Artifact Detection on Photographic Plates with Convolutional Neural Networks

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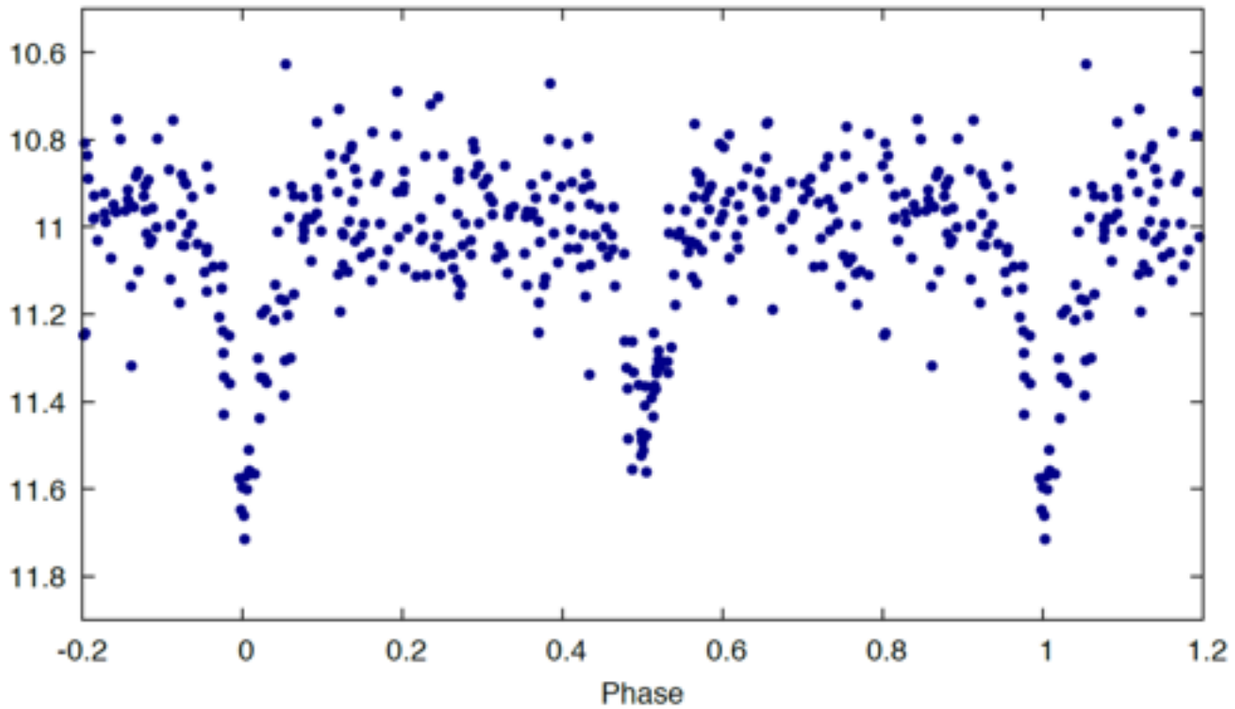
1931/Dez 17/18 K Nord ABCam La 3844

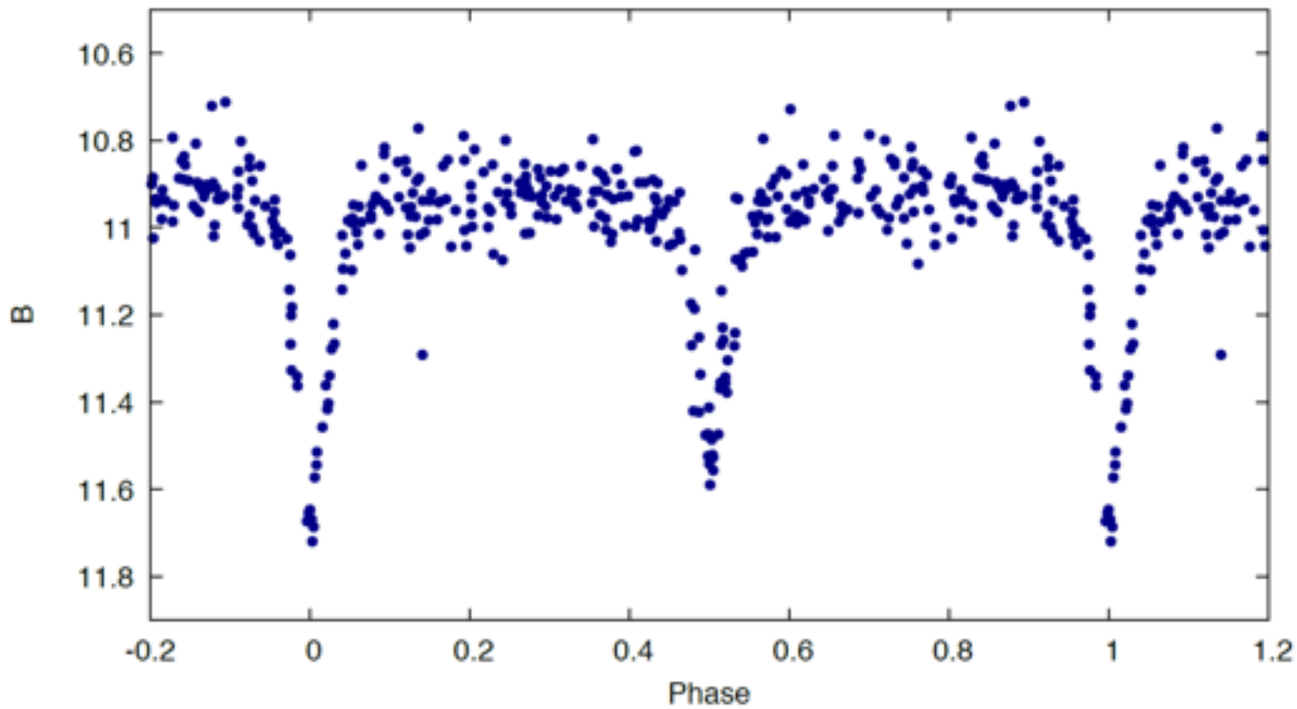
Results: V466 Cyg light curve

APPLAUSE DR2 (PyPlate 2.0)

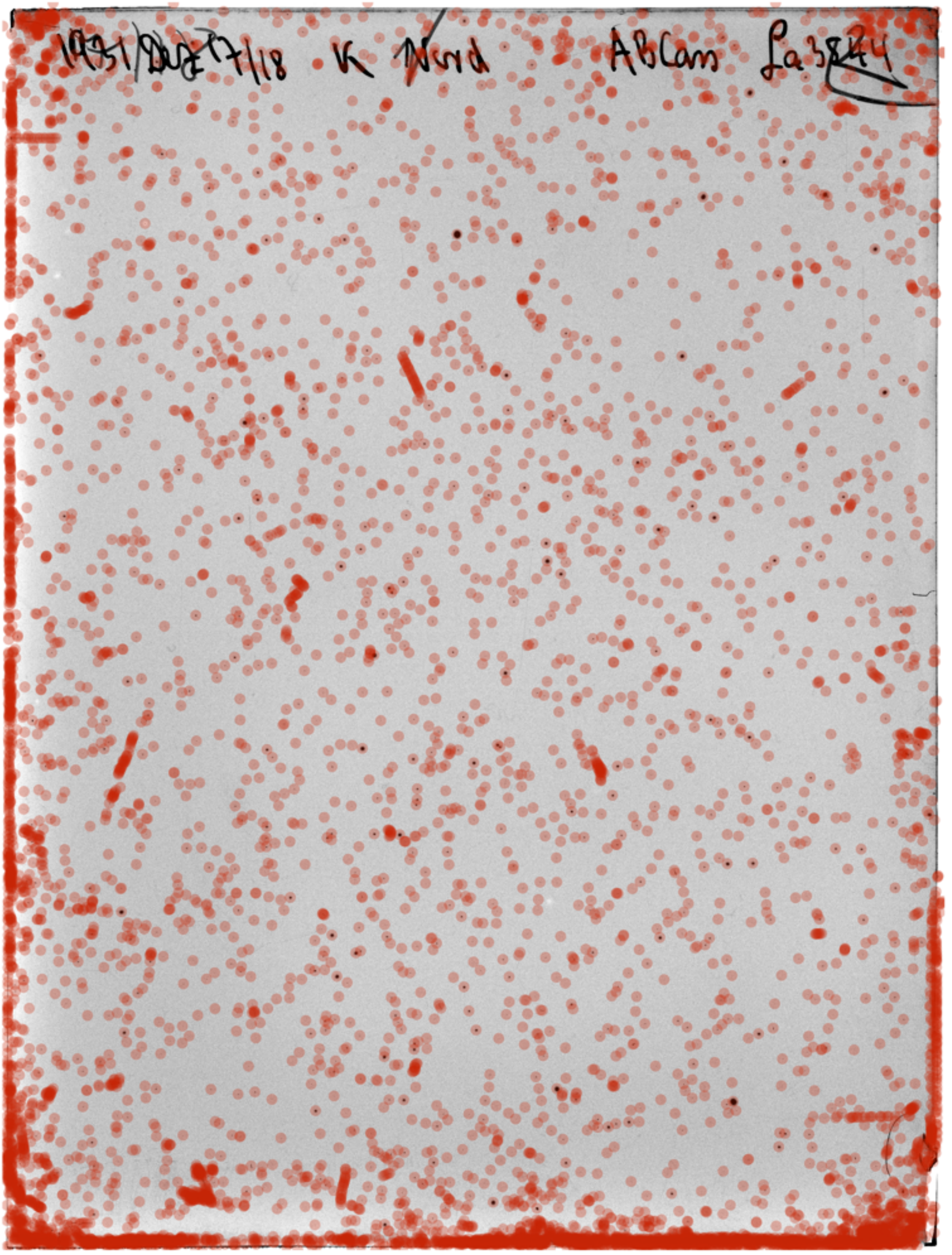


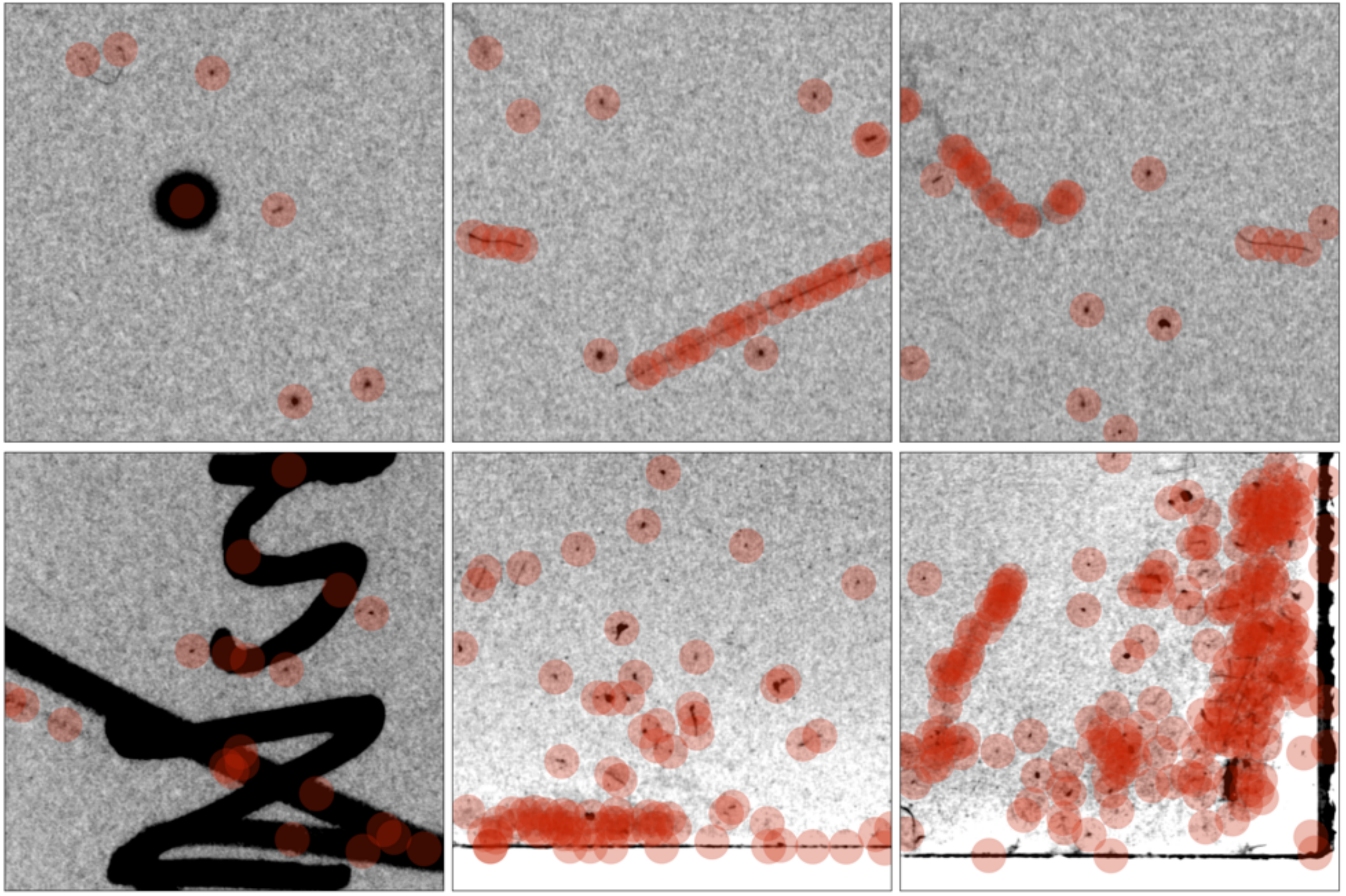
Calibration in annular bins

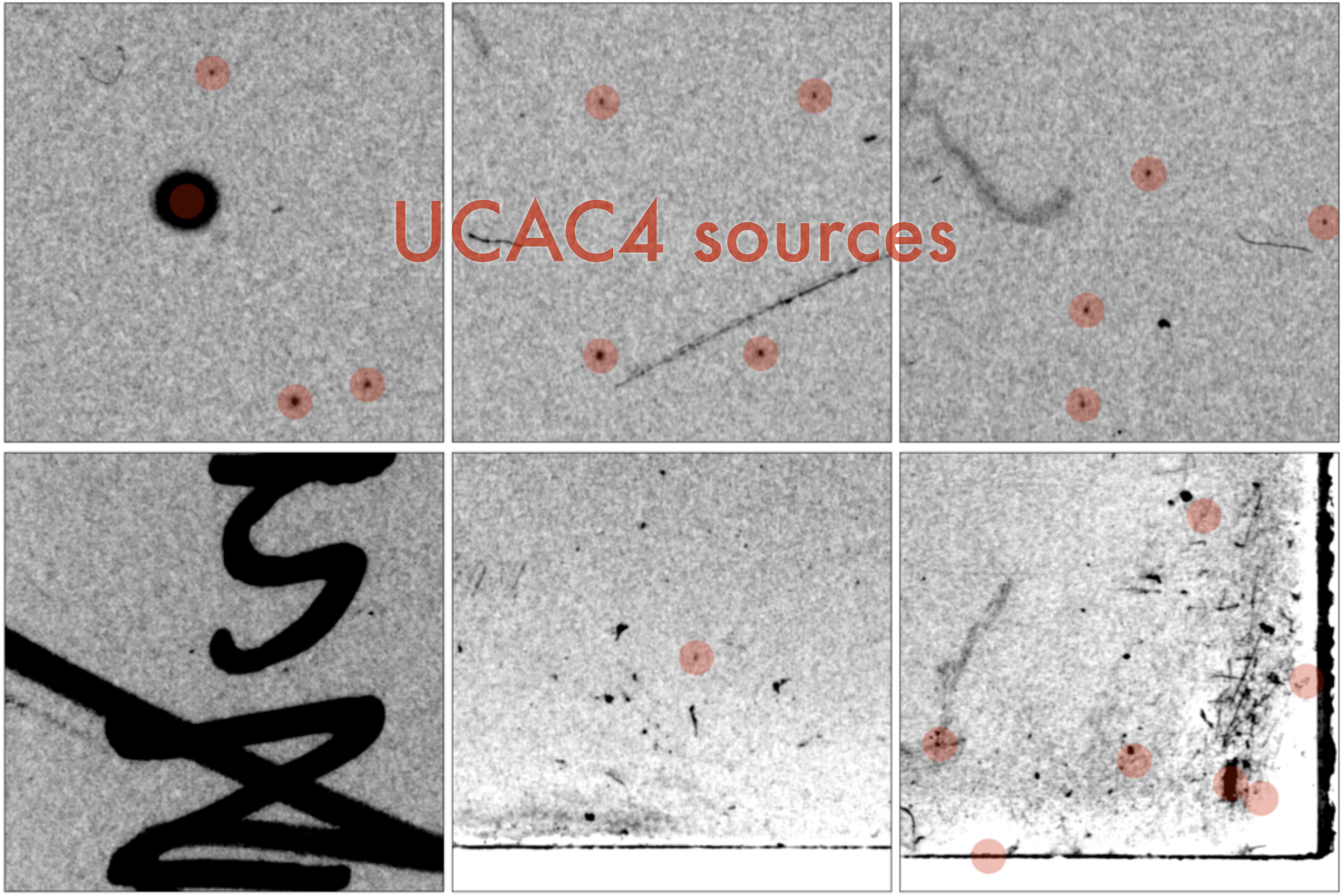
APPLAUSE DR3 (PyPlate 3.0)



Calibration in sub-fields


1931/Dez 7/18 K Nord ABCam La3844



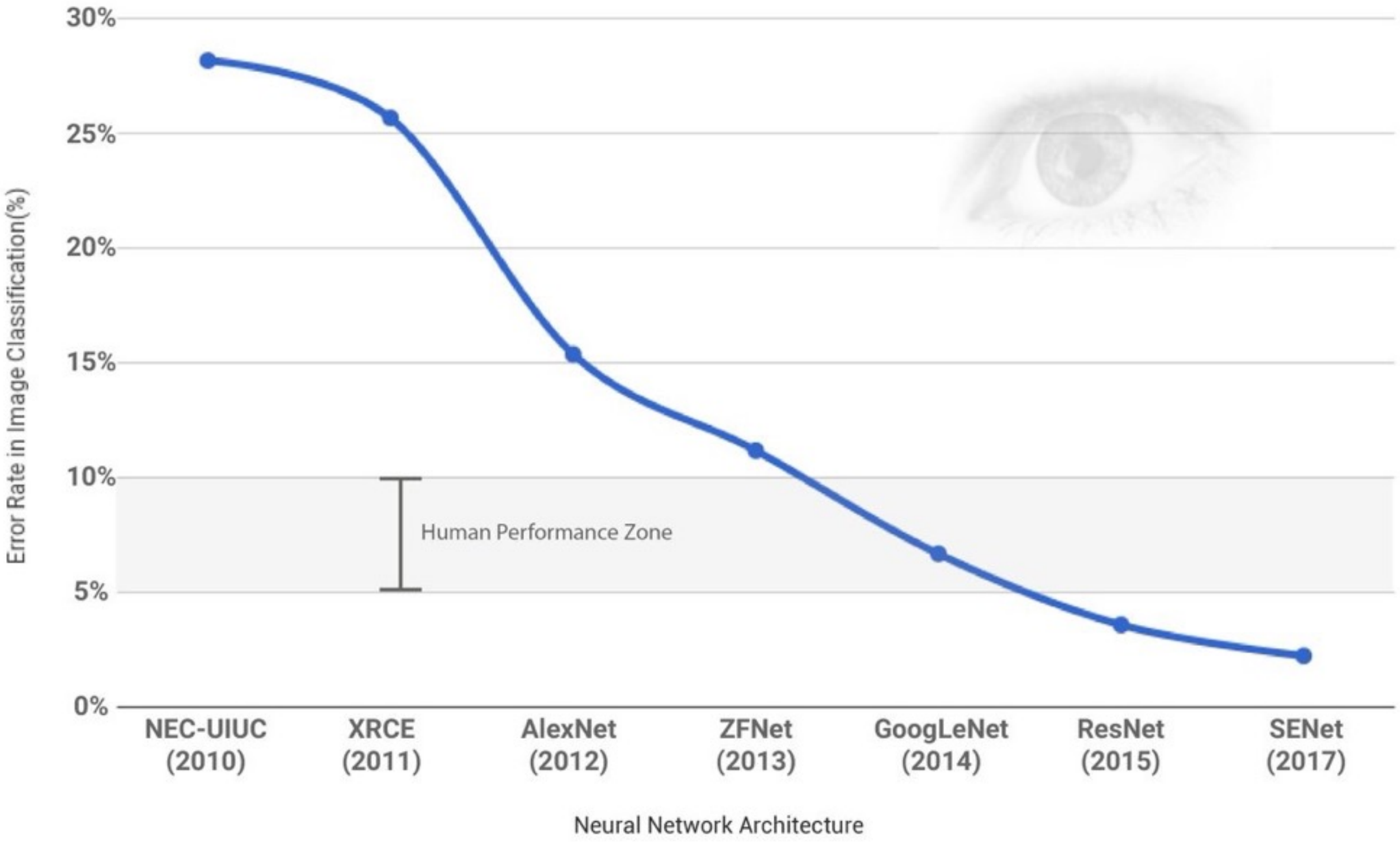

UCAC4 sources

APPLAUSE DR3 has

3,508,339,749

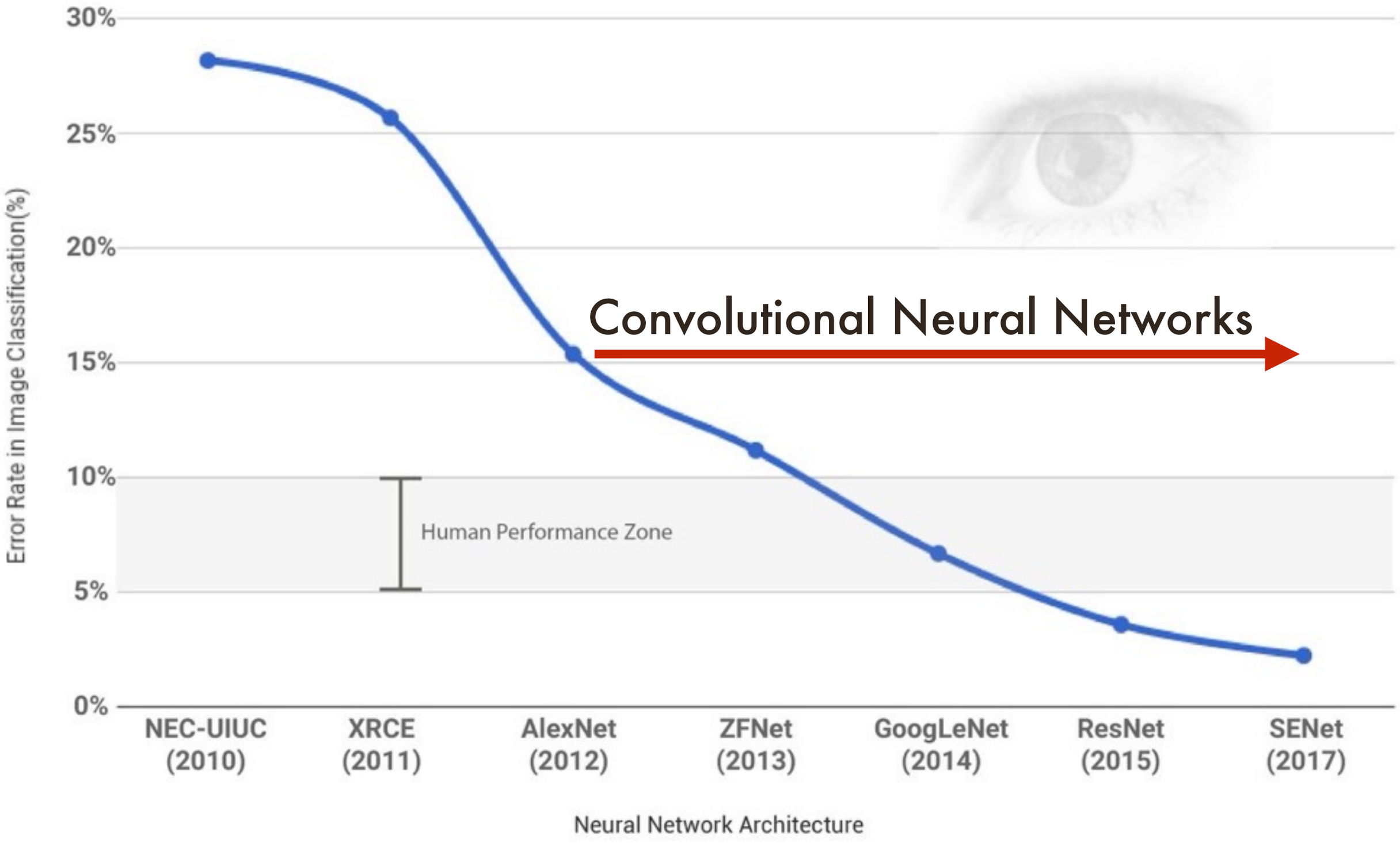
sources

IMAGENET Large Scale Visual Recognition Challenge



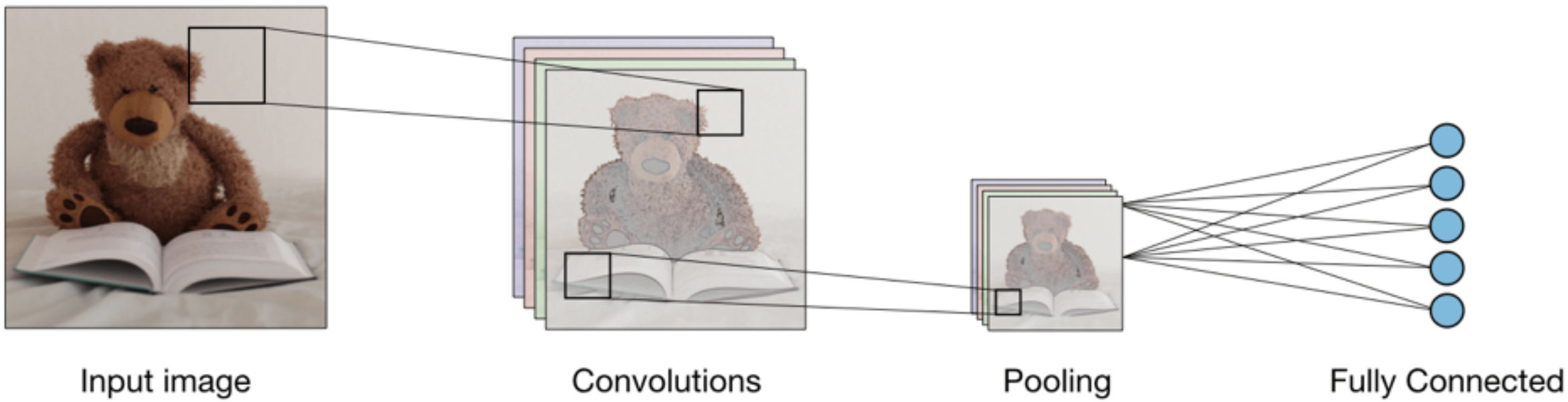
source: twitter.com

IMAGENET Large Scale Visual Recognition Challenge

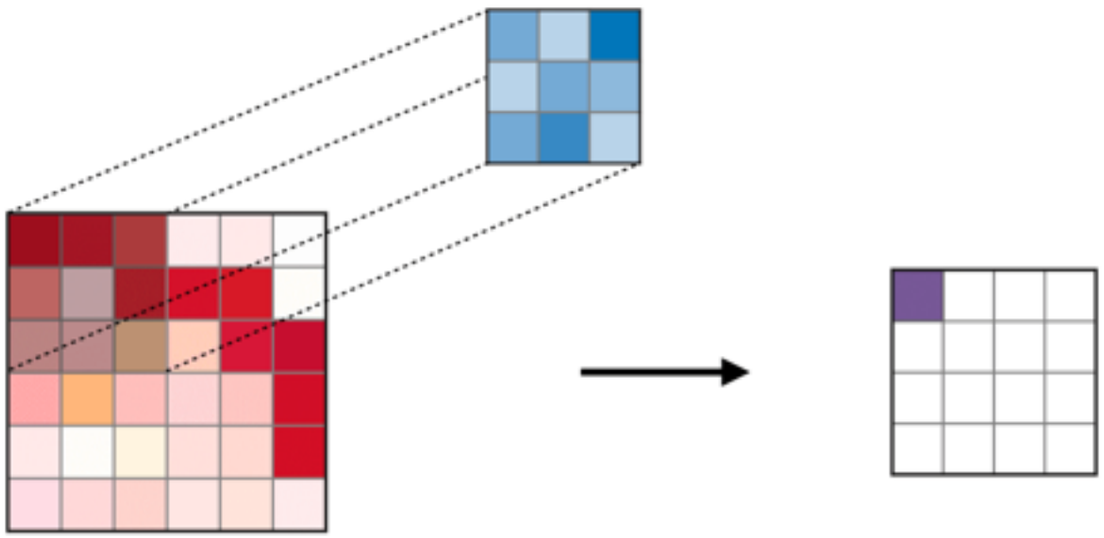


source: twitter.com

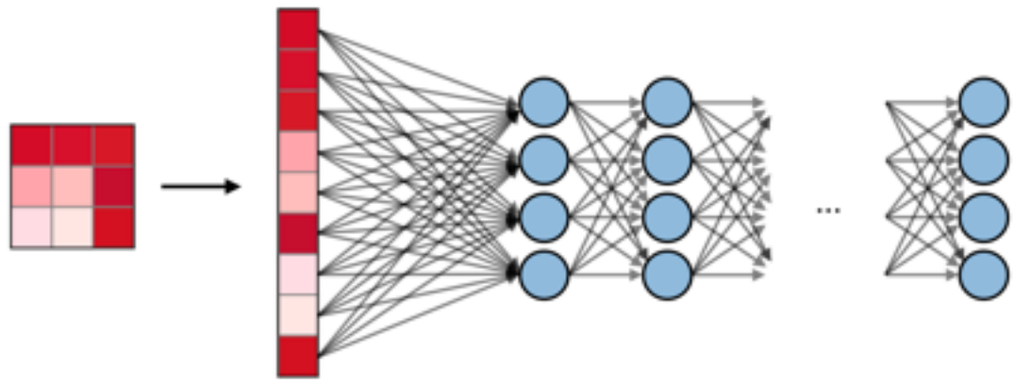
Convolutional neural network (CNN) architecture



Convolutional layer



Fully-connected layers



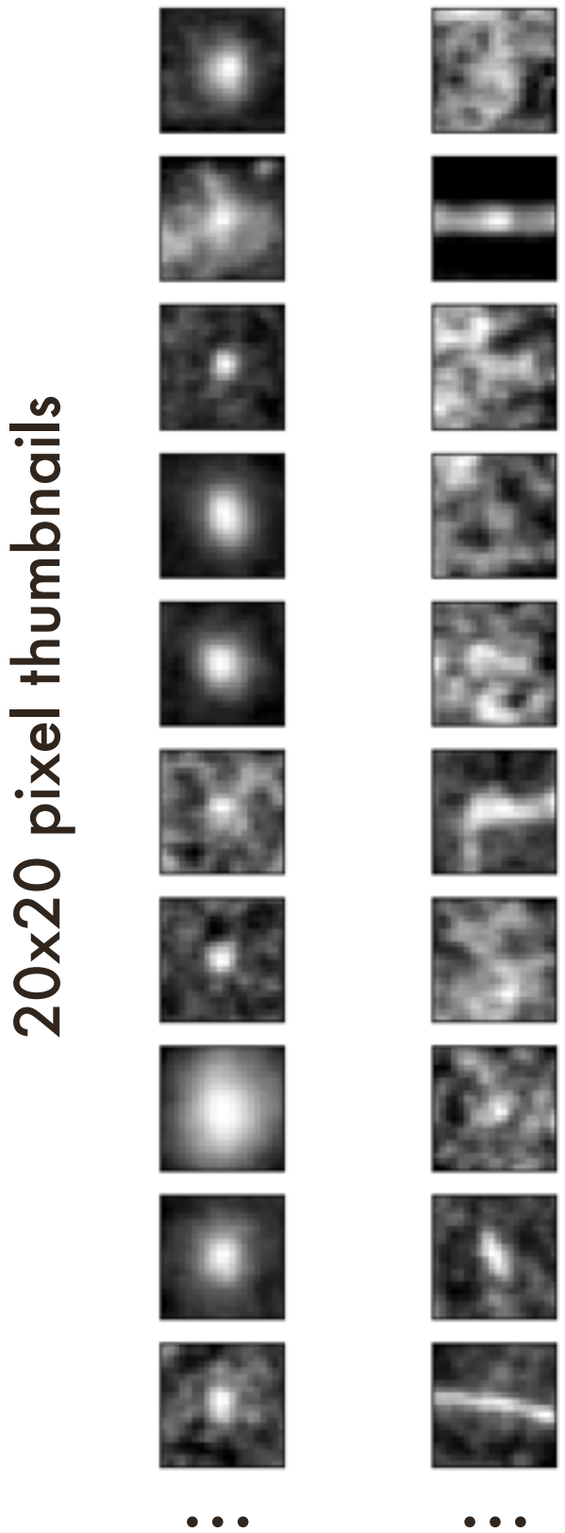
source: Shervine Amidi, stanford.edu

Training process

Training set

(normalized and augmented)

Good=1 Bad=0



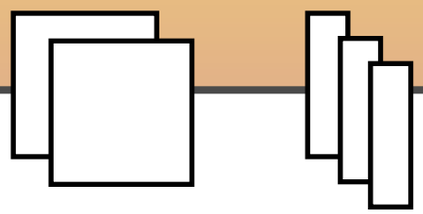
20x20 pixel thumbnails

...

...

2 convolutional layers
3 fully-connected layers

Neural network



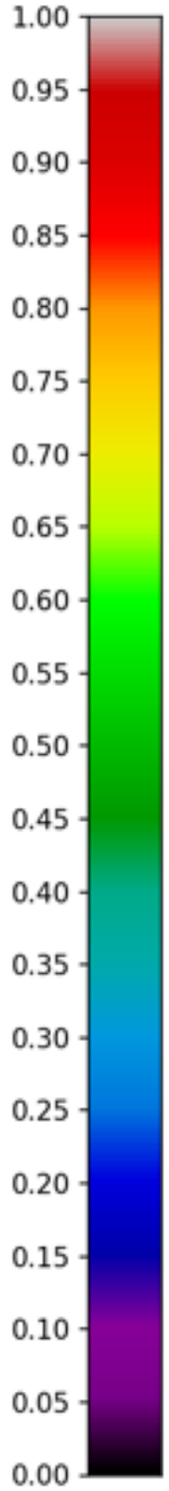
1

...

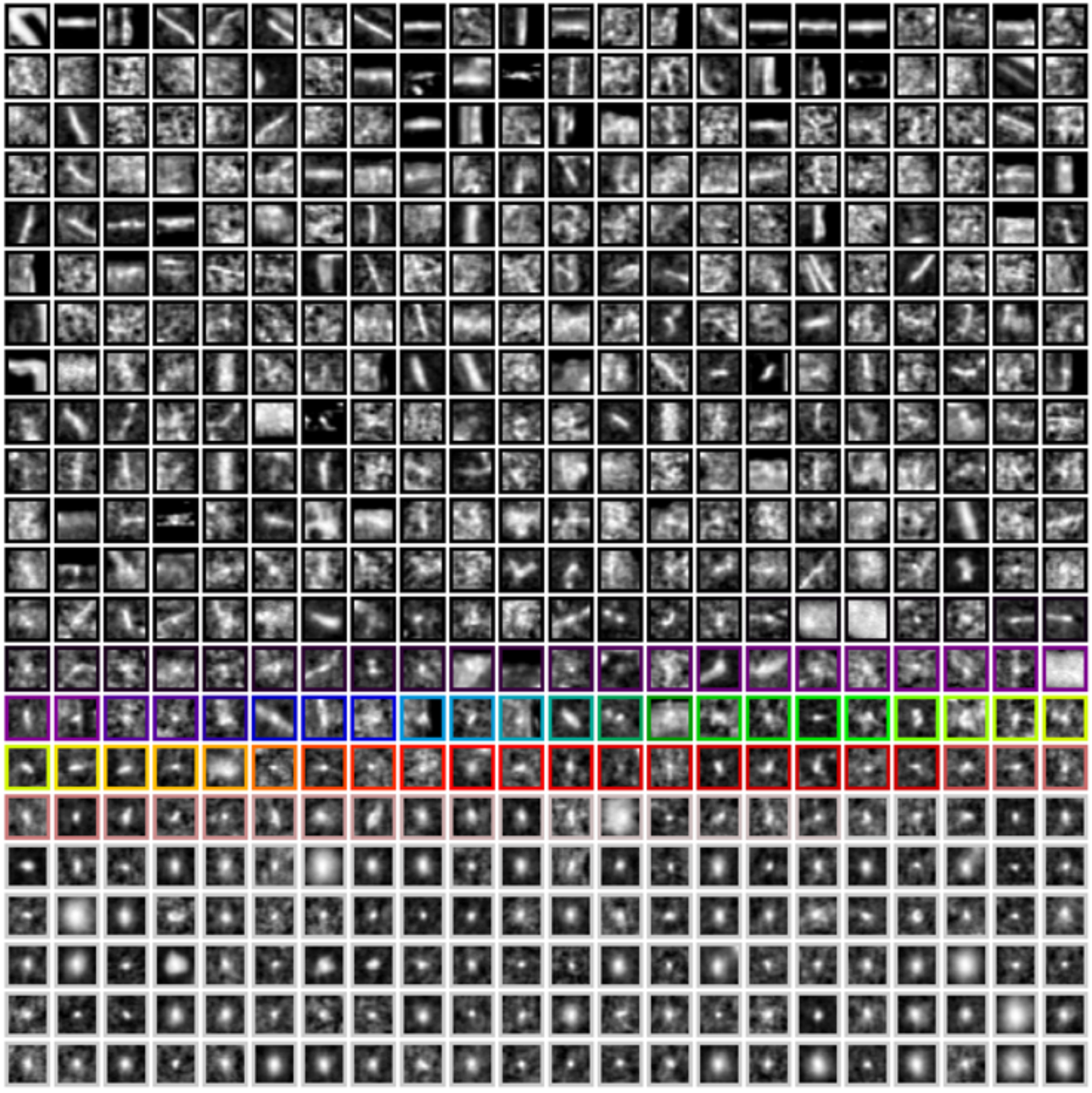
0

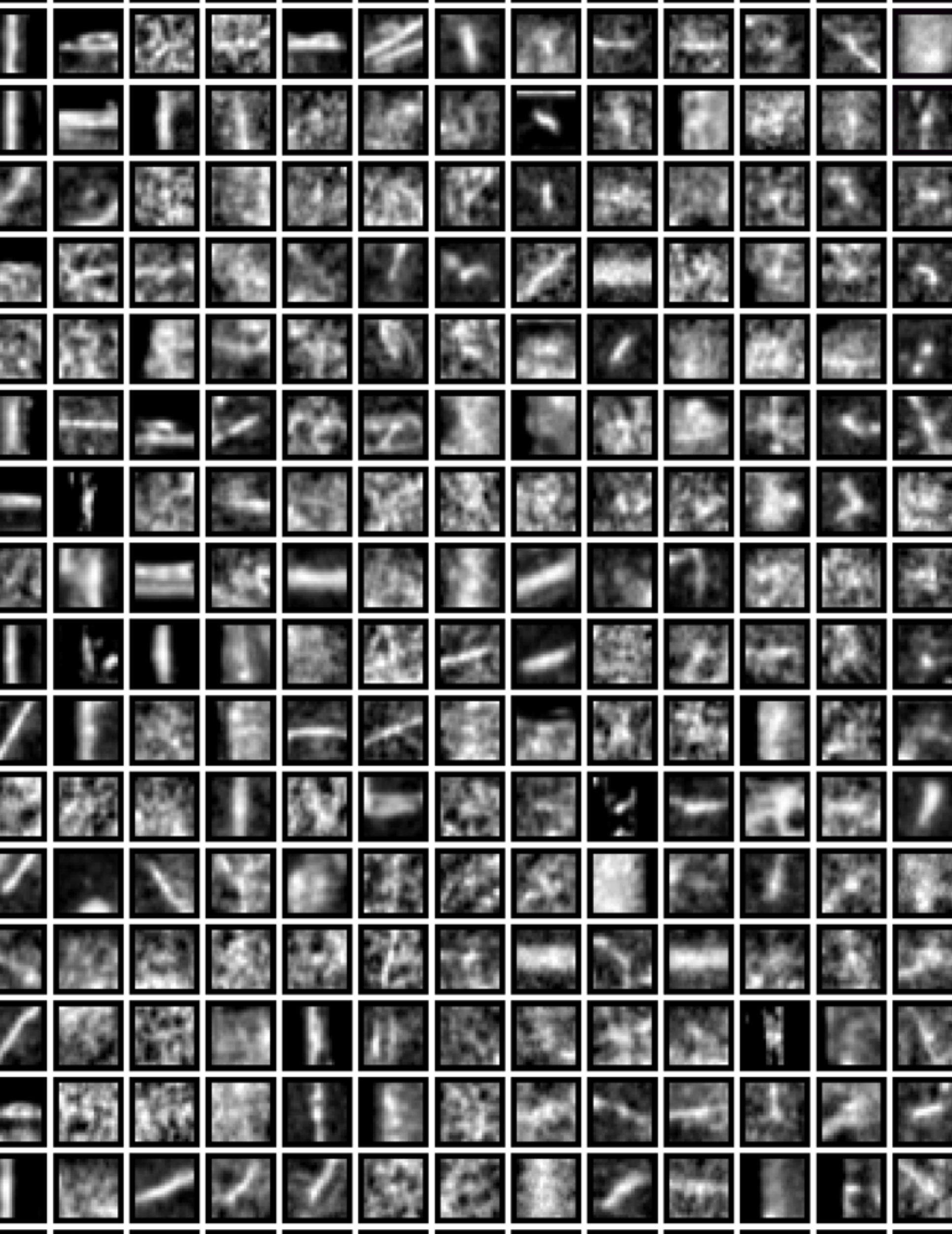
Cost function

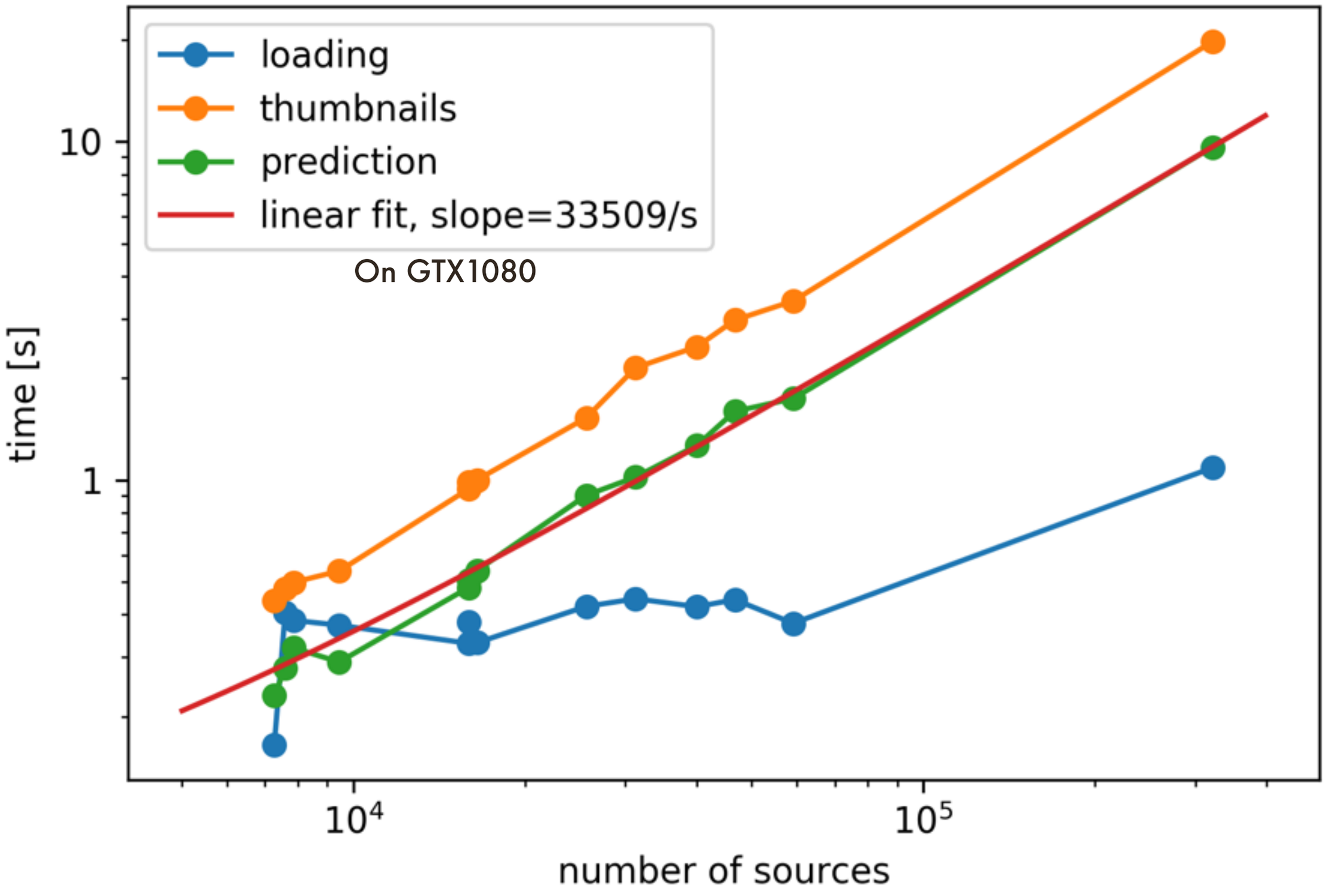
Good=1


1.00
0.95
0.90
0.85
0.80
0.75
0.70
0.65
0.60
0.55
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00

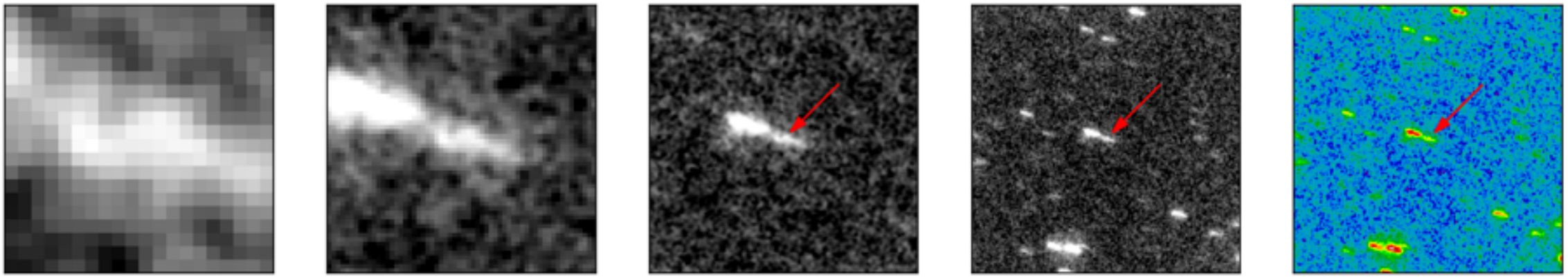
Bad=0



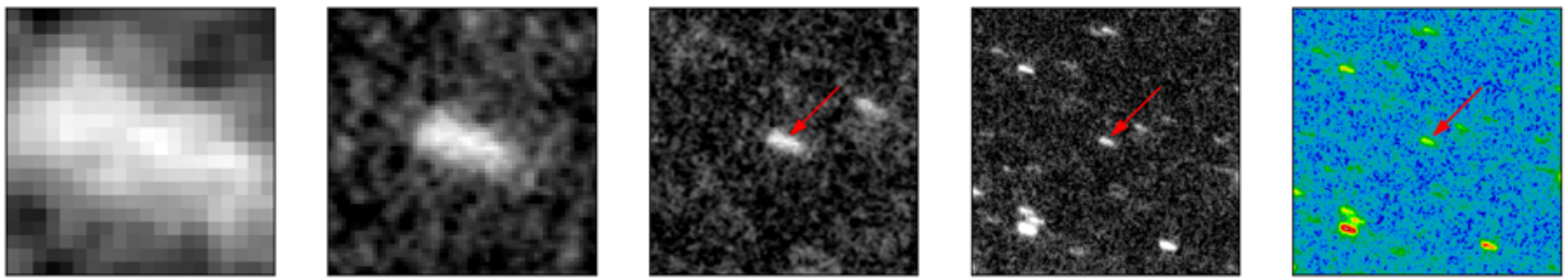



loading
thumbnails
prediction
linear fit, slope=33509/s
On GTX1080
10
1
time [s]
10^4
10^5
number of sources

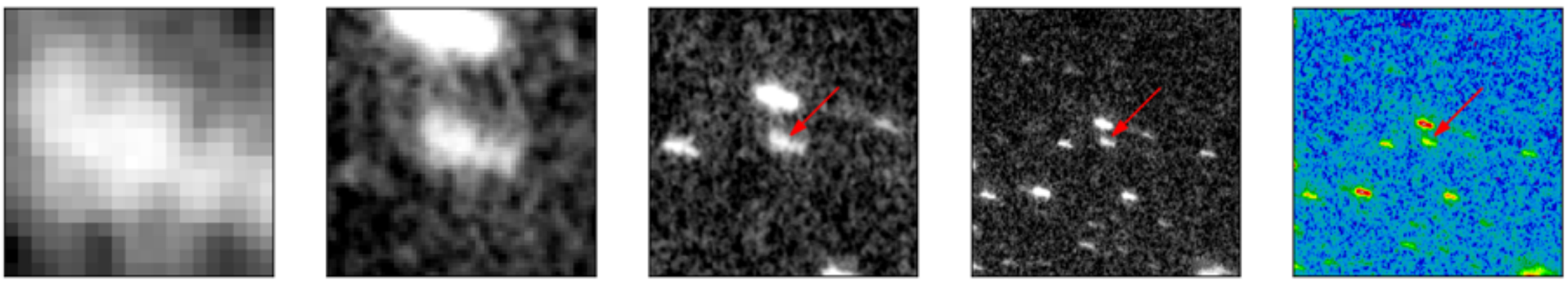
p=0.001



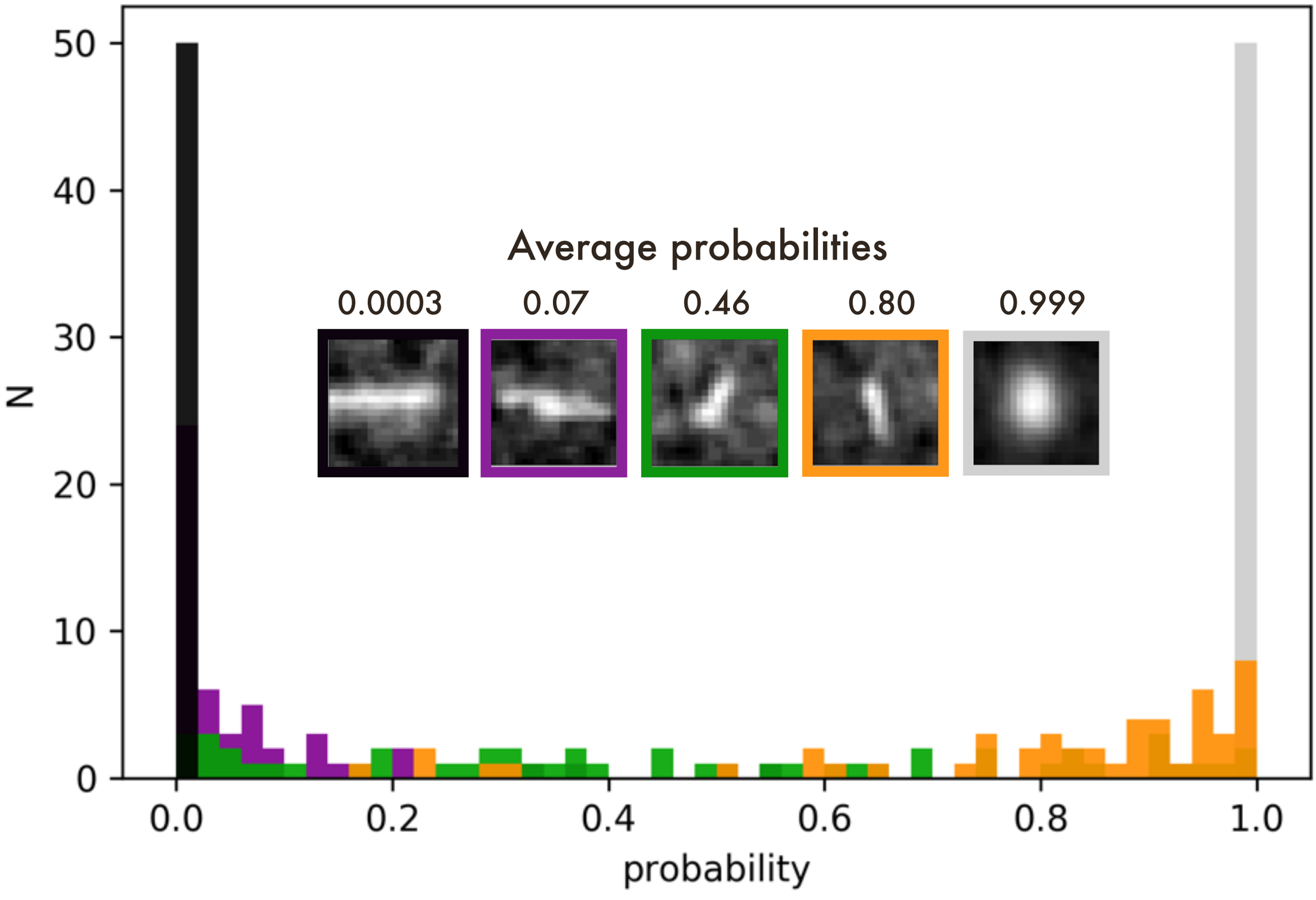
p=0.51



p=0.999



Training set

- include sources from many plates to learn about different PSFs
- positives identified as isolated UCAC4 sources
- negatives have no UCAC4 counterparts and have many other sources inside of a small (several arcsec) circle
- limit sources to the inner part of the plate

Train more CNNs