

Human pose Classification

Pranpaveen Laykaviriyakul
6214500875

Data

Source : <http://www.falldataset.com>

Train 1301 data 1301 images (RGB, Depth images)

With 5 class Standing, Sitting, Lying, Bending, Crawling

Data



Feature Extraction

- 7 HU moments
- Zernike moments
- Co-occurrence Matrices
- Local binary pattern
- Histogram of gradient

7 HU moments

Sub feature = 7

Class Separability	All feature
Divergence	18.9012
Scatter Matrices (J3)	7.0089
Fisher Discriminant Ratio	3.7419

Zernike moments

Sub feature = 25

Class Separability	All feature
Divergence	23.4050
Scatter Matrices (J3)	25.0015
Fisher Discriminant Ratio	3.4094

Co-occurrence Matrices

Distances = 10

Theta = (0°, 90°, 180°, 270°)

Feature : Energy, Contrast, Correration

Sub feature = 12

Co-occurrence Matrices

Sub feature = 12

Class Separability	All feature
Divergence	36.4752
Scatter Matrices (J3)	12.0227
Fisher Discriminant Ratio	42.1641

Local binary pattern



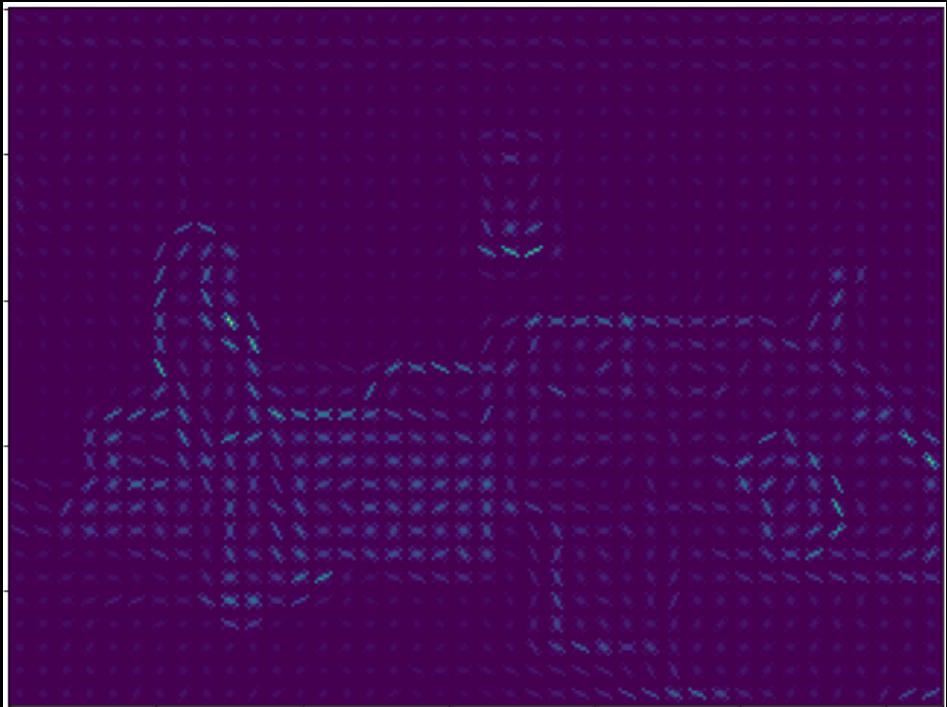
Sub feature = 65

Local binary pattern

Sub feature = 65

Class Separability	All feature
Divergence	89.9810
Scatter Matrices (J3)	68.8138
Fisher Discriminant Ratio	35.0166

Histogram of gradient



Sub feature = 4800

Histogram of gradient



Sub feature = 4800

Histogram of gradient



Sub feature = 4800

Histogram of gradient

Sub feature = 4800

Class Separability	All feature
Divergence	1629.7157
Scatter Matrices (J3)	-
Fisher Discriminant Ratio	900.6913

Classification with KNN classifier

7 HU moments

	precision	recall	f1-score	support
1.0	0.58	0.77	0.66	129
2.0	0.60	0.45	0.51	130
3.0	0.44	0.40	0.42	96
accuracy			0.55	355
macro avg	0.54	0.54	0.53	355
weighted avg	0.55	0.55	0.54	355

5 Neighbors

Classification with KNN classifier

Zernike moments

	precision	recall	f1-score	support
1.0	0.42	0.53	0.47	129
2.0	0.42	0.36	0.39	130
3.0	0.38	0.32	0.35	96
accuracy			0.41	355
macro avg	0.41	0.41	0.40	355
weighted avg	0.41	0.41	0.41	355

5 Neighbors

Classification with KNN classifier

Co-occurrence Matrices

	precision	recall	f1-score	support
1.0	0.98	0.97	0.97	129
2.0	0.91	0.89	0.90	130
3.0	0.88	0.91	0.89	96
accuracy			0.92	355
macro avg	0.92	0.92	0.92	355
weighted avg	0.92	0.92	0.92	355

3 Neighbors

Classification with KNN classifier

Local binary pattern

	precision	recall	f1-score	support
1.0	0.97	0.87	0.92	129
2.0	0.76	0.72	0.74	130
3.0	0.64	0.78	0.70	96
accuracy			0.79	355
macro avg	0.79	0.79	0.79	355
weighted avg	0.80	0.79	0.79	355

3 Neighbors

Classification with KNN classifier

Histogram of gradient

	precision	recall	f1-score	support
1.0	1.00	0.97	0.98	129
2.0	0.98	0.97	0.97	130
3.0	0.93	0.98	0.95	96
accuracy			0.97	355
macro avg	0.97	0.97	0.97	355
weighted avg	0.97	0.97	0.97	355

3 Neighbors

Comparison

Feature	Accuracy
7 HU moments	55%
Zernike moments	41%
Co-occurrence	92%
Local binary pattern	79%
Histogram of gradient	97%

→ 12 features

→ 4800 features

Motion Analysis



Motion Analysis (Differential)

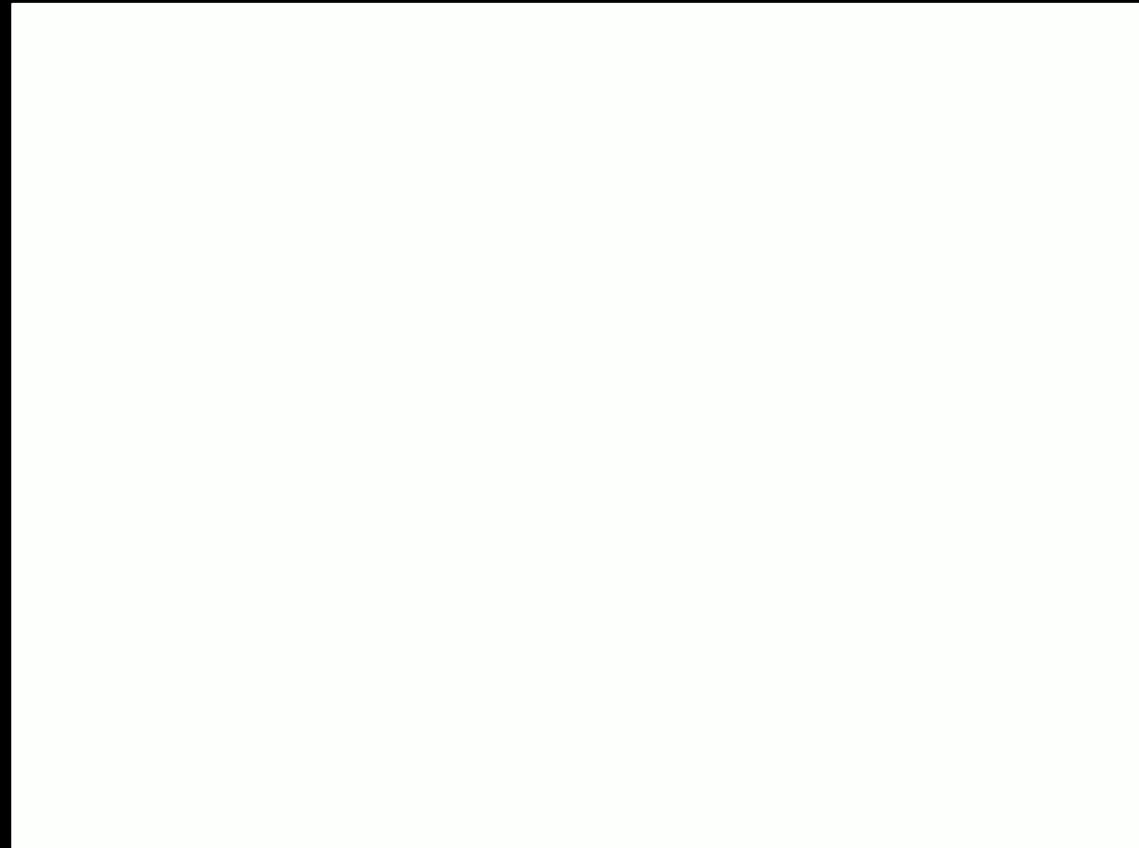


Background image
(Photoshop)



Mask image

Motion Analysis (BackgroundSubtractorMOG2)



Motion Analysis

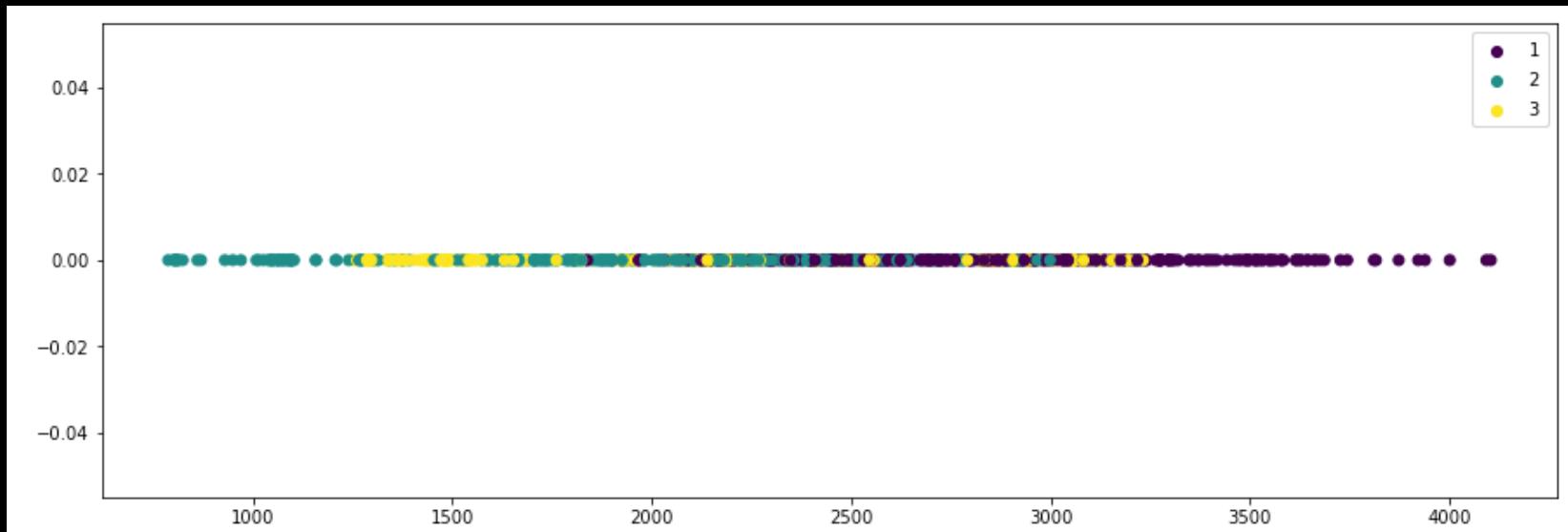
Original

MOG

Differential

Feature Extraction (Mask image)

Area



Feature Extraction (Mask image)

Area

Class Separability	
Divergence	3.1449
Scatter Matrices (J3)	1.0019
Fisher Discriminant Ratio	2.4876

Feature Extraction (Mask image)

Area

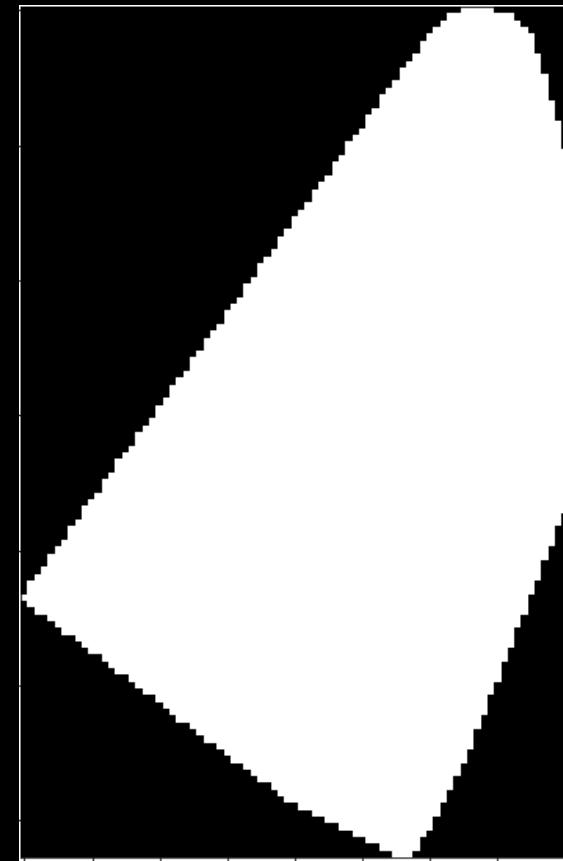
Area feature classification with KNN

	precision	recall	f1-score	support
1.0	0.65	0.75	0.70	131
2.0	0.62	0.72	0.67	106
3.0	0.63	0.44	0.52	118
accuracy			0.64	355
macro avg	0.64	0.64	0.63	355
weighted avg	0.64	0.64	0.63	355

7 Neighbors

Feature Extraction (Mask image)

Convex image shape (X axis,Y axis length)



Feature Extraction (Mask image)

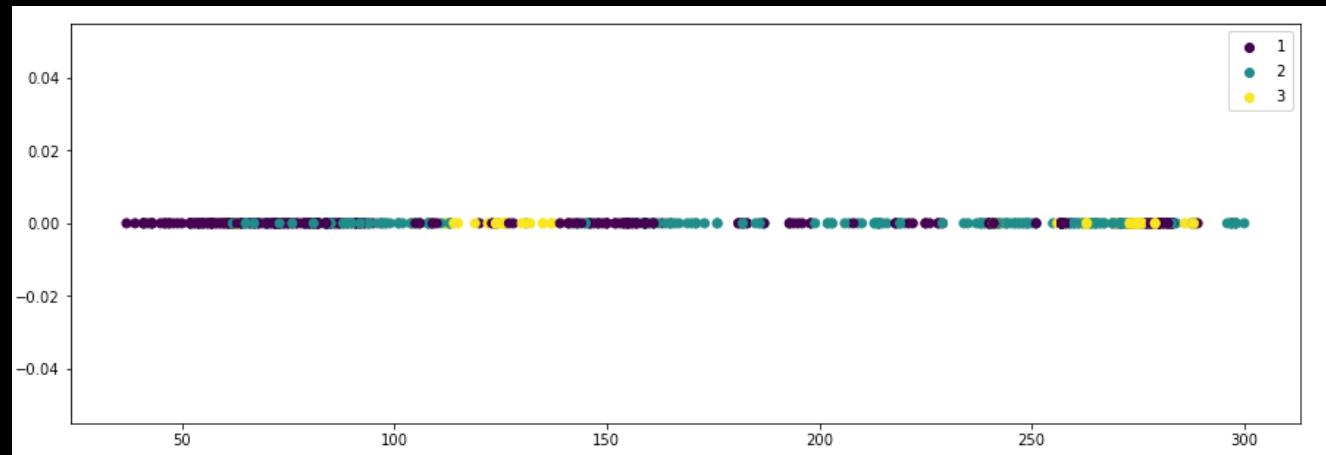
Convex image shape (X axis,Y axis length)



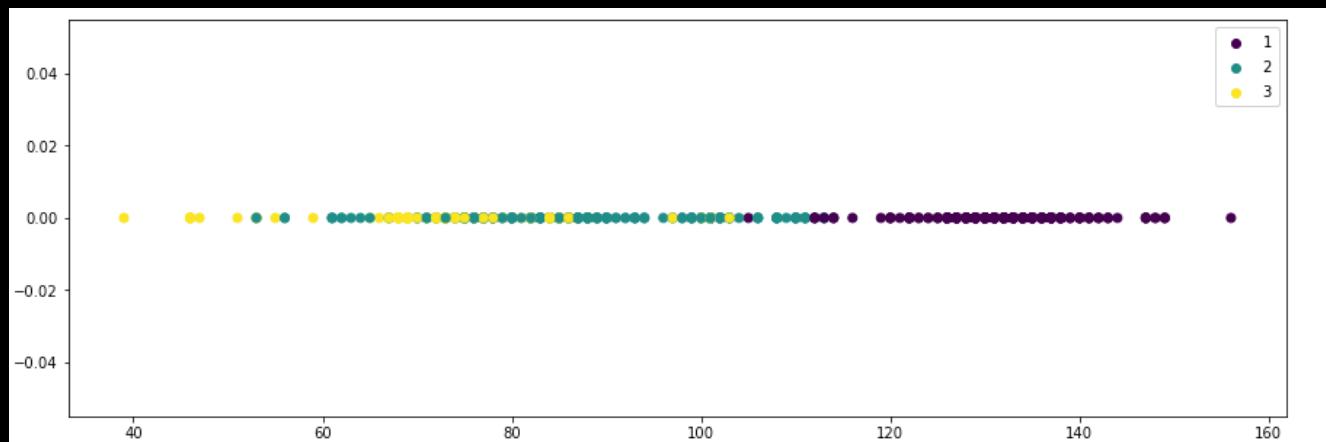
Feature Extraction (Mask image)

Convex image shape (X axis,Y axis length)

X axis length



Y axis length



Feature Extraction (Mask image)

Convex image shape (X axis,Y axis length)

Class Separability	X-axis length	Y-axis length
Divergence	3.273	1.1285
Scatter Matrices (J3)	1.005	1.0208
Fisher Discriminant Ratio	0.737	25.4157

Feature Extraction (Mask image)

Convex image shape (X axis,Y axis length)

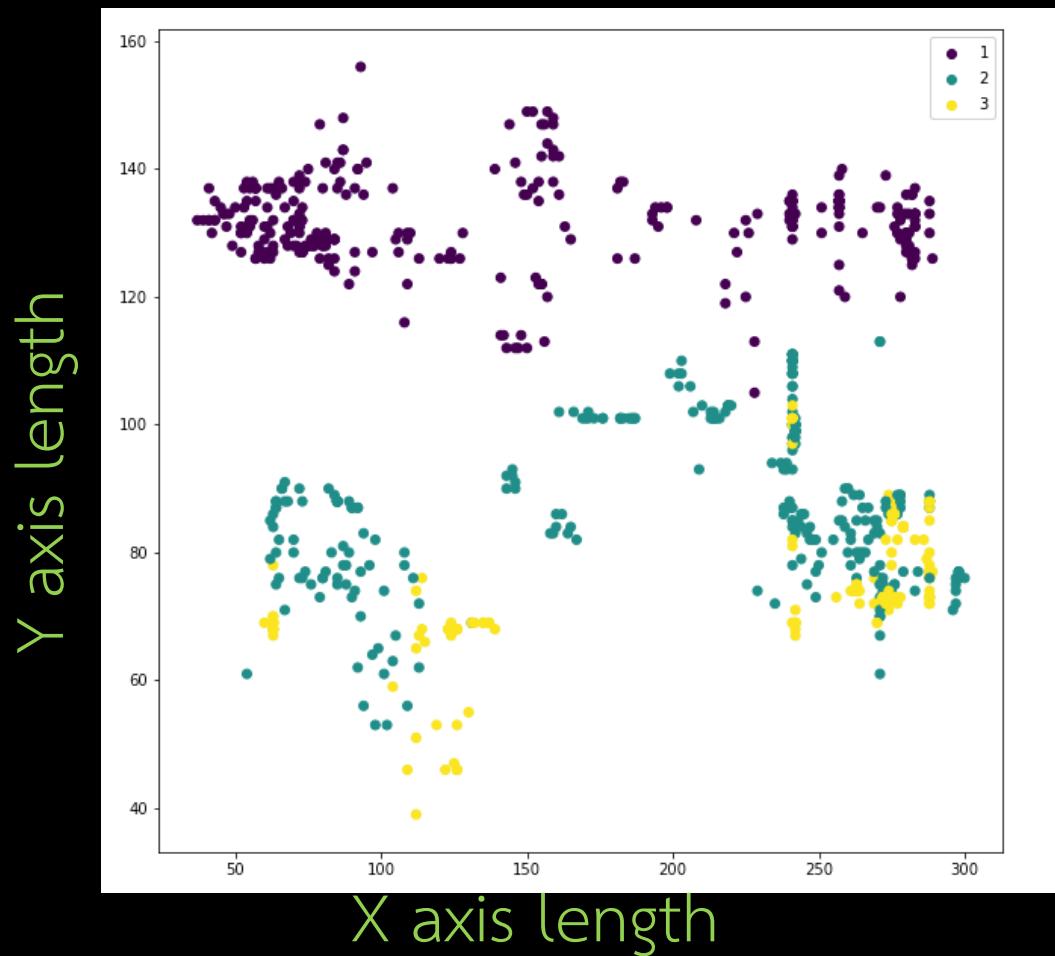
Y axis length feature classification with KNN

	precision	recall	f1-score	support
1.0	0.98	1.00	0.99	131
2.0	0.72	0.78	0.75	106
3.0	0.80	0.73	0.76	118
accuracy			0.85	355
macro avg	0.84	0.84	0.84	355
weighted avg	0.85	0.85	0.84	355

5 Neighbors

Feature Extraction (Mask image)

Convex image shape (X axis,Y axis length)



Feature Extraction (Mask image)

Convex image shape (X axis,Y axis length)

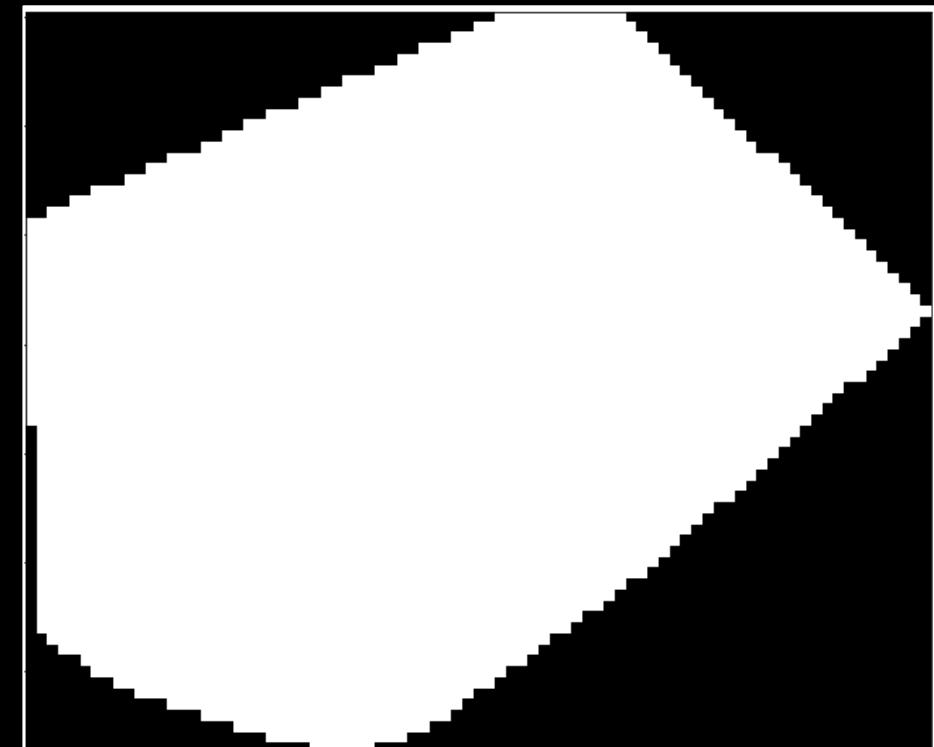
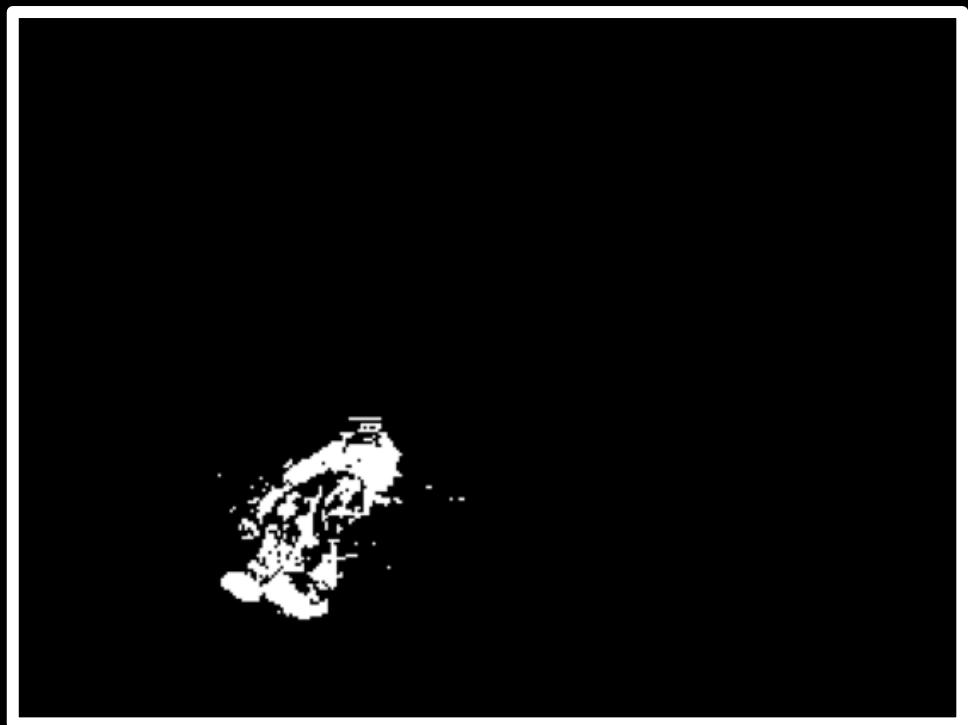
X,Y axis length feature classification with KNN

	precision	recall	f1-score	support
1.0	1.00	1.00	1.00	131
2.0	0.91	0.91	0.91	106
3.0	0.92	0.92	0.92	118
accuracy			0.95	355
macro avg	0.94	0.94	0.94	355
weighted avg	0.95	0.95	0.95	355

3 Neighbors

Feature Extraction (Mask image, MOG)

Convex image shape (X axis,Y axis length)



Feature Extraction (Mask image, MOG)

Convex image shape (X axis,Y axis length) Differential vs MOG

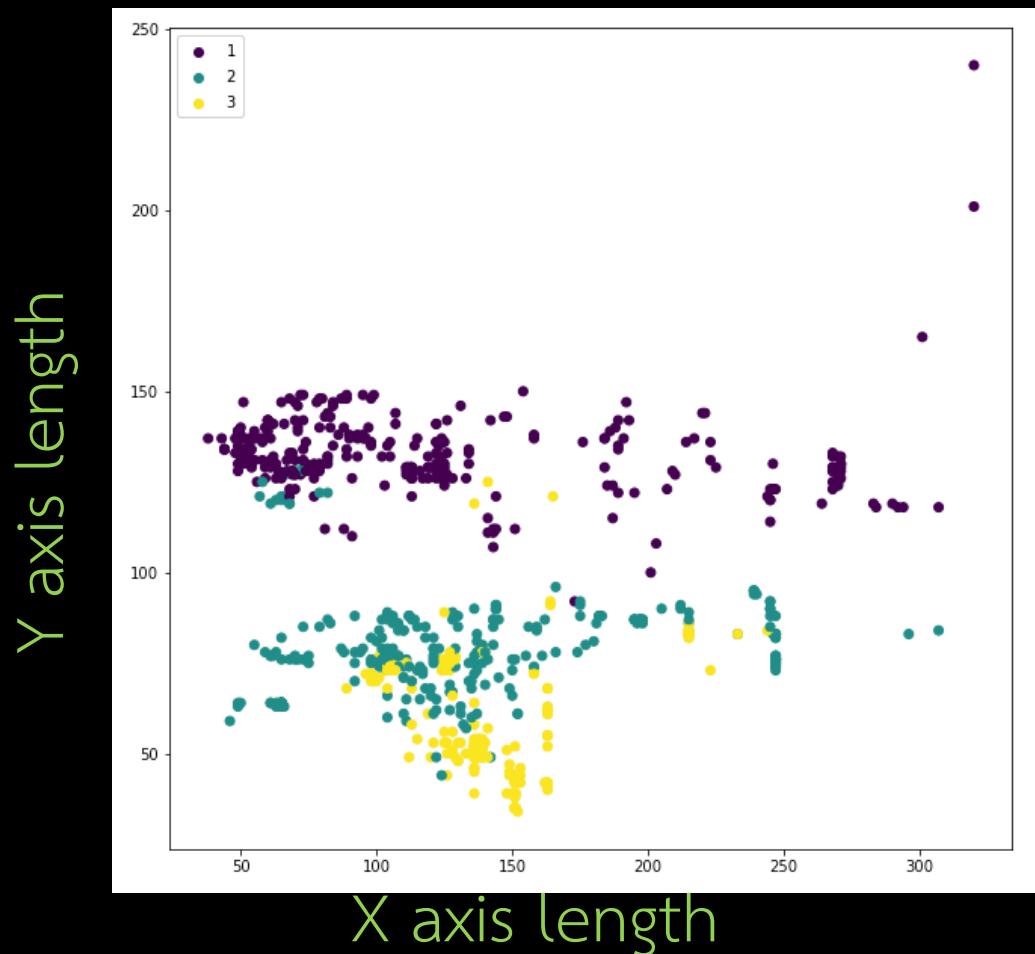
Y axis length feature classification with KNN

	precision	recall	f1-score	support		precision	recall	f1-score	support
1.0	0.98	1.00	0.99	131		1.0	0.98	1.00	0.99
2.0	0.72	0.78	0.75	106		2.0	0.84	0.97	0.90
3.0	0.80	0.73	0.76	118		3.0	0.99	0.77	0.86
accuracy			0.85	355	accuracy			0.93	355
macro avg	0.84	0.84	0.84	355	macro avg	0.94	0.91	0.92	355
weighted avg	0.85	0.85	0.84	355	weighted avg	0.93	0.93	0.93	355

5 Neighbors

Feature Extraction (Mask image, MOG)

Convex image shape (X axis, Y axis length)



Feature Extraction (Mask image, MOG)

Convex image shape (X axis,Y axis length) Differential vs MOG

X,Y axis length feature classification with KNN

precision					recall					f1-score					support					
1.0	1.00	1.00	1.00	1.00	1.0	1.00	1.00	1.00	1.00	1.0	1.00	1.00	1.00	1.00	131	1.0	0.99	0.99	0.99	138
2.0	0.91	0.91	0.91	0.91	2.0	0.91	0.91	0.91	0.91	2.0	0.91	0.91	0.91	0.91	106	0.93	0.89	0.89	0.91	122
3.0	0.92	0.92	0.92	0.92	3.0	0.92	0.92	0.92	0.92	3.0	0.92	0.92	0.92	0.92	118	0.89	0.93	0.93	0.91	95
accuracy					accuracy					accuracy					355					355
macro avg	0.94	0.94	0.94	0.94	macro avg	0.94	0.94	0.94	0.94	macro avg	0.94	0.94	0.94	0.94	355	0.94	0.94	0.94	0.94	355
weighted avg	0.95	0.95	0.95	0.95	weighted avg	0.95	0.95	0.95	0.95	weighted avg	0.95	0.95	0.95	0.95	355	0.94	0.94	0.94	0.94	355

3 Neighbors

Conclusion

Feature	Accuracy
Histogram of gradient	97%
Mask+Convex image shape	94%-95%
Mask(MOG)+Convex Y axis length	93%
Co-occurrence	92%
Mask(difference)+Convex Y axis length	85%

END