SUBJECT....................... : Machine Learning for Business

HALF / YEAR ................. : 1st / 2021

DEPARTMENT................ : TDS

**COURSE ......................... : CG**

**CURRICULUM SEMESTER .....: ELECTIVE DISCIPLINE, FROM THE 4TH SEMESTER**

**NUMBER OF CREDITS ....... : two**

**PROFESSOR .....................: GUSTAVO MIRAPALHETA**

OBJECTIVES of the discipline

In virtually all sectors, organizations today face unprecedented analytical challenges. The data has become more complex, more varied and less and less structured. In this context, analysis and decision making are increasingly based on artificial intelligence and machine learning systems.

This course focuses on how to formulate a business administration problem so that it can be solved using machine learning techniques, as well as understanding the solutions presented by the machine and its presentation to the high decision-making public. level.

The course will cover supervised machine learning techniques, based on neural networks. The main applications will be: text mining, language processing, image and pattern recognition in general.

Learning Objectives

The learning objectives of the discipline are presented in the table below, demonstrating how they contribute to the objectives of the CGA.

|  |  |  |
| --- | --- | --- |
| **Objectives of the CGA** | **Learning objectives of the discipline** | **Degree of contribution** |
| Country reality |  | **○ ○ ○** |
| Global context |  | **○ ○ ○** |
| Knowledge in administration |  | **○ ○ ○** |
| Problems solution | The student should be able to identify what types of problems can or cannot be solved through machine learning and how the results proposed by the machine can be implemented. | **● ● ○** |
| ethic |  | **○ ○ ○** |
| Diversity |  | **○ ○ ○** |
| Written communication | The student should be able to produce reports and analyzes based on the solutions generated by the machine. | **● ○ ○** |
| Multimedia communication |  | **○ ○ ○** |
| Quantitative methods | The student should be able to model a business context, identifying entities and relationships so that the problem can be solved through machine learning. | **● ● ●** |
| Logical reasoning | The student should be able to develop at least one computational model applied to a specific problem of business administration in the area of ​​machine learning. | **● ● ○** |

CONTENTS

1. Current business context: Big Data, Artificial Intelligence, Machine Learning
2. Development Environments: Python Google / Colab
3. Fundamentals of machine learning. Linear regression, logistics, support vector machiens and neural networks.
4. Applications in business administration: Text Mining, Language Processing. Image Recognition. Machine creativity.

EXPECTED TOPICS FOR LESSONS

1. Current technological scenario. Python / Google Colab. Introduction to machine learning.
2. Value forecasting methods. Multiple linear regression. Finance applications. Forecasting the value of shares.
3. Classification methods: Logistic regression. Applications in credit models.
4. Selection and validation of models. Text mining applications.
5. Advanced forecasting and classification techniques: Random forest and Support vector machines.
6. Implementation of predictive model in Python and scikit-learn.
7. Introduction to neural networks and deep learning systems. Tensorflow and keras libraries. Mathematical foundations of machine learning with neural networks: Backpropagation.
8. Deep Learning: Examples of application of neural networks in classification and prediction problems.
9. Business applications: convolutive neural networks: image recognition, recurring: natural language processing, autogenerative: machine creativity.
10. Implementation of machine learning algorithm through the Qubits logic. (using Qiskit, IBM)

As the course progresses, there may be adjustments in the sequence of classes or introduction of other topics of interest.

METHODOLOGY

In class, teachers will present and discuss conceptual aspects and the fundamentals of the main techniques of analysis, data preparation and machine learning. It is essential that students get deeper into each topic through the study of the references and materials indicated. The course assumes that the student will perform extra-class activities on a regular basis (approximately two hours a week, depending on the student's ease with the topic).

Learning will be achieved with intensive use of the Python language and the Google Colab environment. However, in-depth knowledge of these environments is not a prerequisite for the discipline, since both its programming provides for a leveling stage and the student is expected to have the motivation to study and evolve quickly in familiarity with these environments.

EVALUATION CRITERIA

|  |  |
| --- | --- |
| **Grades** | **Weight** |
| 1st Assessment: Machine Learning (value and category) | 30% |
| 2nd Assessment: Deep Learning (category) | 35% |
| 3rd Assessment: Deep Learning Project. | 35% |

1. In Group. Art History of Florence
2. In Group. German Credit
3. In Group. Blu365

Bibliography

Basic bibliography:

CHOLLET, François Deep Learning in Python. Manning, 2018.

GARRETH, James An Introduction to Statistical Learning with Applications in R. Springer, 2013.

HILPISCH, Yves Artificial Intelligence in Finance: A Python Based Guide. O'Reilly, 2020.

Complementary bibliography:

GERON, Aurelien. Hands on Machine Learning. O´Reilly, 2017

HASTIE, Trevor The Elements of Statistical Learning. Springer, 2009.

MEHTA, Nihal Quantum Computing Program Next-Gen Computers for Hard, Real-World Applications. Pragmatic Bookshelf, 2020.

SILGE, Julia Text Mining in R. O'Reilly, 2015

STRANG, Gilbert Linear Algebra: Learning from Data. Cambridge, 2019

WICKHAM, Hadley Data Science in R. O'Reilly, 2017

The student is encouraged to clarify his doubts through Internet searches and consultations on programming forums (examples: Stack Overflow and Quora).

Online resources:

Caltech:<https://work.caltech.edu/telecourse> (Learning from Data)

MIT:<http://introtodeeplearning.com/> (Introduction to Deep Learning)

Stanford: <https://cs224d.stanford.edu/> (Natural Language Processing with Deep Learning)

Neural Net Playground: [https: //playground.tensorflow.org](https://playground.tensorflow.org/) (Visualization of neural networks)

ETHICAL COMMITMENT - TEACHER / STUDENT

The classes and activities of the discipline will be guided by mutual respect, in the classroom and outside. There will be respect from the teacher to the students, preparing for classes, answering questions, evaluating them with impartiality and impartiality and trying to help them in whatever they can. There will be respect on the part of the student, the teacher and his colleagues, behaving ethically and collaborating significantly with the progress of the classes, enriching them whenever possible with questions and doubts relevant to the subject addressed and preparing for the classes in order to make the most of them.

Despite the abundant availability of resources for consultation on the Internet, it is considered an ethical commitment in this discipline not to copy program code, even partially, from other people or sources.

SCHEDULE Lesson-by-class

The class-by-class schedule is announced in the first class, by eClass.



CONTACT AND OFFICE HOURS

|  |  |  |
| --- | --- | --- |
| Teacher | Contact | Office Hours |
| Gustavo Mirapalheta | [gustavo.mirapalheta@fgv.br](mailto:gustavo.mirapalheta@fgv.br)  [gustavo.mirapalheta@gmail.com](mailto:gustavo.mirapalheta@gmail.com) | To be arranged: whatsapp +55 11 9 9204 1201 |