

Introduction in Data Science

&

AI basics

(1 week)

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		Day 1	Day 2	Day 3	Day 4	Day 5	
Hours		3.0	0.0	3.0	0.0	3.0	
Session Title		Basics					
Lecture Content		<ul style="list-style-type: none"> - <i>Introduction to the course</i> - <i>Relevance with the Industry</i> - <i>Brief Description of the lectures & the pre-requisites</i> 		Basics on Data Science		Basics on AI	
Lecturer		Anastasios Drosou		Ioannis Vlahavas		Ioannis Vlahavas	

Applied Data Science

&

Intro in RPA

(3 weeks)

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		Day 6	Day 7	Day 8	Day 9	Day 10	
Hours		3.0	0.0	3.0	0.0	3.0	
Session Title		Data manipulation & Statistical processing					
Lecture Content		Data engineering with Python Hands-on: Loading data/dataset Extracting data from different sources Pandas & NumPy Queries Text/Web scraping		Statistics, Probability & Linear Algebra Hands-on: Statistics (mean, variance, standard deviation, distribution, etc.) Probabilities (Matrix) Calculus		Dimensionality Reduction Hands-on: - Principal Component Analysis (PCA) - Multi-Dimensional Scaling (MDS) - Self-Organizing Maps (SOM) - Graph embedding - t-distributed Stochastic Neighbor Embedding (t-SNE) - Variational Autoencoders	
Lecturer		Thanasis Vafeiadis		Ilias Kalamaras		Ilias Kalamaras	

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	Day 11	Day 12	Day 13	Day 14	Day 15	
Hours	3.0	0.0	3.0	0.0	3.0	
Session Title	Data Storage & Visualization				Project Management	
Lecture Content	Data Visualization Hands-on: Python: (i) basic plots; (ii) advanced plots; (iii) facets JavaScript: (i) SVG graphics; (ii) data binding; (iii) first chart; (iv) scales; (v) complex charts		Data storing & recalling in/from Relational & Big-Data specific Databases Hands-on: DB schemas architecture SQL query; Advanced manipulations; SQL client software MongoDB Apache Sparkle		Project Structure & tools WPs, Tasks, Gantt, Pert, Workflows	
Lecturer	Ilias Kalamaras		George Gerovasilis		Dimitrios Giakoumis	

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	Day 16	Day 17	Day 18	Day 19	Day 20	
Hours	3.0	0.0	3.0	0.0	3.0	
Session Title	Robotic Process Automation					
Lecture Content	RPA value proposition, tools & usage		Workload & Release Management		RPA & AI Risk Testing & Management	
Lecturer	Maria Tsourma		Maria Tsourma		Maria Tsourma	

**Machine Learning
&
Artificial Intelligence**

(5 weeks)

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Hours		Day 21					
Session Title		3,0					
Lecture Content		Machine Learning (I) Introduction to Machine Learning: Definition of learning systems Hands-on: Linear Regression Linear Classification & Logistic Regression					
Lecturer		Tasos Vafeiadis					

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	
Hours			Day 22	Day 23	Day 24	Day 25		
Session Title			0,0	3,0	0,0	3,0		
Lecture Content	Machine Learning (I)							
				<p>Comparative Performance Metrics & Hypothesis testing</p> <p>Hands-on: <u>Evaluation:</u> (i) Accuracy, (ii) AUC, (iii) Precision & Recall, etc. <u>Hypothesis:</u> (i) p-test; (ii) ANOVA, (iii) chi-square, Fisher-exact, etc.</p>		<p>Classification algorithms & Decision Making (1)</p> <p>Hands-on: Non-parametric statistics Decision Trees Ensemble Learning Experimental Evaluation of Learning Algorithms Comparing learning algorithms: cross-validation & learning curves</p>		
Lecturer			Dimitrios Giakoumis Tasos Vafeiadis			Aris Lazaridis		

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	Day 26	Day 27	Day 28	Day 29	Day 30	
Hours	3,0	0,0	3,0	0,0	3,0	
Session Title	Machine Learning (II)					
Lecture Content	Classification algorithms & Decision Making (2) <i>Hands-on: Support Vector Machines Kernel Methods Bayesian networks</i>		Classification algorithms & Decision Making (3) <i>Hands-on: Unsupervised Learning Clustering k-means Mixture of Gaussians Dimensionality reduction, PCA Hidden Markov Models</i>		Application Specific classification Current problems in machine learning <i>Hands-on: Speech recognition Text classification Anomaly Detection & Recommender Systems Large scale machine learning</i>	
Lecturer	Giorgos Spanos Aris Lazaridis		Thanasis Vafeiadis Aris Lazaridis		Tasos Vafeiadis Thanasis Vafeiadis	

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	Day 31	Day 32	Day 33	Day 34	Day 35	
Hours	3,0	0,0	3,0	0,0	3,0	
Session Title	Deep Learning (I)					
Lecture Content	<p>Deep Learning History & Prerequisites</p> <p>Hands-on: Introduction to the tensorflow & pyTorch</p>		<p>Feedforward networks & training</p> <p>Feedforward networks (+ normalization of inputs)</p> <p>Activation functions (sigmoid, tanh, ReLU, LeakyRelu, Softmax etc.)</p> <p>Loss functions (cross-entropy, mse etc.)</p> <p>Backpropagation Algorithm (method description and the loss landscape)</p> <p>First order-Optimization of DL models (batch sgd, rmsprop, lr decay, momentum, adagrad, adam etc)</p> <p>Hands-on: Creating & Training Feedforward networks (+ save/load of checkpoints)</p>		<p>Avoiding Overfitting</p> <p>Early stop</p> <p>L1/L2 weight decay (+ Gaussian noise on inputs)</p> <p>BatchNormalization</p> <p>Dropout</p> <p>Neural Network Playground</p> <p>(https://playground.tensorflow.org/)</p> <p>Hands-on: Example of overfitting in Feedforward networks and solutions (regression)</p>	
Lecturer	Tasos Vafeiadis		Anastasios Alexiadis		Anastasios Alexiadis	

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	Day 36	Day 37	Day 38	Day 39	-	Day 40
Hours	3,0	0,0	3,0	0,0		3,0
Session Title	Deep Learning (II)					
Lecture Content	Convolutional Neural Networks (I) Convolution operator Convolutional Neural Networks Pooling Alexnet, VGG, Resnet, Inception Hands-on: MNIST classification		Convolutional Neural Networks (II) Object detection (YOLO) Instance detection (Mask-R CNN), Siamese Networks One-shot learning Hands-on: YOLO			Convolutional Neural Networks (III) - Explainable CNNs - Class Activation Map (CAM) - Feature Visualization - Graph Convolutional Networks (GCNs) Hands-on: MNIST classification, Node classification
Lecturer	Nikos Dimitriou		Dimitrios Glakoumis Nikos Dimitriou			Athanasios Salamanis

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	
		Day 41	Day 42	Day 43	Day 44			
Hours		3,0	0,0	3,0	0,0			
Session Title		Deep Learning (III)						
Lecture Content		Autoencoders Autoencoder (AE) DenoisingAE VAE Applications (anomaly detection, generation, manifold learning, information retrieval, semantic hashing) Hands-on: AE for MNIST semantic hashing VAE for MNIST generation		Sequence models (I) RNNs & backpropagation through time LSTM GRU Hands-on: Creating & training sequence models Text generation (Shakespeare) or Text Classification (e.g. emotion)				
Lecturer		Ioannis Mariolis		Athanasios Salamanis				

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	
		Day 46	Day 47	-	Day 49	Day 49	Day 50	
Hours		3,0	0,0	3,0	0,0	3,0		
Session Title		Deep Learning (IV)					Reinforcement Learning	
Lecture Content		Sequence models (II) Seq2Seq Word2Vec (and extensions, e.g. Node2Vec etc.) Hands-on: Creating and training sequence models Text generation (Shakespeare) or Text Classification (e.g. emotion)			Generative Adversarial Networks GAN history Theory & evolution (present multiple GAN evolutions, conditionalGAN, DCGAN, Pix2Pix, CYCLEGAN, etc.) Latent space interpolation Hands-on: GAN for MNIST generation (unconditional & conditional)		Reinforcement Learning Planning & Learning in MDPs Function Approximation & RL Hands-on: The RL Agent Using Deep Q Network (DQN)	
Lecturer		Stavros Papadopoulos			Stavros Papadopoulos		Nikos Dimitriou Aris Lazaridis	

Deployment Automation

(2 weeks)

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		Day 51	Day 52	Day 53	Day 54	Day 55	
Hours		3.0	0.0	3.0	0.0	3.0	
Session Title	Kubernetes, VMs & dockers						
Lecture Content	<p>Introduction to microservices</p> <p>Containers vs VMs</p> <p><i>Introduction to Dockers (image & container)</i></p> <p><i>Introduction to micro-services Container Orchestration</i></p> <p><i>What is Kubernetes (overview, architecture, nodes & pods)</i></p> <p>Hands-on: Installing Kubernetes & docker</p>			<p>Kubernetes Building Blocks (1)</p> <p>Hands-on: Dockerfile configuration (yaml file)</p> <p><i>Docker Client</i></p> <p><i>Setting Up a Single Node Kubernetes Cluster</i></p> <p><i>Scaling using metrics Services</i></p>		<p>Applications with Helm charts</p> <p>Hands-on: Stateless & stateful applications</p> <p><i>Cassandra cluster deployment</i></p> <p><i>Service mesh on Kubernetes</i></p>	
Lecturer	George Gerovasilis		George Gerovasilis			George Gerovasilis	

Thesis/Project

(2 weeks)

	Sun	Monday	Tuesday	Wednesday	Thursday	Friday	Sat
		Day 56	Day 57	Day 58	Day 59	Day 60	
Hours		0.0	0.0	0.0	0.0	0.0	
Session Title		<i>Project week (1)</i>					

	Sun	Monday	Tuesday	Wednesday	Thursday	Friday	Sat	
		Day 61	Day 62	Day 63	Day 64	Day 65		
Hours		0.0	0.0	0.0	0.0	0.0		
Session		<i>Project week (2)</i>						
Title								