPU training
- Label: Peak finding algorithm