



MBA IN DATA SCIENCE AND ANALYTICS

course description

second half of 2021

MBAUSP
ESALQ

MODULE - DATA SCIENCE AND ANALYTICS TRENDS

Data Wrangling

Data manipulation I; Data manipulation II; Creation of projects and RMarkdown scripts; Data Science & Analytics Projects in GitHub; Functional programming with the purrr package and Advanced Data Visualization.

Spatial Analysis

Shapefiles - presentation, data manipulation, cut, and merge of shapefiles; Simple Feature Objects; Raster Images; Spatial Exploratory Analysis; Applications of real market databases in R.

Basic concepts for Introduction to Deep Learning

Basic concept of Artificial Neural Network; Construction of Artificial neural network without computational packages.

Deep Learning

Concepts of optimization of Artificial Neural Networks; Types of Feed Forward Neural Networks; Feed Forward Neural Networks; Convolutional Neural Networks: practical application in R; Recursive Neural Networks; Introduction to Boltzmann Machines.

Data collection: Crawlers and Web Scraping

Introduction to HTML; HTML Parsing; Writing a scraper with R.

Text Mining and Sentiment Analysis

Text preprocessing; Classification algorithms; Detection of emotions with Naive Bayes; Use of other algorithms for sentiment analysis.

Operational Research and Optimization and Simulation Modeling

Operations research: objective function, parameters, decision variables and restrictions in optimization models; Linear Programming; Optimization methods; Integer Programming; Binary programming; Monte Carlo simulation; Applications of real market databases in Excel;

Cloud Computing

Cloud computing architecture; cloud services and storage solutions; Cloud computing cases and applications; Architecture and infrastructure for big data and analytics; Cloud computing; HDFS; Hadoop and MapReduce; Spark, Applied cases.

Introduction to Data and Cyber Security

The importance of security and data protection in the business area; principles related to information and data security; most used solutions for information and data security; cyber security; IT governance.

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MODULE - DATA SCIENCE AND BIG DATA IN BUSINESS ENVIRONMENT

Big Data and Decision-Making Process

Fundamentals of Big Data; Data Life Cycle; What are Data Strategies; Structuring a Data Lake case; Profiles and responsibilities of Big Data professionals; Successful cases using Big Data; Analytics as a decision tool applying Big Data; Introduction to computer clusters; The fundamental concepts to understand the Hadoop Framework; How Hadoop ensures data security and privacy for business demands; Demonstrations of Services and Managers of a Hadoop environment.

Data Mining

Overview of decision support systems and business intelligence; understanding of the three main frameworks for data sciences - KDD, CRISP-DM and SEMMA and, in particular, about data preparation; study on the main tasks of data mining and its three stages: exploration, model definition, and verification; data mining and its use in real case studies.

Business Intelligence and Data Visualization

Suitable graphics for each type of variables; Business Intelligence Concept; Simplification and data classification; Mapping data geographically; Personalization of data and units; Data analysis based on quick calculations from tables; Create segmentations (Filters) in Power BI; Real database applications in Microsoft Power BI; Creation of professional templates in Power BI and elaboration and customization of Dashboards in line with a company's brand manual.

Information Technology (IT) and Technological Innovation

How to obtain gains from the adoption of new digital technologies?; The role of Information Technology (IT) in digital transformation; The use of IT as a competitive weapon and business leverage; The relationship of the digital leader x CIO; Shadow IT; IT strategic alignment; IT Governance and Strategic Planning. Structuring the IT area

Data Engineering

Introduction to the database and SQL; data engineering x data science; database concepts; database management systems; Introduction to modeling of relational databases; Building an entity-relationship diagram; Abstraction levels; Introduction to relational algebra; Restrictions of referential integrity and types of normalization; Practical exercises.

Agile Methodologies

Fundamentals of Project Management; What are agile methodologies?; Knowing the main agile methodologies and where to apply them; Concepts and main differences: Scrum, Kanban, Lean, Agile Development; Agile Team Organization (Squads, Chapters, Tribes, Guilds); Cases and practical examples in national and international companies.

Subject: Analytics and Risk Management

*Disciplines and teaching plan to change

Description: Operational and compliance risk management models; Basel III; credit risk models; legal and regulatory risk models; models of social and environmental risk; reputational risks; cyber risks; real and practical cases.

Economic Conjecture Analysis in Disruptive Technologies Scenarios

Fundamentals of economic policy and its instruments; Main macroeconomic variables and their relationships; GDP - Gross Domestic Product, interest rate, exchange rate and balance of payments; National financial system; Impacts of the world scenario on the Brazilian economy; Variables that impact consumption: income, credit, employment and consumer confidence; Economic scenario and trend assessment

Legislation in the Digital Environment

Digital Law; Principles and responsibilities - LGPD (Law No. 113709/2018); Implications of LGPD in the business of retail companies; Transparency x privacy; Information security; Scenarios of uses and applications of LGPD in the consumer market.

Special Topics in Business Management

Contemporary themes in data science and analytics.

Module bibliography

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MODULE - EXPLORATORY ANALYTICS, PREDICTIVE ANALYTICS & MACHINE LEARNING

Database Structures, Types of Variables and Measurement Scales

*Disciplines and teaching plan to change

Databases; observations and variables; longitudinal and transverse structures; qualitative and quantitative variables; scales for measuring variables; nominal and ordinal variables; metric variables.

Introduction to Machine Learning

Machine learning and pattern recognition; concept of supervision and non-supervision; unsupervised techniques and relationship with scales for measuring variables; supervised techniques and relationship with scales for measuring variables; real and practical cases.

Unsupervised Machine Learning - Clustering

Analysis of conglomerates and clusters; standardization of variables and z-score procedures; distance and similarity measures; hierarchical clusters; non-hierarchical clusters k-means; agglomeration schemes; dendrogram; multidimensional scaling; applications of real market databases in R.

Unsupervised Machine Learning - Factor Analysis and PCA

Factor analysis; principal component analysis (PCA); construction of factors; correlation matrix; scores and factor loads; cargo map; creation of rankings in datasets; applications of real market databases in R.

Unsupervised Machine Learning - Simple and Multiple Correspondence Analysis

Frequency tables; frequency masses; frequentist waste; chi-square test; association between variables and between categories; coordinates of categories and perceptual maps; clustering and rankings of observations from qualitative variables; applications of real market databases in R.

Supervised Machine Learning - Simple and Multiple Regression Analysis

Correlation map; simple regression models; least squares estimation; adjustment coefficient R^2 ; F test, t tests, multiple regression models; Stepwise procedure; multicollinearity; Shapiro-Francia test; Box-Cox procedure; non-linear models; confidence and forecast intervals; applications of real market databases in Excel and R.

Supervised Machine Learning - Binary and Multinomial Logistic Models

Concepts of probability and chance of occurrence of events; sigmoid S curve and probabilistic model; maximum likelihood estimation; credit risk and default probability models; confidence and forecast intervals; cutoff concept; confusion matrix; sensitivity analysis; accuracy, sensitivity and specificity indicators; ROC curve; GINI index; multinomial models; spline curves; applications of real market databases in Excel and R.

Supervised Machine Learning - Models for Count Data

Count data; exhibition concept; maximum likelihood estimation; Poisson model; negative binomial model; overdispersion; Cameron and Trivedi test; confidence and forecast intervals; modeling for rare events; zero-inflated models; applications of real market databases in Excel and R.

Supervised Machine Learning - Multilevel Modeling

Generalized linear multilevel models (GLMM); concepts and definitions; characterization of nesting and grouping in the data; hierarchies and contexts in data modeling; contextual effects; random effects of intercept and slope between contexts; advantages of multilevel models and real increase in predictive performance; linear hierarchical models (HLM); correct insertion of individual and contextual variables in multilevel models; applications of real market databases in R.

Other Machine Learning Models

Decision trees; bagging, boosting; random forest; neural networks; validation techniques; training, validation and testing, out-of-time, overfitting, cross-validation; applications of real market databases in R.

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MBAUSP
ESALQ

Rua Alexandre Herculano, 120, Vila Monteiro
Piracicaba/SP CEP: 13.418-445

queroinfos@pecege.com

+55 19 3377 0937 +55 19 3377 0940

[@](#) [f](#) [in](#) [▶](#) /mbauspesalq