

ITMD/ITMS/STAT 514: Programming for Data Analytics/Cyber Security

Spring 2022

Instructor: Dr. Yuhan Ding

Lectures: Monday and Wednesday, 5 : 00 PM~ 6 : 15 PM @PH 131

Office Hours: Monday and Wednesday, 3 : 30 PM ~ 4 : 30 PM or by appointment

Lecture Zoom Meeting **Meeting ID:** 830 1102 7856 **Passcode:** 434212

Email: yding2@iit.edu

Textbook:

1. R for Data Science by Garrett Golemund and Hadley Wickham, available freely online.
2. An Introduction to Statistical Learning: with Applications in R by James, Witten, Hastie, and Tibshirani (Springer Texts in Statistics), ISBN-10: 1461471370.
3. Data Science Using Python and R, ISBN-10: 1119526817. (You can access the e-version via IIT library)

Other required material: This course requires the use of statistical programming language R and Python and writing reports and homeworks in Markdown. Students are expected to have available to them Python Anaconda (miniconda), R and RStudio. Online reading materials and resources will be made available to the students during the course.

Other references: An Introduction to statistical inference and its applications with R, ISBN-10: 1584889470, and Probability and Statistics for Engineers and Scientists, 9780321629111.

Course Objectives:

1. Students will become familiar with the fundamental statistical concepts underlying analytics, including basics on data, samples, populations, randomness, modeling of random phenomena, and steps required for extracting information from data in general.
2. Students will develop the ability to recognize what descriptive statistics and predictive models are typically used in various applied scenarios through a set of illustrative use cases.
3. Students will gain practical skills of programming in R and Python for analytics, with the goal of implementing the systematic data analysis algorithms and obtaining information from them.
4. Students will understand how to perform data preprocessing and visualization techniques and generate descriptive statistics.
5. Students will learn to apply predictive models on data and evaluate models using model diagnostics and model fitting tests.

Homework:

Homework will be weekly or biweekly based. You are supposed to do all problems and submit them on time to receive full consideration. Students are encouraged to discuss homework sets together, but you have to finish the homework by your own. **No late homework will be accepted.** You can request an extension before the deadline. Under no circumstances may you copy solutions from

any other sources.

Exams:

There will be **one midterm exam** and a final project. I will give at least one-week notice in class of the upcoming midterm exam. You must have a doctor's note or University authorized excuse in order to make up a missed test. The exam problems will be similar to those from the homework. Thus, if a student has made a good attempt at the homework and understand all homework problems, he/she should do well on the exams.

Final Project:

This is a group project for groups of **three or fewer**. Each group must do their own work. The project is to explore a dataset and analyze it. The analysis should include at least one Hypothesis testing and one regression model. Please prepare a 25-minute (+5 minute question & answer) oral presentation. You can find the instruction on Blackboard.

Assessment:

Homework: 25%, Midterm: 35%, Final Project: 40%.

A	B	C	E
85% and above %	70%-84%	60%-69%	< 60%

Course Plan (tentative):

Time	Date	Topic/Activities
Week 1	1/10, 1/12	Framework for Viewing Data & Intro to R/Python/Markdown
Week 2	1/19	Intro to Probability and Statistics
Week 3	1/24, 1/26	Population attributes and sampling distributions
Week 4	1/31, 2/2	Inference
Week 5	2/7, 2/9	Statistics and sampling distributions for one-and two-sample location and scale problems
Week 6	2/14, 2/16	EDA
Week 7	2/21, 2/23	Confidence Intervals
Week 8	2/28, 3/2	Hypothesis Testing and P-values
Week 9	3/7, 3/9	Midterm
Spring Break	No classes	
Week 10	3/21, 3/23	Intro to Statistical Learning
Week 11	3/28, 3/30	Model Accuracy & Intro to Regression
Week 12	4/4 4/6	Correlation and Subset Selection
Week 13	4/11 , 4/13	Regression: Model Diagnostics and Extensions
Week 14	4/18, 4/20	Cross-Validation
Week 15	4/25, 4/27	Final Presentation

Illinois Techs Sexual Harassment and Discrimination Information:

Illinois Tech prohibits all sexual harassment, sexual misconduct, and gender discrimination by any member of our community. This includes harassment among students, staff, or faculty. Sexual harassment of a student by a faculty member or sexual harassment of an employee by a supervisor is particularly serious. Such conduct may easily create an intimidating, hostile, or offensive environment.

Illinois Tech encourages anyone experiencing sexual harassment or sexual misconduct to speak with the Office of Title IX Compliance for information on support options and the resolution process.

You can report sexual harassment electronically at iit.edu/incidentreport, which may be completed anonymously. You may additionally report by contacting the Title IX Coordinator, Virginia Foster at foster@iit.edu or the Deputy Title IX Coordinator at eespeland@iit.edu.

For confidential support, you may reach Illinois Techs Confidential Advisor at (773) 907-1062. You can also contact a licensed practitioner in Illinois Techs Student Health and Wellness Center at student.health@iit.edu or (312)567-7550.

For a comprehensive list of resources regarding counseling services, medical assistance, legal assistance and visa and immigration services, you can visit the Office of Title IX Compliance website at <https://www.iit.edu/title-ix/resources>.

COVID-19 Precautions and Face Coverings in Class

Illinois Tech students are required to wear face coverings indoors, regardless of vaccination status. Students who are feeling ill or experiencing symptoms such as sneezing, coughing, or a higher than normal temperature will be excused from class and are expected to stay at home.

Instructors have the right to ask those who are not complying with these requirements to leave class in the interest of everyone's health and safety. In the event that a student refuses to comply with instructor directions regarding face masks, the instructor has the right to ask the student to leave, and/or cancel class. A student who refuses to comply with these requirements will be referred to the Office of the Dean of Students for possible disciplinary action under the Student Code of Conduct.

Additionally, as a reminder, following other simple practices such as frequent and thorough hand washing, wiping down desks and seats with disinfectant wipes when possible, not sharing personal items such as pens and cell phones, and avoiding crowded hallways and other enclosed spaces will promote good health in and out of the classroom.

Visit iit.edu/COVID-19 for details on Illinois Techs response to coronavirus (COVID-19). For information from government authorities, please see the Centers for Disease Control and Prevention website at cdc.gov.

Illinois Techs Academic Integrity:

Illinois Institute of Technology expects students to maintain high standards of academic integrity. Students preparing for the practice of a profession are expected to conform to a code of integrity and ethical standards commensurate with the high expectations that society places upon the practitioners of a learned profession. Therefore, incidents of cheating, plagiarism, or interference with the work of others during an examination will not be tolerated. Such acts of academic dishonesty will be reported to the Dean of Students and may be grounds for immediate dismissal from the class with a grade of E.

Illinois Techs ADA Statement:

Reasonable accommodations will be made for a student with a documented disability. In order to receive such considerations, the student must obtain a Letter of Accommodation from the Center for Disability Resources. He/she should then schedule an appointment to discuss the matter with the course instructor as early in the term as possible. The Center for Disability Resources (CDR) is located at 3424 S. State St., room 1C3-2 (on the first floor). Call (312)567-5744 or email disabilities@iit.edu for further details.

Feedback:

I will be more than happy to discuss with you any questions regarding the class. If you have any questions, recommendations, please feel free to visit my office hours or arrange an appointment.