Big O Theory Club

8/27: FIRST MEETING

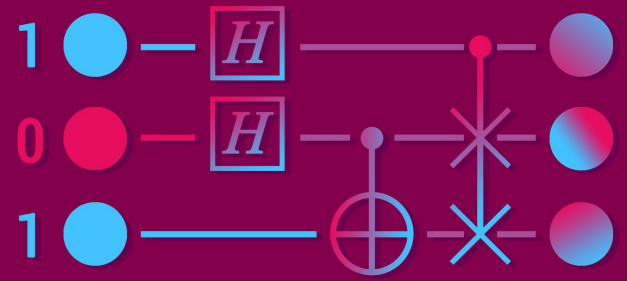
What We Do

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

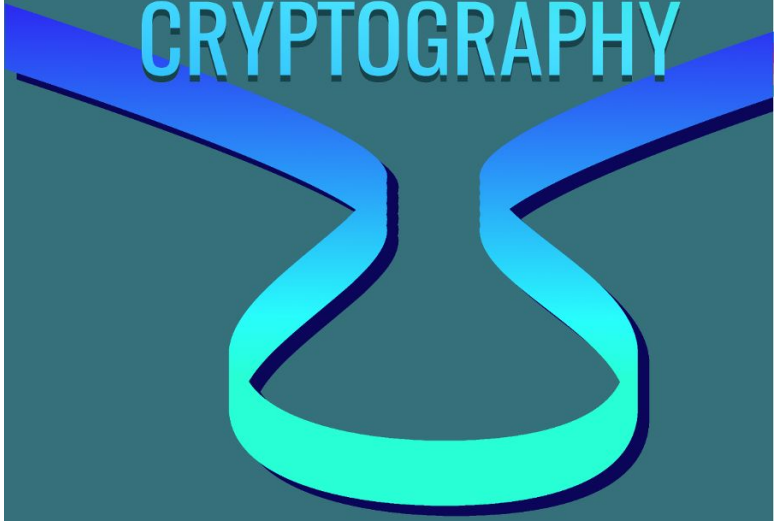
QUANTUM COMPUTING ALGORITHMS



ES&T L1175: 02/27 @6PM
with
DEVON INGRAM

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

SPRINGTIME

PROBLEM SESSION

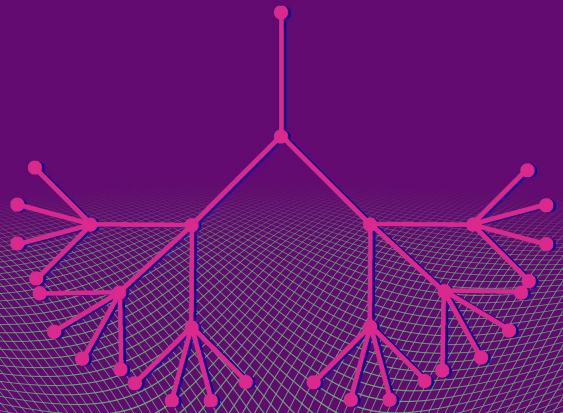
CCB 102: 03/26 @6PM

with

SHYAMAL PATEL

THEORY CLUB

PROBLEM SESSION



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

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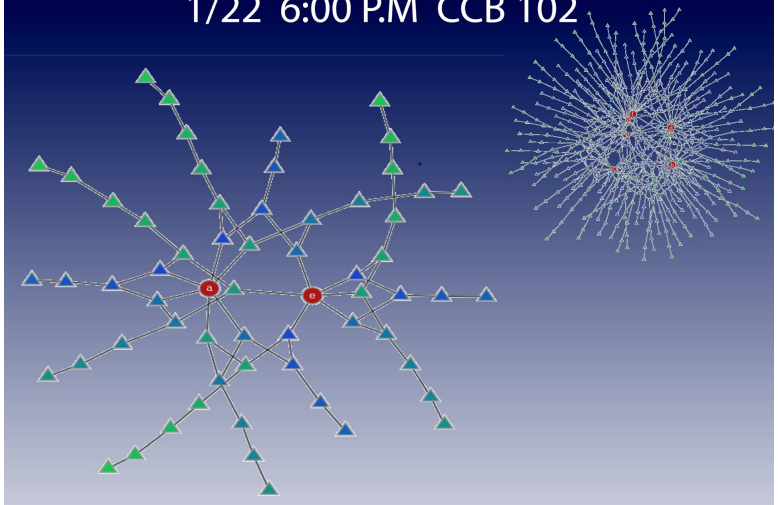
1/22 6:00 P.M CCB 102



REDUCING THE
GROUP ISOMORPHISM PROBLEM
TO THE
GRAPH ISOMORPHISM PROBLEM

BY DANIEL HATHCOCK

THE HOME DEPOT
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
Georgia Tech Machine Learning
THEORY CLUB

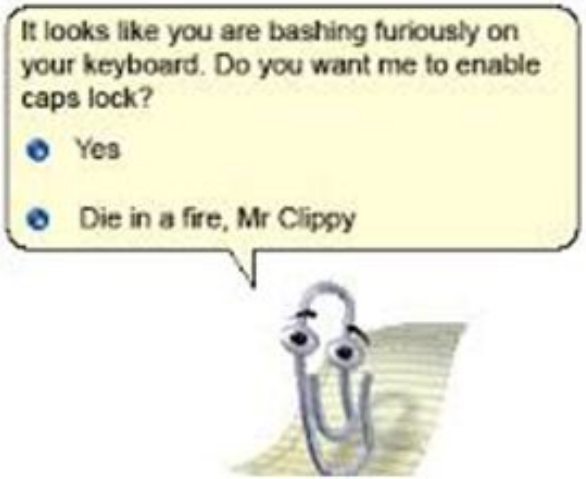
THE HOME DEPOT
09.07.2018 7pm
09.08.2018 12pm
KLAUS 2443/2456
DEEP
LEARNING
HACKA
THON
prizes
1st: PS4(s)
2nd: Bose Headphones(s)
3rd: Rasberry PI(s)
+ Job Opportunities
bring a resume :D
- teams of up to 3
- food will be provided
THEORY CLUB

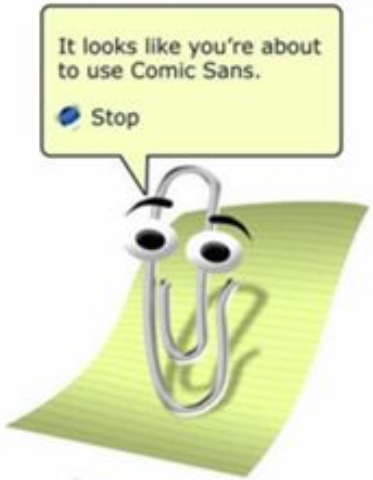
What We Do

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 an option (5 remain and my opponent can take away 6).
- So on my move, *I start* the 3 paper clip game. This means I will also start the 5 paper clip game.

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** : $F_{n + 1} < 2 * F_n < F_{n + 2}$
  - OBVIOUS
- 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?