Summer of Science, 2020

MnP Club, IIT Bombay

Coding Theory

- Plan of Action -

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Overview

I'll be mainly covering the book *A First Course in Coding Theory* by *Raymond Hill* as suggested by my mentor. My main objective will be to cover the basics of coding theory, and side-by-side learning the mathematical background, as I progress.

Chapters of the book

These are the chapters of the suggested book which I intend to cover as a part of this year's SoS.

1. Introduction to error-correcting codes
2. The main coding theory problem
3. An introduction to finite fields
4. Vector spaces over finite fields
5. Introduction to linear codes
6. Encoding and decoding with a linear code
7. The dual code, the parity-check matrix, and syndrome
8. The Hamming codes
9. Perfect codes
10. Codes and Latin squares
11. A double-error correcting decimal code and an introduction to BCH codes
12. Cyclic codes
13. Weight enumerators

I'll definitely want to finish the book, but after covering two introductory chapters and talking to the mentor, it seems like these topics will take more time than I expected. I'll try my best to cover as much as possible.

Weekly Goals

I have already covered 2 introductory chapters. Also, I have repeated the same chapters two weeks several times as Im planning to cover that chapter somewhere in the middle of the two weeks.
More or less, I'll follow this schedule :-

- Week 1 : *April 11, 2020 - April 17, 2020*
  - Chapter 3
  - Chapter 4
  - Chapter 5
- Week 2 : *April 18, 2020 - April 24, 2020*
  - Chapter 6
  - Chapter 7
- Week 3 : *April 25, 2020 - May 1, 2020*
  - Chapter 7
  - Till Chapter 7 in Mid-summer report (*April 30, 2020*)
  - Chapter 8
- Week 4 : *May 2, 2020 - May 8, 2020*

  - Chapter 8
  - Chapter 9

- Week 5 : *May 9, 2020 - May 15, 2020*
  - Chapter 9
  - Chapter 10

- Week 6 : *May 16, 2020 - May 22, 2020*
  - Chapter 10
  - Chapter 11

- Week 7 : *May 23, 2020 - May 29, 2020*
  - Chapter 12
  - Chapter 13

Learning LaTeX

During this project work, I'll also be learning LaTeX (this is the the first implementation). Here, I'll like to thank *Aryaman Maithani* for all the LaTeX realted material he provided (not only for LaTeX though), through his website. It definitely helped a lot.