Yerevan State University

Faculty of Economics and Management

Data Science in Business Master's Program

Neural Networks and Deep Learning course

Fall 2019

Syllabus

Literature

Main:

1. **[BOOK 1] Michael A. Nielsen**, 2015. "*Neural Networks and Deep Learning*", website/e-book
2. **[BOOK 2] Francois Chollet**, 2017. "*Deep Learning with Python",* 1st Edition. Amazon e-book
3. **[BOOK 3 – Ed2] Aurélien Géron**, 2019. *"Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems"*. 2nd Edition. Amazon e-book

   2nd Edition is not finalized yet. Please check out the 1st Edition for missing chapters.

   [BOOK 3 – Ed1] Aurélien Géron, 2017. *"Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems".* 1st Edition. Amazon e-book

Additional:

4. **[BOOK 4]** Ian Goodfellow, Yoshua Bengio, Aaron Courville, 2016. *"Deep Learning"*. e-book

Course Schedule (subject to change)

N	Topics	Subtopics	Week	Study materials (PPT presentations, Jupyter Notebooks with relevant links or lecture notes will be provided after each lecture)	Homework
1	Introduction to Neural Networks (NN) and Deep Learning (DL)	**Introduction to Machine Learning and Deep Learning**	W1	[Book 2] Chapter 1	
2	Feedforward NN	**Introduction to Neural Networks**	W2	[Book 1] Introduction [Book 1] Chapter 1	
		Backpropagation algorithm – 1	W3	[Book 1] Chapter 2	
		Backpropagation algorithm – 2	W4	[Book 1] Chapter 2	
		Training Deep NN: Vanishing/exploding gradient problem, Activation functions, Weight initialization, Batch Normalization	W5	[Book 1] Chapter 3 [Book 3 – Ed2] Chapter 11	
		Training Deep NN: Optimization Algorithms, Regularization	W6	[Book 1] Chapter 3	
3	DL libraries	**DL libraries**: Tensorflow, Keras	W7	[Book 3 – Ed2] Chapter 10 -13	
		DL libraries: Tensorflow, Keras (practical session)	W8	[Book 2] Chapter 7	
4	Convolutional NN	**Convolutional NN – 1**: Intro, building blocks	W9	[Book 2] Chapter 5	
		Convolutional NN – 2: Key CNN architectures	W10	[Book 2] Chapter 5 [Book 3 – Ed2] Chapter 14	
		Transfer Learning/ Fine tuning of NN	W11	[Book 2] Chapter 5 [Book 3 – Ed2] Chapter 14	
5	Recurrent NN	**Recurrent NN – 1**: Intro, building blocks	W12	[Book 2] Chapter 6	
		Recurrent NN – 2: GRU, LSTM units	W13	[Book 2] Chapter 6	
		Recurrent NN – 3: RNNs in Language Modelling	W14	[Book 2] Chapter 6	
6	Generative Models	**Autoencoders**	W15	[Book 2] Chapter 8.4	
		Generative Adversarial Networks (GAN)	W16	[Book 2] Chapter 8.5	
7		Wrapping everything up	W17		