

Welcome to The R Workshop

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This Workshop Will Introduce You to R Programming

- What is R?
 - R is a programming language
 - Used for:
 - Data wrangling
 - Statistical analyses
 - Data visualization
- Why should you learn R?
 - Unlock data analysis tools
 - Bioinformatics, statistics, ect.
 - Create publication quality figures



In This Workshop You Will Learn...

- ...How to set up R/Rstudio on your computer
- ...Basics of R syntax
- ...Using Large Language Models (LLMs) for coding/troubleshooting
- ...Data wrangling with tidyverse
- ...Data visualization with ggplot2
- ...Single-cell analysis with Seurat
- ...Web app development with R Shiny

Download the Tutorial Scripts and Files From Github

- https://github.com/avanhelene/BGSA_R_workshop



Set Up Your R Environment

- Follow this tutorial
 - <https://rstudio-education.github.io/hopr/starting.html>



Basics of R Syntax

```
# Character variable
example_R_character_variable <- "variable value"

# Numeric variable
example_R_numeric_variable <- 1234

# Data frame
example_R_data_frame <- tibble::tribble(
  ~column_1, ~column_2, ~column_3,
  "a", "A", 1,
  "b", "B", 2,
  "c", "C", 3
) |>
  as.data.frame()

# There are different classes of variables
class(example_R_variable) # example_R_character_variable is a "character" string
class(example_R_numeric_variable) # example_R_numeric_variable is numeric
class(example_R_data_frame) # example_R_data_frame is a data frame
```

Coding Hack: Use Large Language Models (LLMs) to Write Code

- LLMs are very good at writing code from scratch
- LLMs are also helpful for troubleshooting
- <https://chatgpt.com>

LLMs Are Better at Coding than Most People...

make me an R plot that creates a picture of a cat

Here's a fun way to make a simple "ASCII-art style" cat in R using plotting functions. This example uses `symbols()` and `points()` to place circles and triangles that roughly look like a cat face:

```
r Copy code

# Basic cat face with R base plotting
plot(0, 0, type = "n", xlim = c(-5, 5), ylim = c(-5, 5), asp = 1,
     xaxt = "n", yaxt = "n", xlab = "", ylab = "", bty = "n")

# Face
symbols(0, 0, circles = 4, inches = FALSE, add = TRUE, bg = "lightgray")

# Ears
polygon(c(-2.5, -1, -3.5), c(2, 4.5, 3.5), col = "lightgray", border = "black")
polygon(c(2.5, 1, 3.5), c(2, 4.5, 3.5), col = "lightgray", border = "black")

# Eyes
symbols(-1.2, 0.8, circles = 0.4, inches = FALSE, add = TRUE, bg = "white")
symbols( 1.2, 0.8, circles = 0.4, inches = FALSE, add = TRUE, bg = "white")
points(-1.2, 0.8, pch = 19, cex = 1.5)
points( 1.2, 0.8, pch = 19, cex = 1.5)

# Nose
points(0, 0, pch = 19, cex = 1.2, col = "pink")

# Mouth
lines(c(-0.3, 0, 0.3), c(-0.7, -1.2, -0.7) ↓
```

+ Ask anything

