

CS 590 Special Topics: Programming and Data Science for Applied Research

	R programming	Python Programming
Time	<i>M, 1:30 - 2:45 pm</i>	<i>M, 3:00 - 4:15 pm</i>
Week 1	Anaconda Distribution Install and Overview; Anaconda Prompt Setup for Jupyter Notebook Install; Jupyter Notebooks and Course Overview	
Week 2	Introduction to R Basics Arithmetic in R Variables R Basic Data Types List Basics Vector Basics Vector Operations Comparison Operators Vector Indexing and Slicing R Basics Training Exercise	Introduction to Python Basics Arithmetic in Python Variables Strings Indexing and Slicing with Strings Print Formatting List Basics Dictionary Basics Tuples with Python Sets in Python Booleans in Python Comparison Operators Python Basics Training Exercise
Week 3	R Basics Training Exercise - Solutions Introduction to R Matrices Creating a Matrix Matrix Arithmetic Matrix Operations Matrix Selection and Indexing Factor and Categorical Matrices Matrix Training Exercises	Python Basics Training Exercise - Solutions Introduction to Numpy Numpy Arrays Numpy Array Indexing and Slicing Numpy Matrices Numpy Matrix Arithmetic Numpy Matrix Operations Numpy Training Exercise
Week 4	Matrix Training Exercises - Solutions Introduction to R Data Frames Data Frame Basics Data Frame Indexing and Selection Data Frame Operations Data Frame Training Exercise	Numpy Training Exercise - Solutions Introduction to Pandas Pandas Series Pandas DataFrame Basics Pandas DataFrame Operations Pandas DataFrame Training Exercise
Week 5	Data Frame Training Exercise - Solutions Introduction to Data Input and Output with R CSV Files with R Excel Files with R SQL with R Web Scraping with R	Pandas DataFrame Training Exercise - Solutions Introduction to Data Input and Output with Python I/O File Basics CSV Files with Pandas Excel Files with Pandas Web Scraping with Python

Week 6	Introduction to Programming Basics (Part I) Logical Operators IF, ELSE and ELSE IF Statements Conditional Statements Training Exercise	Introduction to Programming Basics (Part I) Logical Operators IF, ELSE and ELSE IF Statements Conditional Statements Training Exercise
Week 7	Conditional Statements Training Exercise - Solutions Introduction to Programming Basics (Part II) While Loops For Loops Functions Functions Training Exercise	Conditional Statements Training Exercise - Solutions Introduction to Programming Basics (Part II) While Loops For Loops Functions Functions Training Exercise
Week 8	Functions Training Exercise - Solutions Advanced R Programming Built-in R Features Apply Math Functions in R Regular Expressions Dates and Timestamps Advanced R Programming Training Exercise	Functions Training Exercise - Solutions Advanced Python Programming Built-in Python Features Lambda Expressions Map Function in Python Filter Function in Python Advanced Python Programming Training Exercise
Week 9	Advanced R Programming Training Exercise - Solutions Data Manipulation in R Dplyr Pipe Operator TidyR Data Manipulation Training Exercise	Advanced Python Programming Training Exercise - Solutions Introduction to Object Oriented Programming in Python Attributes and Class Keyword Class Object Attributes and Methods Inheritance, Polymorphism and Special Methods Object Oriented Programming Training Exercise
Week 10	Guest Lecturer: SQL Programming and Data Visualizations using Tableau	
Week 11	Data Manipulation Training Exercise - Solutions Data Visualizations with R ggplot2 Basics Two-variable plotting Corrdinates and Faceting Themes Interactive Plots with Plotly	Object Oriented Programming Training Exercise - Solutions Data Visualizations in Python Matplotlib Seaborn Pandas Built-in Data Visualizations Plotly and Cufflinks Geographical Plotting

	ggplot2 Training Exercise	Data Visualizations in Python Training Exercise
Weeks 12-15	ggplot2 Training Exercise - Solutions	Data Visualizations in Python Training Exercise - Solutions
	Introduction to Machine Learning	Introduction to Machine Learning
	Linear Regression	Linear Regression
	Logistic Regression	Logistic Regression
	K Nearest Neighbors	K Nearest Neighbors
	Decision Trees and Random Forests	Decision Trees and Random Forests
	Support Vector Machines	Support Vector Machines
	Principal Component Analysis	Principal Component Analysis
	K-Means Clustering	K-Means Clustering
	Neural Networks	Neural Networks
Final (12/16)	2414 Williams Hall, Course Project Presentations	