Cheat Sheet | GeoAI

ArcGIS Pro | Python | ArcPY

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Version 3.0

Install Libs

```
pip install arcgis
```

```
conda install -c esri arcgis_learn
```

Export Training Data

```
from argis.learn import *
```

```
arcgis.learn.export_training_data(input_raster, input_class_data=None,
                                  tile_size=256, rotation_angle=0
                                  stride_size=128, metadata_format= 'RCNN_Maks',
                                  classvalue_field=None, buffer_radius=None,
                                  output_location=None, context=None,
                                  input_mask_polygons=None,chip_format='TIFF',
                                  reference_system='MAP_SPACE')
```

Metadata Format

`KITTI_rectangles`: used with FasterRCNN, RetinaNet, SingleShotDetector and YOLOv3 models.

`PASCAL_VOC_rectangles`: sed with FasterRCNN, RetinaNet, SingleShotDetector and YOLOv3 models.

`Classified_Tiles`: used with BDCNEdgeDetector, DeepLab, HEDEdgeDetector, MultiTaskRoadExtractor, PSPNetClassifier and UnetClassifier models.

`RCNN_Masks`: used with MaskRCNN model.

`Labeled_Tiles`: used with FeatureClassifier model.

`Multi-labeled Tiles`: used with FeatureClassifier model.

Others:

`Classified_Tiles`, `ChangeDetection`, `Imagenet`, `PointCloud`, `ImageCaptioning`, `superres`, `Panoptic_Segmentation`, `ImageCaptioning`, `ChangeDetection`, `CycleGAN`, `Pix2Pix`, `WNet_cGAN`, `ObjectTracking`

Prepare data

```
data = arcgis.learn.prepare_data(path, class_mapping=None,
                                 chip_size=256, val_split_pct=0.1, batch_size=64,
                                 transforms=None, seed=42, dataset_type=None,
                                 resize_to=None, imagery_type = 'sentinel2',
                                 bands = ['r', 'g', 'b', 'nir'])
```

`dataset_Type`: argument is the same as exported in samples

```
data.classes
```

```
data.show_batch()
```

Model Training

`backbone` : resnet18, resnet34, resnet50, resnet101, resnet152, densenet121, densenet161, densenet169, densenet201, mobilenet, vgg11, vgg13, vgg16, vgg19, darknet53, reidv1, reidv2.

Object Detection

- **FasterRCNN**

  https://arxiv.org/abs/1506.01497

  ```
  model = FasterRCNN(data, backbone='resnet50',
                     pretrained_path=None)
  ```

- **RetinaNet**

  ```
  model = RetinaNet(data, scales=None,
                    ratios=None, backbone='resnet50',
                    pretrained_path=None)
  ```

- **SingleShotDetector**

  ```
  model = SingleShotDetector(data, grids=None, zooms=[1.0],
                             ratios=[[1.0, 1.0]],
                             backbone='resnet50',
                             drop=0.3, bias=- 4.0,
                             focal_loss=False,
                             pretrained_path=None)
  ```

- **MaskRCNN**

  https://arxiv.org/abs/1703.06870.

  ```
  model = MaskRCNN(data, backbone='resnet50',
                   pretrained_path=None,
                   pointrend=False)
  ```

- **YOLOv3**

  ```
  model = YOLOv3(data, pretrained_path=None)
  ```

- **MMDegtection**

  ```
  model = MMDetection(data, model, model_weight=False,
                      pretrained_path=None)
  ```

- **DETReg**

  ```
  model = DETReg(data, backbone='resnet50',
                 pretrained_path=None)
  ```

Classify Pixel

- **UnetClassifier**

  ```
  model = UnetClassifier(data, backbone='resnet50',
                         pretrained_path=None)
  ```

- **PSPNetClassifier**

  https://arxiv.org/abs/1612.01105

  ```
  model = PSPNetClassifier(data, backbone='resnet50', use_unet=True,
                           pyramid_sizes=[1, 2, 3, 6]
                           pretrained_path=None)
  ```

- **DeepLab**

  https://arxiv.org/abs/1706.05587

  ```
  model = DeepLab(data, backbone='resnet50',
                  pretrained_path=None)
  ```

- **BDCNEdgeDetector**

  https://arxiv.org/pdf/1902.10903.pdf

  ```
  model = BDCNEdgeDetector(data, backbone='vgg19')
  ```

- **HEDEdgeDetector**

  https://arxiv.org/pdf/1504.06375.pdf

  ```
  model = HEDEdgeDetector(data, backbone='vgg19')
  ```

- **MultiTaskRoadExtractor**

  https://doi.org/10.1109/CVPR.2019.01063

  ```
  model = MultiTaskRoadExtractor(data, backbone='resnet50')
  ```

- **ConnectNet**

  https://doi.org/10.1109/CVPR.2019.01063

  ```
  model = ConnectNet(data, backbone='resnet50',
                     pretrained_path=None)
  ```

- **ChangeDetection**

  https://www.mdpi.com/2072-4292/12/10/1662

  ```
  model = ChangeDetector(data, backbone='resnet50',
                         attention_type='PAM',
                         pretrained_path=None)
  ```

- **MMSegmentation**

  ```
  model = MMSegmentation(data, model, model_weight=False,
                         pretrained_path=None
  ```

- **MaxDeepLab**

  ```
  model = MaXDeepLab(data, backbone=None,
                     pretrained_path=None,)
  ```

Image Translation Models

- **CycleGAN**

  https://arxiv.org/abs/1703.10593

  ```
  model = CycleGAN(data, pretrained_path=None, gen_blocks=9, lsgan=True)
  ```

- **Pix2Pix**

  ```
  model = Pix2Pix(data, pretrained_path=None)
  ```

- **Pix2PixHD**

  ```
  model = Pix2PixHD(data, pretrained_path=None)
  ```

- **WNetcGAN**

  ```
  model = WNet_cGAN(data, pretrained_path=None)
  ```

- **ImagemCaptione**

  ```
  model = ImageWNet_cGAN(data, pretrained_path=None)
  ```

- **SuperResolution**

  ```
  model = SuperResolution(data, backbone='resnet50', pretrained_path=None)
  ```

Object Tracking Models

- **SiamMask**

  ```
  model = SiamMask(data)
  ```

- **DeepSort**

  ```
  model = DeepSort(data)
  ```

- **ObjectTracker**

  ```
  model = SiamMask(data)
  ```

- **Track**

  ```
  model = Track(id, label, bbox, mask)
  ```

Automated Machine Learning

- **MLModel**

  ```
  model = MLModel(data, model_type)
  ```

- **AutoML**

  ```
  model = AutoML(data, total_time_limit=3600,
                 mode='Explain', algorithms=None,
                 eval_metric='auto')
  ```

- **AutoML**

  ```
  model = ImageryModel(data)
  ```

Scanned Maps

- **TimeSeriesModel**

  ```
  ScannedMapDigitizer(input_folder, output_folder)
  ```

Feature, Tabular and Timeseries models

- **TimeSeriesModel**

  ```
  model = TimeSeriesModel(data, seq_len,
                          model_arch='InceptionTime')
  ```

- **FullyConnectedNetwork**

  ```
  model = FullyConnectedNetwork(data, layers=None, emb_szs=None)
  ```

- **MLModel**

  ```
  model = MLModel(data, model_type)
  ```

3D Models

- **PointCNN**

  ```
  model = PointCNN(data, pretrained_path=None)
  ```

Inferencing Methods

- **Detect Objects**

  ```
  model = detect_objects(input_raster, model, *)
  ```

- **Classify Objects**

  ```
  model = classify_objects(input_raster, model, *)
  ```

- **Classify Pixels**

  ```
  model = classify_pixelscompute_accuracy_for_object_detection(detected_features, ground_truth
  ```

- **Compute Accuracy**

  ```
  model = compute_accuracy_for_object_detection(detected_features, ground_truth_features, dete
                                                Embeddings(dataset_type='image', backbon
  ```

- **Embeddings**

  ```
  model = Embeddings(dataset_type='image', backbone=None)
  ```

Training Model

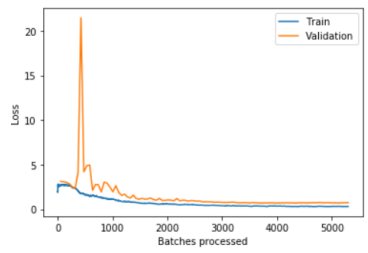
```
lr = model.lr_find()

model.fit(epochs=10, lr=lr, one_cycle=True,
          early_stopping=False, checkpoint=True)
```

Metrics

Object Detection

```
model.plot_losses()
```




```
model.average_precision_score()
```

```
model.show_results()
```

```
model.save(name_or_path, framework='PyTorch',
           publish=False, gis=None,
           compute_metrics=True,
           save_optimizer=False,
           save_inference_file=True)
```

Deploy

```
model = FasterRCNN.from_model(model_path)
```

```
model.predict(image_path, threshold=0.1,
              nms_overlap=0.1,
              return_scores=True,
              visualize=False, resize=False)
```

```
model.predict_video(input_video_path=video_file,
                    metadata_file=None,
                    track=True,
                    threshold=0.95,
                    visualize=True,
                    resize=True)
```

Links

Pretrained AI Models

Blog ESRI GeoAI

Deep Learning Framework

Deep Learning Tooset

ArcGIS API for Python

ArcGIS Pro Documentation