EE568: Information Theory
Fall 2013       Natalia A. Schmid

Syllabus
August 19, 2013

1. Instructor       Natalia Schmid
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       URL:   http://www.csee.wvu.edu/~natalias/ee568.html
       (This web-page will contain important announcements and materials handed out in class)

2. Office Hours
       TBA

3. Class time
       11-11:50 am. (M,W,F)

4. Class location
       ESB-E 207

5. Prerequisites
       EE513 or its equivalent. Calculus III is useful.

6. Description
       Mathematical description of channels and sources; entropy, information, data compression, channel
       capacity, Shannon’s theorems, rate-distortion theory.

7. Instructor’s expectations from Students
       This is a second year graduate class. Lectures will provide the necessary basics. However, they will
       not cover all topics in depth. Students are expected to do their own independent work that will include
       reading papers distributed in class, performing additional literature research, and learning some
       concepts on their own. I expect you to work hard and be creative. If you are not familiar with some
       topics or with some fundamentals, please ask me to prepare a handout for you with a brief
       introduction to the unknown topic.

       The goal is to enable you to do your own independent research as well as learn about subjects on your
       own. This will be expected from you if you target an academic career and will be of great benefit to
       you if you follow a professional career path.

8. Textbook
       T. M. Cover and J.A. Thomas, *Elements of Information Theory*, John Wiley & Sons, New York,
       2006.

9. Collateral Textbook
       The following textbook covers similar material. It is not required but may be useful as a second
       reference.
10. Topics and Tentative Schedule
We will cover material in Ch. 1-3, 5, 7-10 of the book by Cover and Thomas (Ed.2006). Ch. 11 and 12 will be covered as the time permits. The reference material from the textbook is as follows (tentatively):

- Introduction (0.5 weeks)
- Measures of Information and Information inequalities (2 weeks)
- Convergence of sequences of random variables. AEP (1 week)
- Lagrange Multipliers (1.5 weeks)
- Lossless data compression (Huffman, Ziv-Lempel, Arithmetic, Shannon-Fano codes): Kraft inequality, Shannon’s source coding theorem (3 weeks)
- Channel capacity: jointly typical sequences, Fano’s inequality, Shannon’s channel coding theorem and its converse (2 weeks)
- Differential entropy (1 weeks)
- Gaussian channels (1.5 weeks)
- Rate distortion (2.5 weeks)
- Maximum entropy principle (as the time permits)
- Testing Hypotheses (as the time permits)

11. Examinations:
There will be a midterm examination. The date of the exam will be announced in advance. At the end of the class, students will be offered either a final exam or a project.

12. Homework
There will be approximately 6-8 homework assignments. *No late homeworks will be accepted.* From each homework set, 3 problems will be selected at random and graded. The contribution of homework assignments towards the final grade will be based on the average of all homework grades.

12. Computer Usage
Several homework problems and the final project will require computer usage. You may select any computer system and programming language to address these problems.

13. Ethics
Interaction among students in EE568 for the purpose of understanding concepts and developing solution strategies on homework assignments is permitted and very much encouraged, *but submitted homework solutions should be your own effort.*

14. Grade
The final grade for the EE568 will be based on the following factors, which will be weighted as indicated.

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
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<tbody>
<tr>
<td>Homework</td>
<td>40%</td>
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<tr>
<td>Midterm Examination</td>
<td>30%</td>
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<tr>
<td>Final Project/Exam</td>
<td>30%</td>
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Inclusivity Statement:
The West Virginia University community is committed to creating and fostering a positive learning and working environment based on open communication, mutual respect, and inclusion.
If you are a person with a disability and anticipate needing any type of accommodation in order to participate in this class, please advise me and make appropriate arrangements with the Office of Disability Services (293-6700). For more information on West Virginia University's Diversity, Equity, and Inclusion initiatives, please see http://diversity.wvu.edu.