Spatiotemporal Analysis

STP 598

Instructor Info

Shiwei Lan

Office Hrs: TT 9:30-10:30 AM

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Course Info

Prereq: STP 421, STP 427

TuTh 10:30 – 11:45 AM

WXLRA309

https://slan-teaching.github.io/STP598sta/

Grader Info

TBD

Office Hrs: TBD

TBD

TBD

Description

This course focuses on modern techniques in analyzing spatiotemporal data. It consists of two major parts: spatial statistics and time series. The topics will include spatial process, areal data models, hierarchical spatial modeling, time series regression, ARMA/ARIMA models, Gaussian process, and state-space models.

Objective

By the end of the course, students should get a good overview of spatiotemporal analysis. They will learn classical models including CAR, spatial process models, separable spatial models, ARIMA, Gaussian process, HMM, etc..

Textbooks

Required

HMASD - Hierarchical Modeling and Analysis for Spatial Data (2nd Edition) by Sudipto Banerjee, Bradley P. Carlin, Alan E. Gelfand

TSA - Time Series Analysis and its applications, with examples in R (4th Edition) by Robert H. Shumway and David S. Stoffer

Recommended

SSTD - Statistics for Spatio-Temporal Data by Noel Cressie and Christopher K. Wikle

Grading Scheme

Homework	50 %
Midterm	15 %
Final Project	35 %
Total	100 %

A+	[97%, 100%]	A	[93%, 97%)	A-	[90%, 93%)
B+	[87%, 90%)	B	[83%, 87%)	B-	[80%, 83%)
C+	[77%, 80%)	C	[70%, 77%)		
D	[60%, 70%)			E	[0%, 60%)

Homework

There will be 5 written homework assignments each worth 10 points to cover the corresponding material. The total will be 50 points. Homework will be announced and submitted on canvas. Each homework report should be submitted in either Word or PDF format, no other formats accepted. Late home will NOT be accepted. Do NOT send your homework by email!

Exam

There will be 1 take-home midterm exam, each worth 25 points. If you are unable to take an exam, you must contact the instructor in advance. All excuses must be verifiable. The make-up exams will be given only under exceptional circumstances.

Final Project

The final project will consist of a novel analysis of a spatial/temporal data set of the student's choosing. The student should submit a 1-2 page plan for their project including a description of the data set by November 10. The student will submit a written report to canvas by the scheduled final time (December 10 at midnight). This is an individual project. Discussion is allowed but this is NOT a group work!

FAQs

Where can I find help?

You can go to my virtual office hours and the grader's office hours. In addition, you can go to Discussion Forum to post your questions and help others.

How do I keep track of the class?

Constantly check canvas and the course website. I will make announcements, post homework solutions, etc..

Do we have incentives?

I will give bonus points through the semester for e.g. extra-credit homework problems, most helpful discussion participants, etc..

When shall I drop if I choose to?

Last Day to Register or Drop/Add Without College Approval is 08/28/2024. Tuition & Fees Refund Deadline is 09/04/2024 for session C. Course Withdrawal Deadline (without 'W' on your transcript) is 11/06/2024 for session C. Refer to https://students.asu.edu/academic-calendar for more deadlines.

Disability Accommodations

Qualified students with disabilities are encouraged to make their requests at the beginning of the semester to get disability accommodations. Disability information is confidential. Note: *Prior to receiving disability accommodations, verification of eligibility from the Disability Resource Center (DRC) is required.* Therefore, you should contact DRC immediately. Their office is located on the first floor of the Matthews Center Building. DRC staff can also be reached at: 480-965-1234 (V), 480-965-9000 (TTY). For additional information, visit: www.asu.edu/studentaffairs/ed/drc. Their hours are 8:00 AM to 5:00 PM, Monday through Friday.

Make-up Policy

In case of valid absence (such as serious illness, going to court, etc.) during scheduled exam, you must notify the instructor BEFORE the exam, if the circumstances allow. To be eligible for make-up exam, valid excuse has to be supported by valid documentation (such as doctor's note, letter from court, etc.). Also, please follow Academic Affairs Manual, ACD 304-04, for appropriate University policies about requesting an accommodation for religious practices, in case you have to miss an assignment due to religious practice.

Cell phones and Electronic Devices

Picture taking, talking or texting on your cell phone or any electronic device during class is prohibited. If you bring a cell phone and/or any other electronic equipment to the class, make sure they are turned off before class begins. Any sounds produced by such devices are disruptive to the class and, as such, will not be tolerated and may be reported to the Office of the Dean of Students.

Academic Honesty

ASU expects and requires all its students to act with honesty and integrity, and respect the rights of others in carrying out all academic assignments. For more information on academic integrity, including the policy and appeal procedures, please visit http://provost.asu.edu/academicintegrity.

Inclusion

The School of Mathematical and Statistical Sciences encourages faculty to address and refer to students by their preferred name and gender pronoun. If your preferred name is different than what appears on the class roster, or you would like to be addressed using a specific pronoun, please let me know.

Sexual Violence and Harassment

Both Title IX federal law and university policy make clear that sexual violence and harassment based on sex is prohibited. An individual who believes they have been subjected to sexual violence or harassed on the basis of sex can seek support, including counseling and academic support, from the university. If you or someone you know has been harassed on the basis of sex or sexually assaulted, you can find information and resources at https://sexualviolenceprevention.asu.edu/faqs. As a mandated reporter, I am obligated to report any information I become aware of regarding alleged acts of sexual discrimination, including sexual violence and dating violence. ASU Counseling Services, https://eoss.asu.edu/counseling, is available if you wish to discuss any concerns confidentially and privately. ASU online students may access 360 Life Services, https://goto.asuonline.asu.edu/success/online-resources.html.

Syllabus Disclaimer

This syllabus is tentative and should not be considered definitive. The instructor reserves the right to modify it (including the dates of the tests) to meet the needs of the class. Every effort will be made to avoid changing the course schedule but the possibility exists that unforeseen events will make syllabus changes necessary. It is the student responsibility to attend class regularly and make note of any change.

Class Schedule (tentative)

Week	Date	Topic	Assignments
1	08/22 - 08/23	Introduction	
2	08/26 - 08/30	Overview of spatial/temporal data problems	Homework 1 out
3	09/03 - 09/06	Basics of point-referenced data models	
4	09/09 - 09/13	Basics of areal data models	Homework 1 due
5	09/16 - 09/20	Basics of Bayesian inference	Homework 2 out
6	09/23 - 09/27	Hierarchical modeling for univariate spatial data	
7	09/30 - 10/04	Multivariate spatial modeling	Homework 2 due
8	10/07 - 10/11	Multivariate spatial modeling	Homework 3 out
9	10/12 - 10/15	Fall break / Review	midterm-exam: due 10/18/2024
10	10/21 - 10/25	Introduction to time series	Homework 3 due
11	10/28 - 11/01	ARIMA and related models	Homework 4 out
12	11/04 - 11/08	ARIMA and related models	project proposal: due 11/10/2024
13	11/12 - 11/15	State space models	Homework 4 due
14	11/18 - 11/22	State space models	Homework 5 out
15	11/25 - 11/27	Multivariate models	
16	12/02 - 12/06	Gaussian process	Homework 5 due
Final	12/09 - 12/14	Final Exam	final-project: due 12/10/2024