Comprehensive Syllabus for ggplot2 in R

# Module 1: Introduction to ggplot2

* Understand the grammar of graphics.
* Set up and install required packages.
* What is ggplot2?
* Installing ggplot2: install.packages("ggplot2")
* Loading the package: library(ggplot2)
* Understanding the Grammar of Graphics: Data + Aesthetics + Geometries

# Module 2: Basic Plot Types

* Learn to create basic plots using ggplot()
* Scatter plot: geom\_point()
* Line plot: geom\_line()
* Bar chart: geom\_bar(), geom\_col()
* Histogram: geom\_histogram()
* Boxplot: geom\_boxplot()
* Density plot: geom\_density()
* Working with categorical vs. continuous variables

# Module 3: Aesthetics and Layers

* Customize the appearance of plots
* Mapping vs. setting aesthetics
* Aesthetic mappings: color, size, shape, alpha, fill
* Adding multiple geoms
* Layering: adding smoothing lines (geom\_smooth()), annotations

# Module 4: Faceting (Subplots)

* Use faceting to compare subgroups
* facet\_wrap()
* facet\_grid()
* Customizing facet labels and layout

# Module 5: Scales and Axes

* Customize axes and scales
* Scale functions: scale\_x\_continuous(), scale\_y\_log10(), scale\_fill\_manual()
* Formatting numbers and dates on axes
* Reversing, transforming, and customizing axis ticks
* Legends: titles, ordering, position

# Module 6: Themes and Labels

* Improve plot appearance and readability
* Titles, subtitles, and captions: labs()
* Axis labels and legends
* Prebuilt themes: theme\_bw(), theme\_minimal(), etc.
* Custom themes: theme()
* Theme elements: axis.text, panel.grid, plot.title, legend.position

# Module 7: Working with Colors

* Effectively use colors in plots
* Discrete vs. continuous color scales
* scale\_color\_manual(), scale\_fill\_brewer(), scale\_fill\_gradient()
* Using RColorBrewer, viridis, and ggsci palettes

# Module 8: Plot Customization and Annotation

* Annotate plots with custom text and shapes
* annotate()
* geom\_text(), geom\_label()
* Conditional labeling
* Adding horizontal/vertical lines: geom\_hline(), geom\_vline()

# Module 9: Advanced Plots

* Create more complex plots and layouts
* Time series plots
* Maps with geom\_sf() or geom\_map()
* Violin plots: geom\_violin()
* Ridgeline plots (with ggridges)
* Bubble plots
* Heatmaps
* Pair plots (with GGally::ggpairs())

# Module 10: Combining Multiple Plots

* Arrange multiple plots together
* patchwork package (plot1 + plot2, plot1 / plot2)
* gridExtra::grid.arrange()
* cowplot package
* Shared legends and titles

# Module 11: Saving and Exporting Plots

* Export plots in high quality
* ggsave(): specifying size, resolution, file type
* Vector vs. raster formats (PDF, PNG, SVG)

# Module 12: Case Studies and Projects

* Apply ggplot2 in real data scenarios
* EDA on survey data
* Time series visualization of economic indicators
* Visualization of correlations and distributions
* Dashboards (optional integration with shiny)

# Bonus: Integrations and Extensions

* ggthemes: additional themes
* plotly::ggplotly(): interactive plots
* gganimate: animation with ggplot2
* ggpubr: publication-ready plots
* ggcorrplot: correlation heatmaps