

R Programming

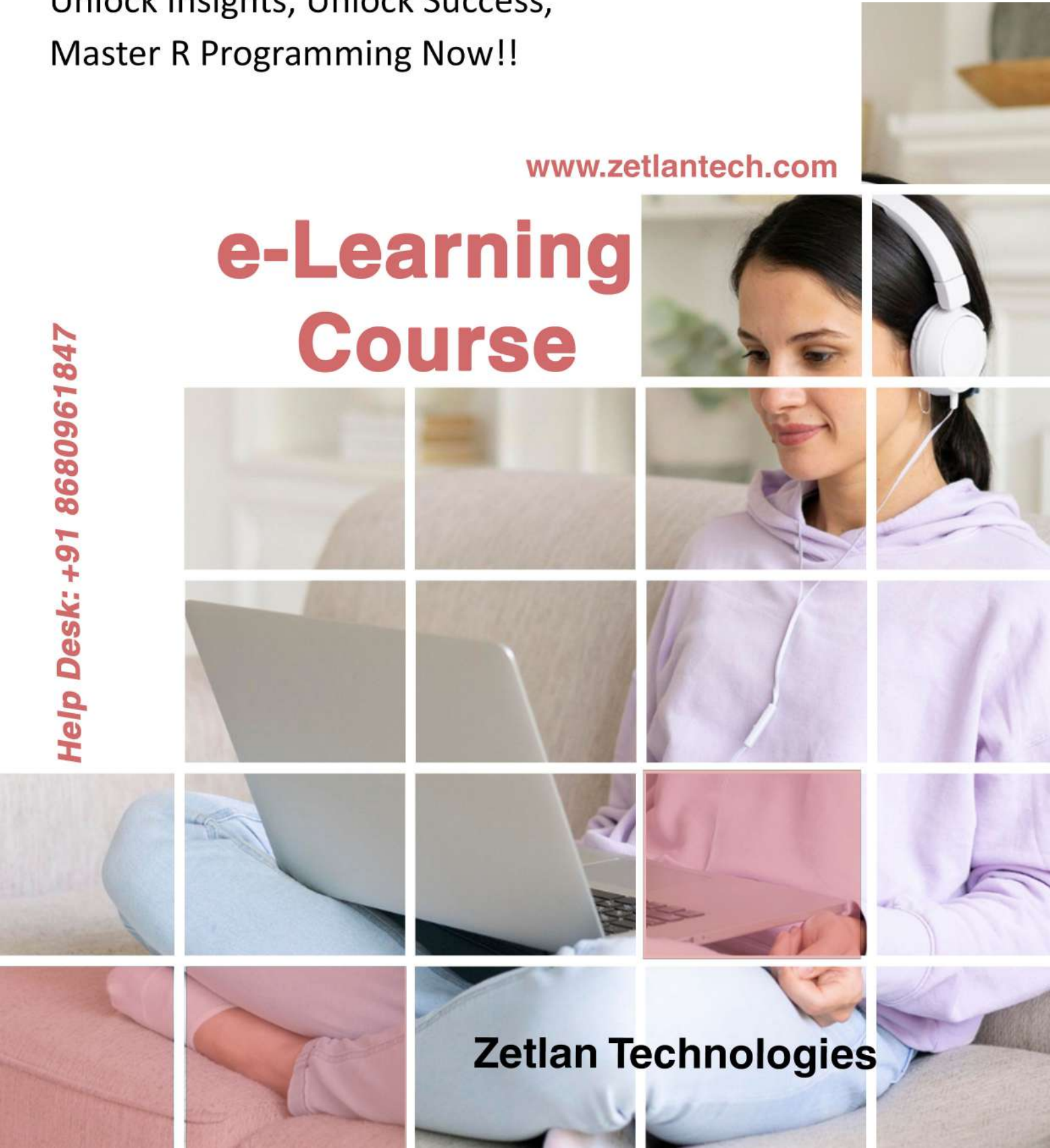
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COURSE MODULES

Introduction to R and RStudio

- Overview of R programming and its applications.
- Installing R and RStudio.
- Introduction to RStudio interface: Console, Scripts, Plots, Environment, etc.
- Basic R syntax: Variables, Data Types (numeric, character, logical).
- Operations in R: Arithmetic, comparison, and logical operators.

Working with Data Structures in R

- Vectors: Creation, indexing, and operations.
- Lists: Creation, indexing, and types of lists.
- Matrices: Creation, indexing, and matrix operations.
- Data Frames: Creating and manipulating data frames.
- Factors and their role in categorical data.

Control Structures and Functions

- Conditional Statements: if, else, ifelse.
- Loops: for, while, repeat loops.
- Functions in R: Writing custom functions, return values, and arguments.
- Scope of variables (local vs. global).

Data Visualization with ggplot2

- Introduction to ggplot2 package.
- Understanding ggplot2 grammar: aes(), geom, and themes.
- Creating different types of plots: scatter plots, line plots, bar plots, histograms, box plots
- Customizing plots: titles, labels, colors, themes.

Data Manipulation with dplyr and tidyr

- Introduction to dplyr for data manipulation: select, filter, arrange, mutate, summarize.
- Pipes (%>%) and chaining functions.
- Using tidyr for reshaping data: gather(), spread(), separate(), unite().
- Handling missing values and data cleaning.

Advanced Data Manipulation

- Merging datasets: inner join, left join, full join, and right join.
- Using data.table for efficient data manipulation.
- Working with dates and times in R using lubridate.
- String manipulation using stringr.

Statistical Analysis in R

- Basic statistical functions: mean(), median(), sd(), var(), etc.
- Probability distributions: Normal, Binomial, Poisson, etc.
- Hypothesis testing: t-tests, chi-square tests, ANOVA.
- Correlation and Regression analysis: linear regression model fitting.

Introduction to Machine Learning in R

- Overview of Machine Learning concepts.
- Introduction to the caret package.
- Supervised learning: Linear regression, decision trees.
- Unsupervised learning: Clustering (K-means, hierarchical).
- Cross-validation and model evaluation.

Reporting and Reproducible Research

- Introduction to RMarkdown for dynamic report generation.
- Creating Markdown documents with code chunks, text, and outputs.
- Producing HTML, PDF, and Word reports.
- Using R for reproducible research.