# Master Course Syllabus

*For additional course information, including prerequisites, corequisites, and course fees, please refer to the Catalog: https://catalog.uvu.edu/*

**Semester:** Spring
**Year:** 2025
**Course Prefix:** BIOL
**Course and Section #:** 3100-002
**Course Title:** Intro to Data Analysis for Biologists
**Credits:** 3

## *Course Description*

This course provides an introduction to analyzing data in the R software environment, assuming no previous R experience.

We cover:

- the justification of using code to explore and analyze data
- best practices for dealing with data
- experimental design, modeling, and hypothesis testing
- how to create publication-quality figures that show interesting relationships in our data sets
- project organization and proper reporting

## *Course Attributes*

This course has the following attributes:

☐ General Education Requirements

☐ Global/Intercultural Graduation Requirements

☐ Writing Enriched Graduation Requirements

☐ Discipline Core Requirements in Program

☒ Elective Core Requirements in Program

☐ Open Elective

Other: *Click here to enter text.*

## *Instructor Information*

**Instructor Name:** *Dr. Jeoffrey Zhan*

## *Student Learning Outcomes*

***Students completing this course should be able to:***

1. Demonstrate proficiency in proper data entry, management, and storage with an emphasis on reproducibility.

2. Convert untidy data to “tidy data” for analyses.
3. Explain the basic principles of exploratory data analyses within a computational software environment.
4. Evaluate the rationale behind using code to analyze data and present results.
5. Develop computational skills for processing common biological data formats, such as DNA sequences.
6. Create appropriate and meaningful data visualizations using the R software environment.
7. Integrate principles of experimental design, statistical modeling, hypothesis testing, and data visualization

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## *Course Materials and Texts*

*NA*

## *Course Requirements*

**We will use a point system. The points you have accumulated by the end of the course determine your grade as follows:**

| Points | Letter Grade |
|---|---|
| 700-800 | A |
| 640-699 | B |
| 560-639 | C |
| 480-559 | D |
| <480 | E |

**Points are based on:**

- 10 Assignments - 20 pts each
- 4 Skills Tests - 100 pts each
- 1 Final Project - 200 pts

### Required or Recommended Reading Assignments

*NA*

### General Description of the Subject Matter of Each Lecture or Discussion

*### **Week 1**{#Week-1}*
***Topics:***

*- Installing Software | Command-line | Git version control*

***Assignments***

*- Read: [What is Git all about?](https://peerj.com/preprints/3159/)*
*- Install Git, R, and R-Studio on your laptop (part of Assignment 1)*
*- Be ready to explain what Git, R, and R-Studio are.*

*- Do [Assignment 1](https://gzahn.github.io/data-course/Repository/Assignments/Assignment_1/Assignment_1.html){target="_blank"} and upload a link to your new GitHub account to Canvas.*
*- Take a look at [this document](https://gzahn.github.io/data-course/Repository/Code_Examples/iris_analysis.html){target="_blank"} to see where this class is going*
*- Go through ALL the resources below. I put them here for a reason. Most are short web resources or videos (some that I made).*

***Resources***

*- Video: Meet the [command line](https://youtu.be/cg115YYQYgc){target="_blank"} of your computer*
*- [Download Git](https://git-scm.com/downloads){target="_blank"}*
*- [Download R](https://cran.cnr.berkeley.edu/){target="_blank"}*
*- [Download R-Studio](https://rstudio.com/products/rstudio/download/#download){target="_blank"}*
*- [Navigating with the command line](https://computers.tutsplus.com/tutorials/navigating-the-terminal-a-gentle-introduction--mac-3855){target="_blank"} (great video!)*
*- [Setting up 2FA for GitHub](https://docs.github.com/en/github/authenticating-to-github/securing-your-account-with-two-factor-authentication-2fa){target="_blank"}*
*- GitHub steps for Assignment 1 [video](https://youtu.be/M9430_eGttI){target="_blank"}*
*- [Git Cheat Sheet](https://www.atlassian.com/git/tutorials/atlassian-git-cheatsheet){target="_blank"} (handy reference)*
*- [Git tutorial](https://product.hubspot.com/blog/git-and-github-tutorial-for-beginners){target="_blank"} for beginners (another walkthrough, if you need it)*
*- Best [Git Cheat Sheet Ever!](https://remembertheapi.com/products/git-cheat-sheet-black-mug-11oz){target="_blank"} (Excellent gift idea for a teacher...joking!)*

***Practice***

*- Make 10 more separate changes and commits to your README.md file and push each one to GitHub*
*- Close and open your command line terminal 10 times*
*- Open your command line terminal and navigate to your new personal GitHub repository for this course (Data_Course_LASTNAME) / Navigate back to your desktop / From your Desktop (without using "cd") display the contents of Data_Course_LASTNAME/README.md onto your computer screen.*
*- Please view this short [video clip](https://gzahn.github.io/data-course/media/paint_the_fence.mp4){target="_blank"} from "Karate Kid" (Seriously)*
*+ When I tell you to close and open your command line 10 times, it's not because I hate you.*
*+ It's because I, too, have had to learn this stuff from scratch*
*+ It's because I know that repetition is crucial to learning this, especially at the beginning*
*+ And it's because if you don't spend the time to do this stuff over and over now, by week 6 you will be drowning and helpless.*
*+ When I say "push 10 separate commits to your GitHub repo," what I'm actually saying is "Show me 'Paint the Fence'!"*
*+ Because very soon, Mr. Miyagi will be attacking you with things like "Error in url[i] = paste(df[,2], gsub(" ", "_", :*
*object of type 'closure' is not subsettable"*

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* *
*```{r, out.width = "350px",echo=FALSE}*
*knitr::include_graphics("../media/file_tree.png")*
*```*
* *

*### **Week 2**{#Week-2}*

***Topics***

*- File paths | Wildcards and pattern matching | Objects | For-Loops*

***Assignments***

*- [Assignment 2](https://gzahn.github.io/data-course/Repository/Assignments/Assignment_2/Assignment_2.html){target="_blank"}*

***Resources***

*- Intro to what RStudio is [video](https://youtu.be/cnQ-v1UUWyE){target="_blank"}*
*- [Paths and files in R](https://gzahn.github.io/data-course/Repository/Code_Examples/navigating_files.html){target="_blank"}*

***If you want to know more about the command-line***

*- [Remedial Unix Shell](https://github.com/gzahn/Data_Course/blob/master/Readings/Further_Reading_for_Shell_Tricks.pdf){target="_blank"}*
*- [Basic Unix Commands](https://www.unixtutorial.org/basic-unix-commands?print=pdf){target="_blank"}*
*- [Very Useful Tutorial](https://www.learnenough.com/command-line-tutorial/basics#sec-introduction){target="_blank"}*
*- On the [Value of](https://medium.com/@eytanadar/on-the-value-of-command-line-bullshittery-94dc19ec8c61#.4qt0dd22r){target="_blank"} Command-Line Bullshittery*
*- On the [Annoyance of](https://gzahn.github.io/archived_websites/command_line_bullshittery.html){target="_blank"} Command-Line Bullshittery*
*- Video walkthroughs of some command line stuff:*
*+ [Part 1 - first commands](https://youtu.be/t5ovp3Iibl0){target="_blank"}*
*+ [Part 2 - pipes and wildcards](https://youtu.be/9YRwN2Tu1AM){target="_blank"}*
*+ [Part 3 - relative filepaths](https://youtu.be/2UsV3xva_Lk){target="_blank"}*
*+ Command line program [flags/parameters](https://youtu.be/sLayockzACQ){target="_blank"}*
*+ How to avoid two potentially dangerous [command line errors](https://youtu.be/_31MXNlHU_E){target="_blank"}*
*+ For-loops [video](https://youtu.be/aMmG4iXTBYk){target="_blank"} walkthrough in BASH*
*- Bonus tips:*
*+ BASH aliases [video](https://youtu.be/21LpBiQVDhM){target="_blank"}*
*+ BASH alias [examples](https://gzahn.github.io/data-course/Repository/Code_Examples/handy_bash_aliases.txt){target="_blank"}*

***Practice***

*- In the directory Data_Course/Data/data-shell/names/ there are a number of subdirectories and csv files. Find all of those csv files and store their **full** absolute filepaths as a character vector in R.*
*- Read in and print just the first 2 lines from each of those files*
*- Find all the .txt files on your entire computer*
*- Find all files on your computer that contain the character string "es" in the filename*

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*## Getting to Know R*

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*```{r, out.width = "350px",echo=FALSE}*
*knitr::include_graphics("../media/Rvariablesdata.jpg")*
*```*
* *

*### **Week 3**{#Week-3}*
***Topics***

*- R Data types and conversions | Reading and Writing Files | Packages and Projects*

***Assignments***

*- Read [this chapter](https://www.datacamp.com/community/tutorials/r-packages-guide){target="_blank"} on what a "package" is in R*
*- Read [this chapter](https://r4ds.had.co.nz/workflow-projects.html){target="_blank"} on R-Projects (We will **ALWAYS** work from within R-Projects from now on)*
*- Do [Assignment 3](https://gzahn.github.io/data-course/Repository/Assignments/Assignment_3/Assignment_3.html){target="_blank"} (We will start this one together during class)*

***Resources***

*- [Data Types in R](https://swcarpentry.github.io/r-novice-inflammation/13-supp-data-structures/){target="_blank"}*
*- [Operators](https://www.statmethods.net/management/operators.html){target="_blank"}*
*- [Subsetting](http://adv-r.had.co.nz/Subsetting.html){target="_blank"}*
*- [More Subsetting](https://www.r-bloggers.com/5-ways-to-subset-a-data-frame-in-r/){target="_blank"} (It's important!)*
*- [For-Loops](https://www.datamentor.io/r-programming/for-loop/){target="_blank"}*
*- [Reading data into R](https://www.datacamp.com/community/tutorials/r-data-import-tutorial){target="_blank"}*
*- Using 'pipes' in R [chapter](https://r4ds.had.co.nz/pipes.html#introduction-11){target="_blank"}*
*- For-loops in R [chapter](https://r4ds.had.co.nz/iteration.html){target="_blank"}*

***Practice***

*- [Vectors](https://github.com/gzahn/Data_Course/blob/master/Exercises/01_Vectors.pdf)*
*- [Factors](https://github.com/gzahn/Data_Course/blob/master/Exercises/07_Factors.pdf)*
*- [Characters](https://github.com/gzahn/Data_Course/blob/master/Exercises/04_Characters.pdf)*
*- [Regular Sequences](https://github.com/gzahn/Data_Course/blob/master/Exercises/02_Regular_Sequences.pdf)*
*- [Indexing](https://github.com/gzahn/Data_Course/blob/master/Exercises/03_Indexing.pdf)*
*- [Missing Values](https://github.com/gzahn/Data_Course/blob/master/Exercises/05_Missing_Values.pdf)*
*- [Loops in R](https://github.com/gzahn/Data_Course/blob/master/Exercises/08_Loops.pdf)*
*- [Logical Operations](https://github.com/gzahn/Data_Course/blob/master/Exercises/06_Logical_Operations.pdf){target="_blank"}*
*- Find a **new** built-in data set in R. Use several methods to subset it over and over until you are an expert!*
*- [Out-of-order Code](https://github.com/gzahn/Data_Course/blob/master/Exercises/data_frame_subsets_out-of-order.R)*

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*```{r, out.width = "350px",echo=FALSE}*

*knitr::include_graphics("../media/ggplot_example.png")*
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</style>
<div class = "blue">

## Visualizing a Data Set

### **Week 4**{#Week-4}
**Topics**

- "Grammar of Graphics" ggplot | dplyr verbs

**Assignments**

- Read through the materials in the Resources section below
- Do [Assignment 4](https://gzahn.github.io/data-course/Repository/Assignments/Assignment_4/Assignment_4.html){target="_blank"}
- #### **Exam 1** (Link at top of page)

**Resources**

- [ggplot Introduction](https://r4ds.had.co.nz/data-visualisation.html){target="_blank"}
- [dplyr Verbs](https://dplyr.tidyverse.org/){target="_blank"}
- [tidyverse Cheat Sheet](https://rstudio.com/wp-content/uploads/2015/02/data-wrangling-cheatsheet.pdf){target="_blank"}
- [More ggplot](https://ggplot2.tidyverse.org/){target="_blank"}
- [Extensive ggplot2 Tutorial](http://r-statistics.co/Complete-Ggplot2-Tutorial-Part1-With-R-Code.html){target="_blank"}
- How to plot anything in ggplot [part 1](https://t.co/LxwwSsESQM?amp=1){target="_blank"} | [part 2](https://t.co/uZda0KRAgp?amp=1){target="_blank"} (This is a **GOOD** thing to watch!)
- Evolution of a ggplot [tutorial](https://cedricscherer.netlify.app/2019/05/17/the-evolution-of-a-ggplot-ep.-1/){target="_blank"}
- Catalog of [visualization types](https://flowingdata.com/chart-types) (Awesome source of inspiration for your plots...but memberhip fee required to see code. Booooo)

**Practice**

- [Out-of-order Plotting Code](https://github.com/gzahn/Data_Course/blob/master/Exercises/out-of-order_CO2_plot.R){target="_blank"}
- ggplot [Shiny App](https://huygens.science.uva.nl/ggPlotteR/){target="_blank"} Lets you use GUI to see ggplot code.
- Convert the following code expressions into "pipe format" to make them more readable:

```{r,eval=FALSE}
unique(stringr::str_to_title(iris$Species))
max(round(iris$Sepal.Length),0)
mean(abs(rnorm(100,0,5)))
median(round(seq(1,100,0.01),1))
```
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```

* *
*```{r, out.width = "350px",echo=FALSE}*
*knitr::include_graphics("./media/gganimate.gif")*
*```*
* *

*### **Week 5**{#Week-5}*
***Topics***

*- More ggplot | ggplot extensions*

***Assignments***

*- Assignment 5 - [Ugly plot contest!](https://gzahn.github.io/data-course/uglyplotcontest.html){target="_blank"}*
*- Prevent embarrassment... see how [NOT to make a chart](https://gzahn.github.io/data-course/embarrassment.html){target="_blank"}, except for the Ugly Plot Contest, of course, where you should try to upend good sense.*

***Resources***

*- ggimage [package](https://mran.microsoft.com/snapshot/2018-05-23/web/packages/ggimage/vignettes/ggimage.html){target="_blank"}*
*- ggforce [package](https://ggforce.data-imaginist.com/){target="_blank"}*
*- patchwork [package](https://patchwork.data-imaginist.com/){target="_blank"}*
*- ggpubr [package](https://rpkgs.datanovia.com/ggpubr/){target="_blank"}*
*- gganimate [package](https://www.datanovia.com/en/blog/gganimate-how-to-create-plots-with-beautiful-animation-in-r/#comments){target="_blank"}*
*- Awesome curated [list of ggplot extensions](https://github.com/erikgahner/awesome-ggplot2){target="_blank"} (an overwhelming amount of resources, but if you need something it is probably in here)*

***Practice***

*- [ggplot Examples](https://github.com/gzahn/Data_Course/blob/master/Code_Examples/ggplot_intro.R){target="_blank"}*

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*## Clean and Transform Data*

* *
*```{r, out.width = "350px",echo=FALSE}*
*knitr::include_graphics("../media/sepalwidth.jpg")*
*```*
* *

*### **Week 6**{#Week-6}*
***Topics***

*- Tidy Data | dplyr verbs | tidyr verbs*

***Assignments***

*- Read this paper: [Tidy Data](https://github.com/gzahn/Data_Course/blob/master/Readings/tidy-data_Wickham.pdf){target="_blank"}*
*- [Assignment 6](https://gzahn.github.io/data-course/Repository/Assignments/Assignment_6/Assignment_6.html){target="_blank"}*

***Resources***

*- [Tidy Data Chapter](https://r4ds.had.co.nz/tidy-data.html#tidy-data-1){target="_blank"}*
*- [Transforming Data Frames](https://r4ds.had.co.nz/transform.html){target="_blank"}*
*- [tidyr Verbs](https://tidyr.tidyverse.org/){target="_blank"}*

***Practice***

*- [Out-of-order Code](https://gzahn.github.io/data-course/Repository/Exercises/out-of-order_CO2_plot.R){target="_blank"}*
*- [Out-of-order Code2](https://gzahn.github.io/data-course/Repository/Exercises/out-of-order_grading_code.R){target="_blank"}*

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* *
*```{r, out.width = "350px",echo=FALSE}*
*knitr::include_graphics("../media/real_world_data.jpg")*
*```*
* *

*### **Week 7**{#Week-7}*
***Topics***

*- Data Wrangling | Joins | [The Curse of Other Peoples' Data](https://gzahn.github.io/media/data_science_workflow.png){target="_blank"}*

***Assignments***

*- Read [This Handout](https://gzahn.github.io/data-course/Readings/Excel_Advice_Handout.pdf)*
*- Read [This Paper](https://gzahn.github.io/data-course/Readings/Broman_and_Woo_2017_Data_organization_in_spreadsheets.pdf)*
*- [Assignment 7](https://gzahn.github.io/data-course/Repository/Assignments/Assignment_7/Assignment_7.html){target="_blank"}*
*- Be prepared to discuss your data set for your final project*

***Resources***

*- [Data Wrangling Chapter](https://r4ds.had.co.nz/wrangle-intro.html){target="_blank"}*
*- [Wrangling Cheat Sheet](https://rstudio.com/wp-content/uploads/2015/02/data-wrangling-cheatsheet.pdf){target="_blank"}*
*- [Visual Explanations of Joins](https://github.com/gadenbuie/tidyexplain){target="_blank"}*
*- Janitor package on [CRAN](https://cran.r-project.org/web/packages/janitor/index.html){target="_blank"}*
*- Rstats [illustrations](https://github.com/allisonhorst/stats-illustrations){target="_blank"}*

*- Working with [strings and regular expressions](https://craig.rbind.io/post/2020-06-28-asgr-2-3-string-manipulation/){target="_blank"} using the *stringr* package*
*- How Excel actually *killed* people [news article](https://www.theguardian.com/politics/2020/oct/05/how-excel-may-have-caused-loss-of-16000-covid-tests-in-england){target="_blank"}*

***Practice***

*- Download [this spreadsheet](https://github.com/gzahn/Tidy_Data_Workshop/raw/master/Worst%20Data%20Storage%20Ever.xlsx){target="_blank"}. See if you figure out all the things wrong with it.*
*- [Error Sleuth Practice](https://gzahn.github.io/data-course/Repository/Exercises/error_sleuth_pt1.R){target="_blank"}*
*- [Data Entry Case Study](https://gzahn.github.io/data-course/Repository/Exercises/Data_Entry_Case_Study.txt){target="_blank"}*

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*## Getting More From R*

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*```{r, out.width = "350px",echo=FALSE}*
*knitr::include_graphics("../media/function.png")*
*```*
* *

*### **Week 8**{#Week-8}*
***Topics***

*- Writing Functions | Conditional Execution | source()*

***Assignments***

*- Watch [this video](https://resources.rstudio.com/rstudio-conf-2020/object-of-type-closure-is-not-subsettable-jenny-bryan){target="_blank"} from Jenny Bryan about debugging*
*- Read [this chapter](https://r4ds.had.co.nz/functions.html){target="_blank"} and do all the exercises in it as you read*
*- #### **Exam 2** (Link at top of page)*

***Resources***

*- [Functions](https://r4ds.had.co.nz/functions.html){target="_blank"}*
*- [Conditional Execution](https://r4ds.had.co.nz/functions.html#conditional-execution){target="_blank"}*
*- Functionals and the *purrr* package [chapter](https://adv-r.hadley.nz/functionals.html){target="_blank"}*

***Practice***

*- Write a function that returns the min, max, and mean of any set of real numbers*
*- Write a function that takes a data frame and returns a new data frame with one **random** column removed*
*- Fix my out-of-order [code](https://gzahn.github.io/data-course/Repository/Exercises/out_of_order_function.R){target="_blank"} for a summarizing function*

*- Write a function that takes a data frame... if there are more than 3 columns, your function should return the column names as-is; if there are 3 or fewer columns, your function should return the column names in **reverse order.***
*- Write a **useful** function that you might want to use in the future (your choice)*
*- Put all of these functions into a new R script and save it in **your** main data course repository*
*- In a new empty R script, call your functions with source() and test them out*
*- There's a stupid function I wrote in "/Code_Examples/thlayli.R"*
*+ It takes a data.frame as an input and does *WHAT* to it?*

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*```{r, out.width = "350px",echo=FALSE}*
*knitr::include_graphics("../media/model1.png")*
*```*
* *

*## Model Building and Testing*

*### **Week 9**{#Week-9}*
***Topics***

*- Building and Testing Models*

***Assignments***

*- [Assignment 8](https://gzahn.github.io/data-course/Repository/Assignments/Assignment_8/Assignment_8.html){target="_blank"}*

***Resources***

*- Recorded lesson [video](https://youtu.be/tjJZVUwLxOs){target="_blank"} (Part 1 - Intro to linear models)*
*- What is a [statistical model?](https://help.xlstat.com/s/article/what-is-statistical-modeling?language=en_US){target="_blank"}*
*- [Modeling Intro](https://r4ds.had.co.nz/model-intro.html){target="_blank"}*
*- [Model Basics](https://r4ds.had.co.nz/model-basics.html){target="_blank"}*
*- [Model Fitting](https://r4ds.had.co.nz/model-building.html){target="_blank"}*
*- [Model Performance](https://easystats.github.io/performance/){target="_blank"}*
*- Interpreting models with [easystats](https://github.com/easystats/easystats){target="_blank"}*
*- [Machine learning models explained](https://mlu-explain.github.io/){target="_blank"}*

***Practice***

*- [Building Models Example](https://github.com/gzahn/Data_Course/blob/master/Code_Examples/building_basic_models.R)*
*- [Intro to Hypothesis Testing](https://github.com/gzahn/Data_Course/blob/master/Code_Examples/hyp_testing_intro.R)*
*- [Cross-Validation and Logistic Regression](https://github.com/gzahn/Data_Course/blob/master/Code_Examples/simple_regression.R)*

* *
*```{r, out.width = "350px",echo=FALSE}*
*knitr::include_graphics("../media/logistic.jpg")*
*```*
* *

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*### **Week 10**{#Week-10}*
***Topics***

*- More models | Statistical Tests*

***Assignments***

*- Show up to class. Models are confusing at first and there's a lot to learn.*
*- Ask questions during class.*

***Resources***

*- [Linear Regression](http://r-statistics.co/Linear-Regression.html){target="_blank"}*
*- [More Linear Regression](https://www.dataquest.io/blog/statistical-learning-for-predictive-modeling-r/){target="_blank"}*
*- [Common Statistical Tests](http://r-statistics.co/Statistical-Tests-in-R.html){target="_blank"}*
*- Most stats test are really [just linear regression models!](https://lindeloev.github.io/tests-as-linear/){target="_blank"}*
*- [Everything is a Regression](https://towardsdatascience.com/everything-is-just-a-regression-5a3bf22c459c){target="_blank"}*
*- [Mixed-effect Models](https://peerj.com/articles/4794/){target="_blank"}*
*- [Introduction to mixed effects models](https://peerj.com/articles/4794/){target="_blank"} This is a VERY good paper!*
*- How to use [lmer](https://rstudio-pubs-static.s3.amazonaws.com/63556_e35cc7e2dfb54a5bb551f3fa4b3ec4ae.html){target="_blank"}*
*- Comparing multiple models with [regression tables](https://evalsp20.classes.andrewheiss.com/reference/regtables/){target="_blank"}*
*- Intro to Machine Learning [online text](https://lgatto.github.io/IntroMachineLearningWithR/an-introduction-to-machine-learning-with-r.html){target="_blank"}*
*- The best way to get into machine learning with R is with the [tidymodels](https://www.tidymodels.org/){target="_blank"} package ecosystem*
*- Free book on [tidy modeling with R](https://www.tmwr.org/){target="_blank"}*
*- See also the [tidyclust](https://github.com/EmilHvitfeldt/tidyclust){target="_blank"} package for clustering algorithms*
*- Free case studies using [Machine Learning in R](https://supervised-ml-course.netlify.app/){target="_blank"}*
*- Awesome student-made [repository](https://github.com/austenapigo/GLAMM-Generalized-Linear-Additive-Mixed-Models){target="_blank"} featuring good explanations of different GLAMM models*

***Practice***

*- Go through the R script [more_models.R](https://gzahn.github.io/data-course/Repository/Exercises/more_models.R){target="_blank"}*
*+ Follow along with my analyses of the first two data sets*
*+ Complete an analysis of the third data set*

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*## Communicating Your Results*

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*```{r, out.width = "350px",echo=FALSE}*
*knitr::include_graphics("../media/rmd.png")*
*```*
* *

*### **Week 11**{#Week-11}*
***Topics***

*- R-Markdown | Reproducible Reports*

***Assignments***

*- [Assignment 9](https://gzahn.github.io/data-course/Repository/Assignments/Assignment_9/Assignment_9.html){target="_blank"}*

***Resources***

*- [Intro to R Markdown](https://github.com/cbwall/Intro-to-Rmarkdown){target="_blank"}*
*- [Markdown Live Preview Generator](https://dillinger.io/){target="_blank"}*
*- Expert-Level [Markdown Project](https://github.com/cbwall/Coral-isotopes-across-space-and-time){target="_blank"}*
*- Example data analysis [webpage](https://gzahn.github.io/data-course/Repository/Assignments/Assignment_9/example.html){target="_blank"}*

***Practice***

*- Using the resources above, generate a markdown document that analyzes the "iris" data set and push it to a new GitHub repository named Iris_Markdown*
*- Play with options and code to create a document that looks good and presents your analysis and results clearly*
*- This is similar to Assignment_9, but I'm asking for a brand new "Iris_Markdown" repository that is a self-contained report of Iris analyses*

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*```{r, out.width = "350px",echo=FALSE}*
*knitr::include_graphics("../media/jennybryan.jpeg")*
*```*
* *

*### **Week 12**{#Week-12}*
***Topics***

*- Proper Project Organization | "There's an R-Package for everything"*

***Assignments***

*- Peer evaluation of Assignment 9 HTML reports (Organization, Portability, Accuracy, Understandablity)*
*- #### **Exam 3** (Link at top of page)*

***Resources***

*- Recorded lesson [video](https://youtu.be/EpgfmrZp2-E){target="_blank"} (Part 1)*
*- [Project-oriented Workflows](https://www.tidyverse.org/blog/2017/12/workflow-vs-script/){target="_blank"}*
*- [Reproducible, Portable, Self-Contained](https://ptds2018.netlify.com/tutorials/workflow/){target="_blank"}*
*- [Proper Project Organization Example](https://github.com/gzahn/Data_Course/tree/master/Code_Examples/Example_Project){target="_blank"}*
*- [Another, More Detailed Example](https://www.britishecologicalsociety.org/wp-content/uploads/2017/12/guide-to-reproducible-code.pdf){target="_blank"}*
*- [Project organization part 1](https://www.youtube.com/watch?v=dSHGfoHTTko){target="_blank"} video*
*- [Project organization part 2](https://www.youtube.com/watch?v=1ntfdvkQZFg){target="_blank"} video*

***Practice***

*- Peer evaluations of Iris_Markdown repositories (from last week); Clean them up and make them more organized*

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*<style>*
*div.gray { background-color:#aabdaf; border-radius: 5px; padding: 20px;}*
*</style>*
* *

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*```{r, out.width = "350px",echo=FALSE}*
*knitr::include_graphics("../media/aliens.jpg")*
*```*
* *

*## Putting it all together*

*### **Week 13**{#Week-13}*
***Topics***

*- Data Analysis from raw to report*

***Assignments***

*- We will work together in class to do a complete analysis in real-time*
*- The rest of the semester will focus on live-coding as we work on your final projects*

***Resources***

*- [Benefits of Live Coding](https://gzahn.github.io/Readings/LiveCoding.pdf){target="_blank"}*

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*```{r, out.width = "350px",echo=FALSE}*
*knitr::include_graphics("../media/404.PNG")*
*```*
* *

*### **Week 14**{#Week-14}*
***Topics***

*- Building a website with GitHub and R-Markdown*

***Assignments***

*- Work on Final Project*
*- Create a GitHub Personal Website*
*- Upload a brief CV and the updated (improved) html of Assignment 9 to your new website*

***Resources***

*- Recorded lesson [video](){target="_blank"} (Recorded during class and posted after)*
*- [GitHub Pages](https://pages.github.com/){target="_blank"}*
*- Here's the [GitHub repository for this course website](https://github.com/gzahn/gzahn.github.io/){target="_blank"}*
*- Rmarkdown to web page walkthrough [video](https://www.youtube.com/watch?v=2-8-L1ltdx0){target="_blank"}*
*- Reproducible workflow [video](https://youtu.be/s3JldKoA0zw){target="_blank"}*

***Practice***

*- Go through my course website repository (link above) and try to relate the code there to the html version of the website your internet browser displays*
*- Work on your personal website:*
*+ Add multiple pages with internal links*
*+ Be sure to have a "Projects" page that links to HTML reports you've made, including your final project*
*+ Be careful not to push any files larger than 50Mb to GitHub or it will break your repository!*

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*```{r, out.width = "350px",echo=FALSE}*
*knitr::include_graphics("../media/final.png")*
*```*
* *

*### **Week 15**{#Week-15}*
***Topics***

*- Intro to genetic data in R*

***Assignments***

*- Work on Final Project*
*- [Assignment 10](https://gzahn.github.io/data-course/Repository/Assignments/Assignment_10/Assignment_10.html){target="_blank"} (Draft of final code)*

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*### **Week 16**{#Week-16}*
***Topics***

*- TBD*

***Assignments***

*- #### **Exam 4** (Redo any previous exam to replace it's score)*

## *Required Course Syllabus Statements*

**Generative AI**
*Use of generative AI is encouraged in this course. We will spend time using it together.*

**Using Remote Testing Software**
☒ This course does not use remote testing software.

☐ This course uses remote testing software. Remote test-takers may choose their remote testing locations. Please note, however, that the testing software used for this may conduct a brief scan of remote test-takers' immediate surroundings, may require use of a webcam while taking an exam, may require the microphone be on while taking an exam, or may require other practices to confirm academic honesty. Test-takers therefore shall have no expectation of privacy in their test-taking location during, or immediately preceding, remote testing. If a student strongly objects to using test-taking software, the student should contact the instructor at the beginning of the semester to determine whether alternative testing arrangements are feasible. Alternatives are not guaranteed.

## *Required University Syllabus Statements*

**Accommodations/Students with Disabilities**
Students needing accommodations due to a permanent or temporary disability, pregnancy or pregnancy-related conditions may contact UVU Accessibility Services at accessibilityservices@uvu.edu or 801-863-8747.

Accessibility Services is located on the Orem Campus in BA 110.

Deaf/Hard of Hearing students requesting ASL interpreters or transcribers can contact Accessibility Services to set up accommodations. Deaf/Hard of Hearing services can be contacted at DHHservices@uvu.edu

DHH is located on the Orem Campus in BA 112.

**Academic Integrity**
At Utah Valley University, faculty and students operate in an atmosphere of mutual trust. Maintaining an atmosphere of academic integrity allows for free exchange of ideas and enables all members of the community to achieve their highest potential. Our goal is to foster an intellectual atmosphere that produces scholars of integrity and imaginative thought. In all academic work, the ideas and contributions of others must be appropriately acknowledged and UVU students are expected to produce their own original academic work.

Faculty and students share the responsibility of ensuring the honesty and fairness of the intellectual environment at UVU. Students have a responsibility to promote academic integrity at the university by not participating in or facilitating others' participation in any act of academic dishonesty. As members of the academic community, students must become familiar with their rights and responsibilities. In each course, they are responsible for knowing the requirements and restrictions regarding research and writing, assessments, collaborative work, the use of study aids, the appropriateness of assistance, and other issues. Likewise, instructors are responsible to clearly state expectations and model best practices.

Further information on what constitutes academic dishonesty is detailed in UVU Policy 541: *Student Code of Conduct*.

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**Equity and Title IX**

Utah Valley University does not discriminate on the basis of race, color, religion, national origin, sex, sexual orientation, gender identity, gender expression, age (40 and over), disability, veteran status, pregnancy, childbirth, or pregnancy-related conditions, citizenship, genetic information, or other basis protected by applicable law, including Title IX and 34 C.F.R. Part 106, in employment, treatment, admission, access to educational programs and activities, or other University benefits or services. Inquiries about nondiscrimination at UVU may be directed to the U.S. Department of Education's Office for Civil Rights or UVU's Title IX Coordinator at 801-863-7999 – TitleIX@uvu.edu – 800 W University Pkwy, Orem, 84058, Suite BA 203.

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**Religious Accommodation**

UVU values and acknowledges the array of worldviews, faiths, and religions represented in our student body, and as such provides supportive accommodations for students. Religious belief or conscience broadly includes religious, non-religious, theistic, or non-theistic moral or ethical beliefs as well as participation in religious holidays, observances, or activities. Accommodations may include scheduling or due-date modifications or make-up assignments for missed class work.

To seek a religious accommodation, a student must provide written notice to the instructor and the Director of Accessibility Services at accessibilityservices@uvu.edu. If the accommodation relates to a scheduling conflict, the notice should include the date, time, and brief description of the difficulty posed by the conflict. Such requests should be made as soon as the student is aware of the prospective scheduling conflict.

While religious expression is welcome throughout campus, UVU also has a specially dedicated space for meditation, prayer, reflection, or other forms of religious expression.