***Deep Learning by Andrew Ng***

***Neural Networks and Deep Learning***

* [Introduction to deep learning](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/1-%20Neural%20Networks%20and%20Deep%20Learning#introduction-to-deep-learning)
  + [What is a (Neural Network) NN?](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/1-%20Neural%20Networks%20and%20Deep%20Learning#what-is-a-neural-network-nn)
  + [Supervised learning with neural networks](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/1-%20Neural%20Networks%20and%20Deep%20Learning#supervised-learning-with-neural-networks)
  + [Why is deep learning taking off?](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/1-%20Neural%20Networks%20and%20Deep%20Learning#why-is-deep-learning-taking-off)
* [Neural Networks Basics](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/1-%20Neural%20Networks%20and%20Deep%20Learning#neural-networks-basics)
  + [Binary classification](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/1-%20Neural%20Networks%20and%20Deep%20Learning#binary-classification)
  + [Logistic regression](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/1-%20Neural%20Networks%20and%20Deep%20Learning#logistic-regression)
  + [Logistic regression cost function](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/1-%20Neural%20Networks%20and%20Deep%20Learning#logistic-regression-cost-function)
  + [Gradient Descent](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/1-%20Neural%20Networks%20and%20Deep%20Learning#gradient-descent)
  + [Derivatives](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/1-%20Neural%20Networks%20and%20Deep%20Learning#derivatives)
  + [More Derivatives examples](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/1-%20Neural%20Networks%20and%20Deep%20Learning#more-derivatives-examples)
  + [Computation graph](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/1-%20Neural%20Networks%20and%20Deep%20Learning#computation-graph)
  + [Derivatives with a Computation Graph](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/1-%20Neural%20Networks%20and%20Deep%20Learning#derivatives-with-a-computation-graph)
  + [Logistic Regression Gradient Descent](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/1-%20Neural%20Networks%20and%20Deep%20Learning#logistic-regression-gradient-descent)
  + [Gradient Descent on m Examples](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/1-%20Neural%20Networks%20and%20Deep%20Learning#gradient-descent-on-m-examples)
  + [Vectorization](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/1-%20Neural%20Networks%20and%20Deep%20Learning#vectorization)
  + [Vectorizing Logistic Regression](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/1-%20Neural%20Networks%20and%20Deep%20Learning#vectorizing-logistic-regression)
  + [Notes on Python and NumPy](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/1-%20Neural%20Networks%20and%20Deep%20Learning#notes-on-python-and-numpy)
  + [General Notes](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/1-%20Neural%20Networks%20and%20Deep%20Learning#general-notes)
* [Shallow neural networks](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/1-%20Neural%20Networks%20and%20Deep%20Learning#shallow-neural-networks)
  + [Neural Networks Overview](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/1-%20Neural%20Networks%20and%20Deep%20Learning#neural-networks-overview)
  + [Neural Network Representation](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/1-%20Neural%20Networks%20and%20Deep%20Learning#neural-network-representation)
  + [Computing a Neural Network's Output](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/1-%20Neural%20Networks%20and%20Deep%20Learning#computing-a-neural-networks-output)
  + [Vectorizing across multiple examples](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/1-%20Neural%20Networks%20and%20Deep%20Learning#vectorizing-across-multiple-examples)
  + [Activation functions](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/1-%20Neural%20Networks%20and%20Deep%20Learning#activation-functions)
  + [Why do you need non-linear activation functions?](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/1-%20Neural%20Networks%20and%20Deep%20Learning#why-do-you-need-non-linear-activation-functions)
  + [Derivatives of activation functions](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/1-%20Neural%20Networks%20and%20Deep%20Learning#derivatives-of-activation-functions)
  + [Gradient descent for Neural Networks](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/1-%20Neural%20Networks%20and%20Deep%20Learning#gradient-descent-for-neural-networks)
  + [Random Initialization](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/1-%20Neural%20Networks%20and%20Deep%20Learning#random-initialization)
* [Deep Neural Networks](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/1-%20Neural%20Networks%20and%20Deep%20Learning#deep-neural-networks)
  + [Deep L-layer neural network](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/1-%20Neural%20Networks%20and%20Deep%20Learning#deep-l-layer-neural-network)
  + [Forward Propagation in a Deep Network](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/1-%20Neural%20Networks%20and%20Deep%20Learning#forward-propagation-in-a-deep-network)
  + [Getting your matrix dimensions right](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/1-%20Neural%20Networks%20and%20Deep%20Learning#getting-your-matrix-dimensions-right)
  + [Why deep representations?](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/1-%20Neural%20Networks%20and%20Deep%20Learning#why-deep-representations)
  + [Building blocks of deep neural networks](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/1-%20Neural%20Networks%20and%20Deep%20Learning#building-blocks-of-deep-neural-networks)
  + [Forward and Backward Propagation](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/1-%20Neural%20Networks%20and%20Deep%20Learning#forward-and-backward-propagation)
  + [Parameters vs Hyperparameters](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/1-%20Neural%20Networks%20and%20Deep%20Learning#parameters-vs-hyperparameters)
  + [What does this have to do with the brain](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/1-%20Neural%20Networks%20and%20Deep%20Learning#what-does-this-have-to-do-with-the-brain)
* [Extra: Ian Goodfellow interview](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/1-%20Neural%20Networks%20and%20Deep%20Learning#extra-ian-goodfellow-interview)

[***Improving Deep Neural Networks: Hyperparameter tuning, Regularization and Optimization***](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/2-%20Improving%20Deep%20Neural%20Networks#improving-deep-neural-networks-hyperparameter-tuning-regularization-and-optimization)

[Practical aspects of Deep Learning](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/2-%20Improving%20Deep%20Neural%20Networks#practical-aspects-of-deep-learning)

* + [Train / Dev / Test sets](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/2-%20Improving%20Deep%20Neural%20Networks#train--dev--test-sets)
  + [Bias / Variance](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/2-%20Improving%20Deep%20Neural%20Networks#bias--variance)
  + [Basic Recipe for Machine Learning](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/2-%20Improving%20Deep%20Neural%20Networks#basic-recipe-for-machine-learning)
  + [Regularization](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/2-%20Improving%20Deep%20Neural%20Networks#regularization)
  + [Why regularization reduces overfitting?](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/2-%20Improving%20Deep%20Neural%20Networks#why-regularization-reduces-overfitting)
  + [Dropout Regularization](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/2-%20Improving%20Deep%20Neural%20Networks#dropout-regularization)
  + [Understanding Dropout](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/2-%20Improving%20Deep%20Neural%20Networks#understanding-dropout)
  + [Other regularization methods](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/2-%20Improving%20Deep%20Neural%20Networks#other-regularization-methods)
  + [Normalizing inputs](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/2-%20Improving%20Deep%20Neural%20Networks#normalizing-inputs)
  + [Vanishing / Exploding gradients](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/2-%20Improving%20Deep%20Neural%20Networks#vanishing--exploding-gradients)
  + [Weight Initialization for Deep Networks](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/2-%20Improving%20Deep%20Neural%20Networks#weight-initialization-for-deep-networks)
  + [Numerical approximation of gradients](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/2-%20Improving%20Deep%20Neural%20Networks#numerical-approximation-of-gradients)
  + [Gradient checking implementation notes](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/2-%20Improving%20Deep%20Neural%20Networks#gradient-checking-implementation-notes)
  + [Initialization summary](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/2-%20Improving%20Deep%20Neural%20Networks#initialization-summary)
  + [Regularization summary](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/2-%20Improving%20Deep%20Neural%20Networks#regularization-summary)
* [Optimization algorithms](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/2-%20Improving%20Deep%20Neural%20Networks#optimization-algorithms)
  + [Mini-batch gradient descent](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/2-%20Improving%20Deep%20Neural%20Networks#mini-batch-gradient-descent)
  + [Understanding mini-batch gradient descent](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/2-%20Improving%20Deep%20Neural%20Networks#understanding-mini-batch-gradient-descent)
  + [Exponentially weighted averages](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/2-%20Improving%20Deep%20Neural%20Networks#exponentially-weighted-averages)
  + [Understanding exponentially weighted averages](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/2-%20Improving%20Deep%20Neural%20Networks#understanding-exponentially-weighted-averages)
  + [Bias correction in exponentially weighted averages](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/2-%20Improving%20Deep%20Neural%20Networks#bias-correction-in-exponentially-weighted-averages)
  + [Gradient descent with momentum](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/2-%20Improving%20Deep%20Neural%20Networks#gradient-descent-with-momentum)
  + [RMSprop](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/2-%20Improving%20Deep%20Neural%20Networks#rmsprop)
  + [Adam optimization algorithm](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/2-%20Improving%20Deep%20Neural%20Networks#adam-optimization-algorithm)
  + [Learning rate decay](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/2-%20Improving%20Deep%20Neural%20Networks#learning-rate-decay)
  + [The problem of local optima](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/2-%20Improving%20Deep%20Neural%20Networks#the-problem-of-local-optima)
* [Hyperparameter tuning, Batch Normalization and Programming Frameworks](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/2-%20Improving%20Deep%20Neural%20Networks#hyperparameter-tuning-batch-normalization-and-programming-frameworks)
  + [Tuning process](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/2-%20Improving%20Deep%20Neural%20Networks#tuning-process)
  + [Using an appropriate scale to pick hyperparameters](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/2-%20Improving%20Deep%20Neural%20Networks#using-an-appropriate-scale-to-pick-hyperparameters)
  + [Hyperparameters tuning in practice: Pandas vs. Caviar](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/2-%20Improving%20Deep%20Neural%20Networks#hyperparameters-tuning-in-practice-pandas-vs-caviar)
  + [Normalizing activations in a network](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/2-%20Improving%20Deep%20Neural%20Networks#normalizing-activations-in-a-network)
  + [Fitting Batch Normalization into a neural network](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/2-%20Improving%20Deep%20Neural%20Networks#fitting-batch-normalization-into-a-neural-network)
  + [Why does Batch normalization work?](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/2-%20Improving%20Deep%20Neural%20Networks#why-does-batch-normalization-work)
  + [Batch normalization at test time](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/2-%20Improving%20Deep%20Neural%20Networks#batch-normalization-at-test-time)
  + [Softmax Regression](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/2-%20Improving%20Deep%20Neural%20Networks#softmax-regression)
  + [Training a Softmax classifier](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/2-%20Improving%20Deep%20Neural%20Networks#training-a-softmax-classifier)
  + [Deep learning frameworks](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/2-%20Improving%20Deep%20Neural%20Networks#deep-learning-frameworks)
  + [TensorFlow](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/2-%20Improving%20Deep%20Neural%20Networks#tensorflow)
* [Extra Notes](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/2-%20Improving%20Deep%20Neural%20Networks#extra-notes)

***Structured Machine Learning Projects***

* [ML Strategy 1](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/3-%20Structuring%20Machine%20Learning%20Projects#ml-strategy-1)
  + [Why ML Strategy](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/3-%20Structuring%20Machine%20Learning%20Projects#why-ml-strategy)
  + [Orthogonalization](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/3-%20Structuring%20Machine%20Learning%20Projects#orthogonalization)
  + [Single number evaluation metric](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/3-%20Structuring%20Machine%20Learning%20Projects#single-number-evaluation-metric)
  + [Satisfying and Optimizing metric](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/3-%20Structuring%20Machine%20Learning%20Projects#satisfying-and-optimizing-metric)
  + [Train/dev/test distributions](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/3-%20Structuring%20Machine%20Learning%20Projects#traindevtest-distributions)
  + [Size of the dev and test sets](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/3-%20Structuring%20Machine%20Learning%20Projects#size-of-the-dev-and-test-sets)
  + [When to change dev/test sets and metrics](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/3-%20Structuring%20Machine%20Learning%20Projects#when-to-change-devtest-sets-and-metrics)
  + [Why human-level performance?](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/3-%20Structuring%20Machine%20Learning%20Projects#why-human-level-performance)
  + [Avoidable bias](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/3-%20Structuring%20Machine%20Learning%20Projects#avoidable-bias)
  + [Understanding human-level performance](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/3-%20Structuring%20Machine%20Learning%20Projects#understanding-human-level-performance)
  + [Surpassing human-level performance](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/3-%20Structuring%20Machine%20Learning%20Projects#surpassing-human-level-performance)
  + [Improving your model performance](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/3-%20Structuring%20Machine%20Learning%20Projects#improving-your-model-performance)
* [ML Strategy 2](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/3-%20Structuring%20Machine%20Learning%20Projects#ml-strategy-2)
  + [Carrying out error analysis](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/3-%20Structuring%20Machine%20Learning%20Projects#carrying-out-error-analysis)
  + [Cleaning up incorrectly labeled data](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/3-%20Structuring%20Machine%20Learning%20Projects#cleaning-up-incorrectly-labeled-data)
  + [Build your first system quickly, then iterate](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/3-%20Structuring%20Machine%20Learning%20Projects#build-your-first-system-quickly-then-iterate)
  + [Training and testing on different distributions](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/3-%20Structuring%20Machine%20Learning%20Projects#training-and-testing-on-different-distributions)
  + [Bias and Variance with mismatched data distributions](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/3-%20Structuring%20Machine%20Learning%20Projects#bias-and-variance-with-mismatched-data-distributions)
  + [Addressing data mismatch](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/3-%20Structuring%20Machine%20Learning%20Projects#addressing-data-mismatch)
  + [Transfer learning](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/3-%20Structuring%20Machine%20Learning%20Projects#transfer-learning)
  + [Multi-task learning](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/3-%20Structuring%20Machine%20Learning%20Projects#multi-task-learning)
  + [What is end-to-end deep learning?](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/3-%20Structuring%20Machine%20Learning%20Projects#what-is-end-to-end-deep-learning)
  + [Whether to use end-to-end deep learning](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/3-%20Structuring%20Machine%20Learning%20Projects#whether-to-use-end-to-end-deep-learning)

***Convolutional Neural Network***

* [Foundations of CNNs](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/4-%20Convolutional%20Neural%20Networks#foundations-of-cnns)
  + [Computer vision](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/4-%20Convolutional%20Neural%20Networks#computer-vision)
  + [Edge detection example](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/4-%20Convolutional%20Neural%20Networks#edge-detection-example)
  + [Padding](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/4-%20Convolutional%20Neural%20Networks#padding)
  + [Strided convolution](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/4-%20Convolutional%20Neural%20Networks#strided-convolution)
  + [Convolutions over volumes](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/4-%20Convolutional%20Neural%20Networks#convolutions-over-volumes)
  + [One Layer of a Convolutional Network](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/4-%20Convolutional%20Neural%20Networks#one-layer-of-a-convolutional-network)
  + [A simple convolution network example](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/4-%20Convolutional%20Neural%20Networks#a-simple-convolution-network-example)
  + [Pooling layers](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/4-%20Convolutional%20Neural%20Networks#pooling-layers)
  + [Convolutional neural network example](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/4-%20Convolutional%20Neural%20Networks#convolutional-neural-network-example)
  + [Why convolutions?](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/4-%20Convolutional%20Neural%20Networks#why-convolutions)
* [Deep convolutional models: case studies](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/4-%20Convolutional%20Neural%20Networks#deep-convolutional-models-case-studies)
  + [Why look at case studies?](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/4-%20Convolutional%20Neural%20Networks#why-look-at-case-studies)
  + [Classic networks](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/4-%20Convolutional%20Neural%20Networks#classic-networks)
  + [Residual Networks (ResNets)](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/4-%20Convolutional%20Neural%20Networks#residual-networks-resnets)
  + [Why ResNets work](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/4-%20Convolutional%20Neural%20Networks#why-resnets-work)
  + [Network in Network and 1×1 convolutions](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/4-%20Convolutional%20Neural%20Networks#network-in-network-and-1-X-1-convolutions)
  + [Inception network motivation](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/4-%20Convolutional%20Neural%20Networks#inception-network-motivation)
  + [Inception network (GoogleNet)](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/4-%20Convolutional%20Neural%20Networks#inception-network-googlenet)
  + [Using Open-Source Implementation](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/4-%20Convolutional%20Neural%20Networks#using-open-source-implementation)
  + [Transfer Learning](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/4-%20Convolutional%20Neural%20Networks#transfer-learning)
  + [Data Augmentation](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/4-%20Convolutional%20Neural%20Networks#data-augmentation)
  + [State of Computer Vision](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/4-%20Convolutional%20Neural%20Networks#state-of-computer-vision)
* [Object detection](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/4-%20Convolutional%20Neural%20Networks#object-detection)
  + [Object Localization](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/4-%20Convolutional%20Neural%20Networks#object-localization)
  + [Landmark Detection](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/4-%20Convolutional%20Neural%20Networks#landmark-detection)
  + [Object Detection](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/4-%20Convolutional%20Neural%20Networks#object-detection-1)
  + [Convolutional Implementation of Sliding Windows](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/4-%20Convolutional%20Neural%20Networks#convolutional-implementation-of-sliding-windows)
  + [Bounding Box Predictions](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/4-%20Convolutional%20Neural%20Networks#bounding-box-predictions)
  + [Intersection Over Union](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/4-%20Convolutional%20Neural%20Networks#intersection-over-union)
  + [Non-max Suppression](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/4-%20Convolutional%20Neural%20Networks#non-max-suppression)
  + [Anchor Boxes](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/4-%20Convolutional%20Neural%20Networks#anchor-boxes)
  + [YOLO Algorithm](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/4-%20Convolutional%20Neural%20Networks#yolo-algorithm)
  + [Region Proposals (R-CNN)](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/4-%20Convolutional%20Neural%20Networks#region-proposals-r-cnn)
* [Special applications: Face recognition & Neural style transfer](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/4-%20Convolutional%20Neural%20Networks#special-applications-face-recognition--neural-style-transfer)
  + [Face Recognition](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/4-%20Convolutional%20Neural%20Networks#face-recognition)
    - [What is face recognition?](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/4-%20Convolutional%20Neural%20Networks#what-is-face-recognition)
    - [One Shot Learning](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/4-%20Convolutional%20Neural%20Networks#one-shot-learning)
    - [Siamese Network](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/4-%20Convolutional%20Neural%20Networks#siamese-network)
    - [Triplet Loss](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/4-%20Convolutional%20Neural%20Networks#triplet-loss)
    - [Face Verification and Binary Classification](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/4-%20Convolutional%20Neural%20Networks#face-verification-and-binary-classification)
  + [Neural Style Transfer](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/4-%20Convolutional%20Neural%20Networks#neural-style-transfer)
    - [What is neural style transfer?](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/4-%20Convolutional%20Neural%20Networks#what-is-neural-style-transfer)
    - [What are deep ConvNets learning?](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/4-%20Convolutional%20Neural%20Networks#what-are-deep-convnets-learning)
    - [Cost Function](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/4-%20Convolutional%20Neural%20Networks#cost-function)
    - [Content Cost Function](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/4-%20Convolutional%20Neural%20Networks#content-cost-function)
    - [Style Cost Function](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/4-%20Convolutional%20Neural%20Networks#style-cost-function)
    - [1D and 3D Generalizations](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/4-%20Convolutional%20Neural%20Networks#1d-and-3d-generalizations)

[***Sequence Models***](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/5-%20Sequence%20Models#sequence-models)

[Recurrent Neural Networks](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/5-%20Sequence%20Models#recurrent-neural-networks)

* + [Why sequence models](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/5-%20Sequence%20Models#why-sequence-models)
  + [Notation](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/5-%20Sequence%20Models#notation)
  + [Recurrent Neural Network Model](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/5-%20Sequence%20Models#recurrent-neural-network-model)
  + [Backpropagation through time](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/5-%20Sequence%20Models#backpropagation-through-time)
  + [Different types of RNNs](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/5-%20Sequence%20Models#different-types-of-rnns)
  + [Language model and sequence generation](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/5-%20Sequence%20Models#language-model-and-sequence-generation)
  + [Sampling novel sequences](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/5-%20Sequence%20Models#sampling-novel-sequences)
  + [Vanishing gradients with RNNs](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/5-%20Sequence%20Models#vanishing-gradients-with-rnns)
  + [Gated Recurrent Unit (GRU)](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/5-%20Sequence%20Models#gated-recurrent-unit-gru)
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  + [Deep RNNs](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/5-%20Sequence%20Models#deep-rnns)
  + [Back propagation with RNNs](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/5-%20Sequence%20Models#back-propagation-with-rnns)
* [Natural Language Processing & Word Embeddings](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/5-%20Sequence%20Models#natural-language-processing--word-embeddings)
  + [Introduction to Word Embeddings](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/5-%20Sequence%20Models#introduction-to-word-embeddings)
    - [Word Representation](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/5-%20Sequence%20Models#word-representation)
    - [Using word embeddings](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/5-%20Sequence%20Models#using-word-embeddings)
    - [Properties of word embeddings](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/5-%20Sequence%20Models#properties-of-word-embeddings)
    - [Embedding matrix](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/5-%20Sequence%20Models#embedding-matrix)
  + [Learning Word Embeddings: Word2vec & GloVe](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/5-%20Sequence%20Models#learning-word-embeddings-word2vec--glove)
    - [Learning word embeddings](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/5-%20Sequence%20Models#learning-word-embeddings)
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    - [GloVe word vectors](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/5-%20Sequence%20Models#glove-word-vectors)
  + [Applications using Word Embeddings](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/5-%20Sequence%20Models#applications-using-word-embeddings)
    - [Sentiment Classification](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/5-%20Sequence%20Models#sentiment-classification)
    - [Debiasing word embeddings](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/5-%20Sequence%20Models#debiasing-word-embeddings)
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  + [Various sequence to sequence architectures](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/5-%20Sequence%20Models#various-sequence-to-sequence-architectures)
    - [Basic Models](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/5-%20Sequence%20Models#basic-models)
    - [Picking the most likely sentence](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/5-%20Sequence%20Models#picking-the-most-likely-sentence)
    - [Beam Search](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/5-%20Sequence%20Models#beam-search)
    - [Refinements to Beam Search](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/5-%20Sequence%20Models#refinements-to-beam-search)
    - [Error analysis in beam search](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/5-%20Sequence%20Models#error-analysis-in-beam-search)
    - [BLEU Score](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/5-%20Sequence%20Models#bleu-score)
    - [Attention Model Intuition](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/5-%20Sequence%20Models#attention-model-intuition)
    - [Attention Model](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/5-%20Sequence%20Models#attention-model)
  + [Speech recognition - Audio data](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/5-%20Sequence%20Models#speech-recognition---audio-data)
    - [Speech recognition](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/5-%20Sequence%20Models#speech-recognition)
    - [Trigger Word Detection](https://github.com/mbadry1/DeepLearning.ai-Summary/tree/master/5-%20Sequence%20Models#trigger-word-detection)