1600\_10\_percents:

**1000**

calculation mAP (mean average precision)...

Detection layer: 30 - type = 28

Detection layer: 37 - type = 28

492

detections\_count = 6901, unique\_truth\_count = 819

class\_id = 0, name = bolt, ap = 43.41% (TP = 307, FP = 156)

for conf\_thresh = 0.25, precision = 0.66, recall = 0.37, F1-score = 0.48

for conf\_thresh = 0.25, TP = 307, FP = 156, FN = 512, average IoU = 47.32 %

IoU threshold = 50 %, used Area-Under-Curve for each unique Recall

mean average precision (mAP@0.50) = 0.434065, or 43.41 %

Total Detection Time: 28 Seconds

**2000**

calculation mAP (mean average precision)...

Detection layer: 30 - type = 28

Detection layer: 37 - type = 28

492

detections\_count = 6307, unique\_truth\_count = 819

class\_id = 0, name = bolt, ap = 57.88% (TP = 482, FP = 284)

for conf\_thresh = 0.25, precision = 0.63, recall = 0.59, F1-score = 0.61

for conf\_thresh = 0.25, TP = 482, FP = 284, FN = 337, average IoU = 47.81 %

IoU threshold = 50 %, used Area-Under-Curve for each unique Recall

mean average precision (mAP@0.50) = 0.578810, or 57.88 %

Total Detection Time: 29 Seconds

**3000**

calculation mAP (mean average precision)...

Detection layer: 30 - type = 28

Detection layer: 37 - type = 28

492

detections\_count = 4091, unique\_truth\_count = 819

class\_id = 0, name = bolt, ap = 60.20% (TP = 487, FP = 258)

for conf\_thresh = 0.25, precision = 0.65, recall = 0.59, F1-score = 0.62

for conf\_thresh = 0.25, TP = 487, FP = 258, FN = 332, average IoU = 50.67 %

IoU threshold = 50 %, used Area-Under-Curve for each unique Recall

mean average precision (mAP@0.50) = 0.601961, or 60.20 %

Total Detection Time: 28 Seconds

**4000**

calculation mAP (mean average precision)...

Detection layer: 30 - type = 28

Detection layer: 37 - type = 28

492

detections\_count = 3538, unique\_truth\_count = 819

class\_id = 0, name = bolt, ap = 62.78% (TP = 515, FP = 187)

for conf\_thresh = 0.25, precision = 0.73, recall = 0.63, F1-score = 0.68

for conf\_thresh = 0.25, TP = 515, FP = 187, FN = 304, average IoU = 58.68 %

IoU threshold = 50 %, used Area-Under-Curve for each unique Recall

mean average precision (mAP@0.50) = 0.627792, or 62.78 %

Total Detection Time: 29 Seconds

**5000**

calculation mAP (mean average precision)...

Detection layer: 30 - type = 28

Detection layer: 37 - type = 28

492

detections\_count = 3099, unique\_truth\_count = 819

class\_id = 0, name = bolt, ap = 63.96% (TP = 531, FP = 257)

for conf\_thresh = 0.25, precision = 0.67, recall = 0.65, F1-score = 0.66

for conf\_thresh = 0.25, TP = 531, FP = 257, FN = 288, average IoU = 54.72 %

IoU threshold = 50 %, used Area-Under-Curve for each unique Recall

mean average precision (mAP@0.50) = 0.639580, or 63.96 %

Total Detection Time: 28 Seconds

**6000**

calculation mAP (mean average precision)...

Detection layer: 30 - type = 28

Detection layer: 37 - type = 28

492

detections\_count = 2882, unique\_truth\_count = 819

class\_id = 0, name = bolt, ap = 63.56% (TP = 529, FP = 247)

for conf\_thresh = 0.25, precision = 0.68, recall = 0.65, F1-score = 0.66

for conf\_thresh = 0.25, TP = 529, FP = 247, FN = 290, average IoU = 55.72 %

IoU threshold = 50 %, used Area-Under-Curve for each unique Recall

mean average precision (mAP@0.50) = 0.635553, or 63.56 %

Total Detection Time: 28 Seconds

**1723\_10\_percent**

**1000**

calculation mAP (mean average precision)...

Detection layer: 30 - type = 28

Detection layer: 37 - type = 28

492

detections\_count = 9497, unique\_truth\_count = 819

class\_id = 0, name = bolt, ap = 16.87% (TP = 202, FP = 385)

for conf\_thresh = 0.25, precision = 0.34, recall = 0.25, F1-score = 0.29

for conf\_thresh = 0.25, TP = 202, FP = 385, FN = 617, average IoU = 22.45 %

IoU threshold = 50 %, used Area-Under-Curve for each unique Recall

mean average precision (mAP@0.50) = 0.168741, or 16.87 %

Total Detection Time: 29 Seconds

**2000**

calculation mAP (mean average precision)...

Detection layer: 30 - type = 28

Detection layer: 37 - type = 28

492

detections\_count = 6972, unique\_truth\_count = 819

class\_id = 0, name = bolt, ap = 25.34% (TP = 346, FP = 467)

for conf\_thresh = 0.25, precision = 0.43, recall = 0.42, F1-score = 0.42

for conf\_thresh = 0.25, TP = 346, FP = 467, FN = 473, average IoU = 29.61 %

IoU threshold = 50 %, used Area-Under-Curve for each unique Recall

mean average precision (mAP@0.50) = 0.253368, or 25.34 %

Total Detection Time: 29 Seconds

**3000**

calculation mAP (mean average precision)...

Detection layer: 30 - type = 28

Detection layer: 37 - type = 28

492

detections\_count = 5685, unique\_truth\_count = 819

class\_id = 0, name = bolt, ap = 43.22% (TP = 439, FP = 442)

for conf\_thresh = 0.25, precision = 0.50, recall = 0.54, F1-score = 0.52

for conf\_thresh = 0.25, TP = 439, FP = 442, FN = 380, average IoU = 35.28 %

IoU threshold = 50 %, used Area-Under-Curve for each unique Recall

mean average precision (mAP@0.50) = 0.432235, or 43.22 %

Total Detection Time: 28 Seconds

**4000**

calculation mAP (mean average precision)...

Detection layer: 30 - type = 28

Detection layer: 37 - type = 28

492

detections\_count = 4834, unique\_truth\_count = 819

class\_id = 0, name = bolt, ap = 38.36% (TP = 439, FP = 487)

for conf\_thresh = 0.25, precision = 0.47, recall = 0.54, F1-score = 0.50

for conf\_thresh = 0.25, TP = 439, FP = 487, FN = 380, average IoU = 33.53 %

IoU threshold = 50 %, used Area-Under-Curve for each unique Recall

mean average precision (mAP@0.50) = 0.383571, or 38.36 %

Total Detection Time: 29 Seconds

**Best**

for conf\_thresh = 0.25, precision = 0.54, recall = 0.54, F1-score = 0.54

for conf\_thresh = 0.25, TP = 440, FP = 381, FN = 379, average IoU = 37.48 %

IoU threshold = 50 %, used Area-Under-Curve for each unique Recall

mean average precision (mAP@0.50) = 0.436697, or 43.67 %

Total Detection Time: 28 Seconds

**1000\_10\_percent**

**1000**

calculation mAP (mean average precision)...

Detection layer: 30 - type = 28

Detection layer: 37 - type = 28

492

detections\_count = 8160, unique\_truth\_count = 819

class\_id = 0, name = bolt, ap = 38.18% (TP = 323, FP = 243)

for conf\_thresh = 0.25, precision = 0.57, recall = 0.39, F1-score = 0.47

for conf\_thresh = 0.25, TP = 323, FP = 243, FN = 496, average IoU = 36.97 %

IoU threshold = 50 %, used Area-Under-Curve for each unique Recall

mean average precision (mAP@0.50) = 0.381835, or 38.18 %

Total Detection Time: 28 Seconds

**2000**

calculation mAP (mean average precision)...

Detection layer: 30 - type = 28

Detection layer: 37 - type = 28

492

detections\_count = 4147, unique\_truth\_count = 819

class\_id = 0, name = bolt, ap = 62.61% (TP = 509, FP = 180)

for conf\_thresh = 0.25, precision = 0.74, recall = 0.62, F1-score = 0.68

for conf\_thresh = 0.25, TP = 509, FP = 180, FN = 310, average IoU = 53.09 %

IoU threshold = 50 %, used Area-Under-Curve for each unique Recall

mean average precision (mAP@0.50) = 0.626119, or 62.61 %

Total Detection Time: 28 Seconds

**3000**

calculation mAP (mean average precision)...

Detection layer: 30 - type = 28

Detection layer: 37 - type = 28

492

detections\_count = 3253, unique\_truth\_count = 819

class\_id = 0, name = bolt, ap = 65.00% (TP = 531, FP = 197)

for conf\_thresh = 0.25, precision = 0.73, recall = 0.65, F1-score = 0.69

for conf\_thresh = 0.25, TP = 531, FP = 197, FN = 288, average IoU = 55.41 %

IoU threshold = 50 %, used Area-Under-Curve for each unique Recall

mean average precision (mAP@0.50) = 0.649954, or 65.00 %

Total Detection Time: 28 Seconds

**4000**

calculation mAP (mean average precision)...

Detection layer: 30 - type = 28

Detection layer: 37 - type = 28

492

detections\_count = 3751, unique\_truth\_count = 819

class\_id = 0, name = bolt, ap = 64.34% (TP = 530, FP = 230)

for conf\_thresh = 0.25, precision = 0.70, recall = 0.65, F1-score = 0.67

for conf\_thresh = 0.25, TP = 530, FP = 230, FN = 289, average IoU = 52.20 %

IoU threshold = 50 %, used Area-Under-Curve for each unique Recall

mean average precision (mAP@0.50) = 0.643370, or 64.34 %

Total Detection Time: 29 Seconds

**5000**

calculation mAP (mean average precision)...

Detection layer: 30 - type = 28

Detection layer: 37 - type = 28

492

detections\_count = 3212, unique\_truth\_count = 819

class\_id = 0, name = bolt, ap = 65.05% (TP = 544, FP = 319)

for conf\_thresh = 0.25, precision = 0.63, recall = 0.66, F1-score = 0.65

for conf\_thresh = 0.25, TP = 544, FP = 319, FN = 275, average IoU = 48.39 %

IoU threshold = 50 %, used Area-Under-Curve for each unique Recall

mean average precision (mAP@0.50) = 0.650523, or 65.05 %

Total Detection Time: 28 Seconds

**6000**

calculation mAP (mean average precision)...

Detection layer: 30 - type = 28

Detection layer: 37 - type = 28

492

detections\_count = 3139, unique\_truth\_count = 819

class\_id = 0, name = bolt, ap = 63.99% (TP = 547, FP = 338)

for conf\_thresh = 0.25, precision = 0.62, recall = 0.67, F1-score = 0.64

for conf\_thresh = 0.25, TP = 547, FP = 338, FN = 272, average IoU = 47.67 %

IoU threshold = 50 %, used Area-Under-Curve for each unique Recall

mean average precision (mAP@0.50) = 0.639857, or 63.99 %

Total Detection Time: 27 Seconds

**1000\_real\_photo**

**1000**

calculation mAP (mean average precision)...

Detection layer: 30 - type = 28

Detection layer: 37 - type = 28

492

detections\_count = 6721, unique\_truth\_count = 819

class\_id = 0, name = bolt, ap = 19.55% (TP = 161, FP = 210)

for conf\_thresh = 0.25, precision = 0.43, recall = 0.20, F1-score = 0.27

for conf\_thresh = 0.25, TP = 161, FP = 210, FN = 658, average IoU = 28.92 %

IoU threshold = 50 %, used Area-Under-Curve for each unique Recall

mean average precision (mAP@0.50) = 0.195528, or 19.55 %

Total Detection Time: 28 Seconds

**2000**

calculation mAP (mean average precision)...

Detection layer: 30 - type = 28

Detection layer: 37 - type = 28

492

detections\_count = 5730, unique\_truth\_count = 819

class\_id = 0, name = bolt, ap = 33.87% (TP = 326, FP = 336)

for conf\_thresh = 0.25, precision = 0.49, recall = 0.40, F1-score = 0.44

for conf\_thresh = 0.25, TP = 326, FP = 336, FN = 493, average IoU = 34.96 %

IoU threshold = 50 %, used Area-Under-Curve for each unique Recall

mean average precision (mAP@0.50) = 0.338688, or 33.87 %

Total Detection Time: 28 Seconds

**3000**

calculation mAP (mean average precision)...

Detection layer: 30 - type = 28

Detection layer: 37 - type = 28

492

detections\_count = 3861, unique\_truth\_count = 819

class\_id = 0, name = bolt, ap = 34.93% (TP = 335, FP = 311)

for conf\_thresh = 0.25, precision = 0.52, recall = 0.41, F1-score = 0.46

for conf\_thresh = 0.25, TP = 335, FP = 311, FN = 484, average IoU = 36.82 %

IoU threshold = 50 %, used Area-Under-Curve for each unique Recall

mean average precision (mAP@0.50) = 0.349291, or 34.93 %

Total Detection Time: 29 Seconds

**4000**

calculation mAP (mean average precision)...

Detection layer: 30 - type = 28

Detection layer: 37 - type = 28

492

detections\_count = 2969, unique\_truth\_count = 819

class\_id = 0, name = bolt, ap = 33.00% (TP = 330, FP = 337)

for conf\_thresh = 0.25, precision = 0.49, recall = 0.40, F1-score = 0.44

for conf\_thresh = 0.25, TP = 330, FP = 337, FN = 489, average IoU = 34.79 %

IoU threshold = 50 %, used Area-Under-Curve for each unique Recall

mean average precision (mAP@0.50) = 0.329981, or 33.00 %

Total Detection Time: 29 Seconds

**5000**

calculation mAP (mean average precision)...

Detection layer: 30 - type = 28

Detection layer: 37 - type = 28

492

detections\_count = 3338, unique\_truth\_count = 819

class\_id = 0, name = bolt, ap = 33.14% (TP = 357, FP = 391)

for conf\_thresh = 0.25, precision = 0.48, recall = 0.44, F1-score = 0.46

for conf\_thresh = 0.25, TP = 357, FP = 391, FN = 462, average IoU = 35.23 %

IoU threshold = 50 %, used Area-Under-Curve for each unique Recall

mean average precision (mAP@0.50) = 0.331392, or 33.14 %

Total Detection Time: 29 Seconds

**6000**

calculation mAP (mean average precision)...

Detection layer: 30 - type = 28

Detection layer: 37 - type = 28

492

detections\_count = 3074, unique\_truth\_count = 819

class\_id = 0, name = bolt, ap = 32.71% (TP = 358, FP = 376)

for conf\_thresh = 0.25, precision = 0.49, recall = 0.44, F1-score = 0.46

for conf\_thresh = 0.25, TP = 358, FP = 376, FN = 461, average IoU = 35.90 %

IoU threshold = 50 %, used Area-Under-Curve for each unique Recall

mean average precision (mAP@0.50) = 0.327109, or 32.71 %

Total Detection Time: 29 Seconds

**self\_made\_dataset**

**\*\*\***

**Joined\_data(bolt+self\_made\_bolt)**

**1000**

calculation mAP (mean average precision)...

Detection layer: 30 - type = 28

Detection layer: 37 - type = 28

492

detections\_count = 14177, unique\_truth\_count = 819

class\_id = 0, name = bolt, ap = 0.13% (TP = 16, FP = 1108)

for conf\_thresh = 0.25, precision = 0.01, recall = 0.02, F1-score = 0.02

for conf\_thresh = 0.25, TP = 16, FP = 1108, FN = 803, average IoU = 0.79 %

IoU threshold = 50 %, used Area-Under-Curve for each unique Recall

mean average precision (mAP@0.50) = 0.001326, or 0.13 %

Total Detection Time: 29 Seconds

**2000**

calculation mAP (mean average precision)...

Detection layer: 30 - type = 28

Detection layer: 37 - type = 28

492

detections\_count = 7522, unique\_truth\_count = 819

class\_id = 0, name = bolt, ap = 2.02% (TP = 65, FP = 895)

for conf\_thresh = 0.25, precision = 0.07, recall = 0.08, F1-score = 0.07

for conf\_thresh = 0.25, TP = 65, FP = 895, FN = 754, average IoU = 3.93 %

IoU threshold = 50 %, used Area-Under-Curve for each unique Recall

mean average precision (mAP@0.50) = 0.020231, or 2.02 %

Total Detection Time: 29 Seconds

**3000**

calculation mAP (mean average precision)...

Detection layer: 30 - type = 28

Detection layer: 37 - type = 28

492

detections\_count = 7483, unique\_truth\_count = 819

class\_id = 0, name = bolt, ap = 1.88% (TP = 71, FP = 1165)

for conf\_thresh = 0.25, precision = 0.06, recall = 0.09, F1-score = 0.07

for conf\_thresh = 0.25, TP = 71, FP = 1165, FN = 748, average IoU = 3.21 %

IoU threshold = 50 %, used Area-Under-Curve for each unique Recall

mean average precision (mAP@0.50) = 0.018806, or 1.88 %

Total Detection Time: 29 Seconds

**1500**

calculation mAP (mean average precision)...

Detection layer: 30 - type = 28

Detection layer: 37 - type = 28

492

detections\_count = 7595, unique\_truth\_count = 819

class\_id = 0, name = bolt, ap = 5.03% (TP = 91, FP = 632)

for conf\_thresh = 0.25, precision = 0.13, recall = 0.11, F1-score = 0.12

for conf\_thresh = 0.25, TP = 91, FP = 632, FN = 728, average IoU = 7.12 %

IoU threshold = 50 %, used Area-Under-Curve for each unique Recall

mean average precision (mAP@0.50) = 0.050315, or 5.03 %

Total Detection Time: 29 Seconds

**3800**

calculation mAP (mean average precision)...

Detection layer: 30 - type = 28

Detection layer: 37 - type = 28

492

detections\_count = 6308, unique\_truth\_count = 819

class\_id = 0, name = bolt, ap = 0.34% (TP = 33, FP = 1180)

for conf\_thresh = 0.25, precision = 0.03, recall = 0.04, F1-score = 0.03

for conf\_thresh = 0.25, TP = 33, FP = 1180, FN = 786, average IoU = 1.48 %

IoU threshold = 50 %, used Area-Under-Curve for each unique Recall

mean average precision (mAP@0.50) = 0.003417, or 0.34 %

Total Detection Time: 30 Seconds