6.UAT High School Conference

Program

Tuesday, October 30, 2018
9 AM-3 PM

Special Thanks To:
Katherine Touafek (School to Careers Partnership)
David Case, Jennifer Hardy (Worcester Tech)
Yuri Petriv (Somerville)
Laura Pang (MIT)
Jurgen Michel (MIT)

Last updated Oct. 29
9 AM

34-301
Optical Tweezers: How nanoscale tug-of-war won the Nobel Prize
Buffer Overflow attacks for controlling a program
charRNN: looking at your past to predict what you will write in the future
That’s Music to My Ears

Jurgen
Taylor Sorenson* (10)
Sam Nguyen (10)
Nadya Balanbanska (10)
Bryan Chen (10)

34-302
Nash Equilibrium: Betrayal and its Consequences
Finding Best Case Traffic
Designing a City using Minimum Spanning Trees
How much can a plumber pump before the max flow pops
How Calculus Helps Us Get To Class On Time

Laura
Meryl Wang (24)
Jessica Zhu* (24)
Crystal Wang (24)
Edmund Williams (30)
Danny Gelman (24)

34-303
Railroad Bombing Strategies in the Cold War: Flow Networks and Max Flow
Probability vs Human Brain: how do we make decisions in life?
BGP Hijacking: How to Break the Internet
The Road to Recovery: Gradient Decent
Protein Mass Spectrometry

Alex
John Murphy (22)
Kalyn Bowen* (5)
Marcin Jackymiak (5)
Steven Timberman (5)
Seung Lee (5)

34-304
How to Find the Optimal Move in 2-Player Board Games
Learn how to Do Faster with Caching!
How to get through a corn maze
Let’s Get Logical: Understanding Digital Systems
How to secretly and privately browse even the most hidden corners of the Internet

Luis
Cynthia Zhou* (26)
Oluwafemi Oladipupo (26)
Jing Lin (26)
Sarah Flanagan (25)
Andres Fabrega (24)

24-307
How Using Thousands of Computers can Solve Complex Problems
Reinforcement Learning: Teach your computer with a familiar framework
Bayes Theorem
Changing code at the source, and beneath it: binary patching intuition

Leslie
James Gordon* (7)
Ricardo Lopez (7)
Suman Nepal (7)
Grant Prater (7)

24-310
Predicting Fortnite Wins Using Bayes’ Theorem
The Floor is Lava for a Robot with a Camera
Counting Jelly Beans and Multiplying Polynomials
Why machine learning models can fail

Martha
Jacob Gasparich* (1)
Katharina Gschwind (1)
Eva Hu (1)
Anna Kazlauskas (1)

*: slide collector, (n): section number, ((n): first half presenter, (n)): second half presenter
9 AM (cont.)

24-317
Karger's Algorithm: The Fast Way to Break Up Groups
Ultrasound: How To See Your Organs
Graphs, Coloring, and Secrets: The Probabilistic Method
Predicting with Perceptron: How computers can help us see the future
Kenny
Chungmin Lee* (5)
Henry Cheung (5)
Livio Fetahu (6)
Sarah Pohorecky (6)

24-319
Curing Cancer and Winning Basketball Games: Smith-Waterman Algorithm
Max-heaps: Maximize your payload, minimize your work
The Water Pipes That Power Your Computer: MOSFETS
Using your body to fight cancer, CAR-T cell therapy explained
Long
Tamar Grey* (7)
Anelise Newman (7)
Aaron Wubshet (7)
Dallace Francis (10)

24-321
From Finches to Functions: solving problems by mimicking evolution
Breaking Down and Building Up Waves with Fourier Transforms
How Sites Know What Content You'll Love
Geography in Your Genes: How To Simplify and Analyze Complex Data
Rajeev
Caleb Noble* (14)
Sanjeev Murty (14)
Andrew Antonitis (14)
Agni Kumar (14)
Rishabh Chandra (6)

24-323
Raytracing: How Computers Make Animated Movies
Top picks for you: How to make good recommendations.
The Pancake Function
How To Know If Your Teacher Reads Your Essays
How to sort records efficiently and uuh, waste space
David
Jared DiCarlo (26)
Kara Luo* (1)
Samira Okudo (1)
Claire Nord (25)
Raveen Nzilani (25)

10 AM

34-301
How to be a good prom matchmaker
Reliable Data Transportation
Making Distance Irrelevant with Quantum Physics
Get More Done, Faster: The Principle of Concurrent Programming
Bus Route Assignment with Ford Fulkerson
Jurgen
Yun Boyer ((26)
Carlos Garcia* (8)
Tim Cardona (8)
Matthew Beveridge (10)
Paula Lahera (10)

34-302
Making a smart toaster smarter with data augmentation
How to choose the best moves in a game
Sending Information through Fiber Optical Cables
Fourier Transforms: Escaping the Time Domain
Share Candies Like a Pro using MapReduce
Laura
Jeffrey Li* (23)
Tiffany Pan (23)
Wings Yeung (23)
Andrew Chen (23)
Abishkar Chhetri (23)

34-303
Play to win: how to minimize your maximum loss
Keeping your backups afloat with RAFT
Intro to Hash Functions: Space, Speed, Security
Just Flow With It - Getting the Most Out of a Network
How to compare almost anything
Alex
Carissa Gadson* (22)
Kundan Chintamaneni (22)
Karim Karimi (13)
Guillermo Diaz (13)
Alexander Katz (13)

*: slide collector, (n): section number, ((n): first half presenter, (n)): second half presenter
<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Presenter</th>
<th>Section</th>
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<tbody>
<tr>
<td>10 AM</td>
<td>DDoS: Taking Down Networks with Computer Zombies</td>
<td>Luis Allen Lee*</td>
<td>(23)</td>
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<tr>
<td></td>
<td>Counting to Infinity with One-to-one Maps</td>
<td>Tony Ding (23)</td>
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<td>Heating up with solar thermal: a clean energy solution</td>
<td>Wilbur Li (23)</td>
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<td>The Mystery Behind Mind-blowing Special Effects in Movies</td>
<td>Janak Agrawal (24)</td>
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<td>How to Decode Messages Sent through Space</td>
<td>Liam Green (25)</td>
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<tr>
<td>24-307</td>
<td>Counting Sort: How to quickly sort a deck of cards</td>
<td>Christie Jason</td>
<td>(15)</td>
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<tr>
<td></td>
<td>Solve problems faster with Dynamic Programming</td>
<td>Paulos*</td>
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<td>How Byzantine Generals are Relevant to Blockchain</td>
<td>Austin Parker (15)</td>
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<td>SIFT: The Secret To Making Panoramic Photos</td>
<td>Kristy Carpenter (15)</td>
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<td>The Illusions Behind our Phone Screens</td>
<td>Bailee Margolis (15)</td>
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<td>Brandon Fountain (15)</td>
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<tr>
<td>24-308</td>
<td>Pipe down, we’re just improving throughput!</td>
<td>Joel Jasin Miguel*</td>
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<td></td>
<td>The Computational Gold Rush</td>
<td>Gohar Khan (15)</td>
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<td>What’s the Buzz: Bee Communication and Understanding of the World</td>
<td>Gwen Edgar (15)</td>
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<td>Binary Search: the fast way to find a number</td>
<td>Anthony Rosario (18)</td>
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<td>Insertion Sort: The Tradeoff Between Simplicity and Efficiency</td>
<td>Bamlak Gessessew (18)</td>
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<tr>
<td>24-310</td>
<td>Git: Making collaboration easy</td>
<td>Martha XingLiang</td>
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<td>Ctrl-F for Experts</td>
<td>Zhao*</td>
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<td>Get Things in Order Super Fast: Merge Sort</td>
<td>Lauren Clayberg (2)</td>
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<td>Blockchain and You</td>
<td>Amir Farhat (2)</td>
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<td>How to make a website</td>
<td>Christopher Madrigal(2)</td>
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<td>Emmanuel Mengistab (2)</td>
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<td>24-317</td>
<td>How Natural Selection Inspires Programming</td>
<td>Kenny Cowboy Lynk*</td>
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<td>Word Embeddings: How Computers Understand the Meanings of Words</td>
<td>Matthew Huggins (8)</td>
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<td>Preventing wrong bank information using Locks</td>
<td>Matthew Woicik (8)</td>
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<td>Making Monsters: A lesson on CRISPr and Gene Editing</td>
<td>Madison Darmofal (8)</td>
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<td>Hilbert’s Paradox of the Infinite Hotel</td>
<td>Katherine Yang (8)</td>
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<tr>
<td>24-319</td>
<td>Design the Cheapest Flight Network to Connect Different Cities</td>
<td>George Anna Song*</td>
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<td>Making Flexible Electronics: Micro fabrication of Personal Health Monitors</td>
<td>Farita Tasnim (30)</td>
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<td>Regression Discontinuity: How To Tell If Test Prep Programs Actually Work</td>
<td>Kevin Li (30)</td>
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<td>Movie and Music Recommendations</td>
<td>Cole Baker (30)</td>
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<td>Increasing your Phone Storage: Data Compression</td>
<td>Xiaoyi Wang (10)</td>
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*: slide collector, (n): section number, ((n): first half presenter, (n)): second half presenter
## 10 AM (cont.)

### 24-321
The Death of a Gambler
Rajeev
Tiancheng Qin* (14)
Avery Nortonsmith (14)
Emily Hu (14)
Lucy Li (13)
Dylan Modesitt (13)

From Music to MP3
If time were money: how Cache saves you Cash
How Many Primes Are There and How Do We Know?

### 24-323
When to Keep Going and When to Call it Quits: Optimal Stopping
David
Janice Lee* (26)
Ruben Merenfeld (2)
Holly Rieping (2)
Kacie Bawiec (6)
Andrew Wong (6)

How To Download Movies Easily
Technicolor: Early Movie Magic
Parsing: How computers read
How Computers See Pictures

## 11 AM

### 24-115
Reliable Data Transportation
Collin
Juan Garcia* (19)
Riker Bixby (19)
Nicholas Guo (19)
Alexander Lynch (19)
Max Murin (19)
Christopher Wang (19)

Verifying DNA Constructs using Gel Electrophoresis
No more spamming! Into to Proof of Work
How to compare almost anything
How to Automatically Fix Errors
Posing With Skeletons: How Pixar Builds a Character

### 24-307
ID Trees: Learning to Ask the Right Questions
Linda / Christie
Virginia Sun* (3)
Jueun Lee (3)
Menghua Wu (3)
Rebecca Weinberger (16)
Santiago Munoz (16)

TCP: how YouTube videos arrive at the click of a button
Who’s Attracting the Cockroaches–A Bayesian Nonparametric Approach
DNS: The Internet’s Address Book
PageRank: Ordering Websites by Importance

### 24-308
How to detect plagiarism: Adventures in string searching
Joel
Lawrence Li* (16)
Jintao Chen (16)
Istvan Chung (16)
Allison Fu (16)
Zoe Gong (16)
Alexandra Martirosian (16)

How do you distribute a large file to your classmates?
Solving the Cosmic Ray Problem
LDA: How to teach a computer to summarize a book for you!
How To Win a Game Show
Huffman Encoding: Smart Strategies for Computer Storage

*: slide collector, (n): section number, ((n): first half presenter, (n)): second half presenter
11 AM (cont.)

24-310
Discover how your devices are able to use the internet for powerful things!
How to Predict Your Exam Results Using Perceptron
How to Quickly Find a Word in a Text: Skip Unnecessary Comparisons
Compilers: transforming code by kneading dough
RSA: Keeping Your $$$ Safe!

24-317
How to Prove Your Point and Not Get Scammed
The Making of a Madlib: Grammar for Computers
Preventing race conditions & how this can save you $50
How to make a robot see
Steps to Solving a Genetic Mystery!

24-319
How to Take Advantage Of Memory You Didn’t Know You Had
Laziness: Why Procrastination is the Best Way to do your Work
When to give up? An adventure in complexity theory
How to minimize your overall travel costs
Coloring With a Handful of Crayons: The 5-Color Theorem

24-321
The Electrical Switch
How to Flip a Coin With Someone You Don’t Trust
Group Theory: Reducing 2 Centuries of Rubik’s Cube Solving to 30 Seconds
Particle Filter Localization: How Robots Find Themselves
Netfix’s Key to Success: Collaborative Filtering

24-323
Turning Pictures into Maps using Graphs
Monte Carlo Magic
How a Star is Born
Why 12 Notes in a Musical Scale?
Why People Can’t Agree When There Are Too Many Trolls

12 PM

34-101
Quantifying the Value of Information
Adding Intuition to AI: Baye’s Rule
Never Lose Again! Using AI to Win Board Games
Keeping Order Without Lists: An Introduction to Binary Trees
P vs. NP: Cracking Codes with Ease
Memory Allocators: Reusing Space

*: slide collector, (n): section number, ((n): first half presenter, (n)): second half presenter
12 PM (cont.)

24-115
The Fight Against Spam
Circuits and Lightning Machines
The FUNdamentals of Insertion Sort
The Secret of the Aromas and Colors in the Grill
A Schnorr-y for online authentication
Understanding Gravitational Waves and its Use for Space Exploration

Collin
Jason Seibel* (22)
Matthew Burns (20)
Yianni Giannaris (20)
Chung-Yueh Lin (20)
James Lovejoy (20)
Vedaant Kudadia (22)

24-308
The Prisoner’s Dilemma: Does teamwork make the dream work?
Reinforcement Learning: How to make your computer a very good boi
Boosting: How to Boost Decision Making Based on Data
Getting Technical with Televisions: is OLED the future?
Visualizing complex data using non-linear transformations
Hidden in Plain Sight: How to Send a Secret Message in a Picture

Anu
Erica Zhou* (20)
Raja Rajcic (20)
Steven Salvas (20)
Christopher Mauck (20)
Ileana Rugina (18)
Felipe Hofmann (18)

24-310
How the Infinite Can Become Finite
Do you guys still use Facebook? They do some merging there
How the Internet Promises to Accurately Send Your Messages
How to win $1,000,000 every time!
Understanding the Building Blocks of Code

Martha
Allan Gelman* (4)
Jada Griffith (4)
Fernando Herrera (4)
Christina Lee (4)
Stephanie Li (4)
Tyler Moroso (4)

24-317
Train your body to fight disease: the power of vaccination
Multithreading: Getting the Most Out of Your Applications
How to make sure all of your friends have a date for prom
What are feedback systems and how to control them?
How to Determine Whether You Will Win a Gamble

Kenny
Meenakshi Chakraborty* (11)
James Rodriguez (11)
Samantha Sappenfield (11)
Amir Cohen (11)
Neha Prasad (11)

24-319
Feedback Controls
How Gamecube Controllers Communicate at 60fps
How classifying information can save time... and lives
Laziness as a (programmer's) Virtue
CRISPR-Cas9: How to Fix Typos in Your Body

George
Walaa Alkhanaizi* (28)
Zachary Pitcher (28)
Eric Bradford (28)
Timothy Ngotiaoco (28)
Kunyi Li (30)

24-321
Hashing: How Companies Like Google Find Your Data Quickly
Maximizing Transportation from Start to End with Ford-Fulkerson
More than Meets the Eye: Matching Color Representation
How to Minimize the Chance of Getting Wiretapped
Think Like a Machine: How (Many) Machines Make Decisions

Rajeev
Michael Arrington* (11)
Adelaide Chambers (11)
Brian Chen (11)
Tossaporn Saengja (14)
Candace Okumko (13)

*: slide collector, (n): section number, ((n): first half presenter, (n)): second half presenter
### 12 PM (cont.)

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<th>Session</th>
<th>Title</th>
<th>Presenter(s)</th>
<th>Section</th>
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<tbody>
<tr>
<td>24-323</td>
<td>Multicore computing: how computers work together (and why that’s hard)</td>
<td>Edward Fan*</td>
<td>(28)</td>
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<td>How to Divvy Up a Secret</td>
<td>Kevin Zhao</td>
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<td>A Day in the Life of Your Internet Service Provider</td>
<td>Brandon Wang</td>
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<td>Cliques</td>
<td>Rui Li</td>
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<td>MapReduce, Halloween Edition: How to efficiently count candy via parallelization</td>
<td>Angela Lin</td>
<td>(26)</td>
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### 1 PM

<table>
<thead>
<tr>
<th>Session</th>
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<th>Presenter(s)</th>
<th>Section</th>
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<tbody>
<tr>
<td>24-115</td>
<td>How to Find Your Missing Cell Phone</td>
<td>Adam Gumbardo*</td>
<td>(21)</td>
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<td>How computers see</td>
<td>Rawn Henry</td>
<td>(21)</td>
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<td>What can no computer ever compute?</td>
<td>Jackson Karl</td>
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<td>Model an alarm to protect your stuff with Finite State Machines</td>
<td>Zoe Klawans</td>
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<td>Hourglasses and Truckers: It’s All About the Bottleneck</td>
<td>Isabel Quispe</td>
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<td>How to locate moving things when you can’t see them</td>
<td>Michelle Tan</td>
<td>(21)</td>
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<tr>
<td>24-308</td>
<td>How to (actually) slow down time</td>
<td>Yueyang Ying*</td>
<td>(21)</td>
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<td>Printing Itself Out: A Sketch of How Programs Can “Reproduce” Themselves</td>
<td>Robert Vasen</td>
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<td>How to survive under an evil jail warden</td>
<td>James Allen</td>
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<td>Why can we trust Bitcoin?</td>
<td>Elorm Koto</td>
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<td>Finding Intersecting Lines Using Laziness and Organization</td>
<td>Martin Schneider</td>
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<td>Digital Computation: How to do math with only switches</td>
<td>Jeremy Sogo</td>
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<td>24-317</td>
<td>Viterbi Decoding: How we can talk across the solar system</td>
<td>Luis Torres*</td>
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<td>Tor: The Onion Router</td>
<td>Serena Do</td>
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<td>The Power of Polynomials: Counting by Encoding &amp; Computing</td>
<td>Diane Zhou</td>
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<td>Nuclear Fusion: Generating Energy by Creating a Mini-Sun on Earth</td>
<td>Mira Partha</td>
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<td>The Birthday Problem: why is our intuition wrong?</td>
<td>Charleen Wang</td>
<td>(24)</td>
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<td>Auto-corset *Auto-correct</td>
<td>Jeet Mohapatra</td>
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<td>24-319</td>
<td>Maximizing Traffic Across Fragile Bridges</td>
<td>Andy Kuang*</td>
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<td>To Bits and Back: Efficient Data Compression Using Huffman Encoding</td>
<td>Rebecca Agustin</td>
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<td>Finding the Best Route with Dijkstra’s</td>
<td>Shannon Duffy</td>
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<td>Use the Bars and Stars Method to count M&amp;Ms</td>
<td>Rachel Levy</td>
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<td>Reading Hearts With Vectors</td>
<td>David Mejorado</td>
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<td>Finding Your Way In the Dark: Online Algorithms</td>
<td>Claudia Wu</td>
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1 PM (cont.)

24-321
- Sorting Trees with Tree Sort
- How to use large numbers to secretly send messages
- Strategic decision making: How to read your competitor’s mind
- Infinity: How big can it really get?
- Your computer knows what you want better than you do!
- How to Find a New Earth!

24-323
- How to use your laundry to get more done in the same amount of time
- How to Teach Computers to Read
- How Does Google Work: The PageRank Algorithm
- How to make sure your friends aren’t cheating – Cryptography schemes
- Why computers make 3D files out of triangles
- How Computers Can Fake Real Life -- And Get Away With It

2 PM

24-308
- Creating Anonymity Through Layers of Non-Anonymous Communication
- It’s Not Just For Piracy! BitTorrent: What Is It and How Does it Work?

*: slide collector, (n): section number, ((n)): first half presenter, (n)): second half presenter