ECE 2595 Advanced topics on bio signal modeling and analysis

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| **Instructor:** | Liang Zhan, Ph.D. |
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| **Phone:** | (412) 648-4361 |
| **Class time and location:** | Thursday 5:20 pm ~ 7:50pm at 158 Benedum Hall  The classes on Sep 2 and 9 will be conducted via Zoom (Same as below)  In person classes will start from Week of Sep 13. |
| **Office hours:** | Thursday 9 am ~ 4pm  In person or Zoom  Meeting ID: 377 198 1234 (Passcode: 425078) |
| **Reference Textbook(s):** | There is no required textbook. The course will be based on various sources of information including, but not limited to peer-reviewed papers, articles and reports. |
| **Grading:** | Homework: 50% (=10%+10%+10%+10%+10%)  Presentation: 45% (=15% + 15% + 15%)  Class participation: 5%  --------------------------------------  Total: 100% |
| **Letter grades assignment:** | A+ (grade > 97%), A (97% ≥ grade ≥ 92%), A- (92% > grade ≥ 87%), B+ (87% > grade ≥ 82%), B (82% > grade ≥ 77%), B- (77% > grade ≥ 72%), C+ (72% > grade ≥ 67%), C (67% > grade ≥ 62%), C- (62% > grade ≥ 57%), D+ (57% > grade ≥ 52%), D (52% > grade ≥ 47%), D- (47% > grade ≥ 40%), F (40% > grade). |
| **Prerequisites:** | Strong familiarity with at least one programming language  Undergraduate courses on statistics, signal and systems |

**Course Description, objectives and potential syllabus:**

This course will focus on statistical theory and practical application related to bio signal modeling and imaging analysis. The topics will include statistical inference, analysis of variance, Bayesian analysis, likelihood and factor analysis (exploratory and confirmatory). The content ranges from the traditional to the contemporary. While specific applications are not treated, this course is strongly motivated by bio applications, especially in computational neuroscience. This would be a graduate level course taught through hands-on examples and tutorial data sets and cover the theory and implementation of these methods. Undergraduates with statistical knowledge background are encouraged to take this course as well. Main topics discussed within this course include, but are not limited to:

1. Background introduction covering statistical Inferences, hypothesis, confidence limits, repeated measures, continuous ordinal measures, categorical measures
2. Multimodal analysis, Significance tests, Analysis of variance
3. Maximum likelihood Decision analysis and non-likelihood-based methods
4. Interpretations of uncertainty，Bayesian analysis, Randomization-based analysis
5. Factor analysis, asymptotic theory
6. Case studies on CT (COVID19 segmentation) and Brain Networks

The topics subject to change depending on the class progression.

**Projects:** Each project’s score will include report (1/2) + classmates’ grade (1/2)

**Participation:** Participation points are assigned at instructor’s discretion based on the perceived attitude of individual students towards learning during the semester.

**Communications:** Class presentations and project assignments will be posted in Canvas. So, please, check Canvas regularly for information, class notes and project assignments.

**Disclaimers:** Although unlikely, this syllabus and the course schedule may change according to my judgment as to what is best for the class. Any changes will be declared in class. For example, due to the particular nature of my research I may need to travel for conferences or seminars on short notice. Although I will communicate these trips in advance along with any potential changes that these trips may cause, it is not possible to know at this time when those trips may occur. General course schedule and administrative deadlines follow the University of Pittsburgh Academic Calendar 2021-2022.

**University Policies:**

**Academic Integrity**

All students are expected to adhere to the standards of academic honesty. Any student engaged in cheating, plagiarism, or other acts of academic dishonesty would be subject to disciplinary action. Any student suspected of violating this obligation for any reason during the semester will be required to participate in the procedural process, initiated at the instructor level, as outlined in the University Guidelines on Academic Integrity <http://www.provost.pitt.edu/info/ai1.html>. This may include, but is not limited to the confiscation of the examination of any individual suspected of violating the University Policy.

**Disability Services**

If you have a disability for which you are or may be requesting an accommodation, you are encouraged to contact both your instructor and [Disability Resources and Services](http://www.studentaffairs.pitt.edu/drswelcome) (DRS), 140 William Pitt Union, (412) 648-7890, [drsrecep@pitt.edu](mailto:drsrecep@pitt.edu?subject=Request%20for%20Accommodation), (412) 228-5347 for P3 ASL users, as early as possible in the term. DRS will verify your disability and determine reasonable accommodations for this course.

**Statement on Classroom Recording**

To address the issue of students recording a lecture or class session, the University’s Senate Educational Policy Committee issued the recommended statement on May 4, 2010. While it is optional, the Committee recommends that faculty consider adding the statement to all course syllabi.

“To ensure the free and open discussion of ideas, students may not record classroom lectures, discussion and/or activities without the advance written permission of the instructor, and any such recording properly approved in advance can be used solely for the student’s own private use.”

**Student Opinion of Teaching Surveys**

Students in this class will be asked to complete a *Student Opinion of Teaching Survey*. Surveys will be sent via Pitt email and appear on your CourseWeb landing page during the last three weeks of class meeting days. Your responses are anonymous. Please take time to thoughtfully respond, your feedback is important to me. [Read more](http://www.cidde.pitt.edu/omet/student-information/) about *Student Opinion of Teaching Surveys*.

**Diversity and Inclusion**

The University of Pittsburgh does not tolerate any form of discrimination, harassment, or retaliation based on disability, race, color, religion, national origin, ancestry, genetic information, marital status, familial status, sex, age, sexual orientation, veteran status or gender identity or other factors as stated in the University’s Title IX policy. The University is committed to taking prompt action to end a hostile environment that interferes with the University’s mission. For more information about policies, procedures, and practices, see: <http://diversity.pitt.edu/affirmative-action/policies-procedures-and-practices>.

I ask that everyone in the class strive to help ensure that other members of this class can learn in a supportive and respectful environment. If there are instances of the aforementioned issues, please contact the Title IX Coordinator, by calling 412-648-7860, or e-mailing [titleixcoordinator@pitt.edu](mailto:titleixcoordinator@pitt.edu). Reports can also be filed online: <https://www.diversity.pitt.edu/make-report/report-form>. You may also choose to report this to a faculty/staff member; they are required to communicate this to the University’s Office of Diversity and Inclusion. If you wish to maintain complete confidentiality, you may also contact the University Counseling Center (412-648-7930).

**ABET Criteria 3. Student Outcomes**

The program must have documented student outcomes that support the program educational objectives. Attainment of these outcomes prepares graduates to enter the professional practice of engineering. Student outcomes are outcomes (1) through (7), plus any additional outcomes that may be articulated by the program.

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.