Flower Detector - Training Iteration Process

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1. Roboflow's Given Split

- Batch: 8, Epochs: 10, Results on Validation Set:

```
Model summary: 157 layers, 7042489 parameters, 0 gradients, 15.9 GFLOPs
                 Class     Images  Instances          P          R      mAP50   mAP50-95:
                   all        438       1051      0.517      0.455      0.447      0.227
         bougainvillea        438         29          1      0.137      0.335      0.215
                 daisy        438        100      0.586       0.86      0.778      0.401
             dandelion        438         48      0.406      0.979      0.841      0.459
             gardenias        438        101      0.429      0.535      0.398      0.194
              hibiscus        438         34          0          0     0.0956     0.0598
            hydrangeas        438         33       0.19      0.303      0.234     0.0697
                lilies        438         35      0.648       0.79      0.758      0.373
                orchid        438        167       0.62      0.437      0.537      0.214
               peonies        438         42      0.396      0.119        0.2      0.101
                  rose        438        152      0.709      0.769      0.818      0.461
             sunflower        438        280          1          0      0.132     0.0741
                 tulip        438         30      0.223      0.533      0.238     0.0969
```

  - Uneven performance across classes

2. Direct Resplit

- Grouped all the images in the dataset by class and resplit them into training/validation/test sets using a 80/10/10 ratio

- Batch: 8, Epochs: 10, Results on Validation Set:

```
Model summary: 157 layers, 7042489 parameters, 0 gradients, 15.9 GFLOPs
                 Class     Images  Instances          P          R      mAP50   mAP50-95:
                   all        232        617      0.504      0.658      0.591      0.291
         bougainvillea        232         25       0.59      0.231      0.411      0.154
                 daisy        232         88      0.861      0.864      0.905      0.457
             dandelion        232         98      0.148      0.827      0.514        0.2
             gardenias        232         51      0.445      0.549      0.446      0.223
              hibiscus        232         22      0.542       0.27      0.406      0.212
            hydrangeas        232         79      0.411      0.747      0.614       0.29
                lilies        232         17       0.38      0.721      0.584       0.26
                orchid        232         70      0.633      0.771      0.643      0.309
               peonies        232         16      0.781      0.438      0.648      0.384
                  rose        232         56      0.684      0.927      0.845       0.55
             sunflower        232         60      0.322      0.751      0.553      0.257
                 tulip        232         35      0.249        0.8      0.518      0.202
```

  - More even performance across classes

- Batch: 16, Epochs: 20, Results on Validation Set:

```
Model summary: 157 layers, 7042489 parameters, 0 gradients, 15.9 GFLOPs
                 Class     Images  Instances          P          R      mAP50   mAP50-95:
                   all        232        603       0.79      0.727       0.79      0.441
         bougainvillea        232         26      0.936       0.56      0.762      0.434
                 daisy        232         82      0.774      0.878       0.91      0.494
             dandelion        232         26      0.905      0.885      0.873      0.553
             gardenias        232         46      0.484       0.37      0.406      0.166
              hibiscus        232         23       0.97      0.826      0.917      0.477
            hydrangeas        232        108      0.718       0.88      0.873      0.391
                lilies        232         18      0.939       0.86      0.949      0.571
                orchid        232         71      0.824       0.69      0.812      0.424
               peonies        232         14      0.784      0.776      0.863      0.568
                  rose        232         67      0.872      0.866      0.932      0.633
             sunflower        232         62      0.705      0.645      0.691      0.377
                 tulip        232         60      0.569      0.483      0.497      0.207

Model summary: 157 layers, 7042489 parameters, 0 gradients, 15.9 GFLOPs
                 Class     Images  Instances          P          R      mAP50   mAP50-95:
                   all        232        617      0.743      0.717      0.763      0.433
         bougainvillea        232         25      0.832      0.594      0.685      0.385
                 daisy        232         88      0.833      0.852      0.924      0.508
             dandelion        232         98      0.357      0.786      0.551      0.271
             gardenias        232         51      0.678      0.496      0.567      0.272
              hibiscus        232         22      0.931      0.682      0.924      0.567
            hydrangeas        232         79      0.808      0.743      0.787      0.413
                lilies        232         17      0.831      0.765      0.878      0.521
                orchid        232         70      0.767      0.757      0.771       0.41
               peonies        232         16      0.628      0.812      0.749      0.484
                  rose        232         56       0.91        0.9      0.953      0.651
             sunflower        232         60      0.694      0.758      0.751      0.454
                 tulip        232         35      0.645      0.457      0.615      0.255

Model summary: 157 layers, 7042489 parameters, 0 gradients, 15.9 GFLOPs
                 Class     Images  Instances          P          R      mAP50   mAP50-95:
                   all        232        598       0.75      0.778      0.798      0.449
         bougainvillea        232         19      0.932       0.72       0.88       0.54
                 daisy        232         64      0.719      0.891      0.923      0.546
             dandelion        232        101      0.798      0.901      0.927      0.457
             gardenias        232         46      0.613      0.652      0.635      0.331
              hibiscus        232         20      0.714       0.75      0.783      0.473
            hydrangeas        232        101      0.684      0.733      0.782      0.379
                lilies        232         22      0.887      0.773      0.821      0.476
                orchid        232         62      0.842      0.688      0.798      0.442
               peonies        232         13      0.309      0.846      0.519      0.338
                  rose        232         69      0.911      0.855      0.904      0.596
             sunflower        232         25      0.947       0.84      0.893      0.556
                 tulip        232         56      0.648      0.692      0.709      0.251
```

  - Improvement in performance
  - Performance for a particular class can vary based on different rounds of resplits

- Batch: 16, Epochs: 50, Results on Validation Set:

```
Model summary: 157 layers, 7042489 parameters, 0 gradients, 15.9 GFLOPs
                 Class     Images  Instances          P          R      mAP50   mAP50-95:
                   all        232        704      0.735      0.745      0.767      0.423
         bougainvillea        232         23      0.692      0.684       0.73      0.316
                 daisy        232         75      0.859      0.907      0.913      0.462
             dandelion        232         49      0.862      0.765      0.848      0.531
             gardenias        232         46      0.701       0.63      0.708      0.384
              hibiscus        232         20      0.756       0.75      0.892      0.594
            hydrangeas        232        170      0.599      0.676      0.685      0.326
                lilies        232         18      0.853      0.778      0.884      0.549
                orchid        232         87      0.767      0.907      0.871      0.459
               peonies        232         33      0.549      0.788      0.559      0.274
                  rose        232         84      0.912      0.866      0.918      0.608
             sunflower        232         68      0.768      0.647      0.714      0.417
                 tulip        232         31      0.497      0.548      0.483      0.157
```

  - Performance is comparable to when the number of epochs is 20

3. Data Augmentation + Resplit

- Counted the number of images per class and augmented underrepresented classes
- Grouped all the images in the dataset by class and resplit them into training/validation/test sets using a 80/10/10 ratio

- Batch: 16, Epochs: 20, Results on Validation Set:

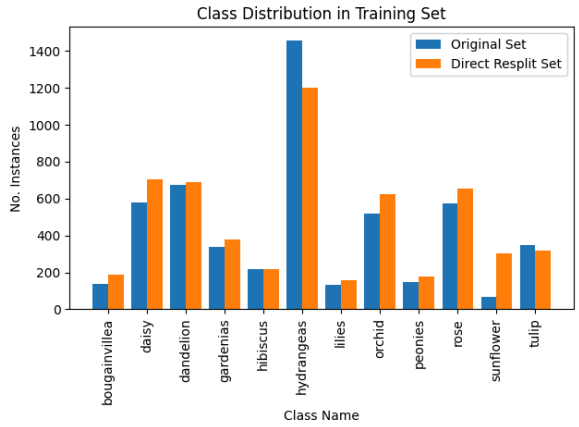
```
Model summary: 157 layers, 7042489 parameters, 0 gradients, 15.9 GFLOPs
                 Class     Images  Instances          P          R      mAP50   mAP50-95:
                   all        360       1066      0.805      0.815      0.858      0.492
         bougainvillea        360         39      0.744      0.745      0.737      0.413
                 daisy        360         53      0.775      0.912      0.899      0.525
             dandelion        360        133      0.879      0.677      0.803      0.465
             gardenias        360         59      0.666      0.473      0.573      0.293
              hibiscus        360         47      0.734          1      0.932      0.538
            hydrangeas        360        241      0.704      0.888      0.887      0.439
                lilies        360         45       0.93      0.933      0.966      0.565
                orchid        360         70      0.766      0.748      0.814      0.437
               peonies        360         57      0.861      0.737      0.896      0.587
                  rose        360         97      0.957      0.922      0.957      0.602
             sunflower        360        102      0.881      0.943      0.963      0.577
                 tulip        360        123      0.762      0.797      0.866      0.464
```

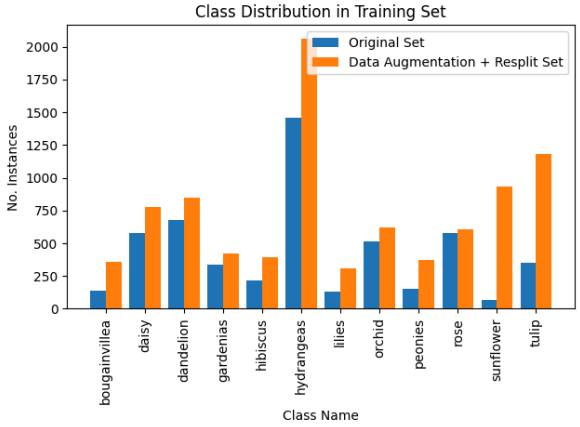
  - Improvement in performance

- Results on Test Set:

Class	Images	Instances	P	R	mAP50	mAP50-95:
all	384	1165	0.795	0.831	0.88	0.515
bougainvillea	384	47	0.946	0.747	0.905	0.536
daisy	384	94	0.799	0.957	0.946	0.554
dandelion	384	85	0.521	0.906	0.781	0.45
gardenias	384	53	0.766	0.509	0.732	0.402
hibiscus	384	50	0.825	0.94	0.945	0.646
hydrangeas	384	364	0.775	0.799	0.866	0.414
lilies	384	43	0.926	0.884	0.957	0.575
orchid	384	93	0.763	0.72	0.818	0.419
peonies	384	43	0.861	0.93	0.913	0.66
rose	384	67	0.849	0.821	0.917	0.547
sunflower	384	89	0.777	0.876	0.905	0.542
tulip	384	137	0.731	0.876	0.877	0.434

Class Distribution (by Instances) in Training Set





Class Distribution (by Images) in Training Set