STA 363: Intro to Statistical Modeling
Fall 2020

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Bulletin Description

Applications of statistics using regression and design of experiments techniques. Regression topics include simple linear regression, correlation, multiple regression and selection of the best model. Design topics include the completely randomized design, multiple comparisons, blocking, and factorials.

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Prerequisites

An introductory statistics course: STA261, 301 or ISA 205, 225. STA 363 may NOT be taken after credit has been earned for STA 463/STA 563.

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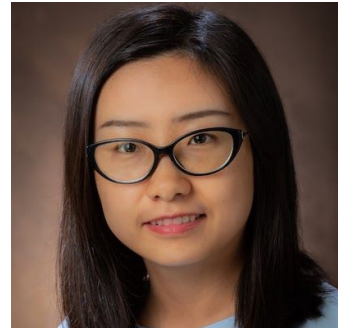## Section and Instructor Information

Section A: Mon & Wed 8:30am-9:50am

- Instructor: **Michael Hughes**

- Email*: hughesmr@miamioh.edu*

- Office hours: Zoom drop-in and by appointment (see email with details)

Section B: Mon & Wed 10:05am-11:25am

- Instructor: **Xin Wang**
- Email: *wangx172@miamioh.edu*
- Office hours: Zoom drop-in and by appointment (see email with details)

Section C: Mon & Wed 11:40am-1:00pm

- Instructor: **Michael O'Connell**
- Email: *oconnemj@miamioh.edu*
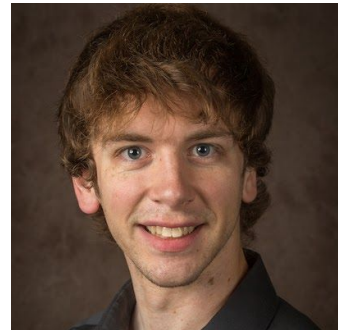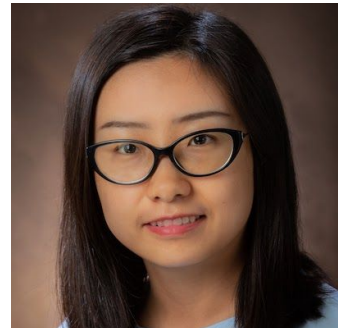- Office hours: Zoom drop-in and by appointment (see email with details)

Section D: Mon & Wed 1:15pm-2:35pm

- Instructor: **Xin Wang**
- Email: *wangx172@miamioh.edu*
- Office hours: Zoom drop-in and by appointment (see email with details)

Section E: Mon & Wed 1:15pm-2:35pm

- Instructor: **Thomas Fisher**

- Email: *fishert4@miamioh.edu*

- Office hours: Zoom drop-in and by appointment (see email with details)

Undergraduate Associates

Four previous STA 363 students will be serving as Undergraduate Associates (UA) this upcoming semester. Their primary responsibilities will be to offer some drop-in (via zoom or similar virtual conferencing tool) help sessions and monitor and contribute to the discussion boards on canvas. This semester the UA's are

- Taylor Garbenis
- Varun Vasudeva
- Wangying Yang
- Zhanbei Liu

If you enjoy STA 363 this semester and would be interested in serving as a UA in the future, please contact your instructor near the end of the semester to express your interest!

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Detailed Class Description

STA 363 has been designed to be an interactive course where you perform statistical analyses as they are performed in the real world. Beginning on day 1 you will be generating reports that perform statistical analysis. As the semester progresses and your computing skills develop, you will learn to embed an analysis with computer output in a well-formatted generated report.

In many ways the class has been designed as a *sneak-peak* for the Data Science & Statistics major, while also providing students outside that major with the opportunity to learn how to perform some hands-on statistical analyses. The class includes introductory material that will later be covered in more detail in other upper-level statistics courses, including STA 404 (Advanced Data Visualization), STA 463 (Regression Analysis), STA 466 (Experimental Design Methods) and STA 467 (Statistical Learning).

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Class Topics

The class covers the following topics that are designed to built upon one-another:

- **≈ 1-2 weeks:** Introduction to R, RStudio, RMarkdown; data handling and a review of Intro stat material.
- **≈ 3 weeks:** Experimental design topics, one-way ANOVA, two-way ANOVA, blocking, repeated measures and within-subjects designs.
- **≈ 3 weeks:** Multiple regression, models, inference, residual analysis, and related topics
- **≈ 3 weeks:** Advanced regression ideas, model building, cross-validation
- **≈ 3 weeks:** Statistical odds and their interpretation; logistic and Poisson regression

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Class Format

Although this class is being implemented online, it is designed to be very interactive, requiring regular student participation. The class is being structured as 13 modules or units, where we will complete a module a week. The modules are structured such that they build upon one-another. Each module will consist of video lectures, video viewing quizzes, "in-class" assignments and a summative end-of-week quiz. Occasionally we will deviate from the following class format (particularly in week 1, 7 and 14) but this is the basic structure of each module:

- **Thursday evening:** Next week's module will be *published* on Canvas
    - All videos, lecture materials and Review Quizzes will be available
- **Sunday at midnight:** Video Review Quiz for Monday class is due
- **Monday (class time):** An "in-class" activity will be assigned, faculty may assist in a synchronous video meeting or students may be required to work asynchronously. Group work is encouraged and may be required on some assignments. Assignment due at midnight with an 8-hour *grace* period.
- **Tuesday at midnight:** Video Review Quiz for Wednesday class is due
- **Wednesday (class time):** Similar to Monday, an activity will be assigned, due at midnight, with an 8-hour *grace* period.
- **Thursday:** End-of-week summative module assessment quiz is available
- **Friday at midnight:** End-of-week summative module assessment quiz is due.

NOTE: All due dates and times will be in Eastern Daylight Time and no late assignments will be accepted.

Lectures

The lectures in this course will consist of posted videos outlining posted notes, along with readings from the textbook. On occasion, we may cover additional material in a synchronous virtual classroom.

Review Quizzes

There will be a short video & note 'review quiz' after each posted "lecture" to Canvas. These quizzes are meant to be "low stakes" and are designed for you to assess your understanding of the fundamental material covered in the lectures. We may use the results of these quizzes to highlight certain widely-missed topics during the in-class discussions on Mondays or Wednesday.

In-class Assignments

You learn software and statistical methods by doing them! Expect to regularly work on problems during the class time, generally in pairs or groups (but individual in-class assignments may be assigned). These assignments consist of learning software to perform statistical analysis. These assignments will be due by midnight on the day of the assignment, with a built-in 8-hour *grace* period.

In-Class meetings and drop-in hours

Throughout the semester we will regularly meet during the allocated class time through a video conferencing platform. In this class we intend to use zoom as this feature allows us to separate the class into "breakout" sessions where you can work in smaller groups with your peers. During large class meetings we ask that you mute your video and audio while the instructor is covering material. To get the instructors attention you can raise your hand through the participants window. During group times, you are encouraged to communicate and will be free to share your screens.

Drop-in office hours are of course optional, but will be conducted through a virtual zoom meeting as well. Faculty will use the "waiting room" feature for drop-ins to protect the privacy of student meetings (e.g., if discussing grades).

Each faculty member will send out notification of the meetings via email and/or a google calendar invite.

Some of the synchronous sessions in this course will be recorded. Such recordings will only be available to students registered for this class. The faculty member will provide you notice if any of these recordings will be shared with anyone outside of this course, and will obtain your prior written consent before sharing. These recordings are the intellectual property of the faculty member and Miami University and may not be shared or reproduced without the explicit, written consent of the faculty member and Miami University. Further, students may not share these sessions with those not in the

class, or upload them to any other online environment. Doing so would be a breach of the Code of Student Conduct.

Module Assessment Quizzes

At the conclusion of each week there will be a quiz that provides a summative assessment of your understanding of the material in the module. This quiz is of higher stakes compared to the review quizzes and is designed to assess your overall learning of the material. Material on these quizzes will be composed of that from both lecture and "in-class"assignments.

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Homeworks

Homeworks will be assigned throughout the semester (anticipating 7 assignments) as an effort to assess your overall comprehension of the material. The first assignment is essentially a technology check while the latter assignments assess understanding of statistical material. Graded homework will be due about every two weeks. Late homework will **not** be accepted unless granted **prior** permission from the instructor.

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Exams

A midterm and final exam will be given in this class. The final exam will be cumulative but will concentrate on the material covered after the midterm exam (roughly one-third pre-midterm material and two-thirds after midterm material). Both exams will be administered through Canvas using Proctorio.

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Class Materials

You will need access to a computer to complete this course. Any of the major operating systems (Windows, Mac or Linux) is acceptable. A small notebook may be useful to take notes while watching video lectures.

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Course Textbook

[Introduction to Statistics Modeling Using R.](#) (2nd edition) by Hughes and Fisher (available through the Canvas site).

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Software

In this course we will be utilizing R and RStudio extensively. You can download both pieces of software for free from:

- http://cran.r-project.org/

- http://www.rstudio.com/

Countless resources are available for help in using this software. **We recommend you complete Homework #0 as soon as possible.**

Note: R is a computing language for statistical analysis. It does require *coding*! However, being a proficient computer programmer is NOT a prerequisite (we do not *program* in 363, but we do *code*). The learning curve in the first few weeks of the course can be steep for some students, but normally by week 3 most students become more comfortable with the coding elements.

Additionally, we will be using the Proctorio proctoring software in Canvas to ensure academic integrity on quizzes and exams in the course. Proctorio requires that you use Google Chrome when you take exams. You must take your exam on a computer (rather than a mobile device). Please download and install Google Chrome from this website: https://www.google.com/chrome/browser/desktop/

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Supplemental Help

- *An R Companion to Linear Statistical Models,* Hay-Jahans.

- *Practicing Statistics: Guided Investigations for the Second Course,* Kuiper & Sklar

- *Using R for Introductory Statistics,* Verzani

- youtube.com - search for R or RStudio help

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Discussion Boards

The discussion boards on Canvas are available for you to post questions, discussions and to help your fellow classmates. The Undergraduate Associates will contribute and monitor these discussion boards. Please note that the posting of solutions is in violation of the academic integrity code. Those postings will be deleted and students may be

prosecuted for a violation of academic integrity standards. The boards are activated as a way to communicate with your classmates.

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Course Schedule

Module	Dates	Topic
Module 01	08/17 -- 08/21	Intro to R, RStudio, Rmarkdown and review of Introductory Statistics material
Module 02	08/20 -- 08/28	Intro to the Design of Experiments (DOE), the paired *t*-test and One Way ANOVA
Module 03	08/27 -- 09/04	Block Designs and two-factor designs
Module 04	09/03 -- 09/11	Advanced Designs: higher factorial and repeated measures
Module 05	09/10 -- 09/18	Introduction to Multiple Regression
Module 06	09/17 -- 09/25	Inference regarding Multiple Regression
Midterm Week	09-28 -- 10/02	Catch-up and review on 09/28 -- 09/30 Midterm Exam live on Canvas, 10/01--10/02
Module 07	10/01 -- 10/09	More on Multiple Linear Regression
Module 08	10/08 -- 10/16	Model Building
Module 09	10/15 -- 10/23	Model (Variable) selection
Module 10	10/22 -- 10/30	Model Validation and Prediction
Module 11	10/29 -- 11/06	Statistical Odds
Module 12	11/05 -- 11/13	Logistic Regression
Module 13	11/12 -- 11/20	Generalized Linear Models and Review
Thanksgiving Break	11/21 -- 11/29	Thanksgiving Break
Final Exam Week	11/30 -- 12/08	Mon 11/30 and Tue 12/01 are "reading" days Exam will be available 12/## -- 12/##

Student & Instructor Expectations:

You, as a student, should try your best to:

- Check the Canvas class site at least once per day during the workweek.

- Check your Miami email every 24 hours (more often if you have sent an email to the instructor or a classmate)

- Read Announcements that are sent via Canvas. Check Announcements on Canvas before emailing your instructor, as the information may have already been posted.

- Post questions you have about the course in the Discussion Forums. If you can answer another student's question, without violating the academic integrity policy, please feel free to do so.

- Actively participate in all synchronous class sessions, online discussions, group assignments, and other activities required in this course.

- Post your ideas and assignments; react to others' ideas, and exchange thoughts with fellow students and the instructor.

- Complete all readings and videos in a timely manner so you can get help if needed.

- Submit assignments at the very least by their due date/time.

- Spend at least 6-9 hours a week outside class, studying, watching videos, and completing assignments.

- Submit work that demonstrates a clear understanding of the material.

- Keep an open mind regarding the material and the opinions of others.

- Notify the instructor, in a timely manner (within 24 hours), if you have any problems.

The instructor will try his/her best to:

- Check the Canvas class site every day to monitor progress.

- Check email at least twice a day, Monday through Friday.

- Respond to all emails within 24 hours (except on weekends).

- Post all grades within 7 days of assignment due dates, except for homeworks which may require up to 2 weeks.

- Make every effort to meet with students who request a meeting.

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Academic Integrity & Proctoring Software

Academic Integrity is at the heart of the mission and values of Miami University and is an expectation of all students. Maintaining academic integrity is a reflection of your character and underpins your learning and understanding of the course material.

According to the Miami University Student Handbook, "Academic dishonesty is defined as any activity that compromises the academic integrity of the institution or subverts the educational process."

Examples of academic dishonesty include but are not limited to:

- Referencing outsides sources or course notes while taking an exam.

- Referencing non-permitted websites while taking a quiz

- Collaborating with another person in any way while taking a quiz or exam

- Copying someone else's solutions to a problem and submitting it as your own work

- Posting class material and assignments to sites not affiliated with Miami University

- Plagiarism - Using another person's ideas without citation and calling them your own

All Miami University policies concerning academic integrity apply to this course. See the Student Guide to Academic Integrity for details.

Suspected Dishonesty: Any suspected instances of academic dishonesty will be handled under Miami University's Academic Integrity policy. It is a student's responsibility to read this policy. Lack of knowledge or understanding of the appropriate academic conduct is not an excuse for committing academic dishonesty.

Students who are found responsible for committing academic dishonesty will receive a sanction that ranges from a zero on the assignment to an F in the course, which could contain the AD transcript notation. Students who are found responsible for committing two acts of dishonesty (academic or Code of Student Conduct section 102 (Dishonesty)) automatically will be suspended from Miami University.

Proctoring Software: In this course, we will use Proctorio for proctoring of online exams. The purpose of the use of a proctoring program is to create a testing environment similar to that of a face-to-face class, in which the presence of a proctor observing student behavior often deters academic dishonesty. Some students have

indicated they think that cheating occurs in online courses or on online assessments because "no one is watching." Cheating in online courses carries the same penalties as those in face-to-face classes, and students who choose to cheat in online courses are typically caught.

To help deter the temptation to cheat and to dispel the myth that "no one is watching," the Proctorio proctoring program will record all students AND will record students' desktops when completing quizzes/exams. This program will "flag" potential cheating behaviors, and a report will be generated for the instructor. It can block use of multiple browsers and tools until the test is over. It also identifies your location based on your IP address. Before taking an official exam or quiz, students will have the opportunity to complete a tutorial to become familiar with the program and to ensure that it works within the computing environment being used.

Proctorio requires that you use Google Chrome when you take exams. You must take your exam on a computer (rather than a mobile device). Please download and install Google Chrome from this website: https://www.google.com/chrome/browser/desktop/

You should complete the exam or quiz without others present, unless authorized by your instructor. During the exam or quiz, you may be directed to show the environment in which the test is being taken; if you have concerns about this, please arrange to take your test in a library study room or similar location where you have privacy. Exams and quizzes are considered to be classroom times, regardless of the time or date they are held.

Once students have completed the assessment, the course instructor will review the "flag" report and view the flagged recordings of the student and desktop to determine if a student has engaged in a potential act of academic dishonesty. All potential acts of dishonesty will be handled through the procedures outlined in the Miami University Academic Integrity Policy.

Students should act honestly in the completion of all course assignments, and ask the instructor for clarification on any assignment guidelines that are not clear.

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Communication Guidelines & Netiquette

Announcements: Please subscribe to the Course Announcements so you can be automatically notified about important information through your email. To subscribe

for auto-email notifications, click on the subscribe button.   , it will turn

green with "subscribed",   .

Discussion Forum: This is the place to ask questions about course content, homework, and "in-class" assignments. General questions about the course should also be asked here so that all students may benefit from the answers. Check here for answers to your questions before sending an email to the instructor or graduate assistants. Questions you do not wish to share with the class should be sent directly to your instructor.

Contacting Your Instructor: Email is the best way to reach your instructor. However, if you would prefer to have a conversation, you may speak to your instructor during office hours or send your instructor an email to set up a time to meet. Given today's ease of communication, it is your responsibility to contact your instructor within 24 hours if you are having any problems. While instructors will attempt to answer emails quickly, it may take up to 24 hours (or longer on weekends) for you to receive a response. Many faculty receive over 50 emails a day, we ask that you put "STA 363" in the subject line of your email as to help sort; we will try and do the same with announcements and emails.

Communication Guidelines: Email is the official mode of communication for the University. You are responsible for any communication that is sent to your Miami email account, so please be sure to check your account frequently. If you have your email forwarded to your preferred account, please be sure you have enough server space for your Miami emails and please check to see that your server will accept Miami emails.

You will be asked to communicate with other students in this class via email. You may access email tools on the Canvas class site. All group members are responsible for initiating contact with one another as soon as the assignment is opened. Failing to make contact with your group members is not an excuse to miss completing an assignment.

Netiquette:* Just because the class is online does not mean the principles you would expect in a face-to-face classroom do not apply. Diversity has many manifestations, including diversity of thought, opinion, and values. We encourage **all learners to be** polite and **respectful** of that diversity and to refrain from inappropriate or offensive commentary. If inappropriate or offensive content is either emailed or posted on the class site, I recommend college disciplinary action. Students guilty of academic misconduct, either directly or indirectly through participation or assistance, are subject to disciplinary action through the regular procedures of Miami University. Learners as well as faculty should be guided by common sense and basic etiquette. Criticism should be presented in a positive light. The following are good guidelines to follow:

- Never post harassing, threatening, or embarrassing comments.

- Never post content that is harmful, abusive; racially, ethnically, or religiously offensive; vulgar; sexually explicit; or otherwise potentially offensive.

- Never post, transmit, promote, or distribute content that is known to be illegal.

- If you disagree with someone, respectfully respond to the subject, not the person.

- Treat others as you would like to be treated.

- Use emoticons such as 🙂 or ;-) when you are joking.

- Be timely in your communication with others.

- Be as brief and succinct as possible.

- Include a descriptive subject line in all emails.

- Use proper spelling and grammar.

- Cite sources appropriately.

Remember that "tone" can usually be detected accurately in verbal communication, but often can be misunderstood in electronic communication. Because of this phenomenon, we encourage you to err on the side of politeness.

*adapted from Regents Online Campus Collaborative

For more information on netiquette check Netiquette Rules for Electronic Communications.

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ADA & Students with Disabilities

Miami University is committed to ensuring equal access to students with disabilities. Miami's Office of Student Disability Services (SDS) assists students with determining eligibility for services and accommodation planning. Miami's AccessMU provides resources and guidance toward equal opportunity for all individuals. Refer to Miami University's Accessible Technology Policy for definitions and additional information.

Students who are entitled to disability-related academic adjustments, auxiliary aids, etc., must register with SDS to receive accommodations in university courses. Please understand that formal communication from SDS must be presented prior to the coordination of accommodations for this course. For more information, see Student Disability Services and/or the Rinella Learning Center. Students may also contact SDS at (513) 529-1541 or via email at sds@miamioh.edu.

If you have a disability, please contact me, and I will be glad to make any necessary accommodations.

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Diversity & Discrimination

All Miami University policies concerning diversity and equal opportunity will be upheld in this class.

> Miami University is a community dedicated to intellectual engagement. Our campuses consist of students, faculty, and staff from a variety of backgrounds and cultures. By living, working, studying, and teaching, we bring our unique viewpoints and life experiences together for the benefit of all. This inclusive learning environment, based upon an atmosphere of mutual respect and positive engagement, invites all campus citizens to explore how they think about knowledge, about themselves, and about how they see themselves in relation to others. Our intellectual and social development and daily educational interactions, whether co-curricular or classroom related, are greatly enriched by our acceptance of one another as members of the Miami University community. Through valuing our own diversity, and the diversity of others, we seek to learn from one another, foster a sense of shared experience, and commit to making the university the intellectual home for us all.

Please see the General Bulletin for more information.

> Miami University is committed to providing equal opportunity and an educational and work environment free from discrimination on the basis of sex, race, color, religion, national origin, disability, age, sexual orientation, gender identity, military status, or veteran status. Miami shall adhere to all applicable state and federal equal opportunity/affirmative action statutes and regulations.

Please see the Miami University policies regarding discrimination and harassment for more information.

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Final Grade Calculation

At the conclusion of the semester, final grades will be compiled using the following point distribution:

Item	Contribution to Final Grade
Video/Notes Review Quizzes • Expect two a week • Short, 4-8 questions • Will drop lowest 3	5%

"In-class" Assignments
    ● Expect two a week
    ● Practice performing statistical analysis in RMarkdown
    ● Will drop lowest 2
	15%

Weekly Assessment Quiz
    ● Summative review of module
    ● Covers all material from the week
    ● Will drop lowest score
	10%

Homework ● More in-depth application	30%
Midterm Exam	20%
Final Exam	20%

Grading Scale

A+ = [97, 100]   A = [93, 97)   A- = [90, 93)

B+ = [87, 90)   B = [83, 87)   B- = [80, 83)

C+ = [77, 80)   C = [73, 77)   C- = [70, 73)

D+ = [67, 70)   D = [63, 67)   D- = [60, 63)

F = [0, 60)