IDST 290.002: DATA SCIENCE FOR COVID-19

Fall Semester 2020

Faculty Coordinators

Jan Hannig	Richard Smith	Serhan Ziya
(email redacted)	(email redacted)	(email redacted)

Course Information

Graduate Instructors:	Alexander Murph		Benjy Leinwand
	(email redacted)		(email redacted)
Time // Place:	M&W 09:20-10:10	//	Remote instruction

Important Links:

1. https://sakai.unc.edu ; for course materials and announcements. You should already be added.

2. https://rls.sites.oasis.unc.edu/COVID.html ; for relevant articles and useful links to information about our speakers.

3. (zoom link redacted)

4. https://www.gradescope.com/; we will use this portal for all assignment submissions. More details on how to use this portal are available on our Sakai page under the Resources tab. Entry Code: (redacted)

Course Description: The COVID-19 pandemic has stimulated research in many directions. Data scientists have been involved in many ways, including mathematical and computational models for the spread of the disease, statistical analyses of data on cases, hospitalizations and deaths, and models for studying such questions as the impact of testing on the effectiveness of social distancing. For this COVID Investigations course, we will explore the current research on data science and COVID-19 in a way that is accessible to a wide audience. We will also participate in facilitated classroom discussion and writing to engage with the material and explore ways that a Carolina education might position one to contribute to the fight against the disease.

Required Text: None. There will be assigned readings throughout the semester.

Attendance of Lectures: Attendance will be based on the Zoom call's roster and will account for a large portion of your grade. You may miss a single lecture without penalty. Each absence beyond this will result in a reduction of a $\frac{1}{(\text{Total \# lectures} + 1)}$ of your attendance grade. "Podcast classes", which are days where we simply discuss a podcast, count as regular lecture days for the purpose of this policy. Lecture days will always be on a Monday class; Podcast classes may happen on a Monday or a Wednesday (see schedule).

One-on-Ones: One of the required attendances for this class will be a one-on-one with the graduate instructor. This 15 minute get-to-know-you meeting will be a chance to chat about your interests and plans for your time at Carolina. These meetings will be scheduled during the first class session.

Small Group Discussions: At the beginning of the semester, we will split our class into 5 groups. Every Wednesday, you will be expected to meet with your group to have a discussion about the most recent lecture. It is encouraged that you do this during class time, but the group may elect to meet outside of class time as long as this is convenient for *every* member. Each group will be expected to submit a short, 1-page summary of a given Monday's talk by the following Friday. More details concerning the content of these summaries can be found on our Sakai site under the Resources tab.

Preparations for the Lecturers: Before most weekly lectures, a reading will be assigned to prepare for the topics that will be covered. Students will be expected to read this material and be ready to engage with the speaker during the Q&A session. Some lecture days are "podcast" classes; students will be expected to have listened to the podcast before coming to class.

Additionally, twice during the semester, each group will participate in a "preparation session" *that will replace the usual expectation that their group meet to discuss the previous speaker.* These sessions will happen during the usually scheduled time on Wednesday, they will use our usual class Zoom link, and they will be led by the graduate instructor. These sessions will involve a group discussion about the readings, a brainstorming session about the perspective our speaker will bring, and a collaborative development of relevant questions for the speaker. In preparation for these sessions, *each student participating must submit two proposed questions for the speaker by midnight the night before the session.* Scheduling who is expected to participate during which week will be done on the first class session.

Final Assessment Paper: (Due Wednesday, Nov. 18th) Each student will complete a 5-8 page reflection paper. Your paper will include a synthesis of the information learned and your observations of all presentations during the semester, addressing the following:

1. As a result of this class, how do you define and describe data science?

2. How might a data scientist's approach to the issues surrounding the COVID-19 pandemic differ from other fields of study?

3. How has data science already impacted the world's response to the COVID-19 pandemic?

4. Select a data problem covered during an in-class presentation and discuss the importance and significance of it, why it is meaningful to you, describe the local and global implications, and what you feel should be potential next steps in mitigating or furthering the solution this issue.

5. Share the best thing you learned in IDST 290.002 and why it was impactful/significant.

6. Discuss how data science may be incorporated and/or impact your future academic and career plans.

Grading Policy: Attendance (40%), Preparation Sessions/Group Discussions (40%), Final Paper (20%). A grade of 70% or above will be considered a Pass, below this will be considered a Fail.

Office Hours (click on day and time to access Zoom link)		
Instructor	Day and Time (in Military Time)	Password
J. Hannig	(redacted)	—
A. Murph	(redacted)	—
R. Smith	(redacted)	—
S. Ziya	(redacted)	–

A Note on Remote Instruction: While we would like to believe that our team's due diligence means that there will be no technical difficulties with doing this class completely over Zoom, we are aware that this is naive. If you have trouble entering an office hour, joining class, or accessing course material, please reach out to Murph promptly for assistance. If you get disconnected during a class, do not stress about your attendance grade, just attempt to get reconnected as quickly as possible.

Course Schedule

Monday, August 10th	Alexander Murph is the course instructor and a graduate student in the Statistics & Operations Research (STOR) Department at UNC. He is very interested in the interface between statistics/data science and medical care. This class will be for general introductions, a discussion all course requirements, a syllabus review, some details about our speakers and topics, and a scheduling session for various things throughout the semester.

Wednesday, August 12th	No preparation session/group discussions!
Monday, August 17th	First Podcast (in-class discussion)
Wednesday, August 19th	Group discussions and preparation session for Paul Delamater
Monday, August 24th	Dr. Paul Delamater is interested in the geographic aspects of health outcomes and behaviors, as well as health care access and utilization. He uses methods that employ geographic information systems (GIS) and spatial analysis to better understand population health issues. His recent research has focused on understanding childhood vaccination, herd immunity, and vaccine-preventable diseases in the US.
Wednesday, August 26th	Group discussions and preparation session for Richard Smith
Monday, August 31th	Dr. Richard L. Smith has been at UNC since 1991 and is one of the faculty coordinators for this course. He holds a PhD in Operations Research from Cornell University but his primary teaching and research interests are in statistics, especially extreme value theory and environmental statistics. He has long-standing interests and collaborations in air pollution epidemiology, such as analyzing increases in mortality due to high levels of ozone or particulate matter. This class is his first venture into the dynamics of infectious diseases.
Wednesday, September 2nd	Second Podcast (in-class discussion, no group discussions)
Monday, September 7th	LABOR DAY (no class)
Wednesday, September 9th	Preparation session for Christl Donnelly (no group discussions)
Monday, September 14th (Public Lecture)	Dr. Christl Donnelly is Deputy Head of Department for the Department of Statistics at the University of Oxford and Deputy Director of the WHO Collaborating Centre for Infectious Disease Modelling, Department of Infectious Disease Epidemiology, Imperial College London. Her research investigates statistical and biomathematical methods to analyze epidemiological patterns of infectious diseases including Severe Acute Respiratory Syndrome (SARS), Middle East Respiratory Syndrome (MERS), Ebola virus disease, Influenza A virus subtype H1N1, and other zoonoses. She has also worked on animal diseases including Bovine Spongiform Encephalopathy (BSE), hoof-and-mouth disease, and bovine tuberculosis (TB) including evaluation of badger culling to control cattle TB in the United Kingdom. Since the outbreak of COVID-19, she has been a senior member of the Imperial College COVID-19 Response Team whose work has informed government policy in both the UK and US. She obtained a Doctor of Science degree in biostatistics from Harvard University and subsequently held positions at the University of Edinburgh, University of Oxford and Imperial College London. She is a Fellow of the Royal Society and of the Academy of Medical Sciences, and is also a Commander of the Order of the British Empire.
Wednesday, September 16th	Group discussions and preparation session for Jan Hannig

Monday, September 21st	Dr. Jan Hannig is a Professor at the STOR Department and one of the faculty coordinators for this course. He holds a Ph.D. in Statistics and Probability from the Michigan State University (2000). His research interests are theoretical statistics (including foundations of statistics) and applied probability. He loves his job and the opportunity it gives him to pursue his passion of research and learning new things. Statistics and Data Science are truly the most fun discipline in the world because they allow you to get a taste of many different areas of science and engineering.
Wednesday, September 23rd	Group discussions and preparation session for Kimberly Powers
Monday, September 28th	Dr. Kimberly Powers uses epidemiological, statistical and mathematical modeling methods to study infectious disease transmission. Her work focuses on improving understanding of the HIV care continuum and using mathematical models to predict the impact of HIV prevention interventions on HIV transmission. She also develops models of SARS-CoV-2 transmission to inform public health efforts against COVID-19. Dr. Powers earned her PhD in Epidemiology here at Chapel Hill in 2010, and has continued to work in this department as an Associate Professor.
Wednesday, September 30th	Group discussions (no preparation session)
Monday, October 5th	Third Podcast (in-class discussion)
Wednesday, October 7th	Fourth Podcast (in-class discussion, no group discussions)
Monday, October 12th	UNIVERSITY DAY (no class)
Wednesday October 14th	Preparation session for Vukosi Marivate (no group discussions)
Monday, October 19th	Dr. Vukosi Marivate holds a PhD in Computer Science (Rutgers University) and MSc; BSc in Electrical Engineering (Wits University). He is currently based at the University of Pretoria as the ABSA Chair of Data Science and works on developing Machine Learning/Artificial Intelligence methods to extract insights from data. A large part of Dr. Marivate's work over the last few years has been in the intersection of Machine Learning and Natural Language Processing (due to the abundance of text data and need to extract insights). As part of his vision for the ABSA Data Science chair, he is interested in Data Science for Social Impact, using local challenges as a springboard for research. In this area, he has worked on projects in science, energy, public safety and utilities. He is further an organizer of the Deep Learning Indaba, the largest Machine Learning/Artificial Intelligence workshop on the African continent, aiming to strengthen African Machine Learning. He is passionate about developing young talent, supervising MSc and PhD students and mentoring budding Data Scientists.
Wednesday, October 21st	Group discussions and preparation session for Ho Kim

Monday, October 26th	**Dr. Ho Kim** is the Dean of the Graduate School of Public Health, Seoul National University. He earned his PhD in Biostatistics from the University of North Carolina at Chapel Hill, the U.S.A. and joined Seoul National University in 1998. His main research interests lie in climate change, air pollution and their health effects and in methodology developments using statistical models. Professor Kim is the former President of the Korean Society for Health Informatics and Statistics, current Vice-Presidents of the Korean Society for Epidemiology and the Korean Society of Climate Change. He is also an elected Fellow of the National Academy of Medicine of Korea. Professor Kim is the Editor of International Journal of Epidemiology and on the editorial boards of the International Journal of Environmental Research and Public Health. He has published more than 300 peer-reviewed papers on the international journals including The Lancet, Environmental Health Perspectives, Nature Planetary Health and Environment International with topics of air pollution, temperature, diurnal temperature range, mortality, kidney diseases, mental health, etc.
Wednesday, October 28th	Group discussions and preparation session for Peter Frazier
Monday, November 2nd	**Dr. Peter Frazier** received a B.S. in Physics and Engineering/Applied Science from the California Institute of Technology in 2000, after which he spent several years in industry as a software engineer, working for two different start-up companies and for the Teradata division of NCR. In 2005, he entered graduate school in the Department of Operations Research & Financial Engineering at Princeton University, and received an M.A. in 2007 and a Ph.D. in 2009. He joined the faculty at Cornell in 2009 as an Assistant Professor in the School of Operations Research & Information Engineering, where he is now an Associate Professor. His research is in sequential decision-making under uncertainty, optimal methods for collecting information, and machine learning, focusing on applications in simulation, e-commerce, medicine and biology. He is the recipient of a CAREER Award from the National Science Foundation and a Young Investigator Award from the Air Force Office of Scientific Research.
Wednesday, November 4th	Group discussions and preparation for Serhan Ziya
Monday, November 9th	**Dr. Serhan Ziya** is a Professor at the STOR Department and one of the faculty coordinators for this course. He holds a Ph.D. in Industrial and Systems Engineering from the Georgia Institute of Technology (2003). His research interests are in operations research, particularly stochastic modeling, and he is mainly motivated by problems that are related to healthcare operations and emergency response systems. Over the last few months, he has been engaged in several projects that use different data science techniques for developing insights into some of the important policy decisions in connection with the COVID-19 pandemic.
Wednesday, November 11th	Group discussions and preparation session for Sir Dr. David Spiegelhalter

Monday, November 16th (Public Lecture)	Dr. David Spiegelhalter is the Chair of the Winton Centre for Risk and Evidence Communication, and previously was the Winton Professor for the Public Understanding of Risk, at Cambridge University. He is a world-leading expert in Bayesian statistics and its applications in medicine, especially clinical trials. He was one of the team that developed BUGS, the first widely available computing package for Bayesian statistics based on the Gibbs Sampling algorithm. He was one of the pioneers of the approach to statistics based on graphical models, which are widely used in the field of causal analysis. He has been in frequent demand as an expert witness, an advisor to numerous scientific and medical societies and the British government, and has been featured many times in the print media, radio and TV. He was once cited as one of the top six scientists on Twitter. Recently, he has published a book, "The Art of Statistics: How to Learn from Data", which explains the fundamental concepts of statistics in delightfully simple terms for the general reader. He holds numerous honors including Fellow of the Royal Society and the Guy Medal in Gold of the Royal Statistical Society; in 2014 he was knighted for services to statistics.

Honor Code

It shall be the responsibility of every student enrolled at the University of North Carolina to support the principles of academic integrity and to refrain from all forms of academic dishonesty. For the complete honor code, please visit http://instrument.unc.edu/.

In addition, please review the document entitled *Zoom Meeting Code Of Conduct* that is under the Resources tab on our Sakai site. Students are expected to adhere to these expectations while in any of our Zoom meetings.

Accessibility & Diversity Statements

This class follows principles of inclusion, respect, tolerance, and acceptance that support the values of diversity. The University of North Carolina at Chapel Hill is committed to equality of educational opportunity. The University does not discriminate in offering access to its educational programs and activities on the basis of age, color, creed, disability, gender, gender expression, gender identity, genetic information, national origin, race, religion, sex, sexual orientation, or veteran status. The Equal Opportunity and Compliance Office (100 E. Franklin Street, Unit 110, CB #9160, Chapel Hill, NC 27599-9160 or (919) 966-3576) has been designated to handle inquiries regarding the University's non-discrimination policies. http://policies.unc.edu/policies/nondiscrim/

The University of North Carolina at Chapel Hill facilitates the implementation of reasonable accommodations, including resources and services, for students with disabilities, chronic medical conditions, a temporary disability or pregnancy complications resulting in difficulties with accessing learning opportunities.

All accommodations are coordinated through the Accessibility Resources and Service Office. See the ARS Website for contact information: https://ars.unc.edu or email ars@unc.edu.

Relevant policy documents as they relation to registration and accommodations determinations and the student registration form are available on the ARS website under the About ARS tab.