BEST Aveiro
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Hello dear participant,

This document is the official Summer Course 2018 Syllabus and contains all information related to academic activities integrated in the course, including classes, workshop and company visit.
For each activity it is possible to obtain various information, such as the type of activity, working hours, the lecturer, a brief summary of the content of the activity, the bibliography indicated by the responsibles and finally what´s expected you learn from it.
Good luck, see you soon!

Your academic responsible of Summer Course 2018,
Daniela Batista

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Name of activity	Big Data
Type of Activity	Theory and laboratory
Working hours	3 hours (1 hour and 30 minutes of theory and 1 hour and 30 minutes of laboratory)
Responsible	Óscar Narciso Mortágua Pereira
Summary of content	Theory: key concepts about Big Data, Hadoop (HDFS, MapReduce and YARN), NoSQL DB and KAFKA. Laboratory: Kafka as a backbone infrastructure for Big Data.
Bibliography	- Slides provided by the professor - Hadoop – The Definitive Guide, Tom White, O'Reilly, 2015, ISBN: 1491901632 - Pramod J. Sadalage, Martin Fowler, "NoSQL Distilled – a brief guide to the world of polyglot persistence, Pearson Educations, 2013, ISBN: 0321826620 - KAFKA – The Definitive Guide, Neha Narkhede, Gwen Shapira & Todd Palino, O'Reilly, 2017, ISBN: 9781491936153 - http://kafka.apache.org/
Expected effect	Students will get an overview of the main concepts about Big Data and also about some of the underlying technologies, namely Hadoop and NoSQL DB. Students will also have an experience with using Apache KAFKA.

Name of activity	Do I need the buzz words?
Type of Activity	Talk
Working hours	2 hours
Responsible	Ricardo Marques
Summary of content	Use cases on Big Data and Data Science being done by Nokia will be presented. The first part focuses on approaches to process different types of data. The second part focuses on what can be done with data, raising the question - Do I need Big data in order to make Data Science?
Bibliography	Not applied
Expected effect	Understand the approaches on Big Data and Data Science at Nokia and that pursuing buzz words is not always the best solution.

Name of activity	Are we doomed?
Type of Activity	Talk
Working hours	1 hour for presentation and 30 minutes for discussion
Responsible	Mário Luís Pinto Antunes
Summary of content	During this presentation we will question the limits of Artificial Intelligence and Machine Learning, as well as, define what can be perceived as an intelligent entity and how close (far) are we from creating one.
Bibliography	Not applied
Expected effect	Students will question the limitations of new learning methods and the potential of Artificial intelligence.

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Name of activity	Big Data Platforms
Type of Activity	Theory and laboratory
Working hours	5 hours (1 hour and 30 minutes of theory and 3 hour and 30 minutes of laboratory)
Responsible	José Maria Fernandes
Summary of content	This module will focus on two main tools for the modern data scientist: docker (https://www.docker.com/) and kafka (https://kafka.apache.org/). Nowadays docker is almost prevalent as quick and effective way to exchange and deploy full stack for data processing and analysis from data gathering (e.g. elastic stack) to more complex system such as Spark. Kafka, due to its popularity and performance, is becoming the integration solution between data sources, processing solutions (e.g.Kafka connect https://www.confluent.io/product/connectors/) with the benefit of allowing asynchronous data handling and processing (e.g. KStreams). In this module we will address and deploy basic examples based on docker and kafka to scope an architectural overview of state of the art solutions for data analysis pipelines - suitable for the data scientist and for the software developer.
Bibliography	Not applied
Expected effect	Students will learn how to deploy a basic architecture for data stream analysis.

Name of activity	Neural & deep neural networks
Type of Activity	Theory and laboratory
Working hours	3 hours (1 hour and 30 minutes of theory and 1 hour and 30 minutes of laboratory)
Responsible	Ana Maria Tomé
Summary of content	Introduction to deep learning. Recent evolution of neural network models. An overview of the convolutional neural networks, a variant widely used in computer vision tasks. The topics are: 1) An Overview of Neural Networks and its evolution since the 1950; 2) Learning with Backpropagation algorithm - main characteristics and drawbacks; 3) Deep Neural Networks: definition and main differences with multilayer perceptron; 4) Deep Neural Network in Vision: Convolutional Neural Networks; 5) Performance: training, validation and test sets.
Bibliography	Not applied
Expected effect	Demo exercises will illustrate the main concepts of the neural network models.

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Name of activity	Data Visualization
Type of Activity	Theoretical presentation on Data Visualization and some simple Graph drawing using google tool charts
Working hours	3 hours and 30 minutes (1 hour and 30 minutes of theory and 2 hours of laboratory)
Responsible	Paulo Dias
Summary of content	Introduction to Data and Information visualization, Brief History, Applications and examples, Phases of the visualization process, concepts and method for representation, presentation and interaction. Lab session using google to create simple interactive charts.
Bibliography	- Tufte, E., Envisioning Information, Graphics Press, 1990 - Bederson, B. , B. Shneiderman, The Craft of Information Visualization: Readings and Reflections, Morgan Kaufmann, 2003. - Card, Stuart K., Mackinlay, Jock D. and Shneiderman, Ben (eds.) (1999): Readings in Information Visualization: Using Vision to Think. Academic Press
Expected effect	Students should have a global view of the main issues and problems in information and data visualization and create some simple interactive charts.

Name of activity	Intelligent Agents
Type of Activity	Theory and laboratory
Working hours	4 hours and 30 minutes (1 hour and 30 minutes of theory and 3 hours of laboratory)
Responsible	Luís Seabra Lopes
Summary of content	In this module, we explore artificial intelligence as a research and engineering discipline that aims to develop intelligent agents, i.e. agents that perceive their environment, choose appropriate actions, possibly taking into account some objectives, and execute the actions in that environment. The basic types of agents as well as some selected agent architectures will be presented.
Bibliography	Not applied
Expected effect	Learning what is an intelligent agent and how to use intelligent agents to solve simple decision problems.

Name of activity	Visit to Altice
Type of Activity	Company visit
Working hours	1 hour and 30 minutes
Responsible	Fernando Morgado
Summary of content	During this visit, presentations on the laboratories of Altice, GI and the streamline project will be given by the activity responsibles. The participants will also visit the "future labs", tecnocet and the testing and homologations laboratory.
Bibliography	Not applied
Expected effect	The participants are expected to obtain knowledge about the different aspects of Altice, both in terms of their labs and some of their projects. It is also expected that they get to know the facilities of this company.

Name of activity	Real-time assessment of trunk posture with smartphone's embedded inertial sensors
Type of Activity	Workshop
Working hours	1 hour and 30 minutes
Responsible	Ana Pereira; Diana Gomes; Dinis Moreira
Summary of content	Human movement and posture characterization is an important research area, with application in prevention, rehabilitation, and many other bioengineering solutions. Posture refers to the body position in static and dynamic activities, and it is considered good when it corresponds to the neutral standing position, which should be adopted in every daily activity, including walking and sitting. Flexed trunk posture and trunk curvature constitute important risk factors for back pain and musculoskeletal disorders, namely in office workers. This motivates further research in trunk posture monitoring during daily living activities, as there is a clear need to improve current approaches through more sophisticated and state-of-theart methods. Wearable inertial sensors (motion sensors) are mostly unobtrusive and ubiquitous, and thus constitute a sensing modality of high potential in this context. This workshop aims the development of a system able to trigger real-time alerts when improper posture is detected. The system will use data from smartphone's inertial sensors to estimate trunk angle as a basis for posture evaluation. Accelerometer data will be transmitted via Bluetooth to a laptop, where it will be processed in order to deliver useful information for opportune alert triggering when improper posture is detected. This exercise will resort to a Python routine, partially implemented by the attendees of the workshop.
Bibliography	Not applied
Expected effect	Each group will develop of a tool for real-time assessment of trunk posture, able to provide feedback to its user for posture correction persuasion. This practical assignment will follow an introduction to the following topics: -Inertial sensors' operational principles; -Basic signal processing techniques; -Real-time data analysis and related concerns/limitations/ drawbacks.

Name of activity	Evaluation
Type of Activity	Written exam (Mini-test)
Working hours	1 hour and 30 minutes
Responsible	José Moreira
Summary of content	What was taught throughout the course will be tested in the form of a written exam.
Bibliography	Bibliography of all the academic activities
Expected effect	Students are expected to consolidate what they learnt throughout the course

Name of activity	Evaluation
Type of Activity	Oral Presentation
Working hours	1 hour and 30 minutes
Responsible	José Moreira
Summary of content	The Students will be divided into several groups and each group will make a presentation of approximately 8 minutes about one of the course modules
Bibliography	Bibliography of all the academic activities
Expected effect	Students are expected to consolidate what they learnt in this module, being able to synthesize information about the module and think about a case study where they can apply the information they learned in the module