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

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

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

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

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

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

*: 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

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

24-321
From Finches to Functions: solving problems by mimicking evolution
Breaking Down and Building Up Waves with Fourier Transforms

10 AM

24-323
How Sites Know What Content You’ll Love
Geography in Your Genes: How To Simplify and Analyze Complex Data

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

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

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

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

34-304
DDoS: Taking Down Networks with Computer Zombies
Counting to Infinity with One-to-one Maps
Heating up with solar thermal: a clean energy solution
The Mystery Behind Mind-blowing Special Effects in Movies
How to Decode Messages Sent through Space

Luis
Allen Lee* (23)
Tony Ding (23)
Wilbur Li (23)
Janak Agrawal (24)
Liam Green (25)

24-307
Counting Sort: How to quickly sort a deck of cards
Solve problems faster with Dynamic Programming
How Byzantine Generals are Relevant to Blockchain
SIFT: The Secret To Making Panoramic Photos
The Illusions Behind our Phone Screens

Christie
Jason Paulos* (15)
Austin Parker (15)
Kristy Carpenter (15)
Bailee Margolis (15)
Brandon Fountain (15)

24-308
Pipe down, we’re just improving throughput!
The Computational Gold Rush
What’s the Buzz: Bee Communication and Understanding of the World
Binary Search: the fast way to find a number
Insertion Sort: The Tradeoff Between Simplicity and Efficiency

Joel
Jasmin Miguel* (15)
Gohar Khan (15)
Gwen Edgar (15)
Anthony Rosario (18)
Bamlak Gessessew (18)

24-310
Git: Making collaboration easy
Ctrl-F for Experts
Get Things in Order Super Fast: Merge Sort
Blockchain and You
How to make a website

Martha
XingLiang Zhao* (2)
Lauren Clayberg (2)
Amir Farhat (2)
Christopher Madrigal (2)
Emmanuel Mengistab (2)

24-317
How Natural Selection Inspires Programming
Word Embeddings: How Computers Understand the Meanings of Words
Preventing wrong bank information using Locks
Making Monsters: A lesson on CRISPr and Gene Editing
Hilbert’s Paradox of the Infinite Hotel

Kenny
Cowboy Lynk* (8)
Matthew Huggins (8)
Matthew Woicik (8)
Madison Darmofal (8)
Katherine Yang (8)

24-319
Design the Cheapest Flight Network to Connect Different Cities
Making Flexible Electronics: Micro fabrication of Personal Health Monitors
Regression Discontinuity: How To Tell If Test Prep Programs Actually Work
Increasing your Phone Storage: Data Compression

George
Anna Song* (18)
Farita Tasnim (30)
Kevin Li (30)
Xiaoyi Wang (10)

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

<table>
<thead>
<tr>
<th>Session</th>
<th>Title</th>
<th>Presenter</th>
</tr>
</thead>
<tbody>
<tr>
<td>24-321</td>
<td>The Death of a Gambler</td>
<td>Rajeev</td>
</tr>
<tr>
<td></td>
<td>From Music to MP3</td>
<td>Tiancheng Qin* (14)</td>
</tr>
<tr>
<td></td>
<td>If time were money: how Cache saves you Cash</td>
<td>Avery Nortonsmith (14)</td>
</tr>
<tr>
<td></td>
<td>How Many Primes Are There and How Do We Know?</td>
<td>Emily Hu (14)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lucy Li (13)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dylan Modesitt (13)</td>
</tr>
<tr>
<td>24-323</td>
<td>When to Keep Going and When to Call it Quits: Optimal Stopping</td>
<td>David</td>
</tr>
<tr>
<td></td>
<td>How To Download Movies Easily</td>
<td>Janice Lee* (26)</td>
</tr>
<tr>
<td></td>
<td>Technicolor: Early Movie Magic</td>
<td>Ruben Merenfeld (2)</td>
</tr>
<tr>
<td></td>
<td>Parsing: How computers read</td>
<td>Holly Rieping (2)</td>
</tr>
<tr>
<td></td>
<td>How Computers See Pictures</td>
<td>Kacie Bawiec (6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Andrew Wong (6))</td>
</tr>
</tbody>
</table>

## 11 AM

<table>
<thead>
<tr>
<th>Session</th>
<th>Title</th>
<th>Presenter</th>
</tr>
</thead>
<tbody>
<tr>
<td>24-115</td>
<td>Reliable Data Transportation</td>
<td>Collin</td>
</tr>
<tr>
<td></td>
<td>Verifying DNA Constructs using Gel Electrophoresis</td>
<td>Juan Garcia* (19)</td>
</tr>
<tr>
<td></td>
<td>No more spamming! Into to Proof of Work</td>
<td>Riker Bixby (19)</td>
</tr>
<tr>
<td></td>
<td>How to compare almost anything</td>
<td>Nicholas Guo (19)</td>
</tr>
<tr>
<td></td>
<td>How to Automatically Fix Errors</td>
<td>Alexander Lynch (19)</td>
</tr>
<tr>
<td></td>
<td>Posing With Skeletons: How Pixar Builds a Character</td>
<td>Max Murin (19)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Christopher Wang (19)</td>
</tr>
<tr>
<td>24-307</td>
<td>ID Trees: Learning to Ask the Right Questions</td>
<td>Linda / Christie</td>
</tr>
<tr>
<td></td>
<td>TCP: how YouTube videos arrive at the click of a button</td>
<td>Virginia Sun* (3)</td>
</tr>
<tr>
<td></td>
<td>Who’s Attracting the Cockroaches–A Bayesian Nonparametric Approach</td>
<td>Jueun Lee (3)</td>
</tr>
<tr>
<td></td>
<td>DNS: The Internet’s Address Book</td>
<td>Menghua Wu (3)</td>
</tr>
<tr>
<td></td>
<td>PageRank: Ordering Websites by Importance</td>
<td>Rebecca Weinberger (16)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Santiago Munoz (16)</td>
</tr>
<tr>
<td>24-308</td>
<td>How to detect plagiarism: Adventures in string searching</td>
<td>Joel</td>
</tr>
<tr>
<td></td>
<td>How do you distribute a large file to your classmates?</td>
<td>Lawrence Li* (16)</td>
</tr>
<tr>
<td></td>
<td>Solving the Cosmic Ray Problem</td>
<td>Jintao Chen (16)</td>
</tr>
<tr>
<td></td>
<td>LDA: How to teach a computer to summarize a book for you!</td>
<td>Istvan Chung (16)</td>
</tr>
<tr>
<td></td>
<td>How To Win a Game Show</td>
<td>Allison Fu (16)</td>
</tr>
<tr>
<td></td>
<td>Huffman Encoding: Smart Strategies for Computer Storage</td>
<td>Zoe Gong (16)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Alexandra Martirosian (16)</td>
</tr>
</tbody>
</table>

*: 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
- Netflix’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
Collin
Circuits and Lightning Machines
Jason Seibel* (22)
The FUNdamentals of Insertion Sort
Matthew Burns (20)
The Secret of the Aromas and Colors in the Grill
Yianni Giannaris (20)
A Schnorr-y for online authentication
Chung-Yueh Lin (20)
Understanding Gravitational Waves and its Use for Space Exploration
James Lovejoy (20)
Vedaant Kudadia (22))

24-308
The Prisoner’s Dilemma: Does teamwork make the dream work?
Anu
Reinforcement Learning: How to make your computer a very good boi
Erica Zhou* (20)
Boosting: How to Boost Decision Making Based on Data
Raja Rajcic (20)
Getting Technical with Televisions: is OLED the future?
Steven Salvas (20)
Visualizing complex data using non-linear transformations
Christopher Mauck (20)
Hidden in Plain Sight: How to Send a Secret Message in a Picture
Ileana Rugina (18)
Felipe Hofmann (18)

24-310
How the Infinite Can Become Finite
Martha
Do you guys still use Facebook? They do some merging there
Allan Gelman* (4)
How the Internet Promises to Accurately Send Your Messages
Jada Griffith (4)
How to win $1,000,000 every time!
Fernando Herrera (4)
Understanding the Building Blocks of Code
Christina Lee (4)
Stephanie Li (4)
Tyler Moroso (4)

24-317
Train your body to fight disease: the power of vaccination
Kenny
Multithreading: Getting the Most Out of Your Applications
Meenakshi Chakraborty* (11)
How to make sure all of your friends have a date for prom
James Rodriguez (11)
It’s Not Just For Piracy! BitTorrent: What Is It and How Does it Work?
Samantha Sappenfield (11)
How to Determine Whether You Will Win a Gamble
Chris Xue (26)
Neha Prasad (11)

24-319
Feedback Controls
George
How Gamecube Controllers Communicate at 60fps
Walah Alkhanaizi* (28)
How classifying information can save time... and lives
Zachary Pitcher (28)
Laziness as a (programmer’s) Virtue
Eric Bradford (28)
CRISPR-Cas9: How to Fix Typos in Your Body
Timothy Ngotiaoco (28)
Kunyi Li (30)

24-321
Hashing: How Companies Like Google Find Your Data Quickly
Rajeev
More than Meets the Eye: Matching Color Representation
Michael Arrington* (11)
How to Minimize the Chance of Getting Wiretapped
Brian Chen (11)
Think Like a Machine: How (Many) Machines Make Decisions
Tossaporn Saengja (14)
What are feedback systems and how to control them?
Candace Okumko (13)
Amir Cohen (11)

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

24-323  
Multicore computing: how computers work together (and why that’s hard)  
How to Divvy Up a Secret  
A Day in the Life of Your Internet Service Provider  
Cliques  
MapReduce, Halloween Edition: How to efficiently count candy via parallelization  

David  
Edward Fan* (28)  
Kevin Zhao (28)  
Brandon Wang (28)  
Rui Li (28)  
Angela Lin (26)

1 PM

24-115  
How to Find Your Missing Cell Phone  
How computers see  
What can no computer ever compute?  
Model an alarm to protect your stuff with Finite State Machines  
Hourglasses and Truckers: It’s All About the Bottleneck  
How to locate moving things when you can’t see them  

Collin  
Adam Gumbardo* (21)  
Rawn Henry (21)  
Jackson Kearl (21)  
Zoe Klawans (21)  
Isabel Quispe (21)  
Michelle Tan (21)  

Anu / Mitchell  
Yueyang Ying* (21)  
Robert Vasen (21)  
James Allen (25)  
Elorm Koto (17)  
Martin Schneider (17)  
Jeremy Sogo (18)

24-308  
How to (actually) slow down time  
Printing Itself Out: A Sketch of How Programs Can “Reproduce” Themselves  
How to survive under an evil jail warden  
Why can we trust Bitcoin?  
Finding Intersecting Lines Using Laziness and Organization  
Digital Computation: How to do math with only switches  

Laura  
Luis Torres* (12)  
Serena Do (12)  
Diane Zhou (29)  
Mira Partha (29)  
Charleen Wang (24)  
Jeet Mohapatra (6)

George  
Andy Kuang* (29)  
Rebecca Agustin (29)  
Shannon Duffy (29)  
Rachel Levy (29)  
David Mejorado (29)  
Claudia Wu (29)

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

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