



General information	
Academic subject	AI Programming in Physics subtitle: "Big Data Processing with Python"
Degree course	Physics
Academic Year	1
European Credit Transfer and Accumulation System (ECTS)	3
Language	English
Academic calendar (starting and ending date)	II semester
Attendance	No

Professor/ Lecturer	
Name and Surname	Gioacchino VINO
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Telephone	
Department and address	Physics Department, ReCaS Datacenter
Virtual headquarters (Microsoft Teams code)	
Tutoring (time and day)	on request, via email

Syllabus	
Learning Objectives	<p>The course aims to provide the knowledge and tools needed to process, prepare, analyse and visualise data for applications using machine learning and non-machine learning algorithms.</p> <p>The tools include:</p> <ul style="list-style-type: none"> the Python programming language, Big Data technologies using Python (Dask and PySpark), use of parallel computing architectures (GPU and FPGA) for speeding up applications. <p>The use of Big Data and Parallel computing architectures enable the possibility to process tera-scale data with no effort.</p> <p>Finally, knowledge on the life cycle of Machine Learning applications will be provided, such as managing and sharing of models and related performance results.</p>
Course prerequisites	Fundamentals of informatics and C++
Contents	<ol style="list-style-type: none"> Python <ul style="list-style-type: none"> Variable and data structure concepts. Modules and namespaces. Code writing, access to file and exception management. Data Analysis <ul style="list-style-type: none"> Fundamentals of numpy, matplotlib, pandas, seaborn. Big Data <ul style="list-style-type: none"> Fundamentals of Big Data Technologies. Fundamentals of Dask and PySpark. Parallel computing Architectures. Machine Learning Life cycle.
Books and bibliography	"Big Data Analysis with Python" By Ivan Marin , Ankit Shukla , Sarang VK.
Additional materials	

Work schedule			
Total	Lectures	Hands on (Laboratory, working groups, seminars, field trips)	Out-of-class study hours/ Self-study hours
75	16	15	44
ECTS			



3	2	1	
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Teaching strategy	Lectures and working group exercises

Expected learning outcomes	
Knowledge and understanding on:	<ul style="list-style-type: none">○ Acquiring basic skills on Python programming language, dataset processing and visualisation and most important Artificial Intelligence algorithms○ Ability to understand the problem under study
Applying knowledge and understanding on:	<ul style="list-style-type: none">○ Ability to write a robust Python code○ Ability to identify and propose a solution of under study problem
Soft skills	<ul style="list-style-type: none">● Making informed judgments and choices<ul style="list-style-type: none">○ Identification of main components of under study problems, evaluation of advantages and limits of every solution and design and implementation of the selected solution● Communicating knowledge and understanding<ul style="list-style-type: none">○ Ability to model the under study problems and support the design with logic arguments● Capacities to continue learning<ul style="list-style-type: none">○ Ability to identify and consult online documentation.

Assessment and feedback	
Methods of assessment	Oral presentation of the project
Evaluation criteria	<ul style="list-style-type: none">● Knowledge and understanding<ul style="list-style-type: none">○ Evaluation of the most important points of interest of the project and selection of usable solutions● Applying knowledge and understanding<ul style="list-style-type: none">○ Identification of advantages and limits of selected solutions and design and implementation of it● Autonomy of judgement<ul style="list-style-type: none">○ Acquire knowledge and experience regarding the described algorithms in order to identify their strong points● Communicating knowledge and understanding<ul style="list-style-type: none">○ Clarity and precision of oral presentation● Communication skills<ul style="list-style-type: none">○ Acquire an appropriate rigorous language● Capacities to continue learning<ul style="list-style-type: none">○ Ability to connections between the subjects of study
Criteria for assessment and attribution of the final mark	Clarity in oral exposition of the implemented project
Additional information	