

MTH491 Independent Study (1 Credit Hour)

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Office hours: By appointment

Text: None required, however various reference texts, provided by the instructor, may be used to review necessary tools from statistics.

University Mission:

Point Loma Nazarene University exists to provide higher education in a vital Christian community where minds are engaged and challenged, character is modeled and formed, and service is an expression of faith. Being of Wesleyan heritage, we strive to be a learning community where grace is foundational, truth is pursued, and holiness is a way of life.

Department Mission:

The Mathematical, Information, and Computer Sciences department at Point Loma Nazarene University is committed to maintaining a curriculum that provides its students with the tools to be productive, the passion to continue learning, and Christian perspectives to provide a basis for making sound value judgments.

Catalog description

Study of a selected problem or topic under the direction of an instructor. The instructor and student propose the course of study. Approval by the department chair is required. May be repeated for a total of six units.

Prerequisites: Consent of instructor.

Topic details:

This primary aims of this project are to perform develop methods for filtering noise from real data and then applying classification tools on the cleaned data. Model validation will be performed on both the uncleaned and cleaned data. Additionally, a literature review of similar techniques used on similar types of data will be performed.

Learning Outcomes:

- Students will understand several advanced statistical tools from the following: multivariate regression, principal component analysis, partial least squares regression, linear models, mixed effects models, and generalized linear models.
- Students will apply their knowledge of statistics to the analysis of a real data set.
- Students will communicate the results of statistical analysis both orally and in writing.

The best way to **learn** mathematics is by **doing** mathematics. In an attempt to further our understanding of statistics, we will perform an in depth statistical analysis of a real world data set. We will also practice communicating the results of data analysis in writing.

Grading:

Grades will be assigned based on the total number of points accumulated throughout the course. The points for each activity are:

Activity	Due Date	Points
Summary of prior research progress	Friday 9/15	100
Literature review	Friday 9/29	200
Preliminary analysis and interpretation	Friday 10/20	50
Final analysis	Friday 11/3	50
Rough draft of final report	Friday 11/24	100
Final report	Friday 12/8	400
Total		1000

In addition, a minimum of 50 hours of work on the project should be documented by the student over the course of the semester. For every hour short of this goal, 10 points will be removed from the total score.

Approximate minimal points required to obtain a given grade are:

	A	B	C	D
+		(875, 900)	(775, 800)	(675, 700)
	[925, 1000]	[825, 875]	[725, 775]	[625, 675]
-	[900, 925]	[800, 825]	[700, 725]	[600, 625]

Note that scores of 599 or lower will result in an F.

Activities:

You will be given a large real world data set and asked to answer a series of research questions based on this data set. A series of activities will be submitted throughout the project in order to measure your progress towards analyzing the data. In addition to these activities it is expected that you will meet weekly with the instructor to give brief updates and discuss the analysis. Meeting times will be determined with the consensus of the student and faculty member.

Final Exam: None

The final exam date and time is set by the university at the beginning of the semester and may not be changed by the instructor. This schedule can be found on the university website and in the course calendar. No requests for early examinations will be approved. Only in the case that a student is required to take three exams during the same day of finals week, is an instructor authorized to consider changing the exam date and time for that particular student.

Due to the nature of this course, a final written project submitted during final exam week. A description is below.

Final Project:

A written final project report describing the goals of the project, an overview of the statistical techniques used in the project, and a summary of the findings of the project will be delivered on or before **Friday December 8, 2017**.

Attendance:

In the context of independent research, a “class” meeting is interpreted to mean a weekly check-in with the faculty advisor, either in person, or by email. The official attendance policy is below.

Regular and punctual attendance at all classes is considered essential to optimum academic achievement. If the student is absent from more than 10 percent of class meetings, the faculty member can file a written report which may result in de-enrollment. If the absences exceed 20 percent, the student may be de-enrolled without notice until the university drop date or, after that date, receive the appropriate grade for their work and participation. See

http://catalog.pointloma.edu/content.php?catoid=24&navoid=1581#Class_Attendance in the Undergraduate Academic Catalog.

Class Enrollment:

It is the student’s responsibility to maintain his/her class schedule. Should the need arise to drop this course (personal emergencies, poor performance, etc.), the student has the responsibility to follow through (provided the drop date meets the stated calendar deadline established by the university), not the instructor. Simply ceasing to attend this course or failing to follow through to arrange for a change of registration (drop/add) may easily result in a grade of F on the official transcript.

Academic Accommodations:

If you have a diagnosed disability, please contact PLNU’s Disability Resource Center (DRC) within the first two weeks of class to demonstrate need and to register for accommodation by phone at 619-849-2486 or by e-mail at DRC@pointloma.edu. See [Disability Resource Center](#) for additional information. For more details see the PLNU catalog:

http://catalog.pointloma.edu/content.php?catoid=24&navoid=1581#Academic_Accommodations

Students with learning disabilities who may need accommodations should discuss options with the instructor during the first two weeks of class.

Academic Honesty:

Students should demonstrate academic honesty by doing original work and by giving appropriate credit to the ideas of others. Academic dishonesty is the act of presenting information, ideas, and/or concepts as one’s own when in reality they are the results of another person’s creativity and effort. A faculty member who believes a situation involving academic dishonesty has been detected may assign a failing grade for that assignment or examination, or, depending on the seriousness of the offense, for the course. Faculty should follow and students may appeal using the procedure in the university Catalog.

See http://catalog.pointloma.edu/content.php?catoid=24&navoid=1581#Academic_Honesty for definitions of kinds of academic dishonesty and for further policy information.

Copyright Protected Materials:

Point Loma Nazarene University, as a non-profit educational institution, is entitled by law to use materials protected by the US Copyright Act for classroom education. Any use of those materials outside the class may violate the law.

Credit Hour:

In the interest of providing sufficient time to accomplish the stated course learning outcomes, this class meets the PLNU credit hour policy for a 1 unit class delivered over 15 weeks. Specific details about how the class meets the credit hour requirements can be provided upon request.

Activity Guidelines

It should be noted, that the activities that you submit are an assessment of your progress towards understanding the data set. In other words these assignments are snapshots of how much progress you have made towards a thorough analysis of the data. Thus you should begin work on many of the activities long before they are due. For example the data clean-up should begin as soon as you have the data, however a final product will not be submitted until the due date.

Summary of prior research progress

- Provide a multi-page summary of prior progress on this project. This should include:
 - Statement of research question
 - Summary of methods
 - Summary of findings
 - Identification of areas needing work
- Additionally, a summary of the relevant statistical tools used should also be provided.

Literature review

- Find and summarize at least 5 research articles using similar techniques or addressing similar research questions. Include a detailed bibliography in APA format.

Preliminary analysis

- Begin the analysis of your data using the tools we have discussed. Be prepared to share the preliminary results for discussion and model assessment.
- In order to perform the analysis it may also be necessary to perform some data clean-up and formatting.

Final analysis

- After discussing the results from the previous step. Modify the results to improve the performance of your model.
- Summarize this final analysis and prepare the results for interpretation. We will discuss the meaning of them together.

Rough draft of final project

- See directions for the final project.
- Data analysis should be complete at this point and the data should be present in the paper.

Final report

The final report should have each of the following components:

1. Introduction into the research project and a statement of the research aims.
2. A brief summary of the statistical methods that were used.
3. Data summary with the appropriate summary statistics.
4. Results
5. Conclusions
6. Also attach the final cleaned version of the data