AGEC 5643 – Agricultural Data Science

Meeting Times: TU/TH 9:30 – 10:45 **am** (computer lab required)

Contact Information:
Dr. Aaron M. Shew
AGRI 222
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Office Hours: The best way to reach me directly is e-mail. I try to answer e-mails within 24 - 48 hours. I have an open-door policy so you can stop by if you have questions but appointments are always appreciated.

Tuesday and Thursday 11:00 am – noon, 1:00 – 3:00 pm

Prerequisite(s): Graduate Standing

Course Summary: Agricultural and environmental data gathering, wrangling, analysis, and visualization with emphasis on applied programming, version control, and analytical skills. This course provides students foundational and applied skills in constructing diverse cross-sectional and panel data sets for econometric investigation. Students should expect to learn and demonstrate competency in programming for data gathering, wrangling, analysis, and visualization. The course will cover common data sources, descriptive analysis, and econometric techniques used in agricultural and production economics.

Required Text(s): We will primarily use free and open source online texts and tutorials. The instructor will provide pdfs and links to materials each week.

Required Technology: The course will utilize Microsoft Office Suite (Excel, PowerPoint, Word), R Statistical Software, R Studio, and Git/Github. The instructor will provide instructions for installing R and R Studio on personal laptops in class. The computer lab will be available to students when other classes are not in session. If students have access to a personal desktop or laptop, this will allow students to complete assignments off campus.

Materials for this course can be found on Blackboard. You can reach Blackboard at http://learn.uark.edu.

Learning Outcomes: Upon successful completion of this course:

1. Students will understand how to programmatically gather and analyze agricultural data in R
2. Students will understand how to use Git for version control and develop intuitive and complete code documentation
3. Students will construct cross-sectional and panel datasets from multiple sources and formats for agricultural production
4. Students will implement econometric techniques on datasets they create and interpret results
5. Students will examine, visualize and communicate spatial and temporal information relevant for agricultural economists

Grading: According to the UA instructions for reporting final grades, they generally will reflect the following:

A – Outstanding achievement (90%+)
B – Good achievement (80%+)
C – Average achievement (70%+)
D – Poor, but passing work (60%+)
F – Failure, given for unsatisfactory work (below 60%)

Grade breakdown:

Task	Points	Percent
Assignments (4)	40	40%
Projects (2)	30	30%
Exams (2)	30	30%
TOTAL	100	100%

Assignments: Four coding and interpretation assignments will be required to demonstrate learning and progress based on the weekly lectures and tutorials. Assignments will count for 40% of the course final grade at 10% each.

Projects: A mid-term and final project will account for 30% of the course final grade. Projects include an R markdown project with fully reproducible code and written description/presentation of results.

Exams: There will be one mid-term and one comprehensive final exam for this course, which together will account for 30% of the course final grade. The exams will be cumulative, covering all course materials and assignments prior to the date given.

Course Schedule: The schedule for class is attached on the following pages and available on Blackboard. The schedule is subject to change during the semester.

Course Schedule

Week	Topics
1	Course Overview & Introductions • What is "Data Science" for agricultural and applied economists? • R Studio tour, first scripts, and functional packages/libraries
2	Getting to know R and R Studio • Best practices for coding and resources for problem solving • Introduction to data types, structures, and basic visualization
3	Version Control • Intro to Github • Replicating other studies to learn new tools
4	Data Wrangling, Descriptive Statistics, and More Data Visualization • Common data sources for agricultural and environmental science • Exploratory data analysis
5	Review of Regression Analysis • concepts, assumptions, suitability, usability • get data and implement regressions • interpretation of results and exporting formatted tables
6	Time Series Analysis • Assumptions, indexing, and formatting • Autocorrelation and decomposition • Prediction, forecasting, breakpoint analysis
7	Presentations, Writing, and Websites with R • Intro to R Markdown and R Shiny
8	Mid-term Project & Exam
9	Dealing with Large Datasets • High Performance Computing • Parallel processing
10	Making Maps and Infographics in R – First Principles • Geographical Information Systems – points, lines, polygons, and grids/rasters • Color theory, types of maps, map projections, and basic cartography
11	Spatial Data Manipulation • Vector to Raster / Raster to Vector • Clipping, zonal statistics, resampling, interpolation
12	Geophysical Data Analysis • Gridded weather from PRISM and weather station data from GSODR • gSSURGO soils data and Digital Elevation Models (DEMs) with elevatr
13	Earth Observation Systems – Essentials of Remote Sensing and Analysis • Concepts, assumptions, limitations • Data sources, types, analysis, and interpretation
14	Land Use/Land Cover Analysis with the USDA Cropland Data Layer
15	Final Project - student presentations and papers due
16	Comprehensive Final Exam

Disabilities: If you need to request reasonable accommodations for this class due to a disability, you must first register with the Center for Educational Access (CEA) and see me during my office hours to discuss options.

Academic Dishonesty: "Each University of Arkansas student is required to be familiar with and abide by the University's 'Academic Integrity Policy' which may be found at http://provost.uark.edu/ Students with questions about how these policies apply to a particular course or assignment should immediately contact their instructor."

Inclement Weather: If the University is open, we will have class. As the instructor, I reserve the right to cancel class due to inclement weather. Students will be notified by email and Blackboard if this is the case. Please use your best judgment before getting on the road. See UA Inclement Weather Policy at http://emergency.uark.edu/inclement-weather/index.php.

Emergency Procedures: Many types of emergencies can occur on campus; instructions for specific emergencies such as severe weather, active shooter, or fire can be found at http://emergency.uark.edu

Severe Weather (Tornado Warning):

- Follow the directions of the instructor or emergency personnel
- Seek shelter in the basement or interior room or hallway on the lowest floor, putting as many walls as possible between you and the outside
- If you are in a multi-story building, and you cannot get to the lowest floor, pick a hallway in the center of the building
- Stay in the center of the room, away from exterior walls, windows, and doors

Violence / Active Shooter (CADD):

- CALL- 9-1-1
- AVOID- If possible, self-evacuate to a safe area outside the building. Follow directions of police officers.
- DENY- Barricade the door with desk, chairs, bookcases or any items. Move to a place inside the room where you are not visible. Turn off the lights and remain quiet. Remain there until told by police it's safe.
- DEFEND- Use chairs, desks, cell phones or whatever is immediately available to distract and/or defend yourself and others from attack.