

Essential Coding Theory 6.440

MIT, Fall 2011

Final Project

1 Important Dates:

Project proposal: Thursday, November 3rd, 2011.

Project submission: Tuesday, December 6th, 2011.

Project presentation: During the last week of the semester (the semester ends on December 14th, 2011).

2 What to do?

Work in groups or individually on a project related to coding theory. The output should be either a paper, other written document(s), or a system. In addition, there will be an oral presentation of the project.

Requirements from a project:

- **Relevant.** Pick a project that centers around codes.
- **New initiative.** Start something new.
- **Useful.** Do something that will help you as a researcher, and, perhaps, other researchers.

3 Types of Projects

There is a lot of flexibility in the type of project you can choose. Some examples are:

- Do a small research project.
- Pick an open problem you are interested in, understand it, and explore natural approaches to its solution.
- Initiate a project related to a project you are already involved in.
- Write a short survey.
- Create a database with easy search (think of the Complexity Zoo as an example).
- Edit and create new Wikipedia entries.

4 Sample Ideas

You are strongly encouraged to pursue your own interests and pick any project you are excited about, as long as it meets the criteria specified above. As a service, you can find a few ideas below. As the semester progresses, more ideas will be added to the subject's website.

- Take a big open problem, like: are there binary codes reaching list decoding capacity? are there linear time encodable and list-decodable codes reaching list decoding capacity? are there constant rate locally testable codes? are there polynomial length locally decodable codes? Understand the problem and read the relevant papers. Why is the problem hard, what kind of directions might be useful for the problem, where are the bottlenecks, and why natural approaches fail? Write your conclusions clearly, together with appropriate background.
- Create an easy to search database for the best codes known today for various parameters (length, distance, alphabet, encoding time, (list) decoding time, list decoding radius, list recovery, locality of decoding, testing time, etc), and for the existing usages of codes (cryptography, hardness vs randomness tradeoffs, pseudorandom objects, PCP, compressed sensing, etc). Use the database to identify interesting open problems.

5 Project Proposal

You are asked to submit a project proposal by the deadline specified in the beginning of this document. The project proposal can be as short as one or two paragraphs, and should clearly and thoughtfully specify what you plan to do. Start planning your project and checking its viability enough time before the proposal deadline. You are advised to discuss the project with Prof. Moshkovitz prior to the proposal deadline.

6 Project Output

There must be a tangible outcome to your project. This outcome can be in the form of a paper, other written document(s), or a system.

7 Project Presentation

All projects will be orally presented to the class in a special session(s) during the last week of the semester. Each presentation will be half an hour.