US02 Data science for market studies and IoT v.2020

Teaching unit category	Scientific knowledge and Understanding

Language of instruction	English
Number of hours	
- In-class lecture	30H
- Project / Workshop	10H
- Non-supervised	60H
ECTS	4
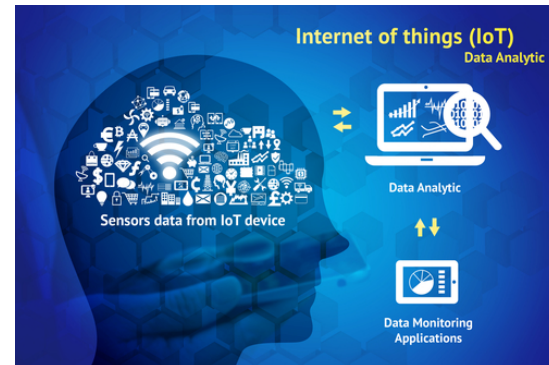
Prerequisites

This course is aimed at students with little or no prior programming experience. Since Data Science involves its own modes of thinking, a logical aptitude and a desire to understand computational approaches to problem solving will be necessary to succeed.

Course Overview and Objectives

The course objective is to give student an overview of the various areas of application of Data Science. Today's innovation relies heavily on data not only as a way to enrich the user experience but to develop whole new innovations on the side particularly when innovation are IoT based.

This Data Science course covers the essential needed by any entrepreneur to help her/him during the market study phase (with web and text analysis), during the R&D phase and the operations. The course covers the major theories, methods, and tools to get data, explore large heterogeneous datasets and visualize them in a relevant and efficient way. Student will be introduced to Python ecosystem, and must apply the acquired knowledges with practical exercices. US02 includes systematic live-coding sessions with real life problem solving.

The evaluation examine both the problem solving cases and a 30h hackathon where students will lead a multidisciplinary team to tackle one of their innovation data problem. More information : http://urbandatachallenge.mystrikingly.com/

Learning outcomes

At the end of the course, students must demonstrate :

• ability to identify, locate and obtain required data

• comprehensive understanding of the applicable techniques and methods of data analysis, new services design and investigation and of their limitations

• practical skills, including the use of computer tools, for solving complex problems based on data analysis

• ability to use data scientist methods to communicate clearly and unambiguously their conclusions, and the knowledge and rationale underpinning these, to specialist and non-specialist audiences in national and international contexts

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US03 Exploratory Data Analysis

v.2020

Teaching unit category	Scientific knowledge and Understanding

Language of instruction	English
Number of hours	
- In-class lecture	30H
- Project / Workshop	10H
- Non-supervised	60H
ECTS	4

EXPLORATORY DATA ANALYSIS IN PYTHON

Prerequisites

There is no need to be computer scientist for this course. The course teaching method a hands-on approach with live coding, live design, open criticizing sessions and projects intertwined with concepts explanation in traditional course style.

Course Overview and Objectives

Exploratory Data Analysis (EDA) is an approach to extract the information enfolded in the data and summarize the main characteristics of the data. It is considered to be a crucial step in any data science project though largely underestimated.

EDA is essential for a well-defined and structured data science project and it should be performed before any statistical or machine learning modelling phase. EDA makes an extensive use of visualization to understand the data.

Learning outcomes

At the end of the course, students will acquire:

• data visualization expertise (visualization grammar, data visualization design, visualization toolbox)

• data exploration skills from various sources: real life challenges from the labs or our industry partners including text data (litterature, lyrics, social networks), map data, complex network data (social networks, roads networks), IOT data and economic data

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ML01 Machine learning

Teaching unit category	Scientific knowledge and Understanding

Language of instruction	English
Number of hours	
- In class	45H
- Non-supervised	55H
ECTS	4

Prerequisites

Notions of probability theory, statistics and linear algebra.

Course Overview

This course will allow students to understand the basic principles and elementary theory of Machine Leaning, a domain at the interface of artificial intelligence and statistics, which aims at automatically extracting knowledge and making predictions from data. Know the main techniques (linear classification and regression, linear feature extraction, decision trees, SVM, clustering, deep learning) and know how to apply them to real data using the R language.

The questions discussed in this course are:

- How to distinguish symbolic AI, numerical AI and distributed AI.

- How to identify basic concepts of AI.

- Apply basic concept of AI.

- Implement these concepts by using a symbolic functional language as LISP.

Learning outcomes

The main objective of this course is allowing students to:

(1) master the basic concepts and techniques of artificial intelligence

(2) know how to implement these concepts with symbolic functional programming.

Professor

Thierry Denoeux graduated in 1985 as an engineer from the Ecole des Ponts ParisTech in Paris, and received a doctorate from the same institution in 1989. Currently, he is Full Professor (Exceptional Class) with the Department of Information Processing Engineering at the Université de Technologie de Compiègne (UTC), France, and deputy director of the Heudiasyc research Lab (UMR 7253). His research interests concern the management of uncertainty in intelligent systems. His main contributions are in the theory of belief functions with applications to pattern recognition, data mining and information fusion. He has published more than 200 journal and conference papers in this area. He is the Editor-in-Chief of the International Journal of Approximate Reasoning}, and an Associate Editor of several journals including Fuzzy Sets and Systems and the International Journal of Uncertainty, Fuzziness and Knowledge-Based Systems (IJUFKS).

UM01 IoT prototyping

Teaching unit category	Scientific methods & tools Engineering practice
Language of instruction	English
Number of hours	
- In-class	40H
- Project & Workshop	10H
- Non-supervised	50H
ECTS	4
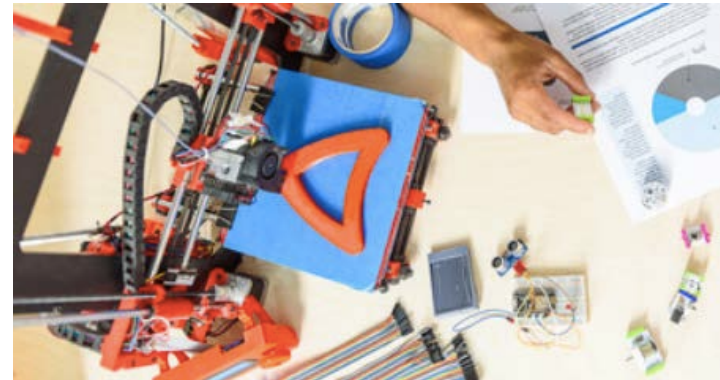
Course Overview and Objectives

This course aims to provide the fundamentals, methodologies and tools for IoT prototyping, engaging students in practical experiences.
Coupled with the course 'Entrepreneurship in China' and 'Technological benchmarking & breakthrough innovations', students get to explore engineering and design processes and put their scientific, technical and business skills to the test.

This course is organized in 2 modules :

1- Design & innovation bootcamp to learn innovation methods such as design thinking, field research techniques, user-oriented design process, to identify problems and imagine innovative solutions for cities, government, citizens, companies or industries associated with in-situ data captured on the explored field.

2- Fast-prototyping bootcamp
- to learn how to build and use an minimum viable product (MVP) to validate/invalidate assumptions
- to build a prototype to iterate and refine the solution developed (product or product-service) using fast-prototyping tools such as 3D modeling, 3D printing, laser-cutting, CNC, etc.
- to experiment interdisciplinary design and engineering workshops

Learning outcomes

Along the different modules of this course, engineering students must demonstrate :

• ability to develop, to design new and complex products (devices, artefacts, etc.), processes and systems, with specifications incompletely defined and/or competing, that require integration of knowledge from mechanical engineering, material science, electronics, computer science as well as non-technical - societal, health and safety, environmental, economic and industrial commercial – constraints; to select and apply the most appropriate and relevant design methodologies or to use creativity to develop new and original design methodologies.

• ability to design using knowledge and understanding at the forefront of engineering specialisation.

• workshop skills and ability to design and conduct experimental investigations, critically evaluate data and draw conclusions;

• comprehensive understanding of applicable materials, equipment and tools, engineering technologies and processes, and of their limitations;

• ability to function effectively in international contexts, as a member or leader of a team, that may be composed of different disciplines and levels, and that may use virtual communication tools.

UM04 Technological benchmarking & breakthrough innovations   v.2020

Teaching unit category   Social Sciences

Language of instruction	English
Number of hours	
- In class	0H
- Workshop/coaching	15H
- Non-supervised	10H
ECTS	2

Course Overview and Objectives

Coupled with the course-project 'Entrepreneurship in China', students get to put their analytical skills in international, complex and fast-moving environment to the test.

In this course, students will learn methods and techniques of Monitoring, Benchmarking and Knowledge Management to apply it for their own projects.
They will also acknowledge the necessity of studying the impact of the ethical, economic, environmental, legal and social implications of breakthrough innovations, on society and organizations.

Learning outcomes

Along the modules of this course, students must demonstrate :

• ability to use research methods and tools (search engines, databases,…) to conduct technological benchmarking in the frame of a new innovative product development projects that requires new strategic approaches, and taking responsibility for decision making.

• knowledge and understanding of the non-technical – societal, health and safety, environmental, economic and industrial - implications of engineering practice;

UM09 Agile project Management

Teaching unit category	Scientific methods & tools Engineering practice

Language of instruction	English
Number of hours	
- In class	30H
- Non-supervised	45H
ECTS	4

Course Overview

This course includes in-class lectures, workshops, coaching, and a real entrepreneurial project led by groups of 2 to 4 students from the beginning until the end of the semester.

Students teams have a specific mentor to work with, and get teaching and coaching sessions on project management all along the semester.

Students teams and projects are defined at the very beginning of the semester. One day per week is dedicated to the realization of the entrepreneurial project.

The course aims at:

- supporting students in practicing project management using different processes, methodologies (agile, scrum, waterfall, lean, etc.) and tools (collaborative platforms, plannings, presentations, etc.)

- bringing different backgrounds students to learn and work in a collaborative mind-set to achieve one common goal

- coaching students while working together solving real issues with concrete outputs for an user or a company or other organization with quantified expectations

Learning outcomes

At the end of the course, students must demonstrate :

• critical awareness of economic, organisational and managerial issues in technical or professional projects

• understanding of the difference between agile and waterfall project management

• ability to use diverse methods to communicate clearly and unambiguously their conclusions, and the knowledge and rationale underpinning these, to specialist and non-specialist audiences in international contexts;

• ability to function effectively in international contexts, as a member or leader of a team, that may be composed of different disciplines and levels, and that may use virtual communication tools

• ability to engage in independent life-long learning on project management

UH01 Intercultural Communication & International Management   v.2020

Teaching unit category	Social Sciences

Language of instruction	English
Number of hours	
- In class	30H
- Project	30H
- Non-supervised	20H
ECTS	4

Course Overview and Objectives

The cities and workplace are more and more intercultural. To evolve in intercultural cities it will require to master intercultural communication and international management knowledge.

This module, built on two chapters, gives not only tools but also new possible ways of thinking and behaving:
- Prepare the skills to be effective abroad, in multicultural teams and international companies.
- Build an awareness on the importance of cultural factors, including as future entrepreneur.
- Understand the origins and reasons of cultural differences, the value judgments, the stereotypes and their functions. - - Learn to decipher the signs to be adequate and operational.
- Build a toolbox and the systems of thinking that are essential in the « intercultural comfort zone ».

Students will have to apply knowledges and methodology acquired during the lectures into a research work on an contemporary intercultural issue.

Lecturer

Christine Gastinel held several responsibility positions in **TOTAL GROUP** :
- Director of the Social Observatory (worldwide),
- Director Press Relationships and Communication (for the Professional Union of Oil and Gas Companies,
- Head of Communications Division Exploration and Production,
- Head of Geopolitical and Intercultural Division…

She was also **consultant** for world size Companies in Finance, Energy, Transports industries.

Christine kept a strong link with the academic world all along her career by giving lectures as **professor** in many countries and top universities in France:
Sorbonne University in Paris and Abu Dhabi, Ecole Centrale Paris and Beijing, ENSAM, HEC, Stanford (USA), Bauman (Russia), Abu Dhabi, Koweit, Qatar, Iran, Morocco, etc.

Christine takes part in the French startup ecosystem as a **business angel.**

UH02 Entrepreneurship in China

Teaching unit category	Social Sciences
Language of instruction	English
Number of hours	
- In-class/supervised	40H
- Project	85H
ECTS	6

Course Overview and Objectives

This program aims to provide the fundamentals of entrepreneurial behavior, mindsets and tools for "wantrepreneurs", engaging students in practical experiences through idea generation and opportunity identification to implementing, managing and harvesting a venture.

All students' must develop their own startup projects by teams during the program.

During weekly classes, students are guided through an iterative process using LEAN principles, and specialists' advices and coaching to:
- Learn how to identify a real pain point
- Build and test a business model: Is it worth pursuing?
- Figure out the potential of development and risks of launching a startup in China
- Define, build and use a minimum viable product (MVP)
- Key marketing and sales tools
- Target and reach customers (convert targets to paying customers)
- Define the best funding solution for the company
- Learn how to elaborate a customer acquisition plan
- Pitch and convince an audience about a business idea

In addition to the weekly classes, students have the chance to boost and enhance their projects by leveraging Shanghai entrepreneurial eco-system :
- Mentoring by successful entrepreneurs of Shanghai, allowing them to accelerate their project while learning from others' experiences, successes and failures
- Visits of co-working spaces, incubators, maker spaces and labs, etc.
- Get access to a pool of industry advisors who are willing to share precious data and recommendations.

Learning by doing

Peer-to-peer support

Real world experience

Intercultural understanding

Positive impact of new

technologies

UH03 Leadership and Presentation Skills   v.2020

Category:	Social Sciences

"You're not allowed to use the sprinkler system to keep your audience awake."

Language of instruction	English
Number of hours	
- In class	30H
- Non-supervised	45H
ECTS	3

Course Overview and Objectives

This course is divided in two modules of 15 hours. It includes coaching and thematic seminars to help future engineers, managers and entrepreneurs get more confidence when addressing a public, or when performing interviews.

The first module "Which leader are you?" is about knowing itself and others, identify people strengths, weaknesses and how to enhance inner motivation.

The second module helps students to design powerful presentations to deliver ideas using various techniques, such as professional keynote address or elevator pitch.

UH05 Understanding Modern China

Teaching unit category Social Sciences

Language of instruction	English
Number of hours	
- In class	30H
- Non-supervised	50H
ECTS	3

Course Overview and Objectives

This course aims to provide the key concepts to understand Modern China, with an emphasis on the social, economical, anthropology contexts. Students following this course will get a deeper and broader insights into China's position in the global economy.

The Chinese management specificities at the corporate level will also be introduced and provide student best business practices to develop strategic thinking and leadership skills.

At the end of this module, students should be able to:

- Define main concepts, historical facts and dates of Modern China
        (19's century to now)
- Understand the legacy of past events and reforms
- Discuss China's position in the global economy
- Develop professional collaboration in a Chinese context

UL04-06 Chinese Mandarin

v.2020

Teaching unit category	Language Social Sciences

Language of instruction	Chinese
Number of hours	
- In class	80H
- Non-supervised	100H
ECTS	6

Course Overview and Objectives

This course enable students to master language syntax and structure, related cultural knowledge, reading and writing comprehension, gradually develop the ability to use Chinese language flexibly and effectively for social and professional purpose.

The students will be expose to real-life situations during extra-scholar activities with their teachers.

The students will be encouraged to take reference HSK Chinese Mandarin test at the end of the semester.

TX Research project realization

Teaching unit category	Engineering practice

Language of instruction	English
Number of hours	
- In class	0H
- Non-supervised	125H
ECTS	5

Course Overview and Objectives

The TX teaching unit allows students to implement engineering approach in a substantive technical cooperation project.

The project must be co-defined and validated by a supervising professor at the beginning of the study period. The programme manager must be informed.

The student will acquire new technical and critical analysis skills, and in close collaboration with an existing research team, propose original and/or innovative solutions to a given problem. In order to succeed, the student will have to demonstrate a proactive attitude, good communication and organizational skills.

Evaluation

The student must write a report on the project and deliver an oral presentation to at least 2 professors, among which the supervising professor.
- Written report 50%
- Oral presentation 50%

Form to be filled

Student name: _____

Programme enrollment: ☐ International engineering (Autumn semester)   ☐ Innovation & entrepreneurship (Spring semester)

Name of the supervising professor : _____ Prof. e-mail address: _____@_____

Name of the research laboratory : _____

Name of the project : _____

Description and objective of the project :

_____

_____

_____

_____

_____

Deadline for report and presentation (before the official end of the semester)   Date: 20__/___/___   Time: ___:___

Organisation of student work.
Provisional working hours dedicated to the project (ex: *Work in the lab every Tuesday 16:00-19:00 from March to June, additional 6 hours of autonomous work at home during the weekends, checkpoint meeting with the professor at the end of each month.*)

_____

_____

Date and signature of the supervising professor: Date and signature of the programme manager: