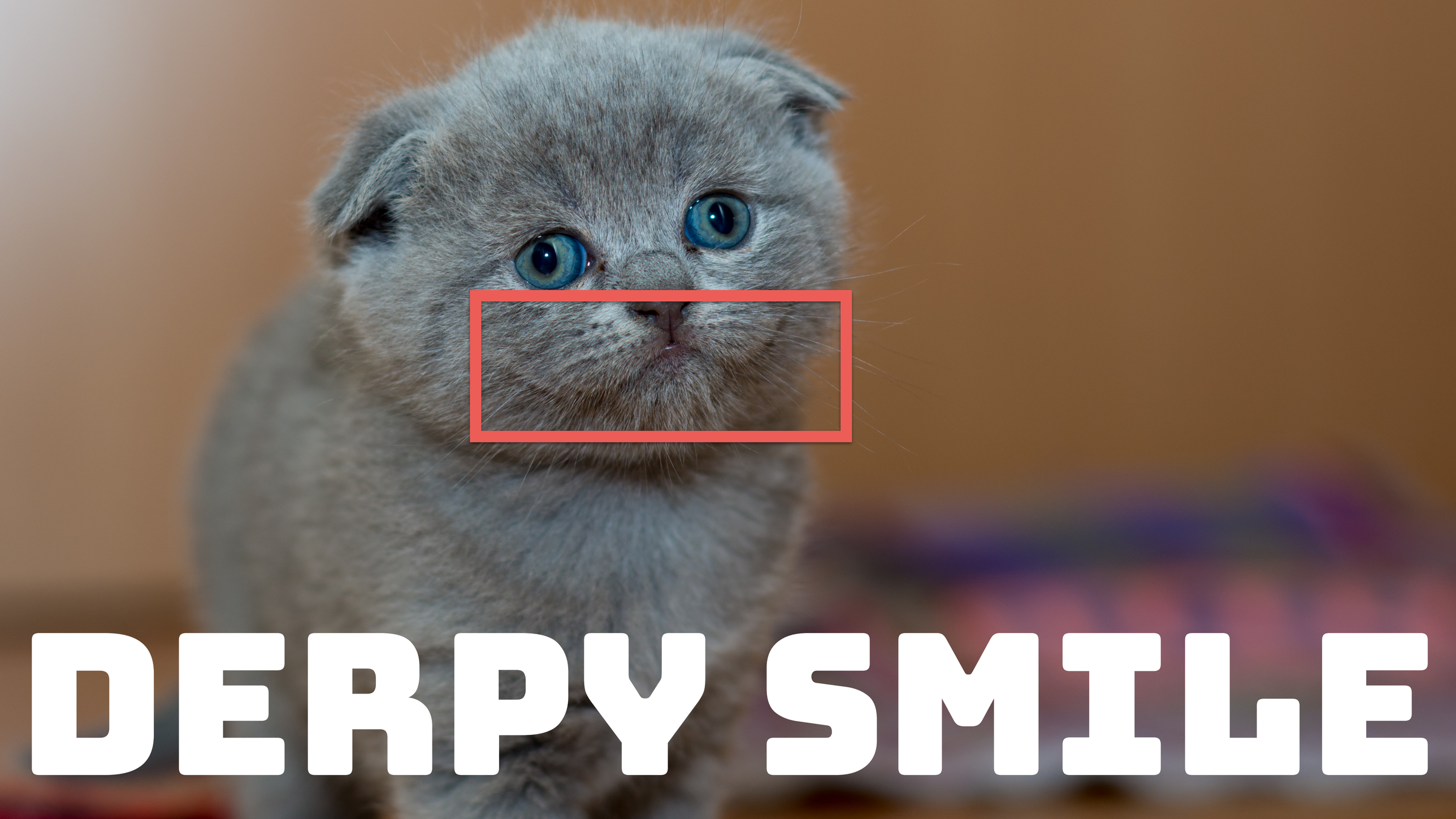
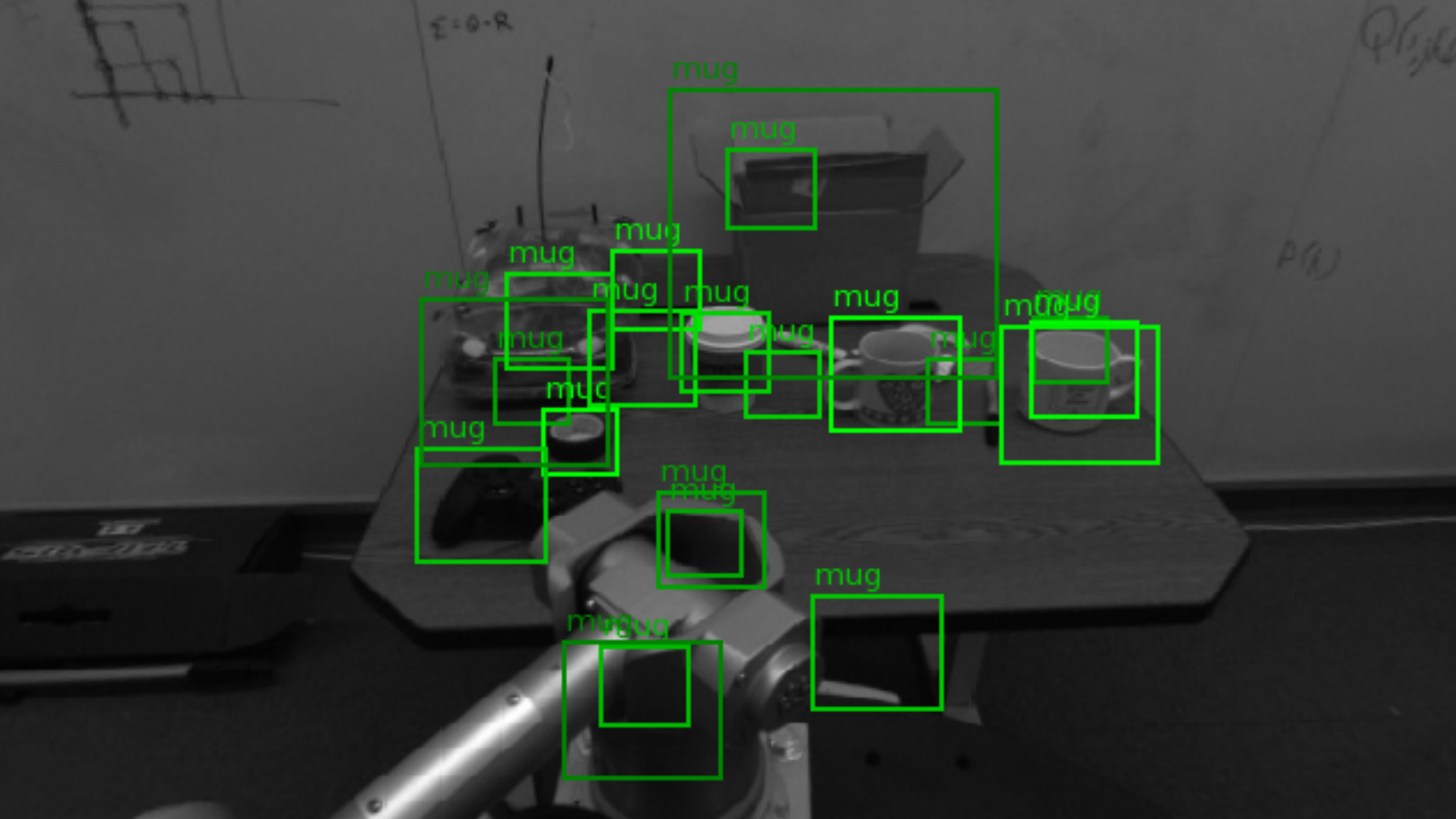
THE CHALLENGES OF IMAGE CLASSIFICATION

CAT


DERPY SMILE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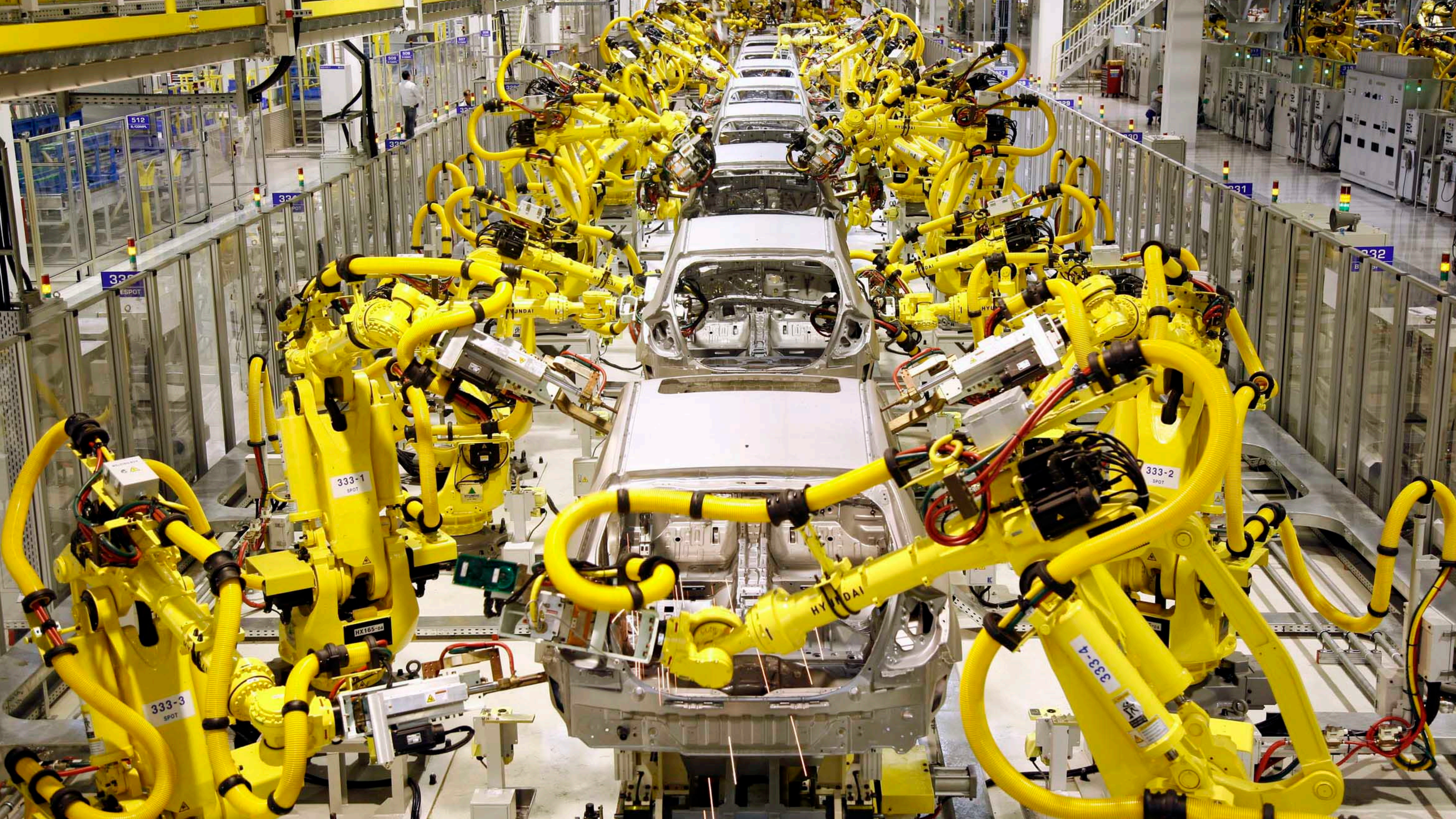
Google
self-driving car
6UEJ089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SPOT
333-3
SPOT
333-4
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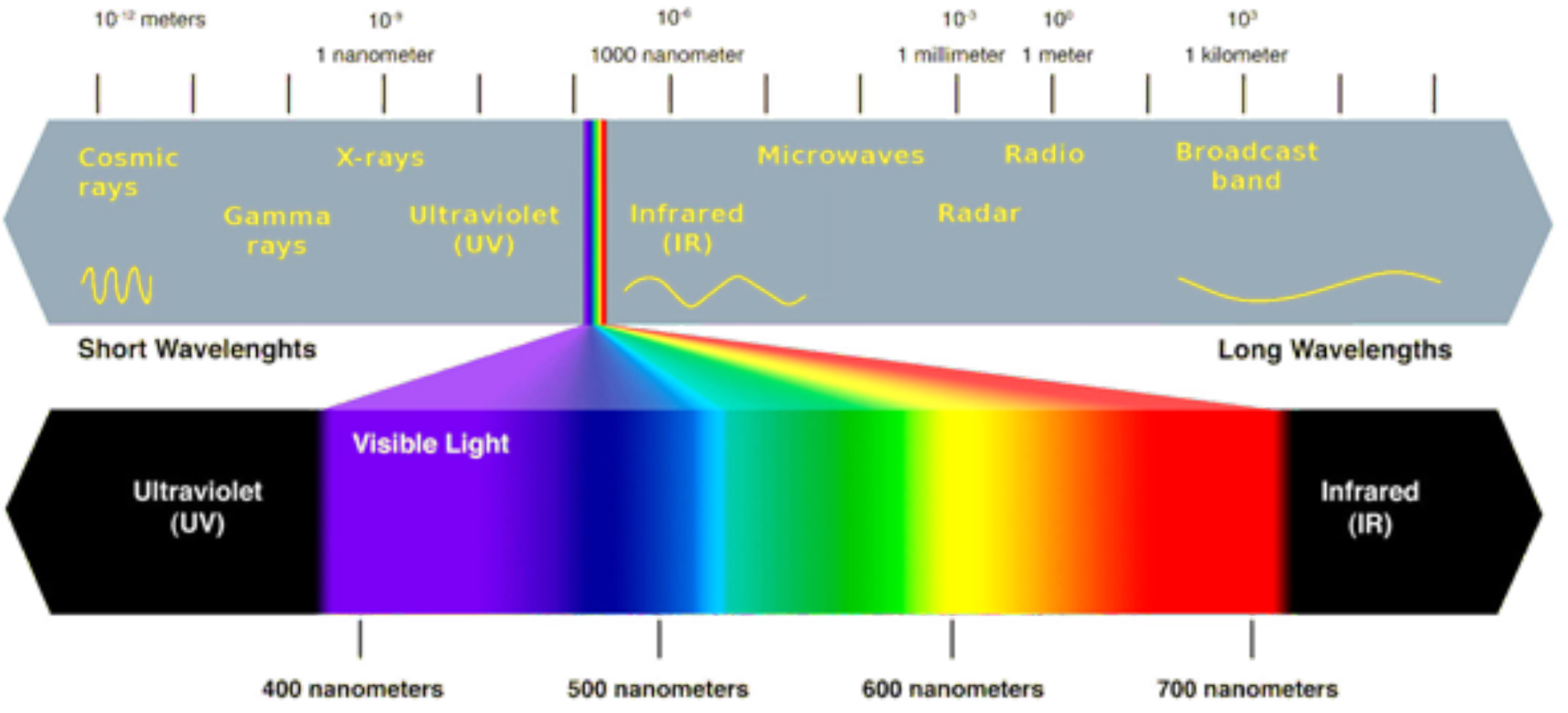
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10^{-9}
1 nanometer
10^{-6}
1000 nanometer
10^{-3}
1 millimeter
10^{0}
1 meter
10^{3}
1 kilometer
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X-rays
Gamma rays
Ultraviolet (UV)
Infrared (IR)
Microwaves
Radar
Radio
Broadcast band
Short Wavelenghts
Long Wavelengths
Ultraviolet (UV)
Visible Light
Infrared (IR)
400 nanometers
500 nanometers
600 nanometers
700 nanometers

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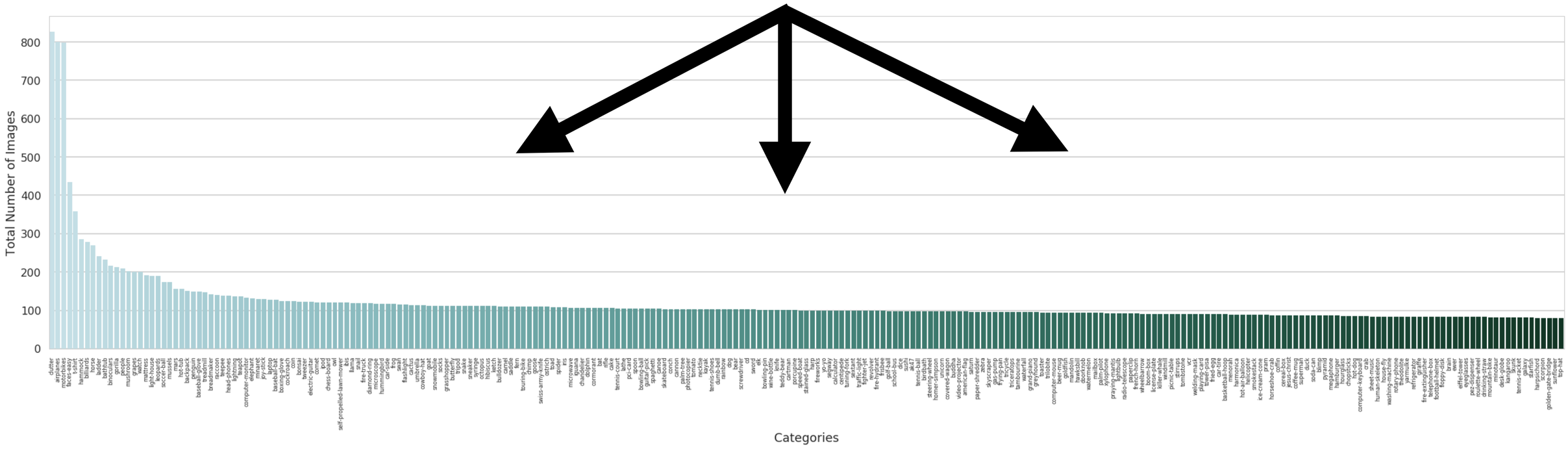
HOMO SAPIEN

FEATURE EXTRACTION

CALTECH 256

A LOT OF CATEGORIES



~30K IMAGES
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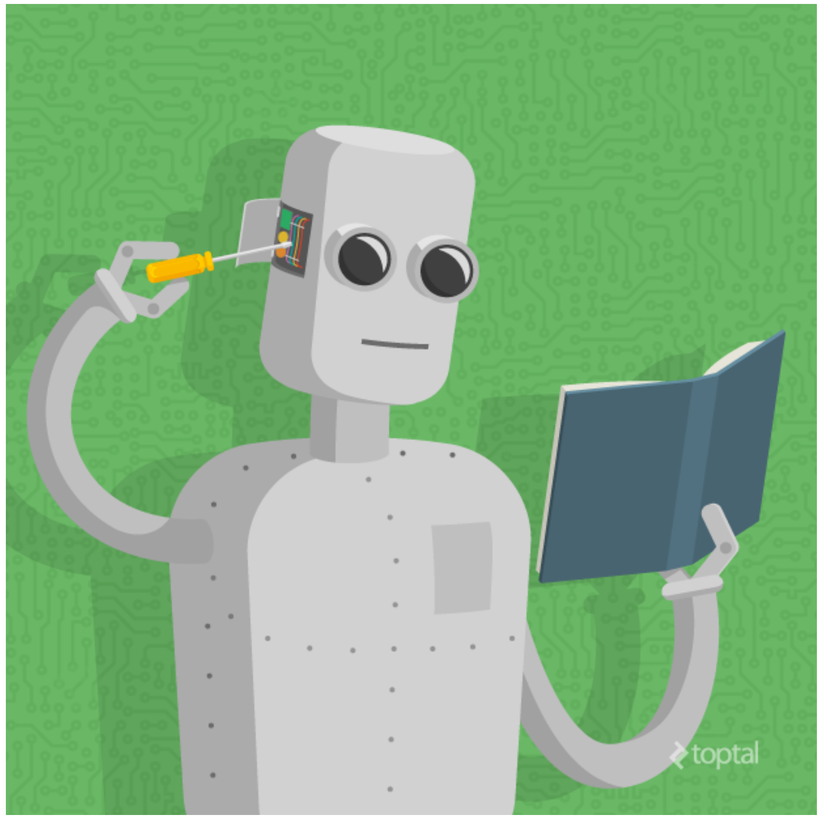
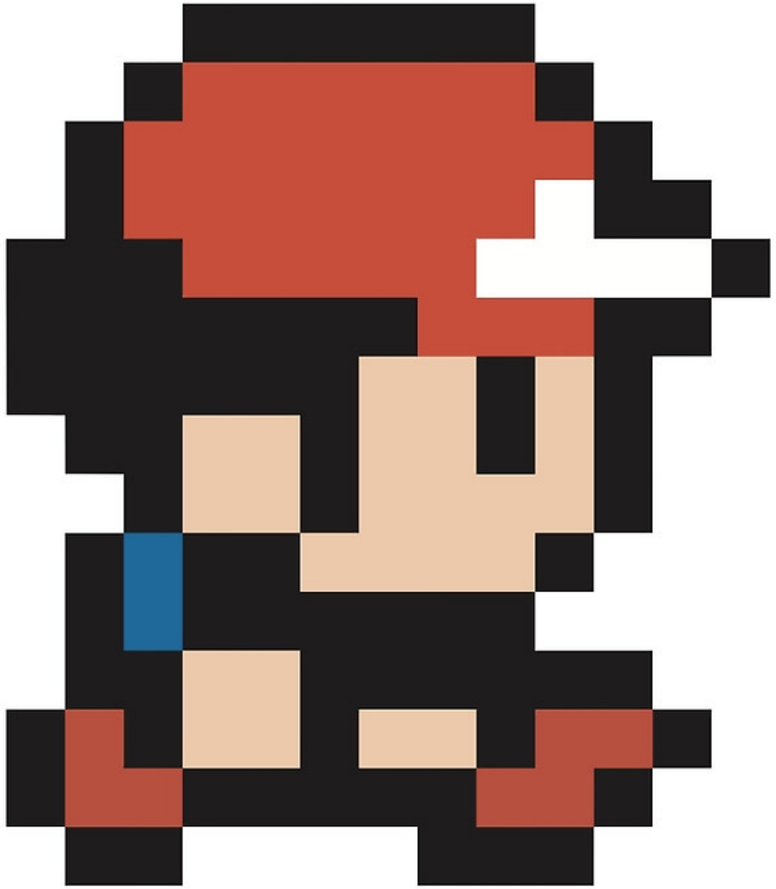


LINEAR SVM



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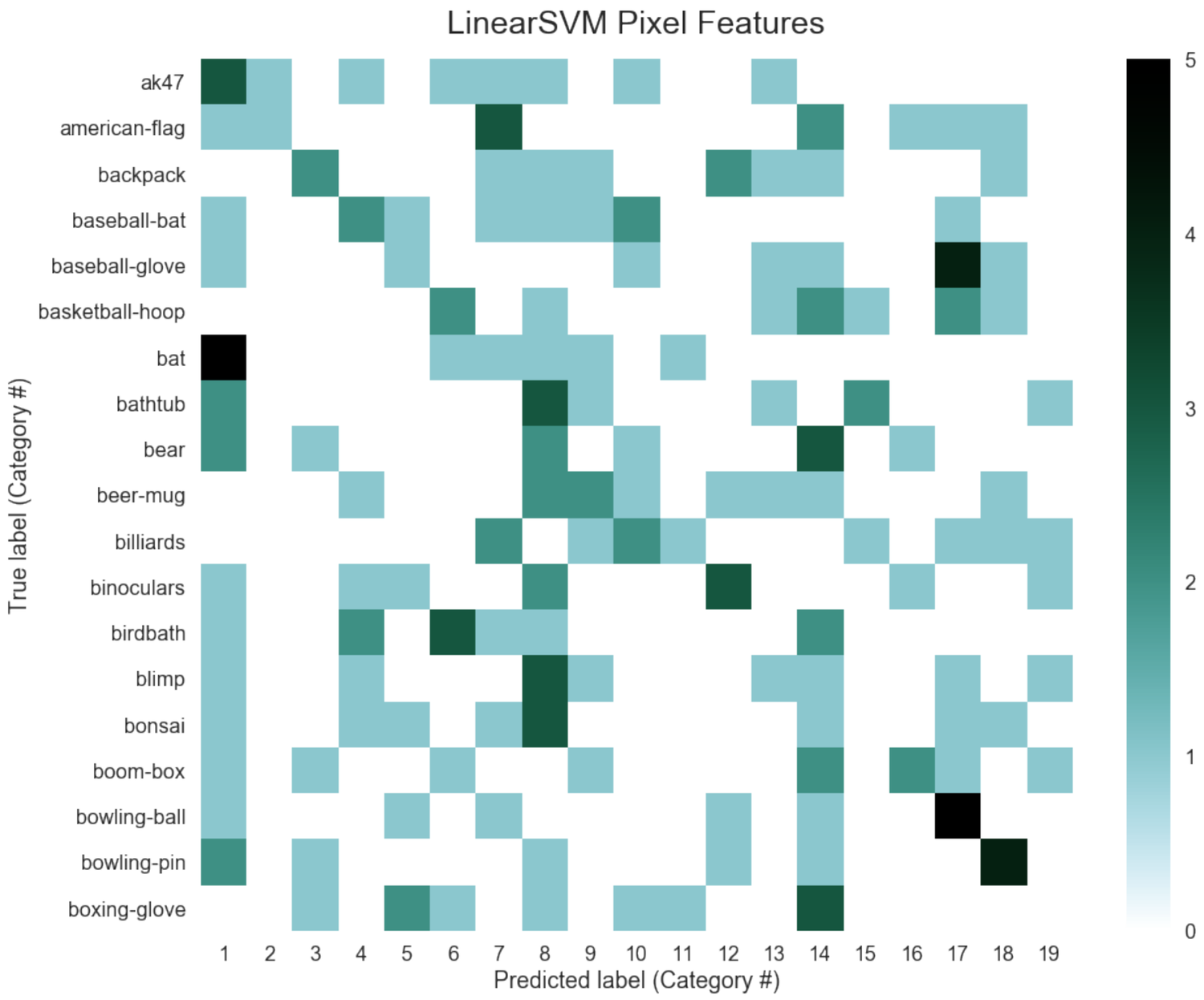
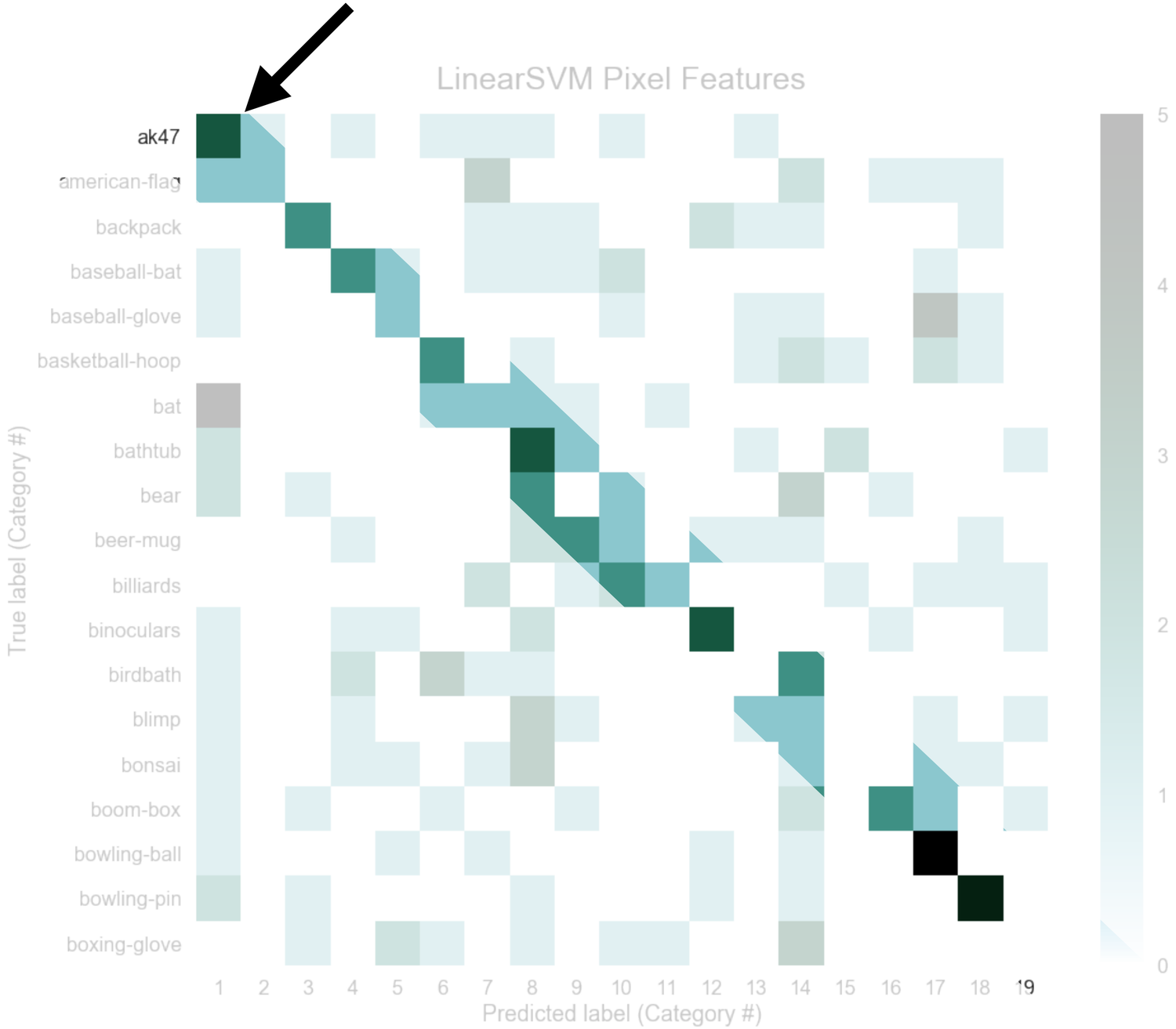


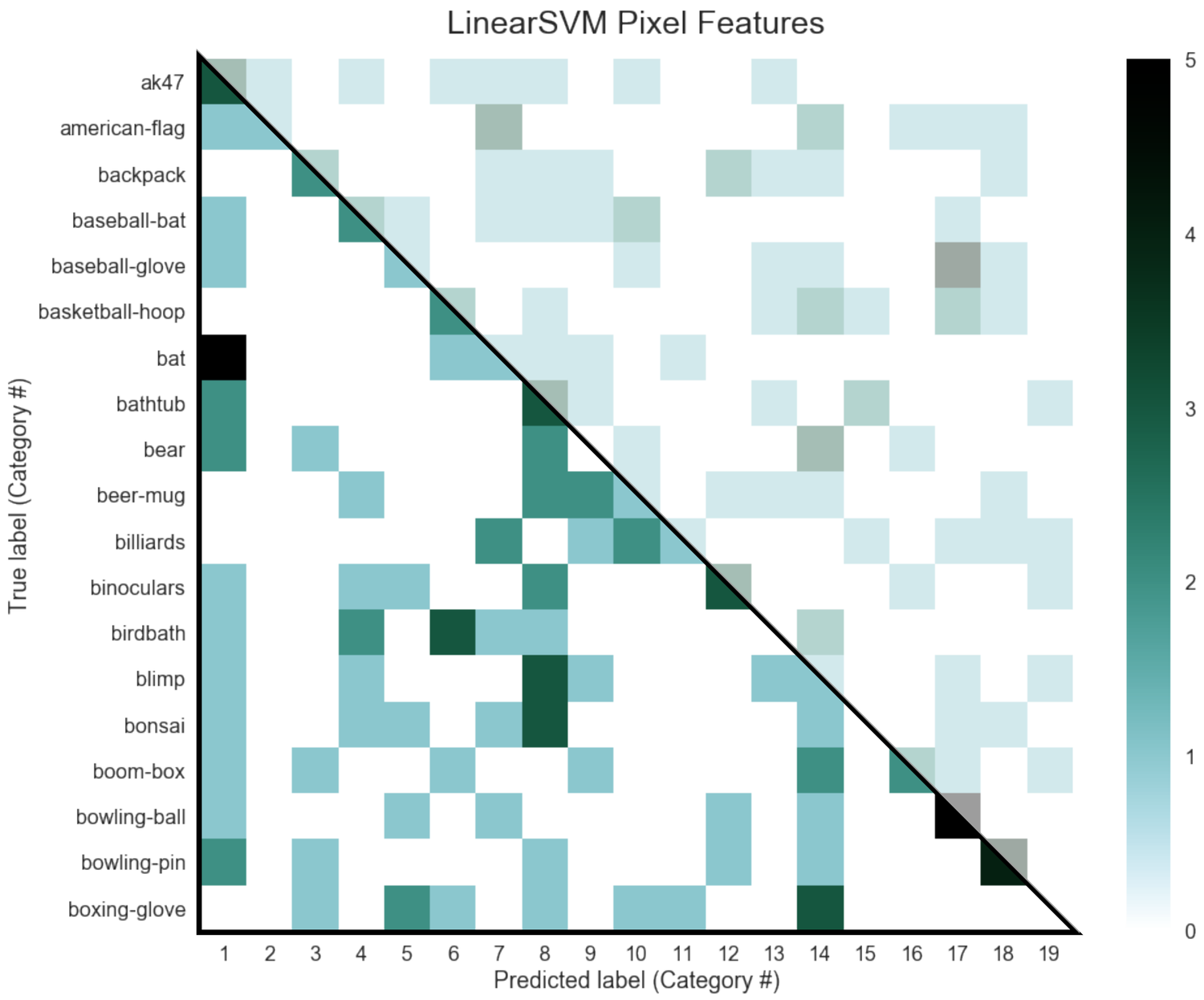
METRICS

16% Accuracy



METRICS

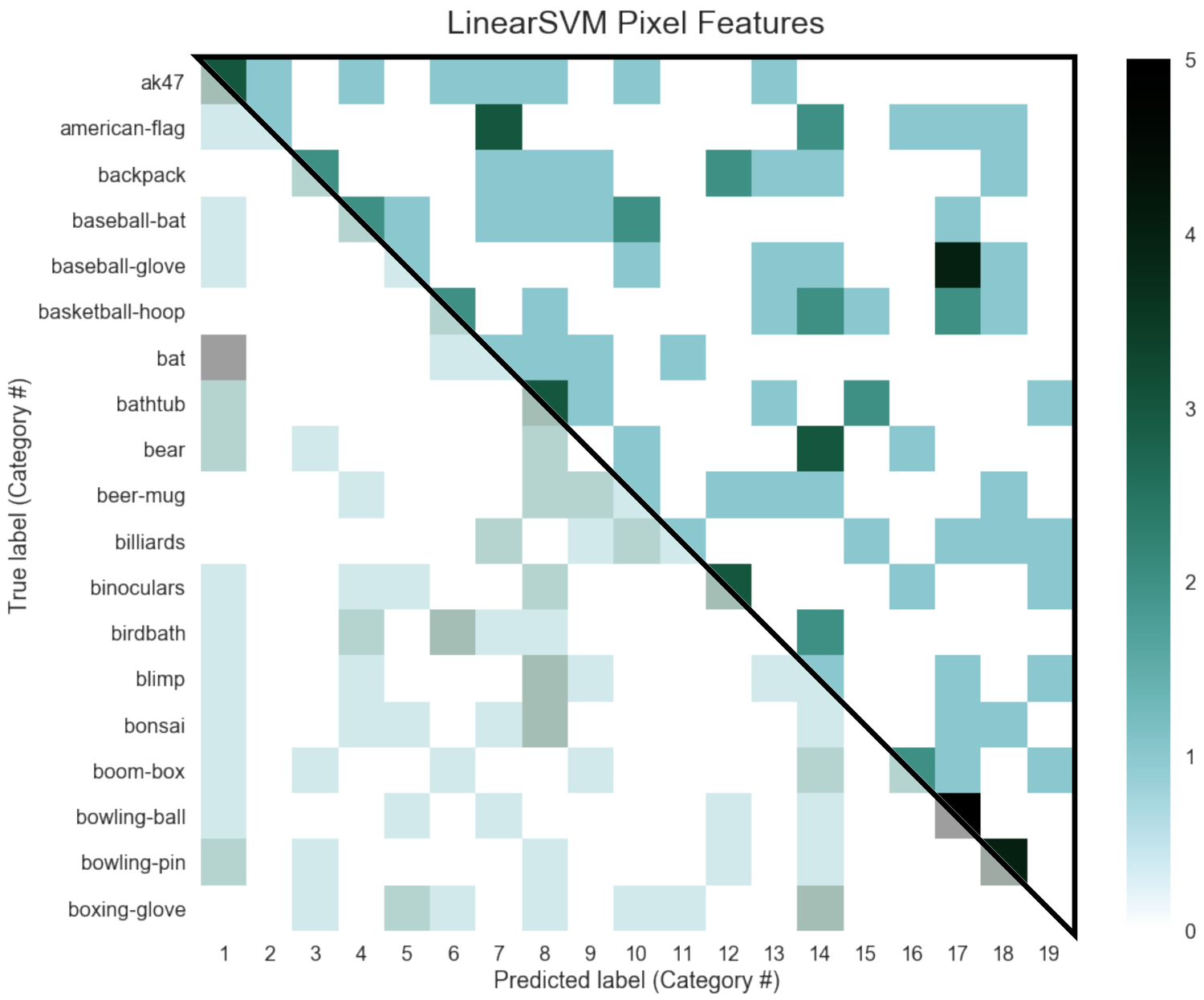
16% Accuracy



METRICS

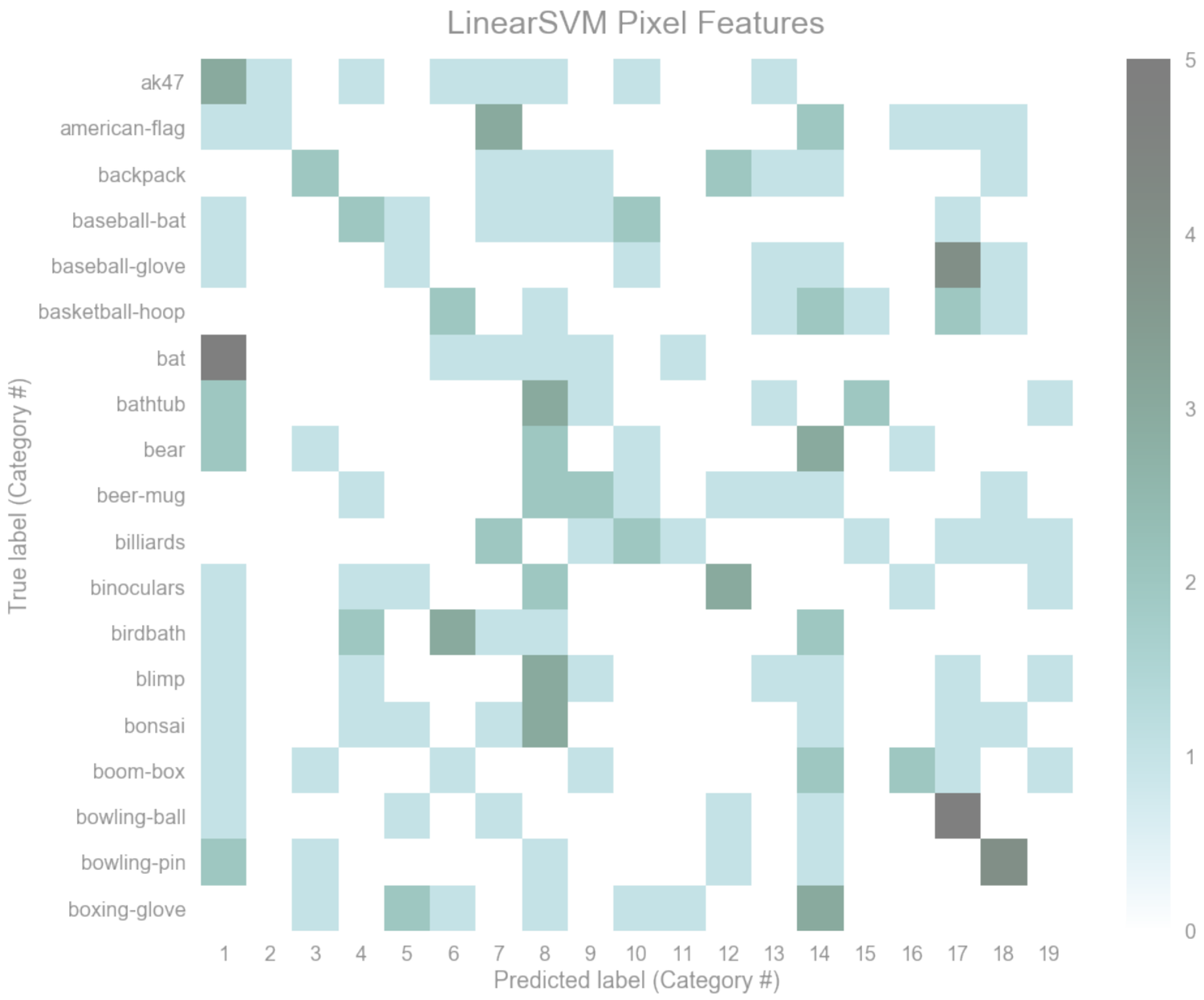
16% Accuracy

METRICS

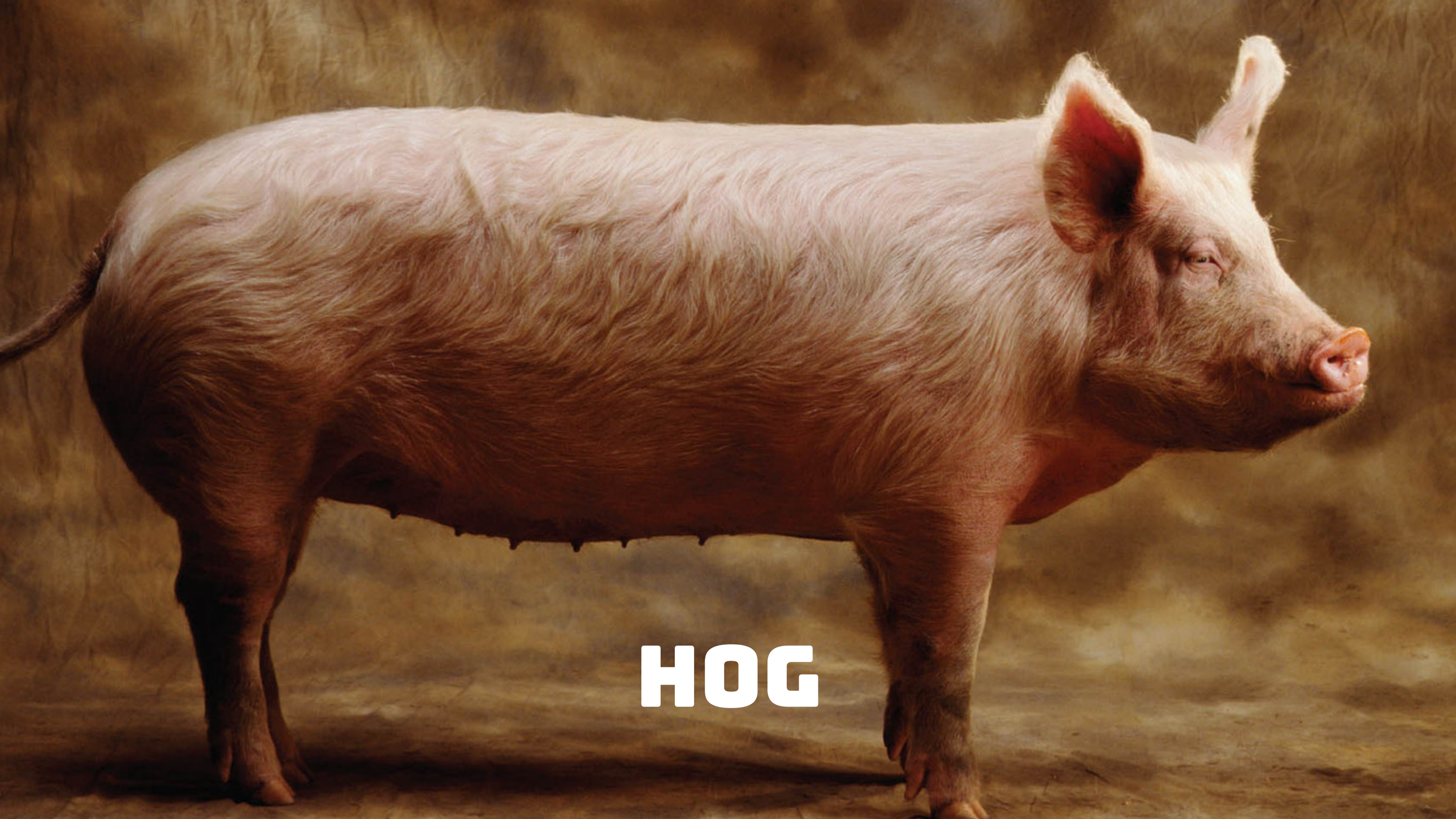


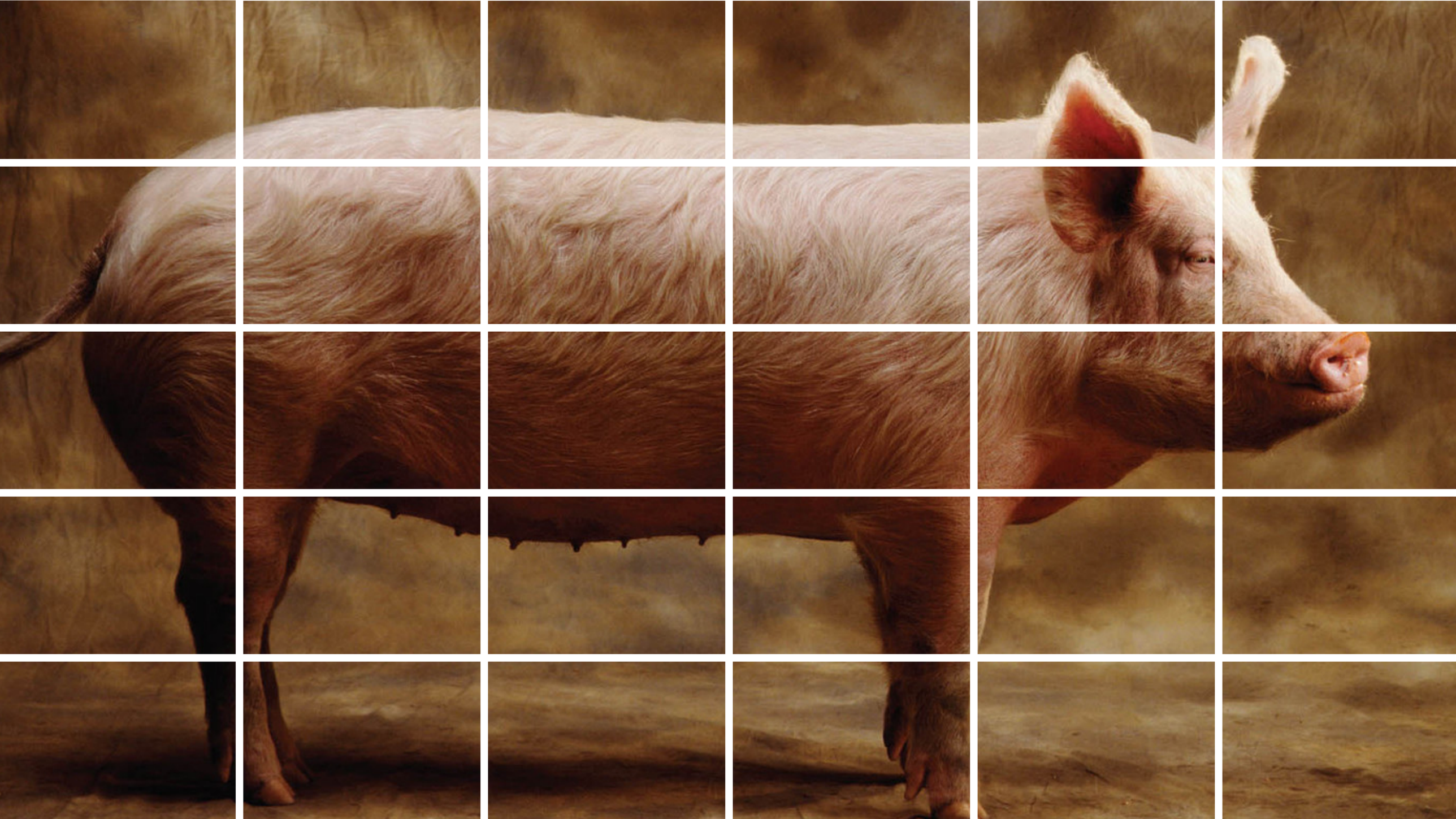
16% Accuracy

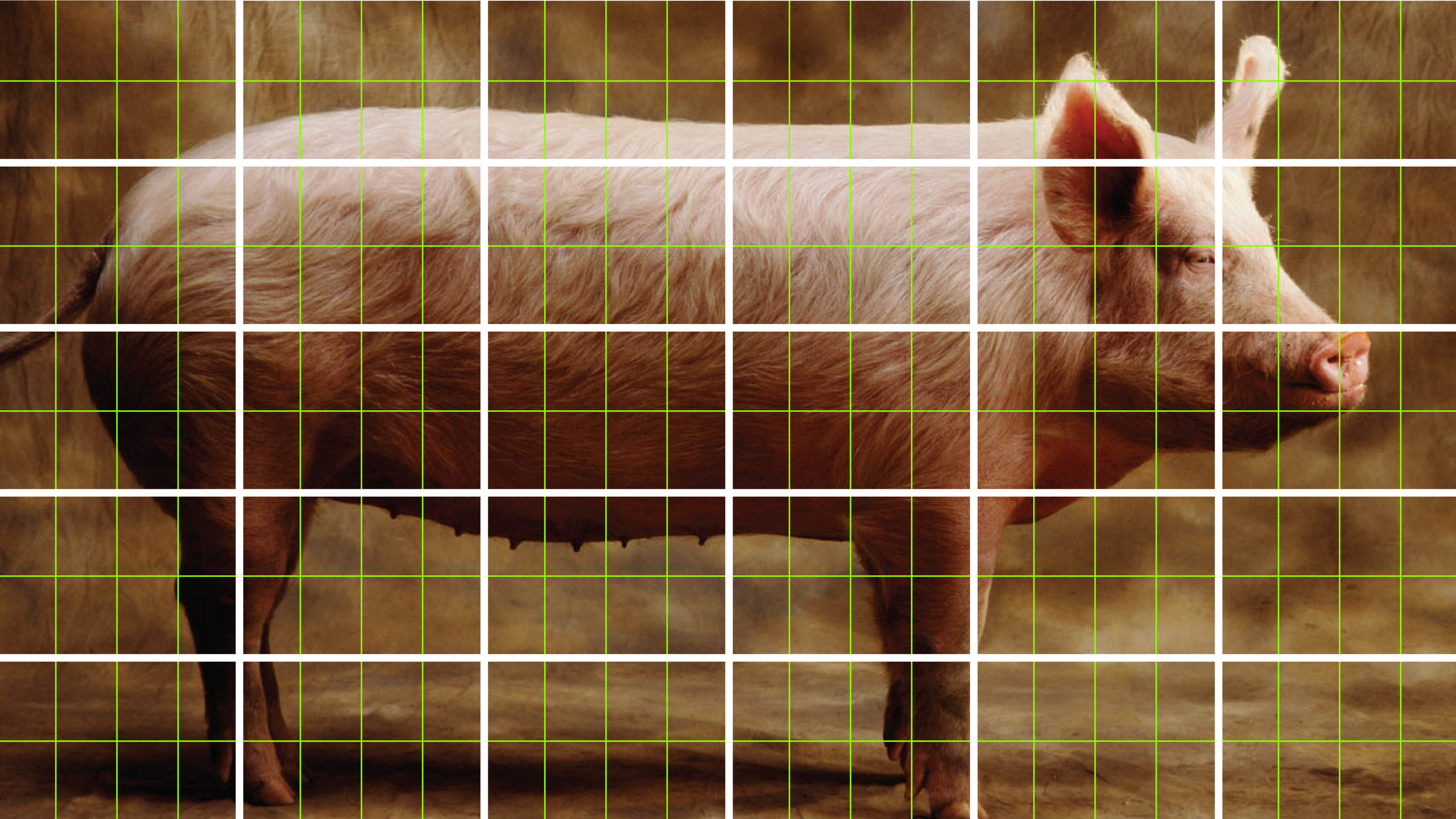
METRICS

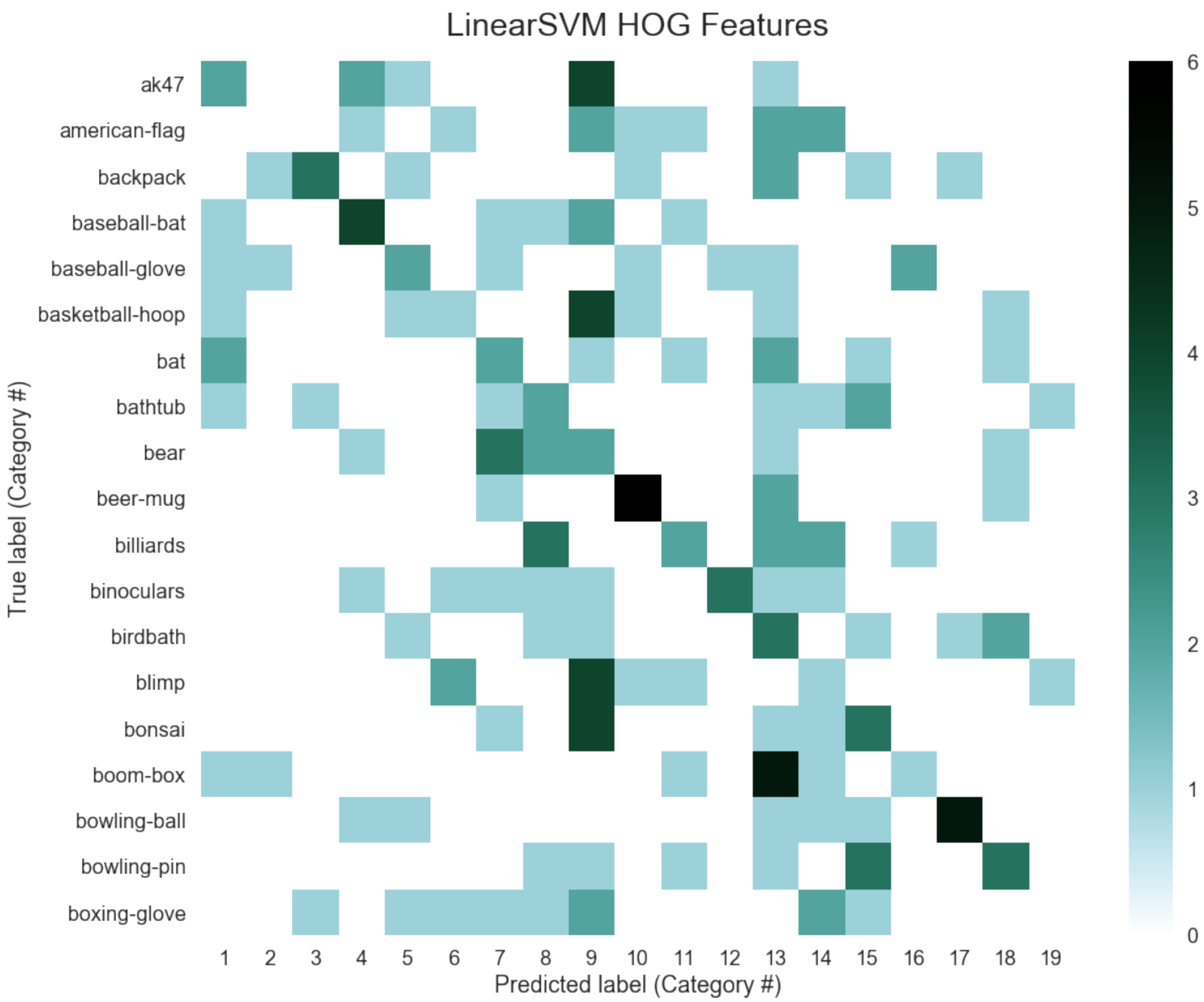


16% Accuracy


HOG

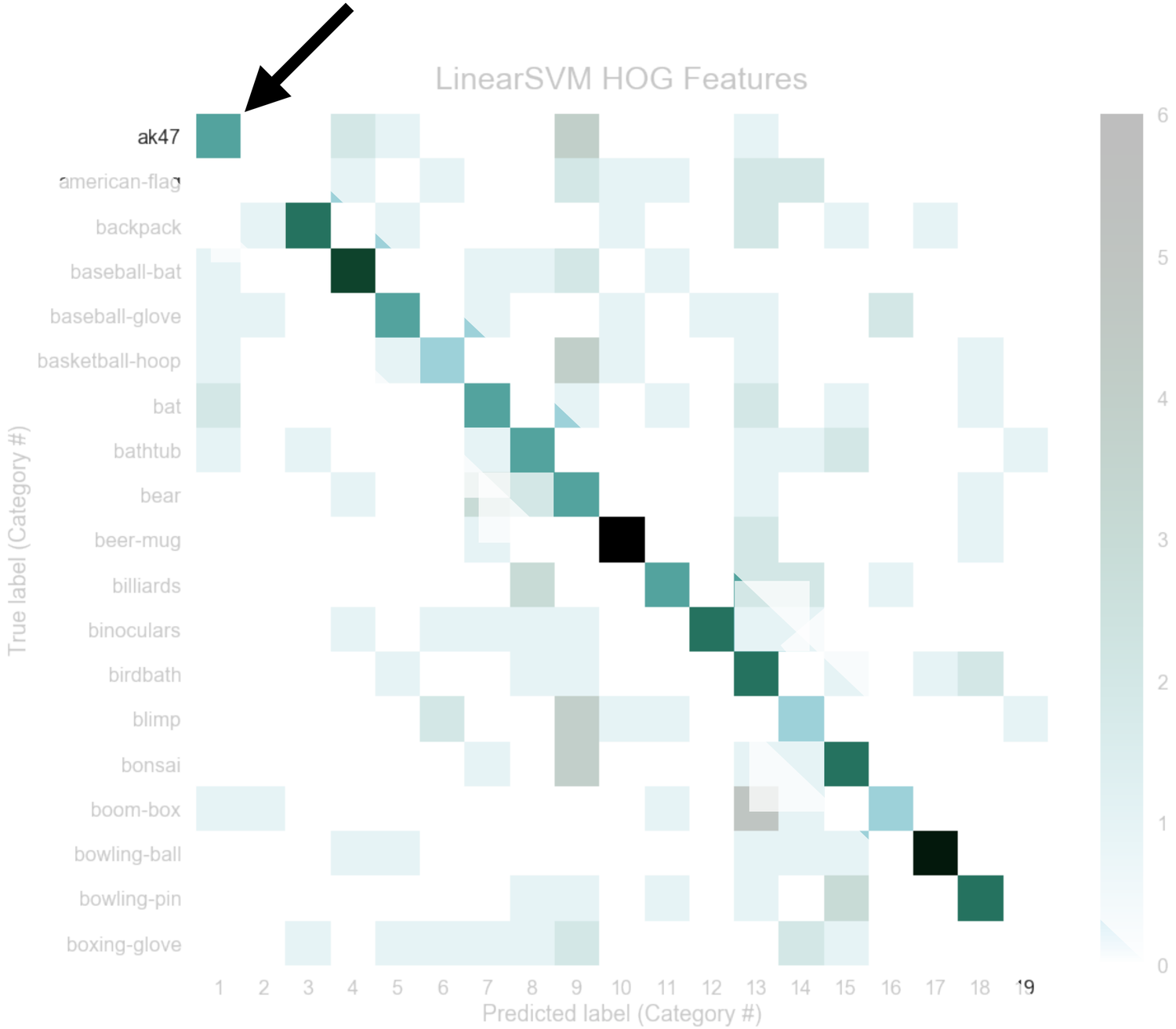






METRICS

	Accuracy
PXL	16%
HOG	23%
CHG	~44%



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	Accuracy
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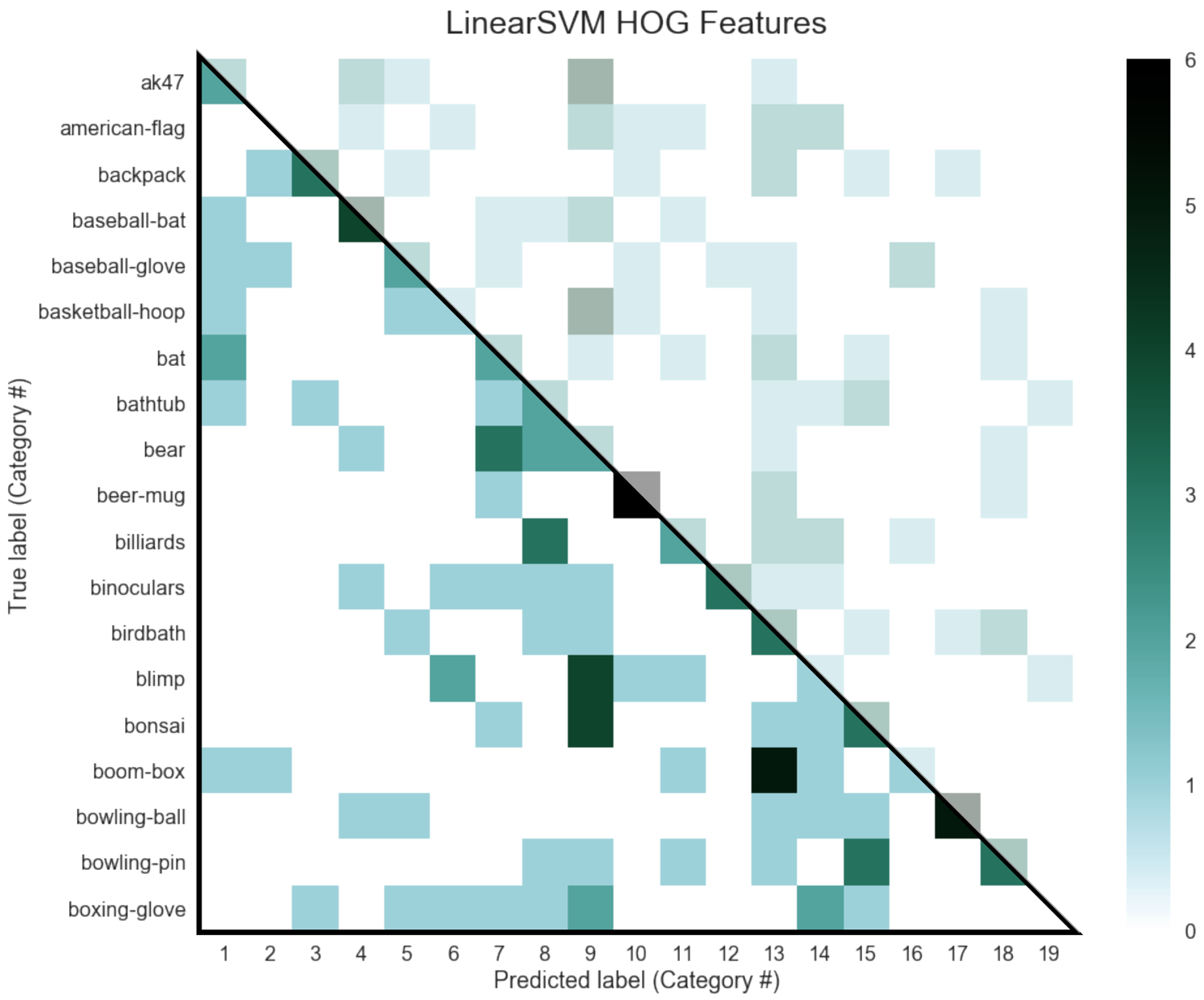

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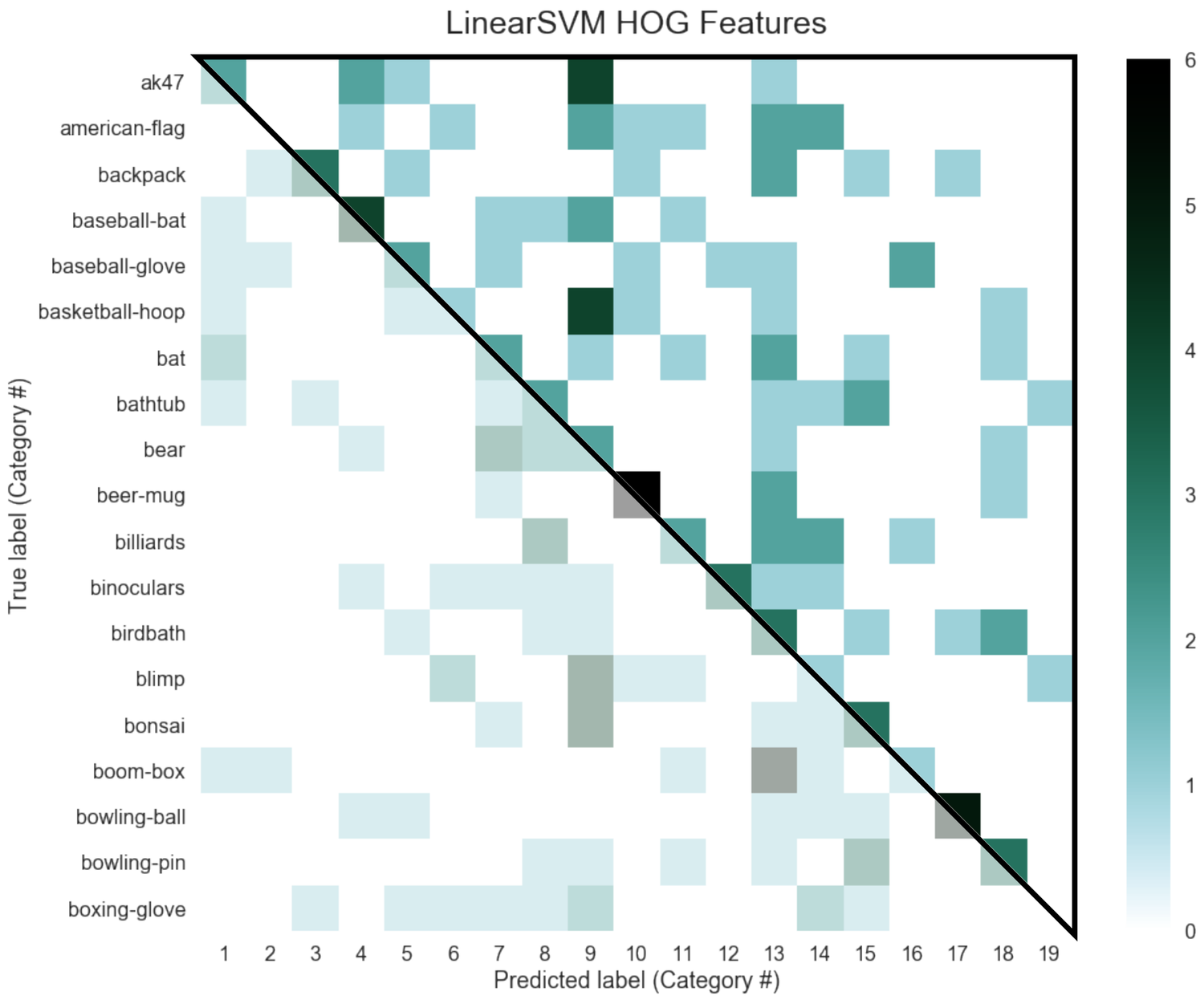

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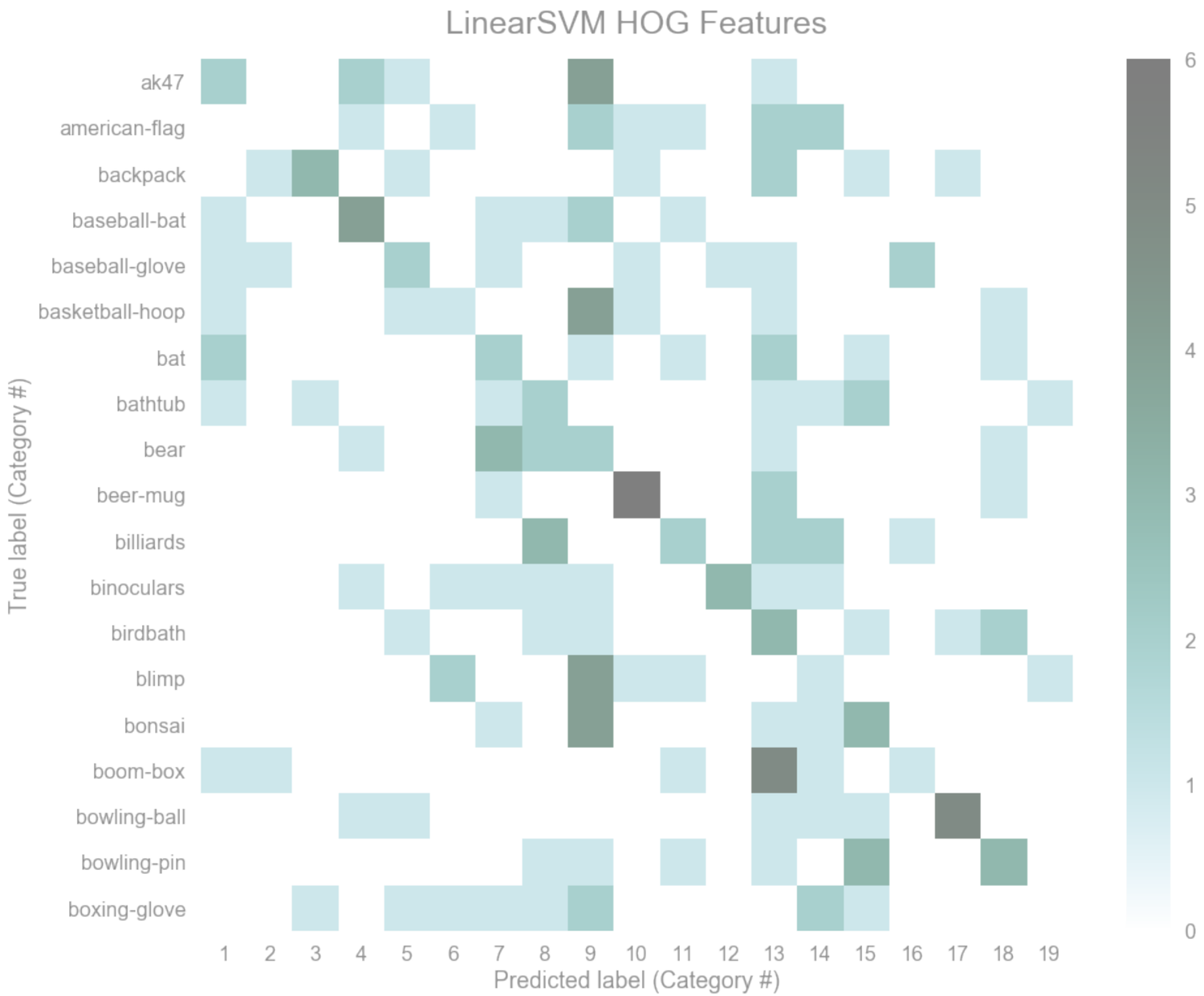

METRICS

	Accuracy
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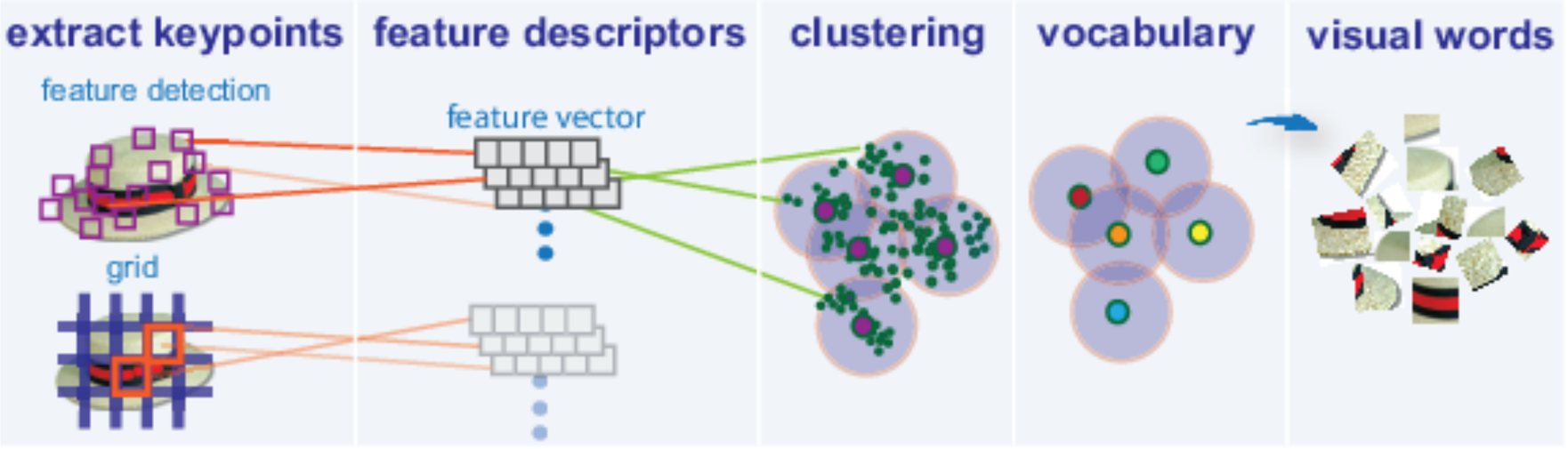
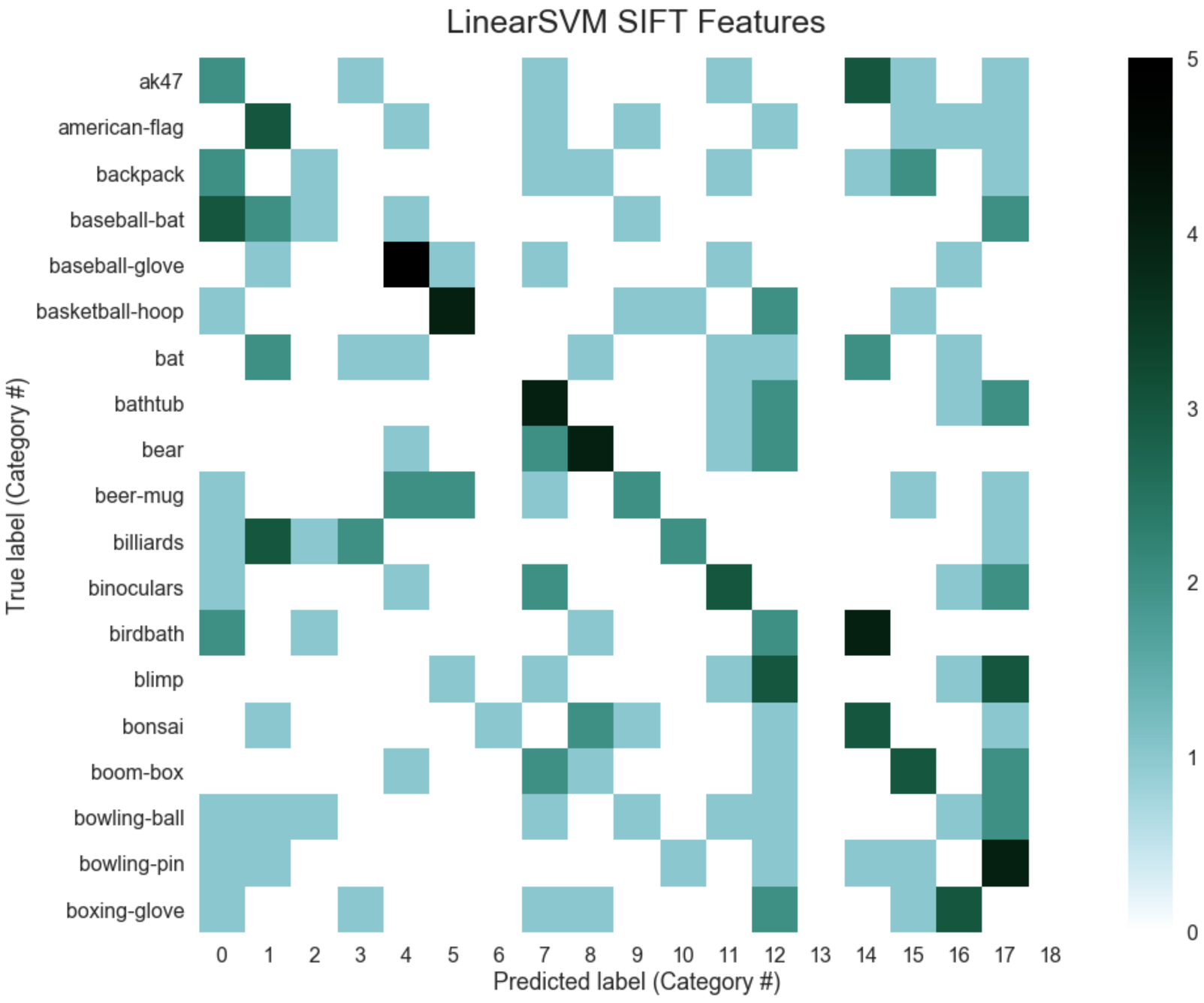
SIFT

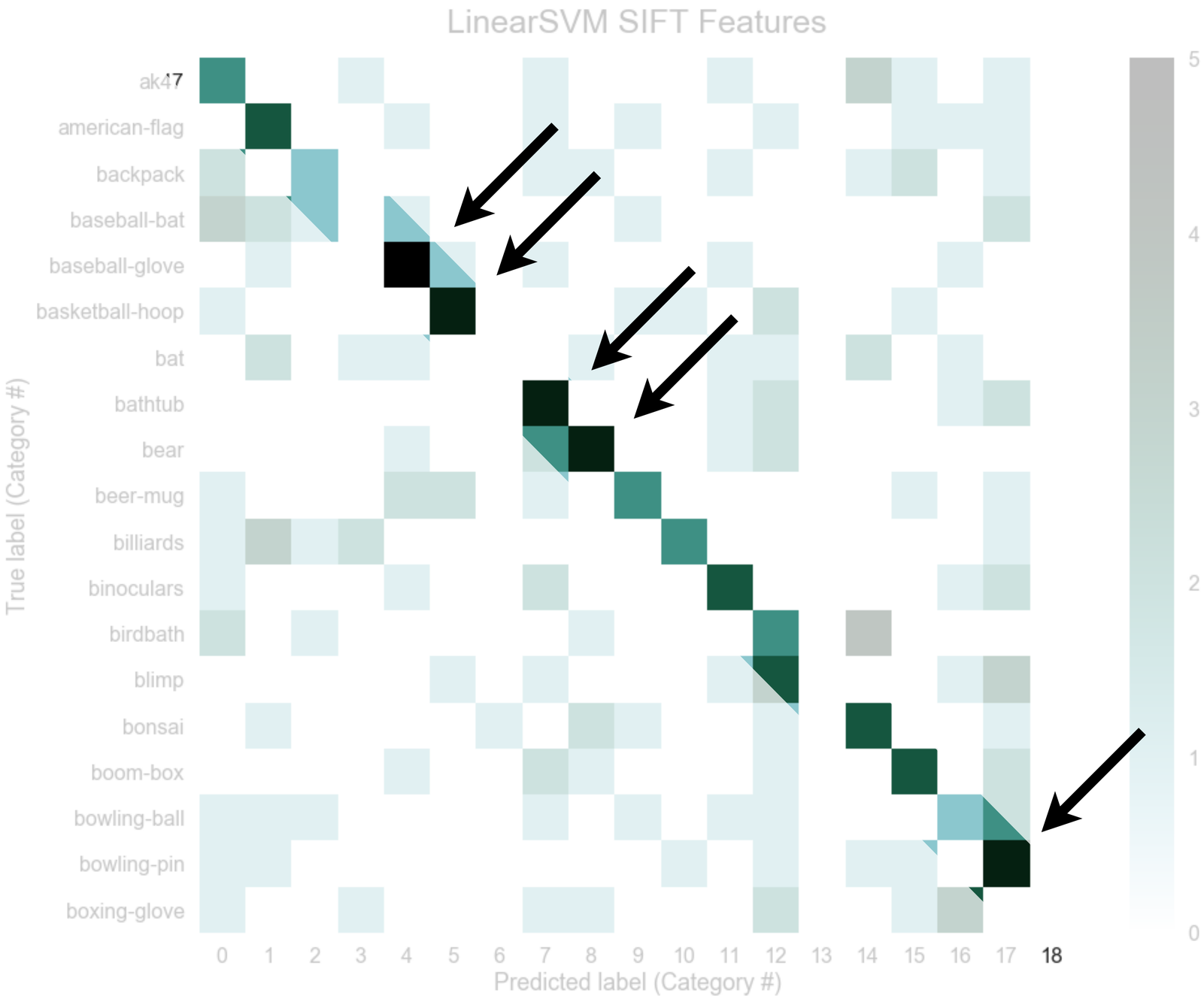
Key Points +
Descriptions


extract keypoints
feature descriptors
clustering
vocabulary
visual words
feature detection
feature vector
grid



METRICS

	Accuracy
PXL	16%
SIFT	28%
CHG	75%
HOG	23%
SIFT	28%
CHG	22%



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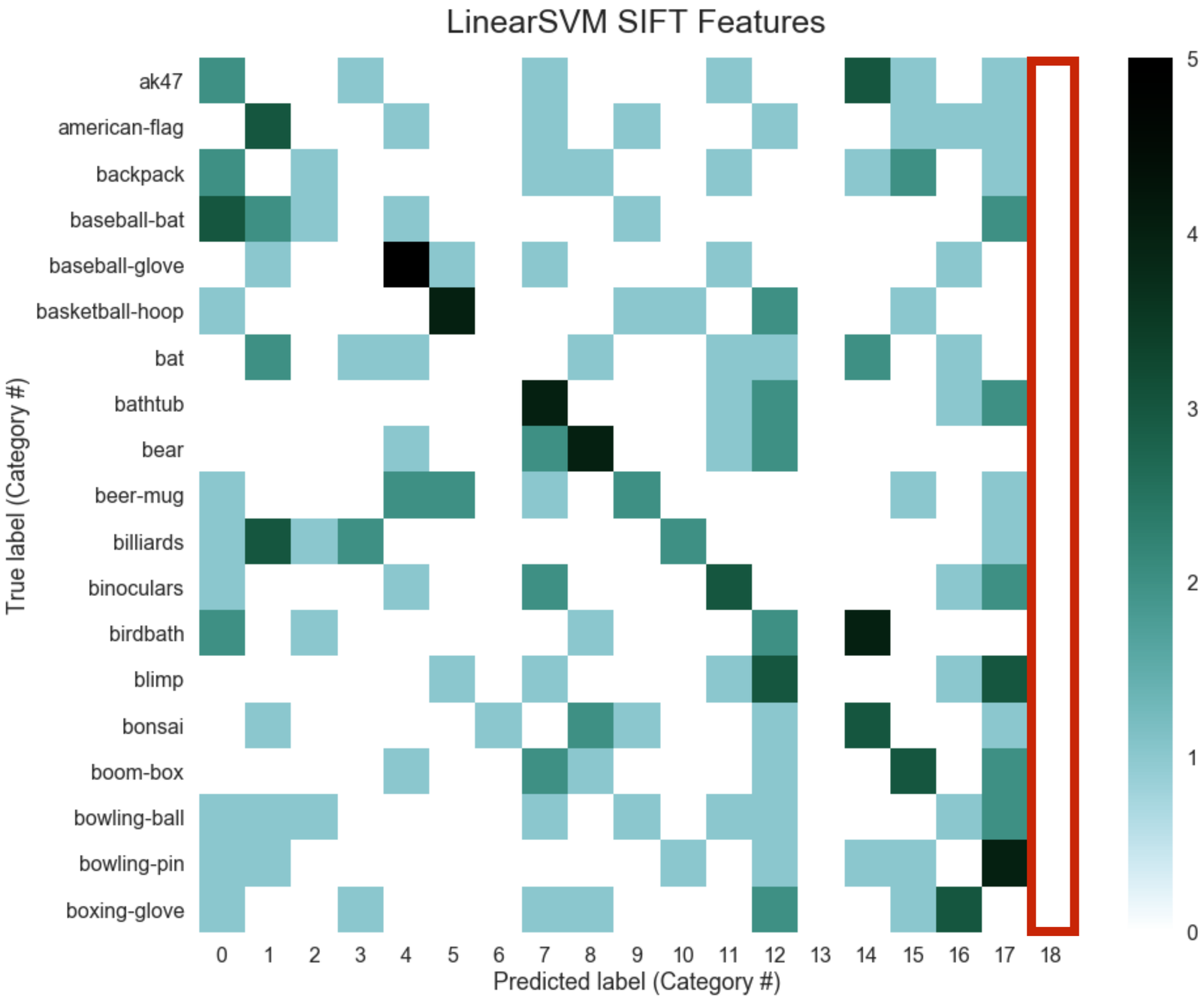

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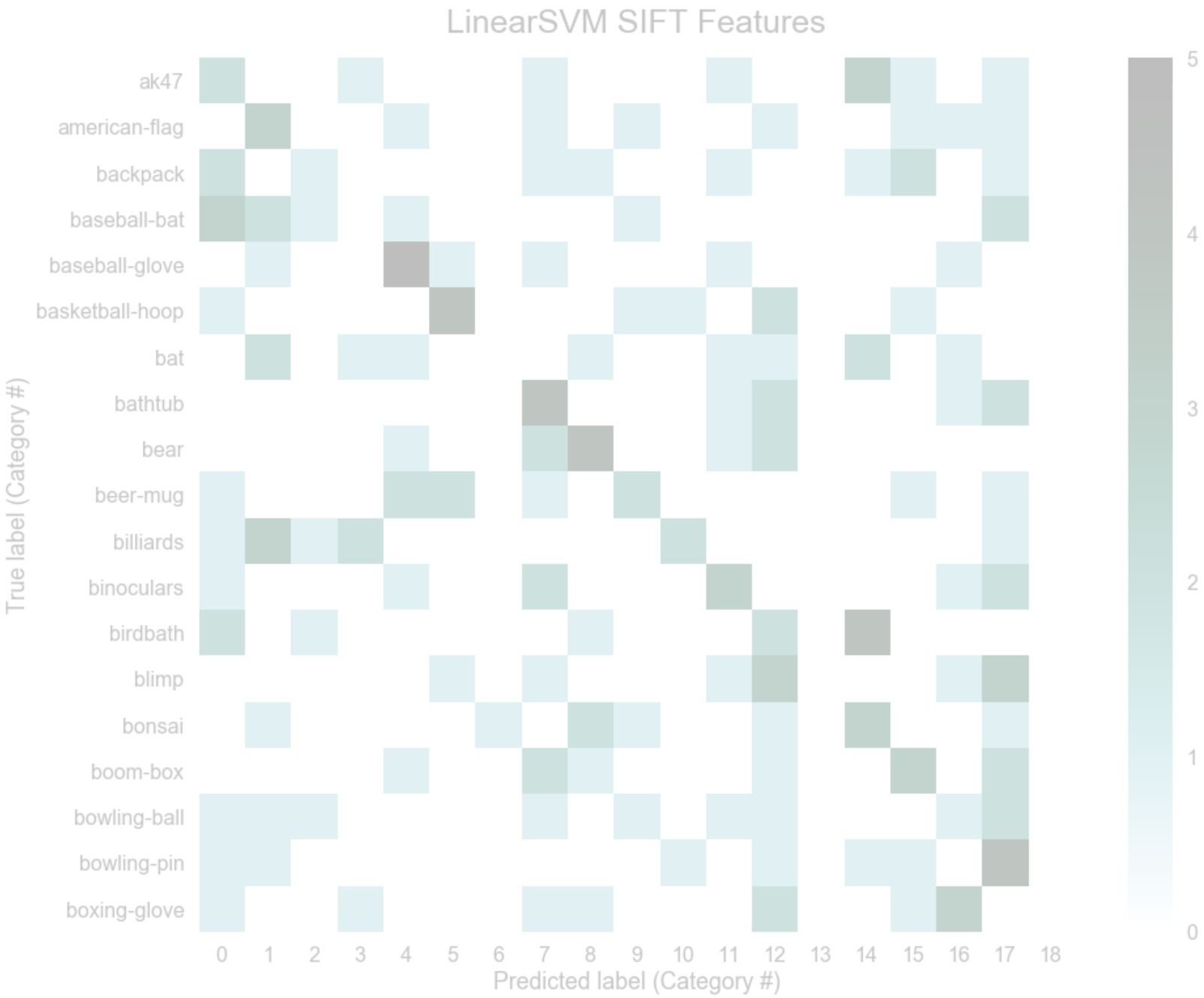

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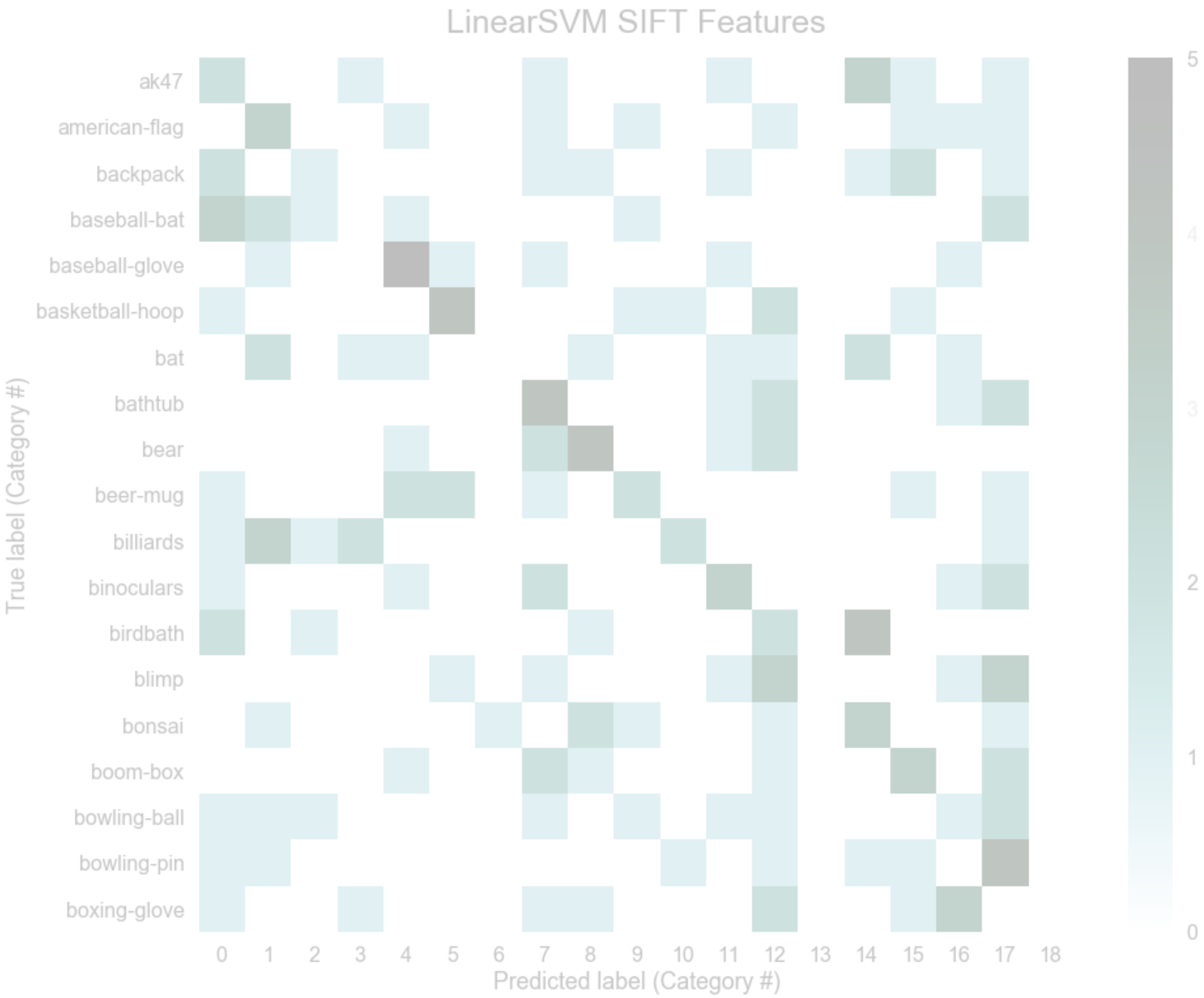


METRICS

	Accuracy
PXL	16%
SIFT	28%
CHG	75%
HOG	23%
SIFT	28%
CHG	22%

SMARTER ABSTRACTION

=

BETTER RESULTS

IMPROVEMENTS

Incorporate spatial information

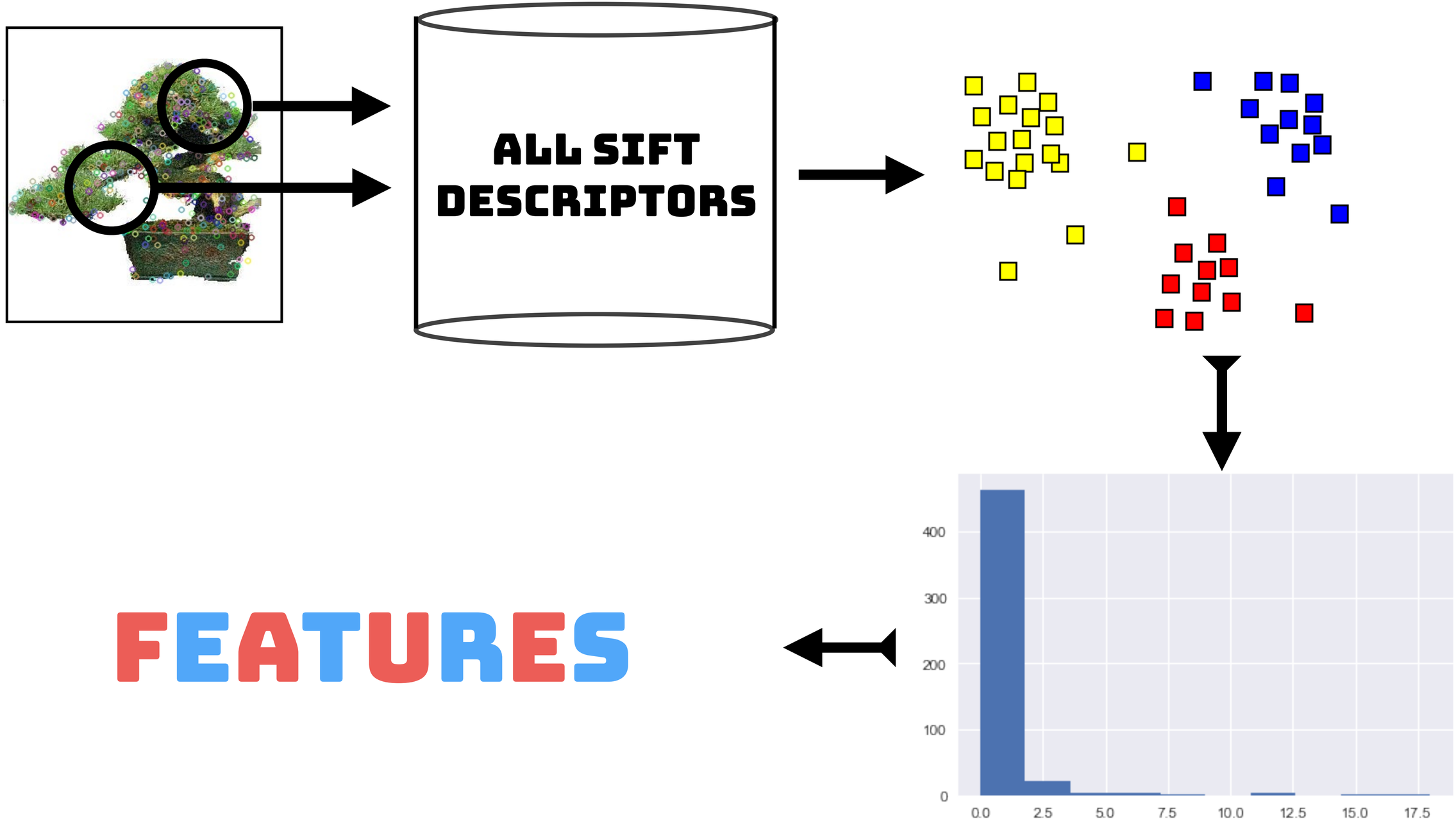
Try different codebook sizes

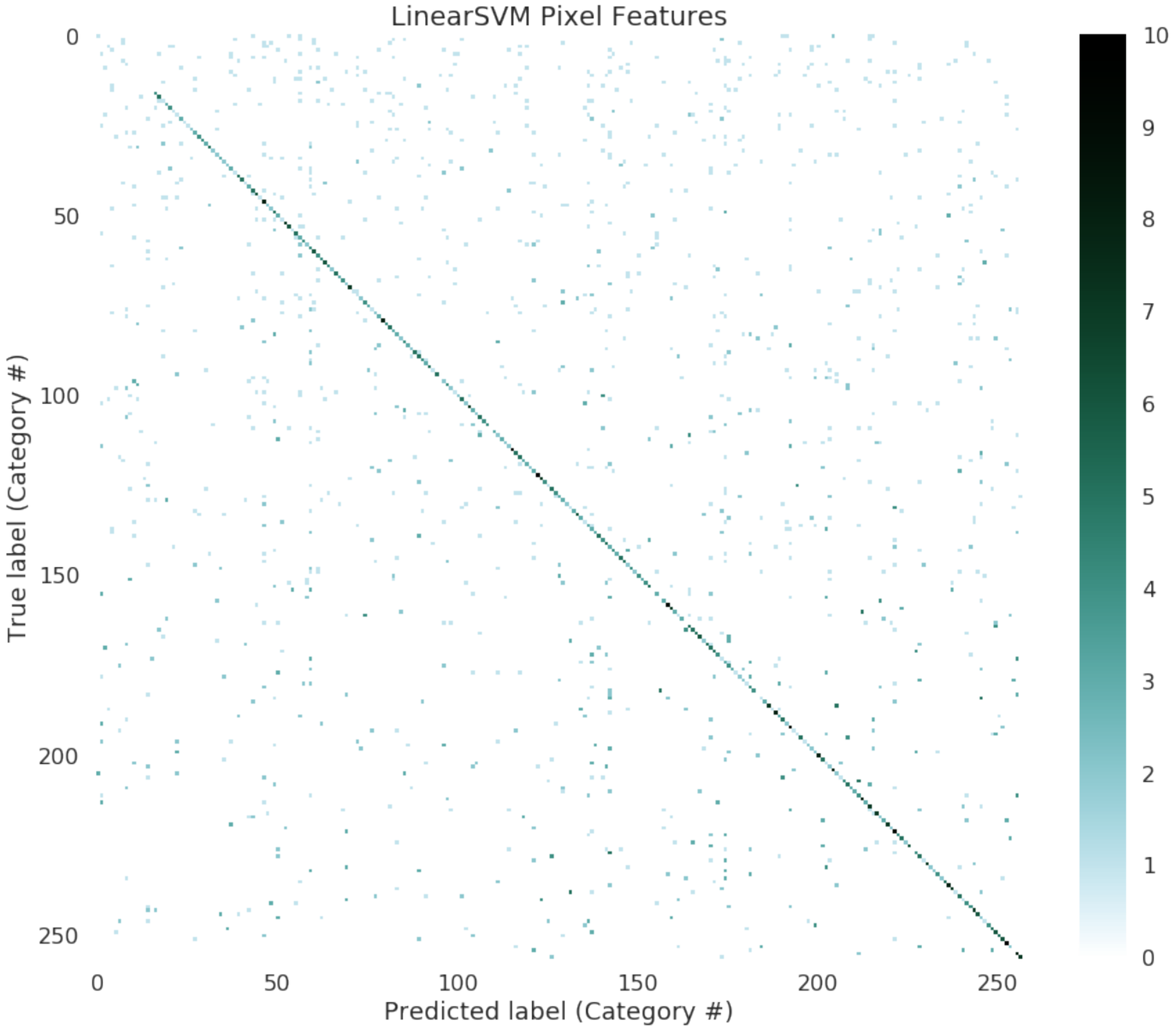
Increase amount of categories and training & test sizes

THX.

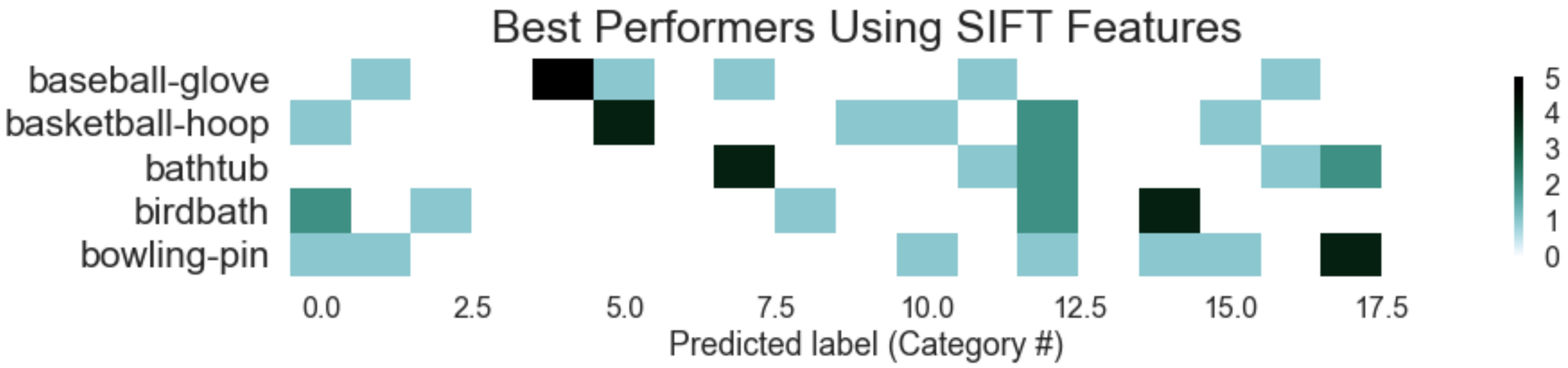
GOOD DATA.

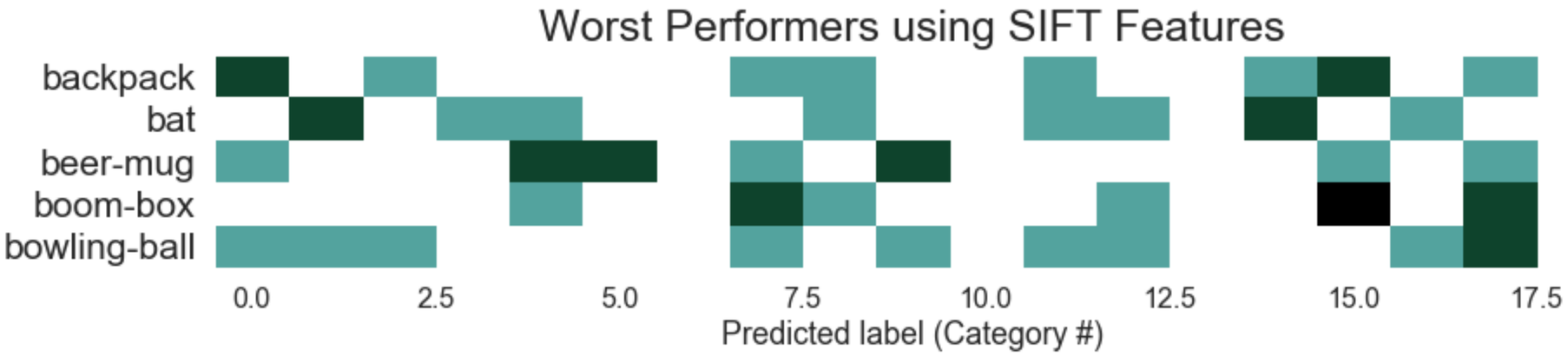
EXTRA


ALL SIFT DESCRIPTORS
400
300
200
100
0
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
FEATURES


LinearSVM Pixel Features
True label (Category #)
Predicted label (Category #)
0
50
100
150
200
250
0
1
2
3
4
5
6
7
8
9
10

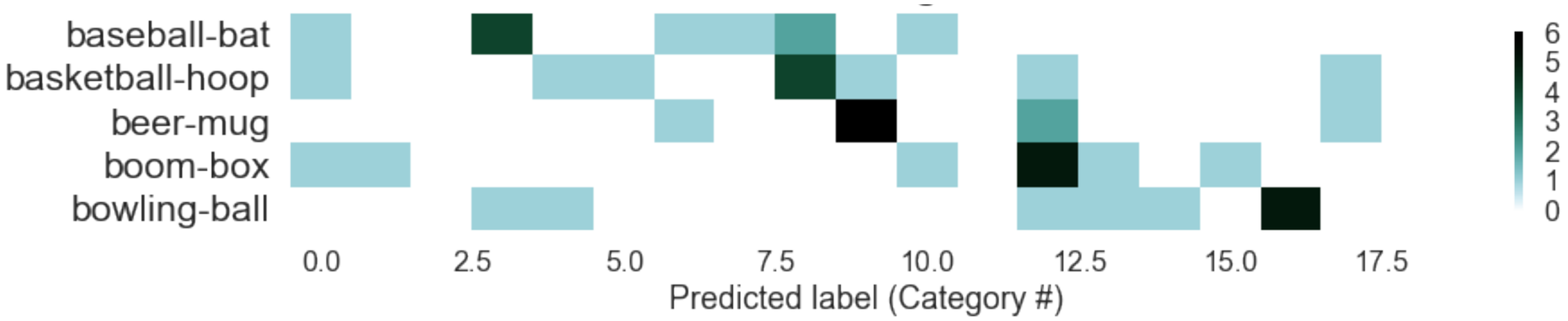
SIFT


Best Performers Using SIFT Features
baseball-glove
basketball-hoop
bathtub
birdbath
bowling-pin
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
Predicted label (Category #)
5
4
3
2
1
0

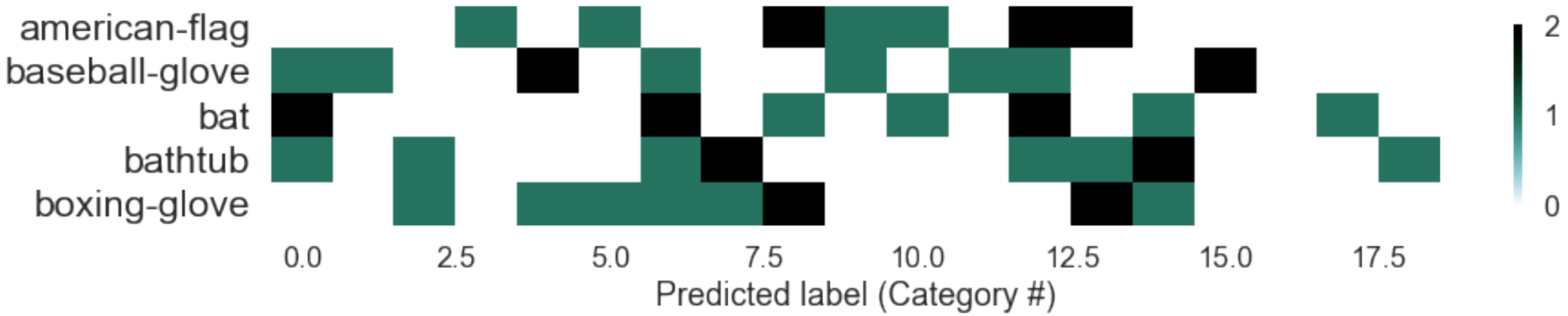

Worst Performers using SIFT Features
backpack
bat
beer-mug
boom-box
bowling-ball
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
Predicted label (Category #)

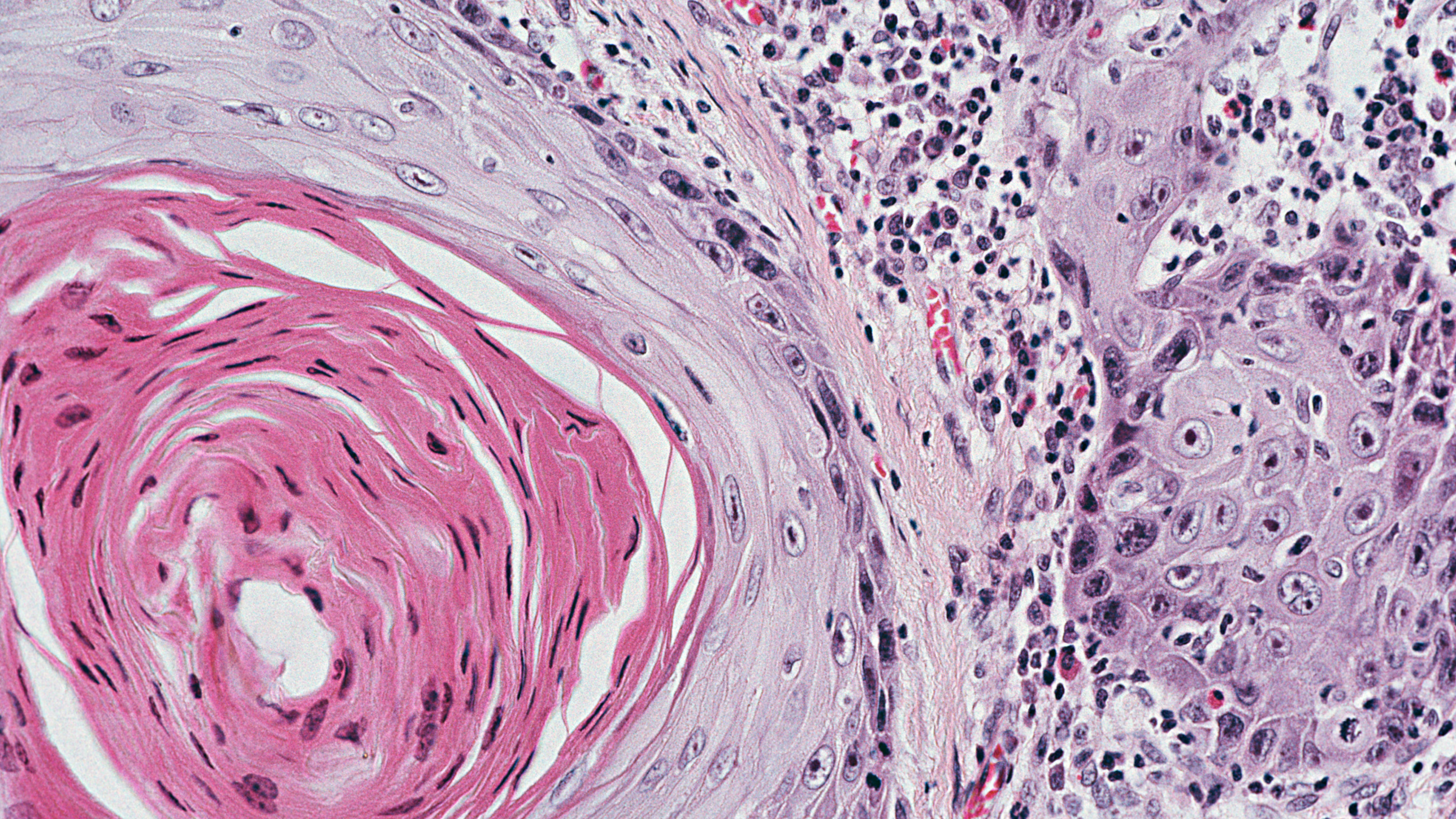
HOG

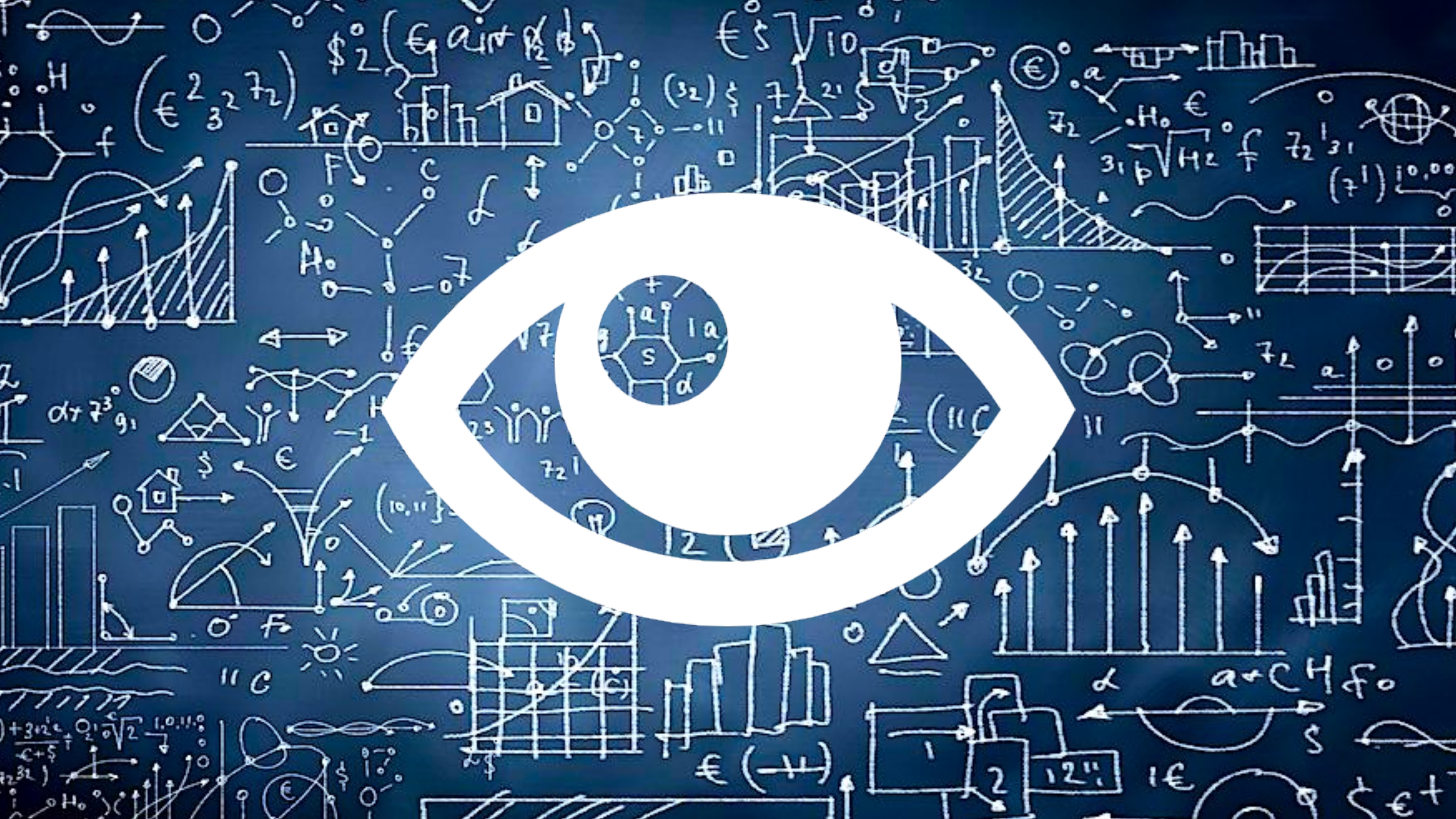
BEST PERFORMERS



WORST PERFORMERS







HAMMER