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Pedestrian Detection

– ITSG report –

Team members

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- Main features

The smartphone will see the traffic ahead through its camera, and then show the driver some extra information that could help him in different situations.

It must recognize pedestrians.

Depending on the user's location, car and speed, the application will show different warnings or alerts, depending on the danger level of the obstacle.

- What does the AI do in this case?

- The AI will learn to differentiate different objects in the space, and also predict behaviors that could put in danger the life of the driver, or the people around

- Related work & useful tools

Apple's Core ML: <https://developer.apple.com/documentation/coreml>

ObjectDetection: <https://github.com/tucan9389/ObjectDetection-CoreML>

Training Object Detection Models in Create ML:

<https://developer.apple.com/videos/play/wwdc2019/424/>

Pedestrians: <http://www.pedestrian-detection.com>

Routing: <http://neo.lcc.uma.es/vrp/vehicle-routing-problem/>

- How it works?

Apple released 2 powerful tools for creating and using ML model:

- CreateML can be used on MacOS (Desktop & Laptops); with CreateML we can create and train custom machine learning models. Also we can use it for improving model's accuracy, by alternating the data we have.
- CoreML can be used on mobile platforms too (both iPhones and Apple Watches); with CoreML we can integrate previously created machine learning models into our apps. If we really want, we can improve model's performance on device, but that usually takes a lot of time due to hardware constraints.

For this project we will use Object Detector feature to find the objects inside our image.

At this point in time, Apple doesn't offer any details on how the Object Detector works behind the scenes. The documentation doesn't offer many details regarding the customization or any low-level details regarding the implementation. This might change over the course of time, as it was release less than 3 years ago.

Docs:

<https://developer.apple.com/documentation/createml>

<https://developer.apple.com/documentation/coreml>

<https://apple.github.io/coremltools/coremlspecification/index.html>

Small data – Caltech (101 images train, 80 images test)

Add

Train

Project

SmallData

Model Sources

SmallData 1

Input

2

Classes

95%

Training

Metrics

96%

Validation

13%


Testing

Output

63,5 MB

▼ Activity

Completed training



Completed after iteration 5000 of maximum 5000

— loss (0,42)

▼ Metrics

Class	^ I/U 50%	Varied I/U
people	100%	90%
person	89%	72%

Training completed after 1 hour, 53 minutes — yesterday at 21:16

Make a Copy

Real bench - Caltech (989 images train, 510 images test)

Add

Train

Project

LearnBench

Model Sources

LearnBench 1

Input

2

Classes

81%

Training

Metrics

83%

Validation

3%

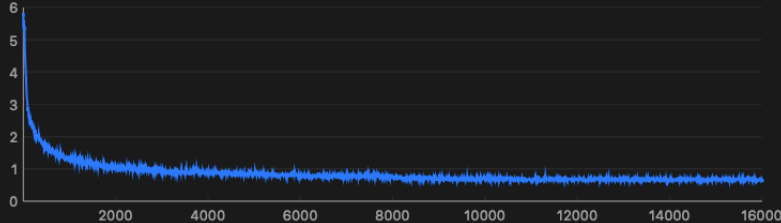
Testing

Output

63,5 MB

▼ Activity

Completed training



Completed after iteration 16000 of maximum 16000

— loss (0,64)

▼ Metrics

Class	^ I/U 50%	Varied I/U
people	88%	56%
person	74%	38%

Training completed after 6 hours, 17 minutes — today at 03:45

Make a Copy

JAAD – Small set of data

Create MLFileEditViewWindowHelp

31°C2013rpmBluetoothWi-Fi100%Sat 3:55 PM

JAADSmall.mlproj

+

Train

Share

Project

JAADSmall

Model Sources

JAADSmall 1

Input

1Classes

91%Training

88%Validation

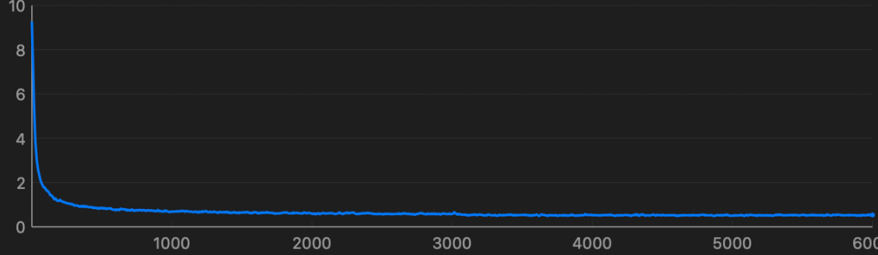
45%Testing

Output

63.4 MB

Activity

Completed training



Completed after iteration 6000 of maximum 6000

loss (0.54)

Metrics

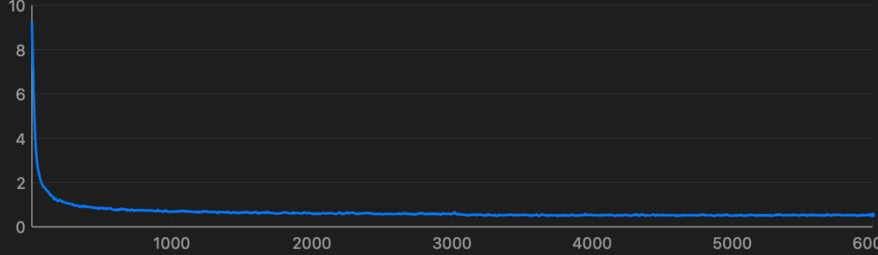
Class	I/U 50%	Varied I/U
Pedestrian	91%	58%

Training completed after 2 hours, 13 minutes — yesterday at 8:00 PM

Make a Copy

Activity

Completed training



Completed after iteration 6000 of maximum 6000

loss (0.54)

Metrics

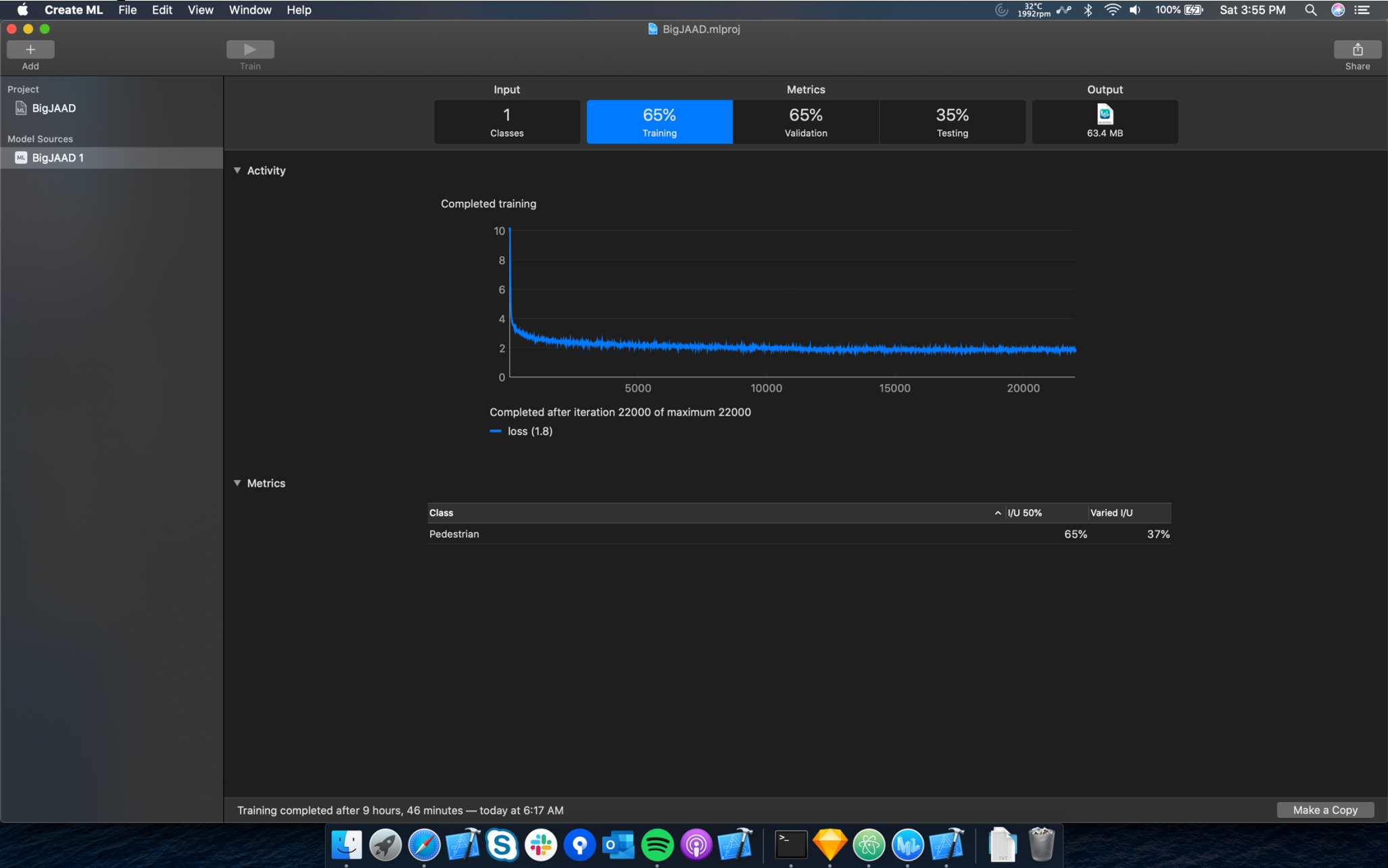
Class	I/U 50%	Varied I/U
Pedestrian	91%	58%

Training completed after 2 hours, 13 minutes — yesterday at 8:00 PM

Make a Copy



JAAD – Big set of data



- Results

	CALTECH		JAAD	
Data Set Size	Small	Big	Small	Big
Training	95%	81%	91%	65%
Validation	96%	83%	88%	65%
Testing	13%	3%	45%	35%

- Conclusions

At this point in time, CreateML is way too new to be used and give good results. In all the testing done, the matching results were below 50%.