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Activity Classification

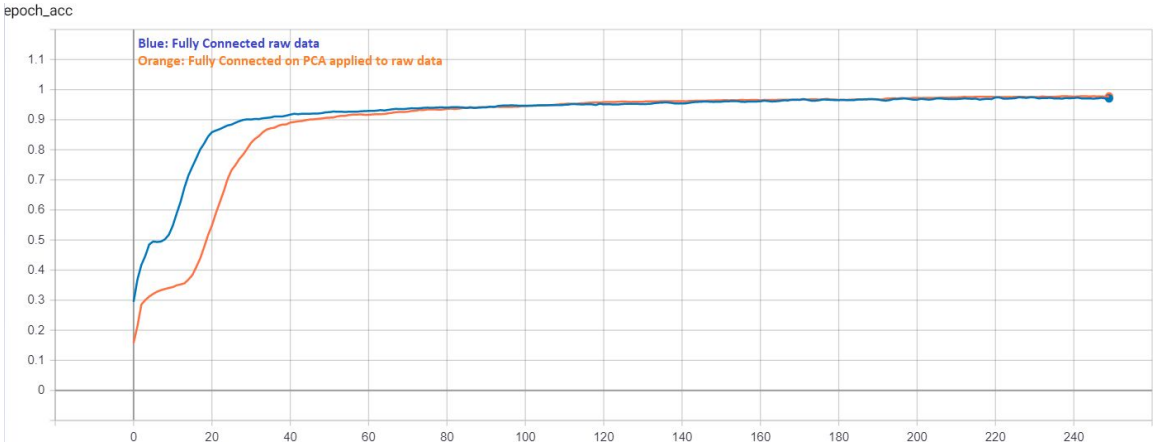
With Deep learning on UCI HAR, VOC 2012 and Kaggle distracted driver state farm datasets

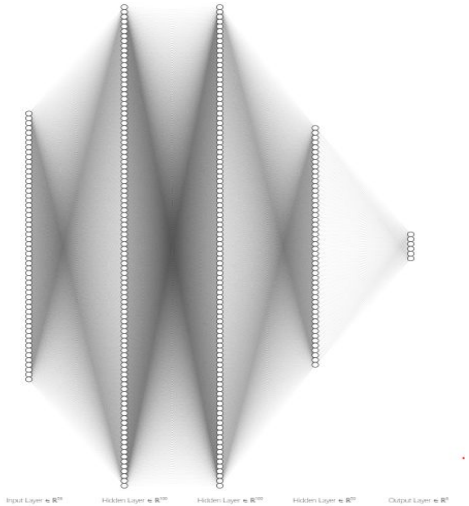
ML - CIT 651

Project repo: https://github.com/MahmoudTamam/Human-activity-Recoginition

UCI HAR: ANN, ANN with PCA

- ANN: 4 Fully Connected layers, Each layer followed by relu activation function, batch normalization and dropout.
- Experiment 0: 561 features Raw data for each subject (avg, variance, std dev), 97% validation & 94.5% Test.
- Experiment 1: Apply PCA on the raw data, 97.8% validation.





Reference : https://archive.ics.uci.edu/ml/datasets/human+activity+recognition+using+smartphones

UCI HAR: LSTM, CNN

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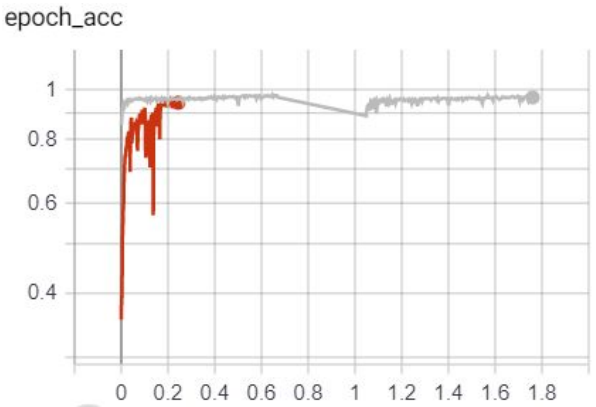
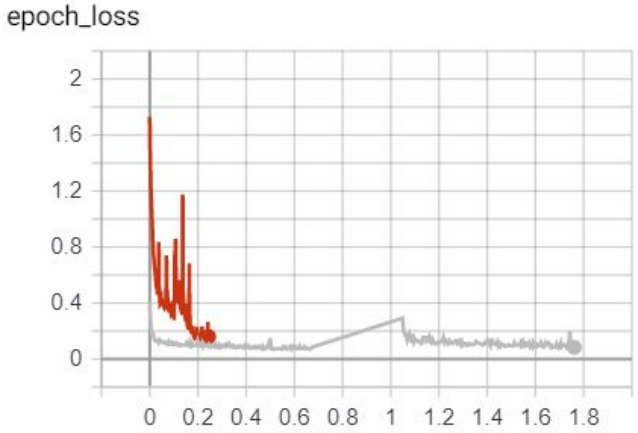
- CNN: 4 1D Conv with relu and batch norm layers followed by ANN.
- CNN Experiment: 9 features with 128 timestamps as input, 97% validation & 93% test.
- LSTM: LSTM network with 32 hidden layers
- LSTM Experiment: 9 features with 128 timestamps as input.





VOC 2012: ResNet50, VGG16

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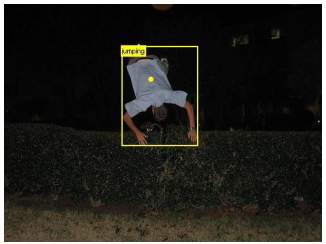
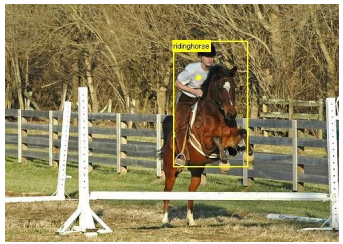
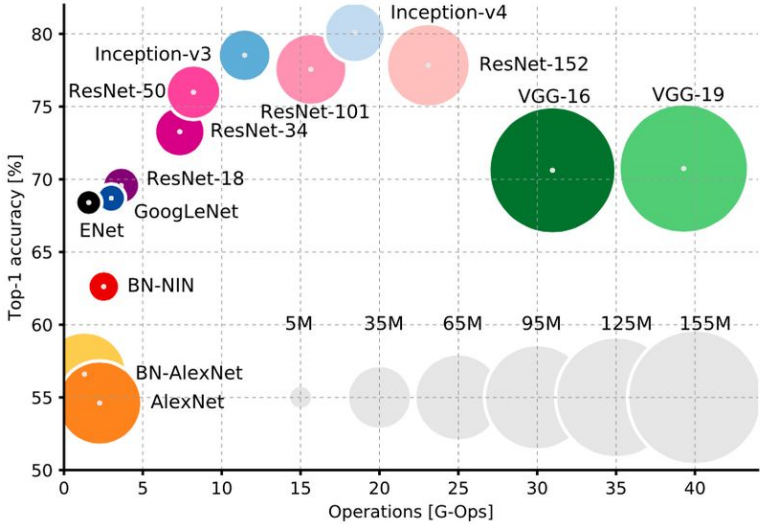
- Wide domain dataset (Indoor, outdoor, ..), 11 classes, bounding box annotation included.
- ResNet50, VGG16 pretrained on imagnet is used for classification.







Reference: http://host.robots.ox.ac.uk/pascal/VOC/voc2012/actionexamples/index.html

VOC 2012: ResNet50, VGG16

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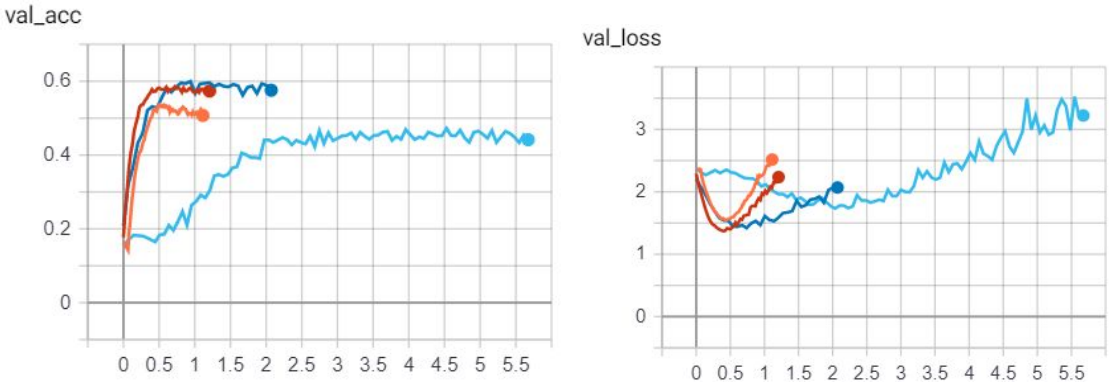
- Experiment 0: Training with 256x256 cropped images with random online augmentation, 58% accuracy.
- Experiment 1: Training with 128x128 cropped images with random online augmentation, 54% accuracy
- Experiment 2: Experiment 1 but with 512x512, 59.5% accuracy.
- VGG Experiment: Same as Experiment 2, 47% accuracy.



Reference: http://host.robots.ox.ac.uk/pascal/VOC/voc2012/actionexamples/index.html

State-farm: ResNet50.

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- Distracted driver, Same domain dataset (Inside Vehicle), 10 classes.
- ResNet50 pretrained on imagnet is used for classification.
- Splitting data so that validation data introduce new subjects.
- Training with different learning rates.

Reference: https://www.kaggle.com/c/state-farm-distracted-driver-detection

State-farm: Results and conclusion

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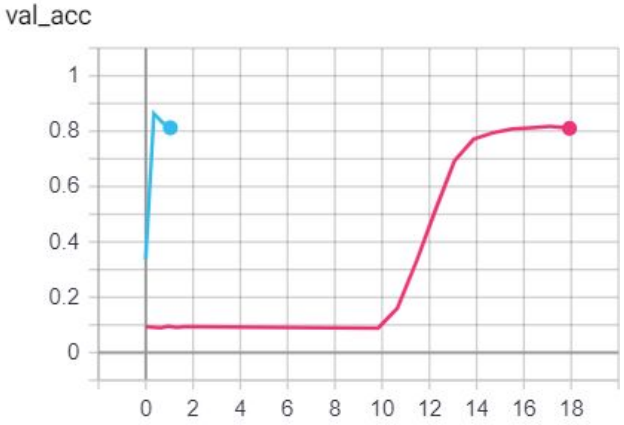
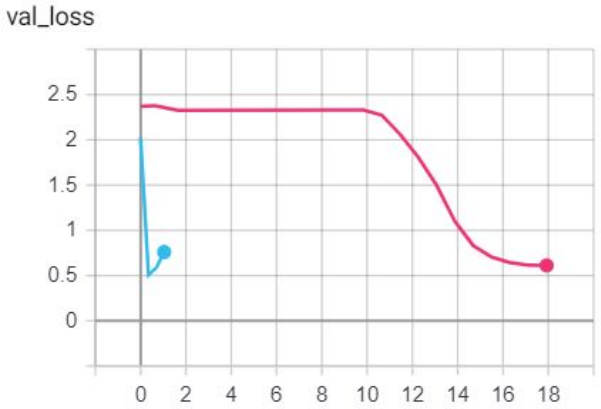
- Training with Adam learning rates (1e-5, 1e-8).
- Model converges quickly with even small learning rate.
- Best Validation accuracy on 1e-5 learning rate with 86% accuracy.
- Wide domain datasets needs supporting features as body joints, bounding box cropping removes scenario features, maybe add bbox as 4th channel.





Project: Files organization.

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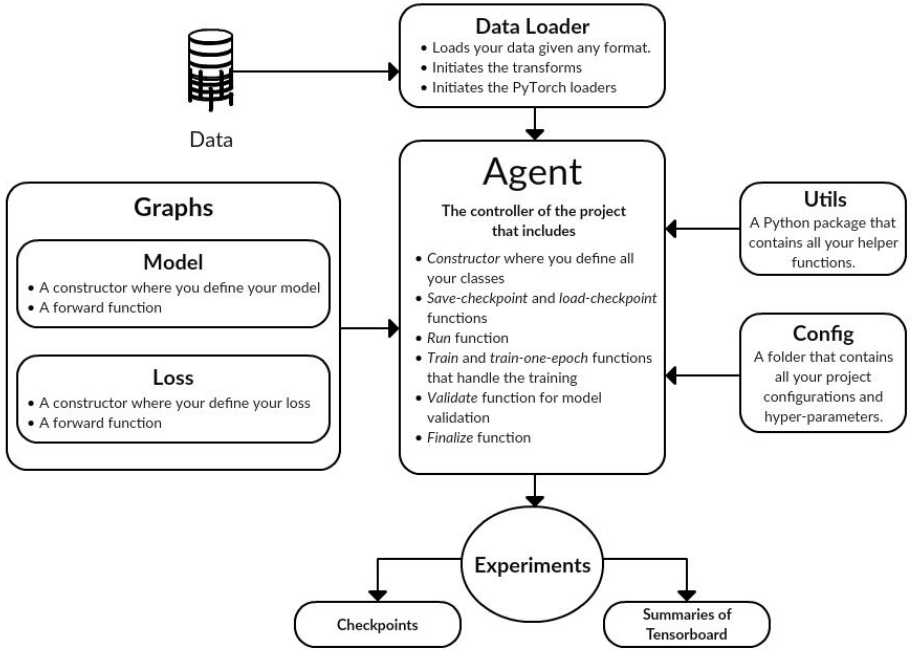
- Used scalable DL template for multiple experiments execution.



Reference: https://github.com/moemen95/Pytorch-Project-Template