



Big O Theory Club

8/27: FIRST MEETING

What We Do

Two Types of Meetings

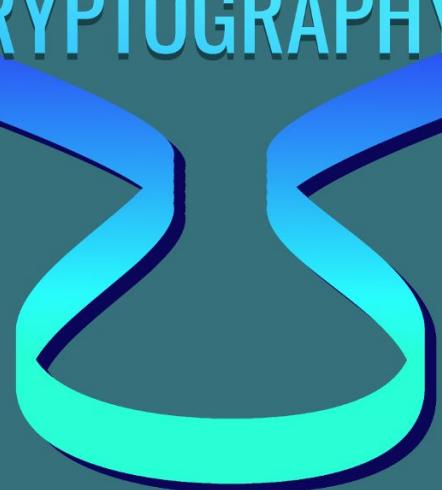
- **Faculty/Student Talks :**
 - No prerequisite knowledge for most talks
 - We welcome talks from students!
- **Problem Sessions**
 - Small group work
 - 3 - 5 themed CS theory problems





THEORY CLUB

ELLIPTIC CURVE CRYPTOGRAPHY



ES&T L1175: 04/03 @6PM
with
PROFESSOR MATTHEW BAKER

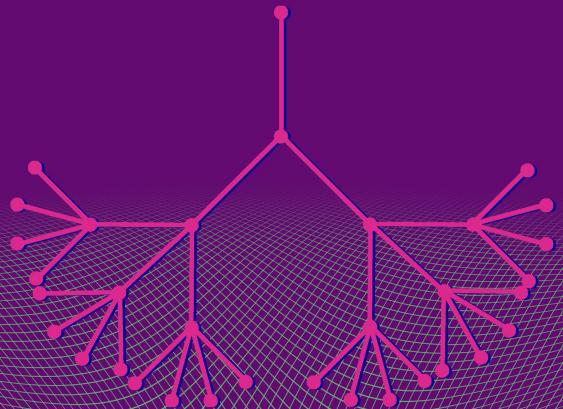
THEORY CLUB
SYNCHRONOUS
CHAOS
AKA THEORY CLUB
ELECTIONS

CCB 102: 04/23 @6PM
with
DIPTODIP DEB



THEORY CLUB

PROBLEM SESSION



CCB 102: 02/26 @6PM
with
SHERRY SARKAR



STAND WITH THE ULTIMATE CLASS OF HEROES



11.03.2017 7PM
11.04.2017 1PM
KLAUS 1116

DEEP LEARNING COMPETITION

prizes

- 1st: GTX 1080 GPU(s)
- 2nd: Google Home(s)
- 3rd: Arduino Starter Kit(s)

food will be provided

teams of up to 3

register at <https://goo.gl/PaqCzz>

(prizes are 1 per person on team)

contact jared_moore@homedepot.com

THEORY CLUB Georgia Tech Machine Learning



What We Do

Get you involved in research

- How to approach professors
- What classes should you take
- How to apply to REUs



Variant of Nim

RULES:

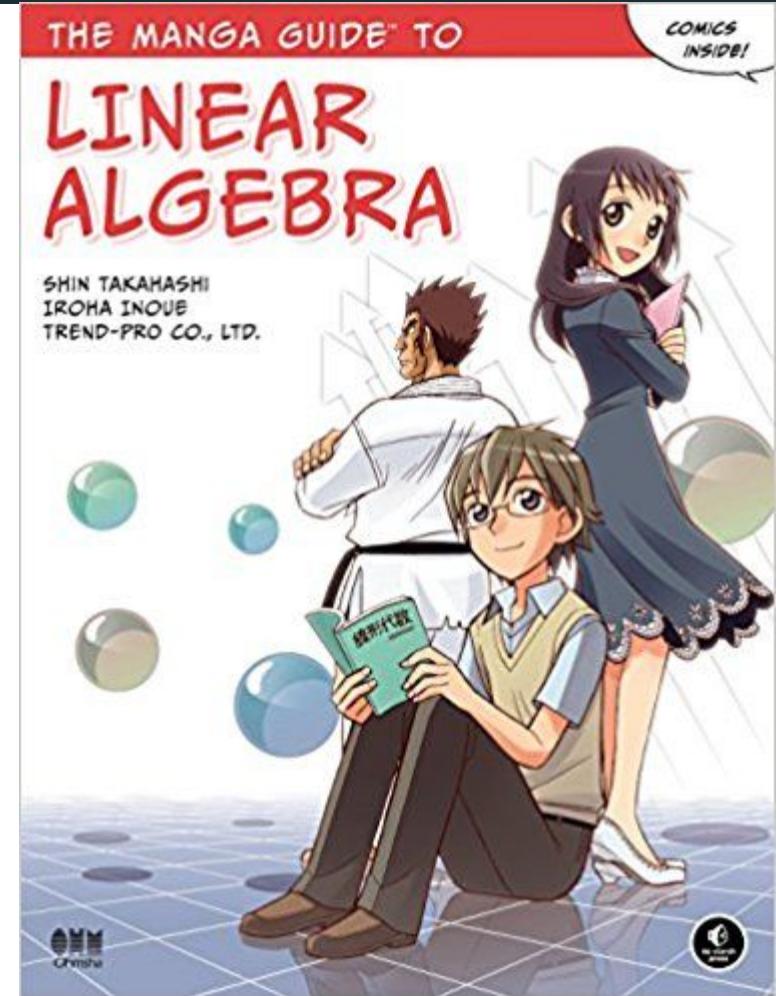
- Two players
- N paper clips in a pile
- Player 1 on his/her first move can take up to $N - 1$ paper clips
- A player can take up to twice the number of paper clips the last player took



GOAL: Take the last paper clip!

Fibonacci Nim

- Many of you noticed that 3 paper clips was a bad game to start.
 - And 5 paper clips
- A *losing position* is a position in which the player who makes a move in that position will surely lose (assuming the other player plays correctly).
 - 3, 5 paper clips are losing positions.
- Consider the 8 paper clip game.
Notice that removing 3 clips is not



Fibonacci Nim

- The losing positions we know so far:
 - 2, 3, 5, 8....
- Perhaps we can “add” two losing positions together to create a larger losing position!
 - Can’t just add two arbitrary losing positions : for example $8 + 2 = 10$ is not a losing position.
 - Left as an exercise to the reader
- **Theorem** : The Fibonacci numbers are losing positions - there is no way to win a Fibonacci number of clips unless you can remove all clips.

Winning Strategy

- **Zeckendorf's Theorem** : Any positive integer can be expressed as the sum of non consecutive Fibonacci terms.
 - $20 = 13 + 5 + 2$
 - Left as a trivial exercise to the reader
- **Lemma** : $F_{n+1} < 2 * F_n < F_{n+2}$
 - ***O B V I O U S***
- So, if we remove the smallest losing position, then we force our opponent to play losing positions (since he/she can't remove the entire position).

Problem 1

A two-player game involves placing pennies on a circular table such that in each turn, the coin that is placed neither overlaps with the other coins nor hangs off the table. Whoever cannot place a coin on a turn loses. Who has a winning strategy?



Problem 2

In a set of n persons, any subset of four contains a person who knows the other three persons. Prove that there exists a person who knows all the others. (If A knows B then B knows A).



Problem 3

Peter has 3 accounts in a bank, each with an integral number of dollars. He is only allowed to transfer money from one account to another so that the amount of money in the latter is doubled.

-Prove that Peter can always transfer all his money into two accounts.

-Can he always transfer all his money into one account?

