Part 1: Deep learning

<http://www.hpc.lsu.edu/training/weekly-materials/2016-Fall/machine_learning_qb2_fall_2016.pdf> ( Page 1 to Page 23 )

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**Python IDE: Anaconda and Python 3.7**

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**Deep learning with Python - Fracois Chollet** - we will be using this book as one of the main resources - This is a functional book, quickly getting into the focus in computation problem solving mode helping us build algorithms and use the software and hardware in the process.  Francois Chollet is our guru providing extensive notes, and we are indebted for him, because copy and paste is so easy, we should not forget that most of the material I will cover are from this book to dotting the “i”s and crossing the “t”s. Buy the book, if you want to master this class, and it is a great resource.

<https://livebook.manning.com/book/deep-learning-with-python/chapter-1/>

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* High-level definitions of fundamental concepts
* Timeline of the development of machine learning
* Key factors behind deep learning’s rising popularity and future potential

Part 2:  Mathematical building blocks of deep learning - The tensors, derivative of derivative of derivative of … (internal compute quantity of essense of back propagating the errors), minimizing error (loss) function, gradient descent and stochastic gradient descent

* A first example of a neural network
* Tensors and tensor operations
* How neural networks learn via backpropagation and gradient descent

Part 3: Basics of neural networks as foundations for Deep Learning Networks

* Core components of neural networks
* An introduction to Keras
* Setting up a deep-learning workstation
* Using neural networks to solve basic classification and regression problems

<http://helper.ipam.ucla.edu/publications/eltut/eltut_14764.pdf>

<https://indico.cern.ch/event/689516/contributions/3028020/attachments/1680198/2699102/2018-06-DeepLearning-Song.pdf>

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Part 4:  Machine Learning foundations

* Forms of machine learning beyond classification and regression
* Formal evaluation procedures for machine-learning models
* Preparing data for deep learning
* Feature engineering
* Tackling overfitting
* The universal workflow for approaching machine-learning problems

Part 5: Deep learning for computer vision

* Understanding convolutional neural networks (convnets)
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* Fine-tuning a pre-trained convnet
* Visualizing what convnets learn and how they make classification decisions

Part 6: Deep learning for text and sequences

* Preprocessing text data into useful representations
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Part 8:   Generative deep learning

* Text generation with LSTM
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Part 9: Deep learning in Recommendation engine - Page 25 to Page 37

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* <http://blog.echen.me/2011/07/18/introduction-to-restricted-boltzmann-machines/>
* <https://github.com/echen/restricted-boltzmann-machines>
* [A Practical guide to training restricted Boltzmann machines](http://www.cs.toronto.edu/~hinton/absps/guideTR.pdf), by Geoffrey Hinton.
* A talk by Andrew Ng on [Unsupervised Feature Learning and Deep Learning](http://www.youtube.com/watch?v=ZmNOAtZIgIk).
* [Restricted Boltzmann Machines for Collaborative Filtering](http://www.machinelearning.org/proceedings/icml2007/papers/407.pdf). I found this paper hard to read, but it's an interesting application to the Netflix Prize.
* [Geometry of the Restricted Boltzmann Machine](http://arxiv.org/abs/0908.4425). A very readable introduction to RBMs, "starting with the observation that its Zariski closure is a Hadamard power of the first secant variety of the Segre variety of projective lines". (I kid, I kid.)

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