Course Syllabus

STAT 519: Time Series Analysis

Winter 2022

Instructor: Fang Han (fanghan@uw.edu)
Office hour:
- W, 1:00-2:00PM in my office (PDL B-317) while simultaneously broadcasted in [https://washington.zoom.us/j/94226274720](https://washington.zoom.us/j/94226274720) (password: 519519)

Course website: [https://www.stat.washington.edu/people/fanghan/teaching/STAT519](https://www.stat.washington.edu/people/fanghan/teaching/STAT519)

Class schedule: MWF, 2:30-3:20 PM in [https://washington.zoom.us/j/93226063833](https://washington.zoom.us/j/93226063833) (password: 519519)

Course overview: This is a 10-week course focused on introducing basic concepts of time-domain time series analysis. Materials to be covered include simple time series models, models for trend and seasonality, basic theory and application of ARMA processes, nonstationary models, and state-space models.

Prerequisites: This course requires familiarity with elementary statistical theory (STAT 512/513). Please do not hesitate to approach the instructor if you have any question.

Grades: Your grades come from three parts:
- seven homework assignments (30%)
- a midterm exam (30%)
- a term project accompanied with a presentation (40%).

Format of HWs: There will be 7 homework assignments (each worth 5%); the lowest one will be dropped and there is no HW due in the weeks of exams. It will be out Friday night and be due at the end of the next Friday (23:59:59). Late HWs will be penalized 20% per day (For instance, a homework turned in two days late will receive only 60% credit). Exceptions to these rules will of course be made for serious illness or other emergency circumstances; in these cases, please contact me as soon as you are aware of the problem. You need to upload your answers to the Canvas. Teamwork is allowed, but it is encouraged to think by yourself first; plagiarism is strictly forbidden. Technical correctness, clarity, and completeness are equally important.

Format of the exam: There will be a midterm exam, intended to be take-home and done in any 2 to 4-hour window, on Feb 09. You will need to upload your answers to canvas. The exam will be open book, though neither access to the internet nor teamwork is allowed; they will be considered as cheating.

Format of the term project:
- It could be a data analysis, a simulation study, methodological or theoretical research, or a report on a research article of interest to you.
- You need approval from the instructor for the project topic no later than Friday, 02/18.
- A concise written report is expected, which should be approximately between 5 to 10 pages.
- The report will be due on 11:59PM on Friday, 03/11.
- The presentation will take place in the final week. It will be 5 to 10 minutes long, depending on the size of the class.

Course textbook: This course is built on Professor Don Percival’s lecture notes as well as the following two books:

COVID-related expectations: Per UW policy, this class will be conducted in person. Therefore, unless you meet the criteria for an accommodation from Disability Resources for Students (DRS) or a special arrangement approved by a respective office that allows you to take the course remotely, you should only register for this class if you can attend in-person.
• Please contact UW Disability Resources for Students (DRS) directly if you feel you may be eligible for an accommodation based on your status as an immunocompromised individual or based on other diagnosed physical or mental health conditions that might prevent you from being able to take classes in-person.

• If you are a student enrolled in a program in SPH, and you are either living with an individual who is immunocompromised, OR you are unable to obtain a visa to travel to the US, you may be eligible for a “special arrangement” that will allow you to take this course remotely. Requests for special arrangements to take the class remotely should have been submitted to and approved by the Students and Academic Services team in the Office of the Dean before the beginning of the quarter. If you have questions about this type of arrangement, please reach out to Student and Academic Services by email at sphsas@uw.edu.

All UW students are expected to complete their vaccine attestation before arriving on campus and to follow the campus-wide face-covering policy at all times. You are expected to follow state, local, and UW COVID-19 policies and recommendations. If you feel ill or exhibit possible COVID symptoms, you should not come to class. If you need to temporarily quarantine or isolate per CDC guidance and/or campus policy, you are responsible for notifying your instructors as soon as possible by email. If you receive a positive COVID-19 test result, you must report to campus Environmental Health & Safety (EH&S) by emailing covidehc@uw.edu or calling 206-626-3344.

Food is not allowed in the classroom. Drinks may be sipped with lifting or removal of your facemask for a brief moment, and immediate re-masking after drinking.

Religious accommodations: “Washington state law requires that UW develop a policy for accommodation of student absences or significant hardship due to reasons of faith or conscience, or for organized religious activities. The UW’s policy, including more information about how to request an accommodation, is available at Religious Accommodations Policy (https://registrar.washington.edu/staffandfaculty/religious-accommodations-policy/). Accommodations must be requested within the first two weeks of this course using the Religious Accommodations Request form (https://registrar.washington.edu/students/religious-accommodations-request/).”

Academic integrity: The University takes academic integrity very seriously. Behaving with integrity is part of our responsibility to our shared learning community. If you’re uncertain about if something is academic misconduct, ask me. I am willing to discuss questions you might have.

Acts of academic misconduct may include but are not limited to:

• Cheating (working collaboratively on quizzes/exams and discussion submissions, sharing answers and previewing quizzes/exams)

• Plagiarism (representing the work of others as your own without giving appropriate credit to the original author(s))

Concerns about these or other behaviors prohibited by the Student Conduct Code will be referred for investigation and adjudication by (include information for specific campus office).

Students found to have engaged in academic misconduct may receive a zero on the assignment (or other possible outcome).

Course schedule:
<table>
<thead>
<tr>
<th>Date (M)</th>
<th>virtual</th>
<th>Date (W)</th>
<th>in-person (except the 1st week)</th>
<th>Date (F)</th>
<th>virtual</th>
</tr>
</thead>
<tbody>
<tr>
<td>01/03</td>
<td></td>
<td>01/05</td>
<td>Simple time series models</td>
<td>01/07</td>
<td></td>
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<tr>
<td>01/10</td>
<td>Models with trend and seasonality I</td>
<td>01/12</td>
<td>Models with trend and seasonality II</td>
<td>01/14</td>
<td>Models with trend and seasonality III</td>
</tr>
<tr>
<td>01/17</td>
<td>MLK Day: no class</td>
<td>01/19</td>
<td>Element. hypothesis testing</td>
<td>01/21</td>
<td>Process mean estimation</td>
</tr>
<tr>
<td>01/24</td>
<td>ACVF estimation</td>
<td>01/26</td>
<td>Linear processes</td>
<td>01/28</td>
<td>ARMA models I</td>
</tr>
<tr>
<td>01/31</td>
<td>ARMA models II</td>
<td>02/02</td>
<td>Forecasting SPs I</td>
<td>02/04</td>
<td>Forecasting SPs II</td>
</tr>
<tr>
<td>02/07</td>
<td>Forecasting SPs III</td>
<td>02/09</td>
<td>Midterm</td>
<td>02/11</td>
<td>Modeling with ARMA models I</td>
</tr>
<tr>
<td>02/14</td>
<td>Modeling with ARMA models II</td>
<td>02/16</td>
<td>Nonstationary SP models</td>
<td>02/18</td>
<td>SARMA models</td>
</tr>
<tr>
<td>02/21</td>
<td>Presidents' Day: no class</td>
<td>02/23</td>
<td>Differenced processes I</td>
<td>02/25</td>
<td>Differenced processes I</td>
</tr>
<tr>
<td>02/28</td>
<td>Regression models</td>
<td>03/02</td>
<td>State-space models I</td>
<td>03/04</td>
<td>State-space models II</td>
</tr>
<tr>
<td>03/07</td>
<td>State-space models III</td>
<td>03/09</td>
<td>Final presentation I</td>
<td>03/11</td>
<td>Final presentation II</td>
</tr>
</tbody>
</table>

ACVF: autocovariance function  
ARMA: autoregressive moving-average  
SP: stationary process  
SARMA: seasonal ARMA

Figure 1: Course schedule (tentative).