Math 345 Project Information

Projects will be done in groups of 2 or 3 (possibly groups of 1, but we'll have to see how many want to do that). A group of 2 would give an approximately 45-50 minute talk; a group of 3 would give a 60 to 65 minute talk (an individual would give a 40 minute talk). I suggest that this presentation either be on pre-made overhead slides or on computer projected slides (e.g., powerpoint). You must give me a print-out of your slides or notes at the beginning of your talk. Also, please let me know in advance whether you need an overhead projector, computer projector, and/or laptop).

You are expected to come and support your fellow students when they are presenting. If you have a good reason why you can't make it, please talk to me.

Deadlines:

Wednesday, April 11 Email me with what group you would like to be in. If you don't know who you want to work with, let me know, and I can try to pair people up. Also, let me know if (and why) you have strong preferences about when you present.

Friday, April 20 Email me a vague topic idea. I encourage you to talk to me so I can help in your search. (If there are conflicts, the choice of topics is first come, first serve.)

Wednesday, April 25 Email me with an exact topic, including an outline of what you will cover and what references you plan to use.

Sunday, May 6, 12:30-5pm and Wednesday, May 9, 4-7pm Presentations (times may vary slightly).

Guidelines:

1. Please strive for clear presentations that the whole class can understand, given what we have learned during the semester. Organize your thoughts carefully. Be sure to practice, either in front of each other or in front of friends / another group.

2. Make us care about what you're doing. Why is it interesting?

3. Do lots of examples!

4. You don't need to prove all of the results that you present (in fact, there probably won't be time).

5. Please do prove something though. It could as simple as working through a specific example and proving that everything works out, though a longer proof is fine too. In other words, do some real math!

6. When your creating a presentation, be sure not to put too many words on there (not too many slides and not too much stuff on a slide). Otherwise you'll end up just reading off them, and that's boring. You can say a lot of things out loud that aren't on the slide, and you can always do something on the blackboard if you find you need to.

7. The topic can be anything related to information theory that we haven't done in class. This could mean a completely new topic, or it could mean extending a topic we discussed in class. What have you enjoyed so far about the class? Look for related things. Look in bibliographies. Search the internet. Come talk to me.

8. All of the books listed in the syllabus would be good places to start flipping through to get ideas.

9. `http://mathworld.wolfram.com` can be good places to scan for ideas, as can `wikipedia` and `google`.

10. To find journal articles, the first place to look is in the bibliography of whatever books you are looking at. I also recommend going to the webpage `http://www.ams.org/mathscinet/search`, where you can search for articles.

11. And have fun!

Some project ideas

1. Applied data compression (mpegs, etc.)

2. Error correcting codes beyond what we do in class (we'll do Ch 24 of Briggs, and talk about Cyclic Redundancy Checks and then only briefly about Reed-Solomon codes)

3. Economic applications beyond what is in Chapter 6 of Cover and Thomas.

4. Kolmorogov Complexity (the amount of information a sequence of bits contains is the length of the shortest computer program that produces it)

5. LZ algorithms; arithmetic codes in more detail

6. Universal source coding algorithms (compression algorithms that learn as they go)

7. Applications to biology and the genome

8. Quantum information theory

9. Entropy in thermodynamics

10. Cryptography from an information theory standpoint

11. Statistics / Fisher information theory

12. Occam's razor and information theory