
AI Courses by OpenCV

DEEP LEARNING WITH PYTORCH

Module 1 : Introduction to Neural Networks

1. History of Artificial Intelligence

- Turing Test
- Perceptron
- First AI Winter
- Backpropagation Algorithm
- Second AI Winter
- Post AI Winter
- AI Spring

2. Applications of Deep Learning

- Speech Recognition
- Natural Language Processing
- Automation
- Medical Diagnostics
- Facial Analysis
- Content Creation

Module 2 : Image Classification

1. Image Classification Overview

- Introduction to Image Classification
- ImageNet

- LeNet and LeNet-5
- Types of layers
 1. Convolutional Layer
 2. Activation Layer
 3. Pooling Layer
 4. Fully Connected Layer

2. Evaluation Metrics

- Confusion Matrix
- Accuracy
- Precision
- Recall
- Specificity
- F1 Score
- ROC Curve, AUC ROC

3. Image Classification Architecture

- AlexNet
- VGG-16
- GoogleNet
- Resnet
- Comparison of methods
- Creating your own architecture

4. Mathematics of Neural Networks

- Mathematical definition of Classifier, Training and Iteration
- Forward Pass
- Loss Function
- Backpropagation
- Deep Learning as Optimization Problem
- Gradient Descent and Weights Update
- Stochastic GD and Mini-Batch GD
- ADAM

- Training Scheme

5. Good Practice + Bias, Batchnorm, Dropout

- Data Shuffling
- Dataset Splits
- Fitting the training set
- Overfitting
- Bias and Variance
- Regularization
- Data Augmentations

Module 3 : Image Segmentation

1. Semantic Segmentation

- Problem Formulation
- Histogram Based Methods
- Conditional Random Fields
- Datasets – PASCAL VOC 2012, CAMVID, CITYSCAPES, FASSEG
- Evaluation Metrics

2. Architecture of Semantic Segmentation

- Fully Convolutional Network
- U-Net
- SegNet
- DeepLab v1, v2
- DeepLab v3
- DeepLab v3+

3. Loss Function and Blocks

- Commonly used Loss Functions
- Mathematical Formulation
- Implementation

Module 4 : Object Detection

1. Introduction of Object Detection

- Problem Formulation
- Challenges
- Accuracy Improvement
- Datasets – VOC PASCAL, MS COCO, ImageNet

2. Traditional Approach to Object Detection

- Background Subtraction
- Sliding Window
- Selective Approach
- Traditional ML
- Hand-crafted Features

3. Evaluation Metrics

- Problem Formulation
- Popular Competitions
- IoU
- Confidence Score
- TP, FP, TN, FN
- Recall & Precision
- Non-maximum Suppression

4. Single stage Object Detection

- Main pipeline
- YOLO
- SSD
- RetinaNet

5. Two Stage Object Detection

- Main Pipeline

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- R-CNN
 - Fast-RCNN
 - Faster-RCNN
 - Comparison between Fast-RCNN and Faster-RCNN

Module 5 : Deploying Applications

1. PyTorch C++ API and LibTorch

- Learn LibTorch for using in deployment
- How to convert models to be used in C++ API
- How to train models in C++ API

2. Cloud Deployment

- Learn about Azure Machine Learning
- Deploy Deep Learning models on the cloud