**Program: Executive MBA**

**Specialization: Strategic Marketing & Sales**

**Syllabus for Module: Brand Management**

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| **Date:**  Nov 6-7 | **Lecturer:**  **Ted Kwartler** | **ECTS:**  2,5? | **Language:**  English |

**Course Description**

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| This module will take students beyond the basics of R programming and introduce them to more sophisticated techniques and tools for data analysis, modeling, and visualization. Students will learn how to apply their knowledge of analytics and data science to real-world business problems using R. They will be able to then take these findings and articulate them in a manner that executives and non-technical people can understand.  Course material will be on our class repository here:  <https://github.com/kwartler/Vienna_24> |

**Objectives and Learning Outcomes**

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| **By the end of the module students will have learned:**   * Advanced R syntax and programming concepts * Applying machine learning algorithms to solve complex business problems * Framing analytics and data science projects for business impact * How custom functions improve data scrubbing in R * Basic API parsing as a data source   **Knowledge and understanding**  After completing this module the students will have:   * The ability to apply decision trees, and random forest algorithms * Applied tuning parameters and knowledge of their impact to new modeling projects * Create customized R functions * Work with APIs using packages like `httr` and `jsonlite` in a modeling workflow * Use R to create interactive HTML pages for business users   **Cognitive and subject specific skills**  After completing this module the students will have the skills:   * To apply machine learning algorithms to complex business problems * Understand more advanced R programming and when to apply it * Think strategically about a business question and the appropriate data narrative, artifact or insight   **Key skills**  After completing this module the students will:   * Frame complex analytical projects for business impact * Customize R functions to meet specific business needs * Integrate R with other tools and technologies (e.g. APIs) * Apply more advanced algorithms on business data to improve insights and accuracy |

**Course Structure and Teaching Methods**

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| Each morning, the course will be delivered with a series of code examples and explanations where students can learn R syntax, visualization, model building and function writing. Students will then divide into groups to accomplish a case with support from the instructor in the afternoon. At the conclusion of the two-day session, and time permitting, groups will be selected to present their code and a business presentation. |

**Transversal Themes and Current Discourse**

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| Faculty instructions: Please specify to students the contemporary issues that will be emphasized in your class, alongside the coverage of fundamental aspects in the field. Examples of such topics include, but are not limited to, sustainability, digital transformation, net zero, ESG, AI, diversity, equity & inclusion. This information will improve our course communication and ensure that students gain a comprehensive understanding of the course content.  **Contemporary issues highlighted in this module:**   * The ethics of algorithmic hiring, that AI fairness is complicated * Good AI Governance |

**Reading Material**

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| **Required readings**   1. **Data exploration and visualization in R**    * [Exploratory Data Analysis with R](https://r4ds.had.co.nz/exploratory-data-analysis.html) from R for Data Science by Hadley Wickham.    * [Data Visualization with ggplot2](http://r-statistics.co/Complete-Ggplot2-Tutorial-Part1-With-R-Code.html) from R Statistics. 2. **Regression modeling in R**    * The [R tutorial on Simple Linear Regression](https://www.r-tutor.com/elementary-statistics/simple-linear-regression): It provides a basic understanding of Simple Linear Regression and helps you to understand how to create a Simple Linear Regression model using R. The navigation is a bit odd for this but the red links at the bottom help you progress. 3. **Model evaluation in R**    * [How To Interpret R-squared and Goodness-of-Fit in Regression Analysis](https://statisticsbyjim.com/regression/interpret-r-squared-regression/) |

**Guidelines Regarding AI Tools**

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| Faculty instructions: Please specify whether the use of AI tools is allowed, partially allowed, or prohibited and outline the extent to which they can be used. For examples and guidance on how to articulate your approach to AI tools, please refer to the [EA Style of Teaching](https://teach.executiveacademy.at/en/) website. This information aims to ensure transparency and consistency in the use of AI tools throughout the course.  *Option 1*:  AI tools, such as ChatGPT and others, are allowed for any assignment with proper citation. |

**Pre-Module**

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| **Reading assignments/material**   1. Read the bolded best practices of visualization here: <https://www.tableau.com/blog/stephen-few-data-visualization> 2. Review <https://r-graphics.org/> to see the many types of charts available through ggplot2 3. Review the types of charts available at <https://echarts4r.john-coene.com/> 4. Review the syntax for creating interactive dashboard at <https://pkgs.rstudio.com/flexdashboard/>   **Pre-module activities**  All Tracks:  Choose the **basic** path if  1. have never programmed in R before.  2. you expect to manage or direct analytical groups with the goal of effective communication and collaboration  Choose the **advanced** path if  1. you have some R programming experience, in a professional setting or if applicable have a solid grasp of the previous session material  2. your goal is to become a Data Scientist yourself  Choose the **master** path if   1. you are proficient in R and have already used it for data analytics and/or machine learning purposes.   **Basic** Pre-Module Assessment:  Complete the following steps in R:   1. Install R & R-Studio   In the console (lower left by default) add packages used in class   * 1. `install.packages(“ggplot2”)`   2. Use the above function to install `ggthemes`, `dplyr`, `caret`  1. Watch the Introduction to R tutorial [here](https://www.youtube.com/watch?v=eR-XRSKsuR4). 2. Create a copy of the scaffolded script **`basic.R`** from our class repository. Fill it out and then save a copy to turn in.   **Advanced** Pre-Module Assessment:  Create a copy of the scaffolded script **`PreAssignment.Rmd`** from the class repository. Fill it out and then save a copy to turn in.   1. Complete the R script **`PreAssignment.Rmd`**. 2. Create 2 presentation slides    1. Slide 1: Make it a side-by-side slide:       1. Left side: Describe the machine learning workflow       2. Right side: Add a ggplot from the script or another you made while exploring the data    2. Slide 2: Make is a slide that has 2 sections side by side:       1. In each section: Name the model, create a 1 sentence “lay-person’s” description of the models’ differences, list the model’s KPI from the script.       2. Denote on the slide which of the two methods is the best model according to adjusted r-squared.   **Master** Pre-Module Assessment   1. Use the data **WA\_Fn-UseC\_-Telco-Customer-Churn.csv** to create a machine learning R script from scratch. You will be expected to follow these steps in your R script:    1. Sample – perform appropriate sampling of the data    2. Explore – Explore the training data building visualizations, summary statistics and identify any issues in the data.    3. Modify – Process the data to account for missing/NA, factors, and outliers.    4. Model – Perform **3** modeling techniques and tune appropriate parameters, and/or change included variables. The dataset is a “**churn**” prediction use case.    5. Assess – Assess each of the 3 modeling types to identify the best one. You need to choose an *appropriate* metric like RMSE, MAPE, LogLoss, Tweedie Deviance etc based on your understanding of the problem. 2. Create 2 presentation slides    1. Slide 1: Make it a side-by-side slide:       1. Left side: Describe the machine learning workflow with steps you’ve taken to clean the data *i.e. remove outliers if applicable*       2. Right side: Create a scatterplot of the Y variable with the most correlated x variable. Apply the g docs theme from `ggthemes`    2. Slide 2: Make is a slide that has 3 sections side by side:       1. In each section: Name the model, create a 1-2 sentence “lay-person’s” description of the model’s learning method, list any parameters or variables chosen to optimize the model output and list the model’s KPI from the script.       2. Denote on the slide which of the three methods is the best model.   **Deadline for pre-module assignment and process of delivery**  Nov 6  *All student work is checked for both plagiarism and the use of AI upon submission.*  *Please submit your assignment as a PDF file onto Moodle, indicate your names in the document and name your document “SURNAME / GROUP NAME\_PRE”.* |
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**Core-Module**

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| **Reading assignments/material**  E.g. reading from the above-mentioned list |

**Distinguished Guest Speakers**

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| Faculty instructions: In line with our commitment to promoting diverse perspectives and enriching the learning experience, we encourage you to invite guest speakers to your class - physically and/or virtually. If you do, kindly share their names and schedules for seamless integration into your teaching plan. Our team is committed to accommodating your needs.  Name:  Expertise and background:  Topic:  Date and time: |

**Detailed Schedule**

**Day 1**

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| |  |  | | --- | --- | | 08:30 – 10:30 |  | | 10:30 – 10:45 | *Coffee break* | | 10:45 – 12:15 |  | | 12:15 – 13:15 | *Lunch time* | | 13:15 – 15:15 |  | | 15:15 – 15:30 | *Coffee break* | | 15:30 – 17:00 |  | |

**Day 2**

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| 08:30 – 10:30 |  |
| 10:30 – 10:45 | *Coffee break* |
| 10:45 – 12:15 |  |
| 12:15 – 13:15 | *Lunch time* |
| 13:15 – 15:15 |  |
| 15:15 – 15:30 | *Coffee break* |
| 15:30 – 17:00 |  |

**Post-Module**

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| **Reading assignments/material**  **Post-module activities**  E.g. write an essay, individual or group work, slide set etc.  **Deadline for post-module assignment and process of delivery**  TBD  *All student work is checked for both plagiarism and the use of AI upon submission.*  *Please submit your assignment as a PDF file onto Moodle, indicate your names in the document and name your document “SURNAME / GROUP NAME\_POST”.* |

**Assessment**

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**Instructor and Contact Information**

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**Short CV of Instructor and Contact Information**

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