


THIS IS CS 1060



COMPUTATIONAL
THINKING AT UTAH



<http://www.sci.utah.edu/~beiwang/teaching/cs1060.html>



HELLO!

I am **Dr. Bei Wang**

You can find me at

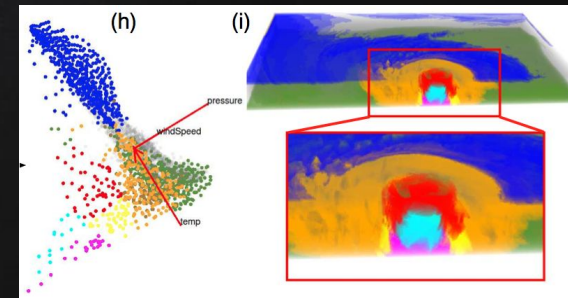
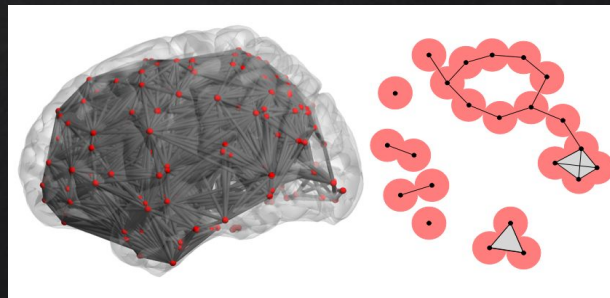
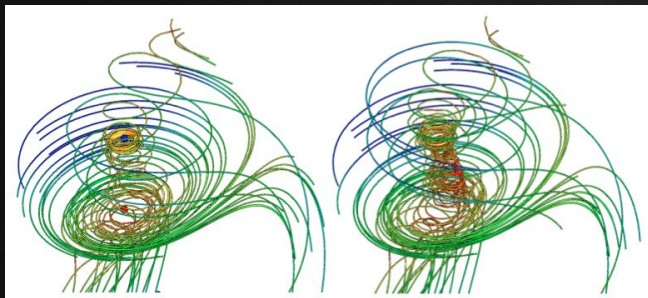
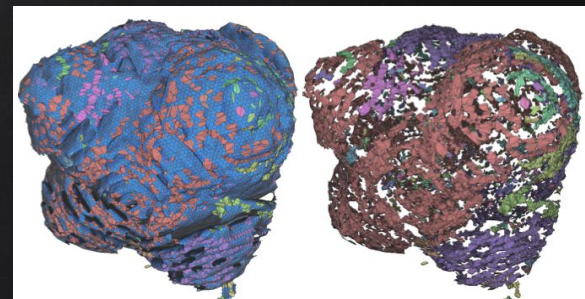
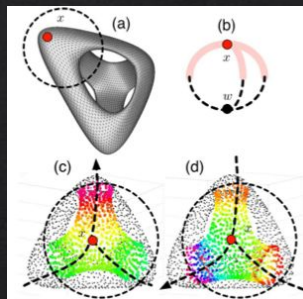
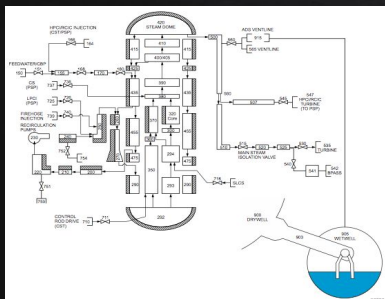
beiwang@sci.utah.edu

www.sci.utah.edu/~beiwang



ABOUT ME

DATA ANALYSIS & DATA VISUALIZATION THEORY, ALGORITHMS & APPLICATIONS





WE ARE GOING TO HAVE FUN!

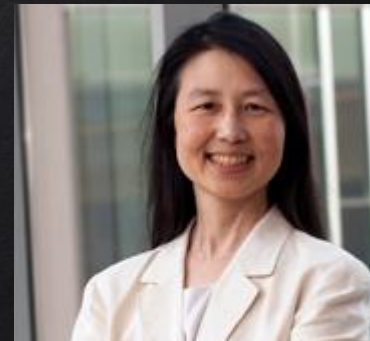
If you have suggestions to make it MORE fun...
I would like to hear about it!



WE ARE ALSO GOING TO LEAN!

Problem solving empowered by computers!

We will study the foundations of computational thinking, by conceptualizing, designing and building solutions to exciting real-world applications.



Computational thinking represents a universally applicable attitude and skill set everyone, not just computer scientists, would be eager to learn and use... it is about the way that humans, not computers, think.

Jeanette Wing VP at Microsoft Research

PROBLEM SOLVING

EMPOWERED BY
COMPUTERS





Making YOU a Computational Thinker and a Problem Solver!



WHO SHOULD TAKE THIS CLASS?

- There are no prerequisites for this course.
- **Any** student interested in enhancing their problem solving skills using computation.
- Appropriate for students seeking an understanding of computational principles that will complement their major field of study.
- Assumes **no background in computing** beyond the ability to use a computer to send email, browse the web, and write papers.
- **No prior experience in programming** is required.
- There is some math, but if you can multiply and understand place value in numbers, you should be fine.
- However, this is **not a computer literacy course**.
- This course satisfies the Applied Science (AS) Intellectual Explorations requirement.



COURSE TOPICS (SUBJECT TO CHANGE)

- Computational thinking: a friendly introduction
- Exploring mummies at the British museum
- Who is Eugene Goostman?
- Roomba and Japan's first upcoming humanoid actress
- What makes online purchases (not) safe?
Emissary panda and identity theft
- Computing basics: a high level view
- Generating art through computing
- TSA is watching you!
- How does the world wide web work?
- The rise of Google
- What powers Instagram?
- Twitter, Twitter, Twitter
- The Social Network
- How did NetFlix Beat Blockbuster?
- What computers can not do?

AND...

ANY OTHER COMPUTING TOPICS YOU FANCY!

Open for suggestions!

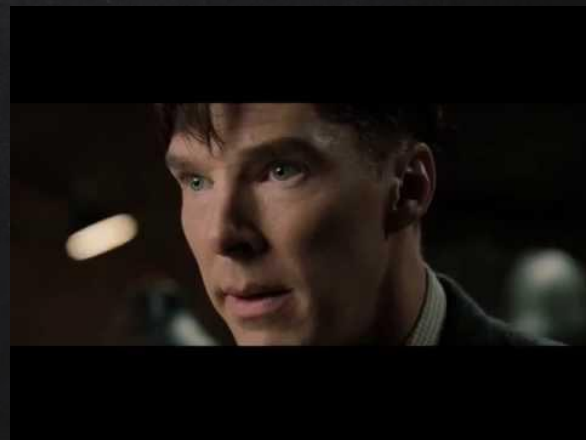


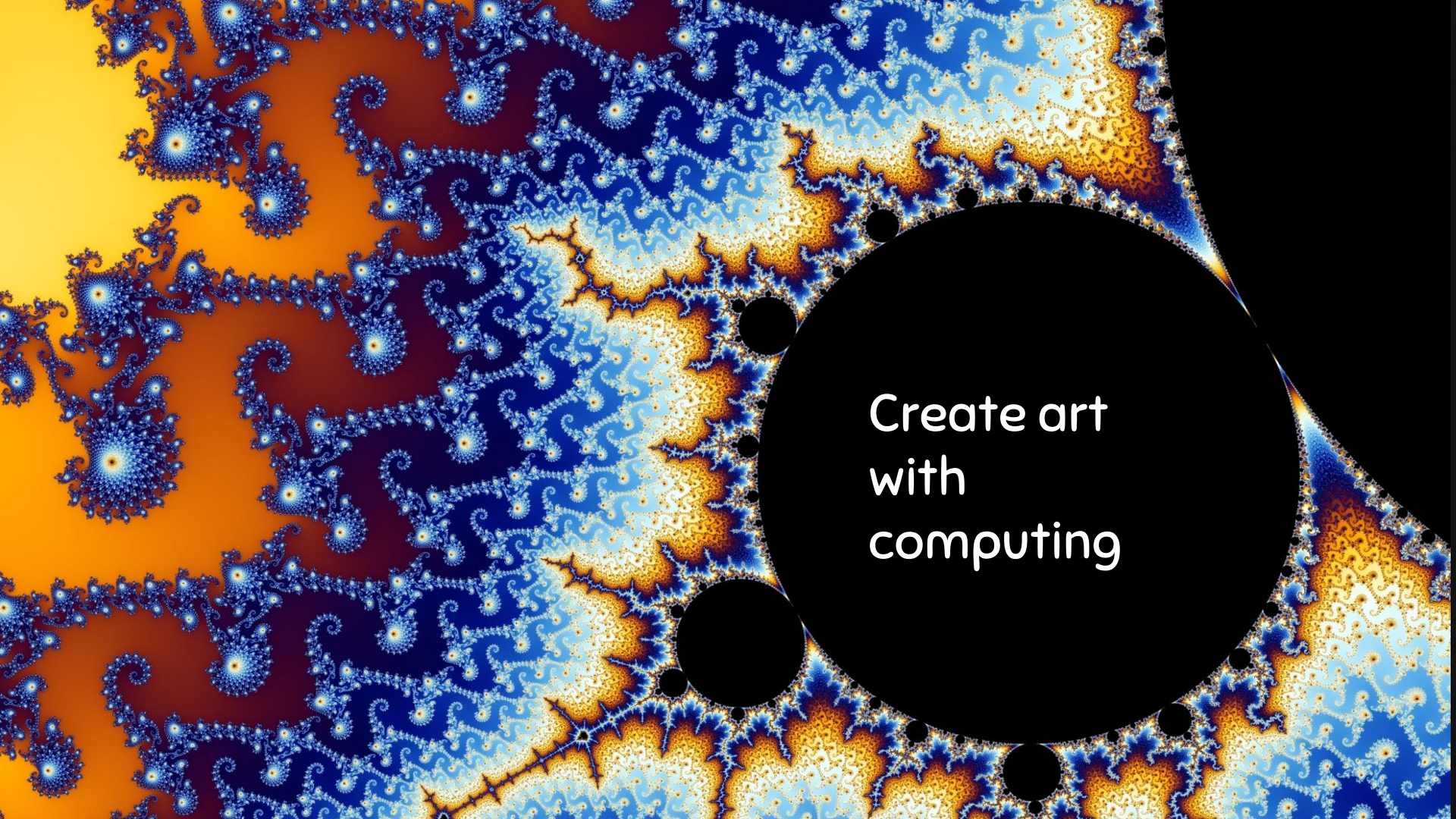
Eugene Goostman

Meet some interesting characters:
Some real, some fictional,
some are, well, somewhere
in between...



Gebelein man





Create art
with
computing

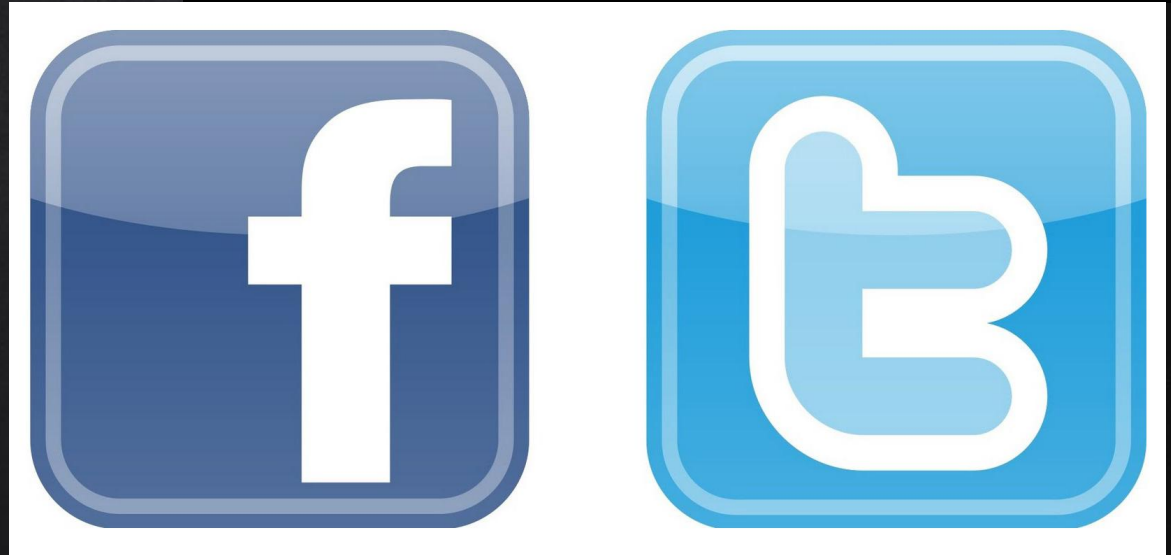
We are going to get a taste of things that transform how we live, work and think.

NETFLIX



Computational Thinking
behind the most powerful
computing companies on
the planet!

Google



Computational Thinking
behind the most powerful
computing companies on
the planet!



\$364.99 billion



\$33 billion



\$245 billion



\$20 billion



IMPORTANT LOGISTICS

- Class **Participation!**
- We are going to learn **simple Python programming** (**don't panic!**)
- **Ask questions** in class, and during office/lab hours!
- We will have homeworks (a few are coding projects)
- Take advantage of TA office/Lab hours!
- Use **Canvas** to discuss and ask questions: ask your fellow classmates, or your instructor and TA.
- Encourage discussions: however you should complete your homeworks on your own!



Credit: Hitchhiker's Guide to the Galaxy



COURSE PROJECTS

Assignments you might do in this course are:

- Interact with a Chatbot, and print out conversation that convince you he is NOT human.
- Create art with computing (light Python).
- Analyze some Twitter feeds.
- Visualize Utah Facebook network.
- Create your own Instagram filter (light Python).
- Query some databases.

There are some opportunities for bonus points!



GRADING

- 6 assignments, each 12 points, drop the lowest scoring one (60 points)
- 5 quizzes (at the beginning of class, 10 m), each 5 points, drop the lowest scoring one (20 points)
- Class participation (5 points)
- Final exam (15 points)

There are many opportunities for bonus points!



GRADING

- 90+ A Grade (A, A-)
- 80+ B Grade (B, B+, B-)
- 70+ C Grade (C, C+, C-)
- And so on...

Please read the syllabus carefully regarding the class policy



MEET YOUR TAs

Undergraduate TAs

Ross Dimassimo

William Garnes

Graduate TA

Vikram Raj



TA OFFICE HOURS

See Class Webpage for detailed information and
locations:

<http://www.sci.utah.edu/~beiwang/teaching/cs1060.html>

This is the best way to get help!



IMPORTANT FOR GETTING HELP!

Important!

Get a lab account or password reset at:

<https://webhandin.eng.utah.edu/cade/>

TAs are going to host office/lab hours at one of the CADE
labs to be decided:

<http://www.cade.utah.edu/>



HOW DO YOU THINK LIKE A
COMPUTER SCIENTIST?

credit: [J.J. McCullough](#)

THE SORTING GAME

SORTING IN THE REAL-WORLD (SORT OF)

- Pancake sorting
- Searching for your favorite movie (alphabetically sorted)
- TA sorting graded exams by hand (what is the fastest way to sort by humans?)
- Pair socks from a pile efficiently? (or using pigeon hole principle)
- What behind google: compression scheme -- sort all the URLs



RULES OF PLAY

- Two teams, each with 5 members and 1 oracle. We need 6 volunteers per team!
- For each team, each member will have a random integer between 1 and 100 attached to his/her back
- Each member is not allowed to see his/her number or the numbers of others
- At every step of the game, a pair of team members are involved in the play
- For the pair of team members during each step, only two operations are allowed:
 - COMPARE: the pair will ask the oracle a question as which one of them is larger
 - SWITCH: the pair will decide based on the oracle whether they switch their positions
- The end goal is to guarantee the numbers are sorted in increasing order with the smallest number of steps possible (WITHOUT KNOWING YOUR NUMBERS!)
- Each team have 5 minutes to discuss their strategies before proceeding
- The team that compete the sorting with the smallest number of steps wins!

THE WINNER IS...



WHAT ALGORITHMS DO WE KNOW ABOUT SORTING?

- Bubble sort: not very efficient
- Radix sort: sort by digits
- Quicksort: choose a pivot, divide and conquer
- Merge sort: divide and conquer
- Selection sort
- Insertion sort
- Bucket sort: sort subsets

...



TAKE HOME MESSAGE

- You are going to learn problem solving using computers!
- The best way to learn is via active participation...
- Ask questions!
- Make use of TA office/lab hours
- Think outside the box
- Some light Python programming is not scary at all!
- This is going to be a fun class!



THANKS!

Any questions?

You can find me at
beiwang@sci.utah.edu

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CREDITS

Special thanks to all the people who made and released these awesome resources for free:

- Presentation template by [SlidesCarnival](#)
- Photographs by [Unsplash](#)