How **Chaminade Julienne** prepared me for a career in the STEM field

Specifically Computer Science

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STEMM Idol Series, Feb. 2018

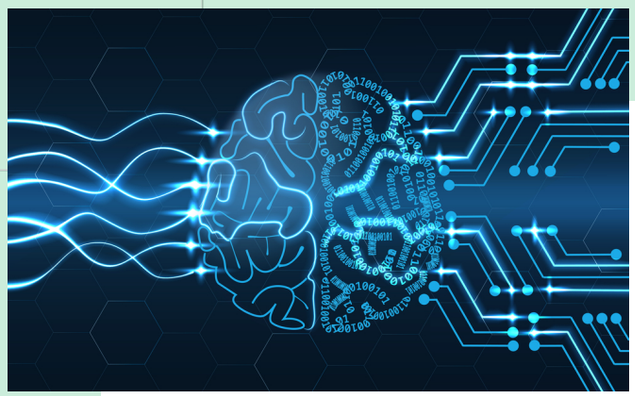
A little about me…

- **CJ** Alumni ’10
- Wright State University
  - B.S. in Computer Science (+ minor in Statistics) ’15
  - M.S. in Computer Science ‘18
- (Somewhere)
  - Ph.D in Computer Science (expected ’22 or ’23)
- Work Experience:
  - **SOCHE** Fellowship @ Air Force Institute of Technology ’13
  - **ORISE** Fellowship @ Air Force Institute of Technology ’14-’16
  - **Graduate Research Assistantship** (Fully funded) @ WSU ’15-’17
  - **D.O.E Fellowship** @ Air Force Research Laboratory ’17
  - Participant of the **Google Summer of Code program** ’17

SOCHE = Southwestern Ohio Council for High Education, ORISE = Oak Ridge Institute for Science and Technology

How CJ prepared me

- CJ is a great education in general…
  - You are *far more prepared* than many entering college!
- Flexibility
  - Allowed me to enroll in engineering course as freshman
  - Offered programming course
  - Thanks Mr. Fuchs and Mr. Young!
- Diversity
  - National Science Olympiad
  - CJ diverse course curriculum *prepared me for college*



Computer Science

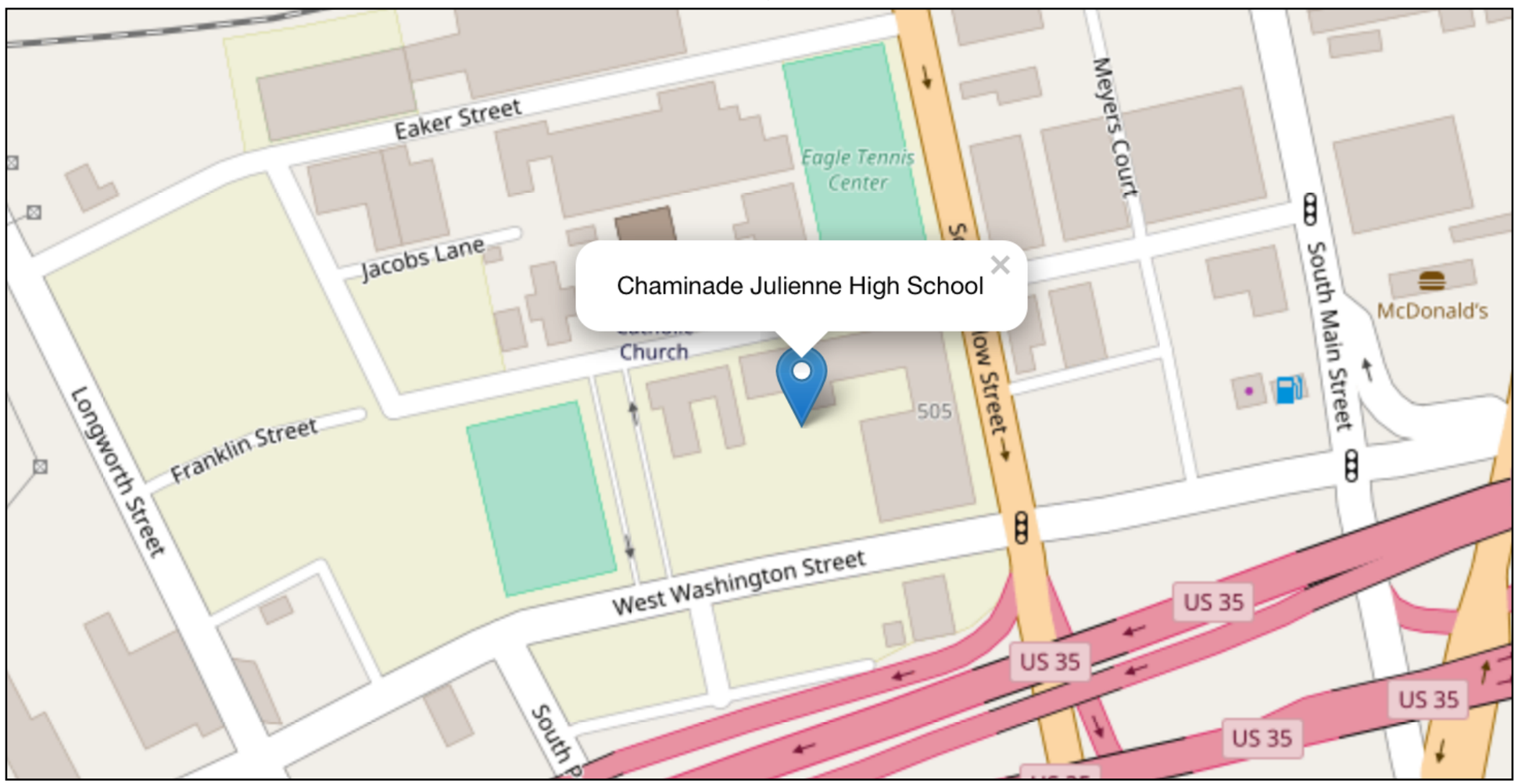
(focus on my sub-field)

- What it is:
  - The study of how to *solve problems logically*
  - The study of how to *automate problem-solving*
  - The study of how to *make machines learn to solve problems themselves* (i.e. AI)
- What it is NOT:
  - Learning how to use computer software
  - Learning how to fix computers (IT)
  - [Only] learning how to program*

*The first two years you do learn how to program

Programming is Not Hard!

```r
library(leaflet)
m <- leaflet() %>%
  addTiles() %>%  # Add default OpenStreetMap map tiles
  addMarkers(lng=-84.19285, lat=39.75272 , popup="Chaminade Julienne High School")
m  # Print the map
```

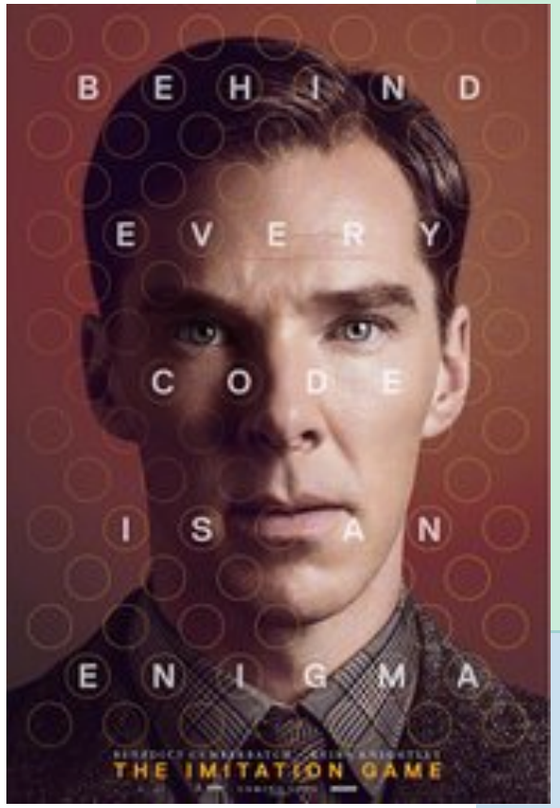


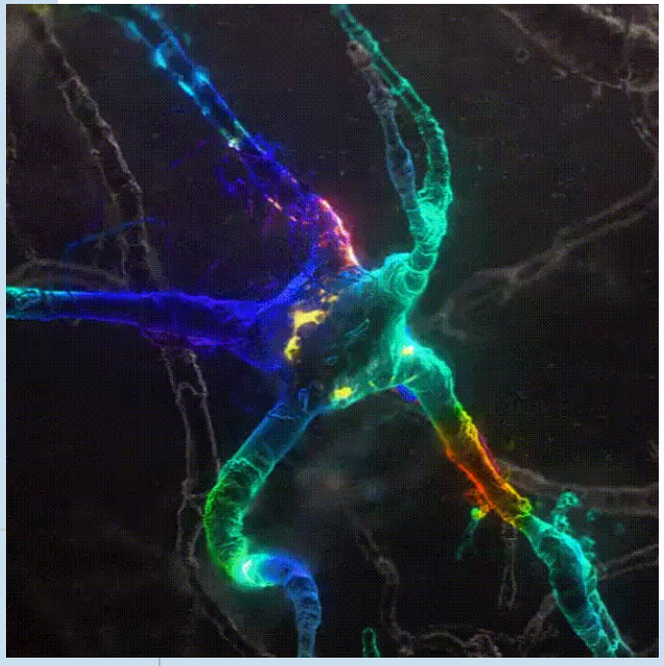
Programming is not just for Computer Scientists!

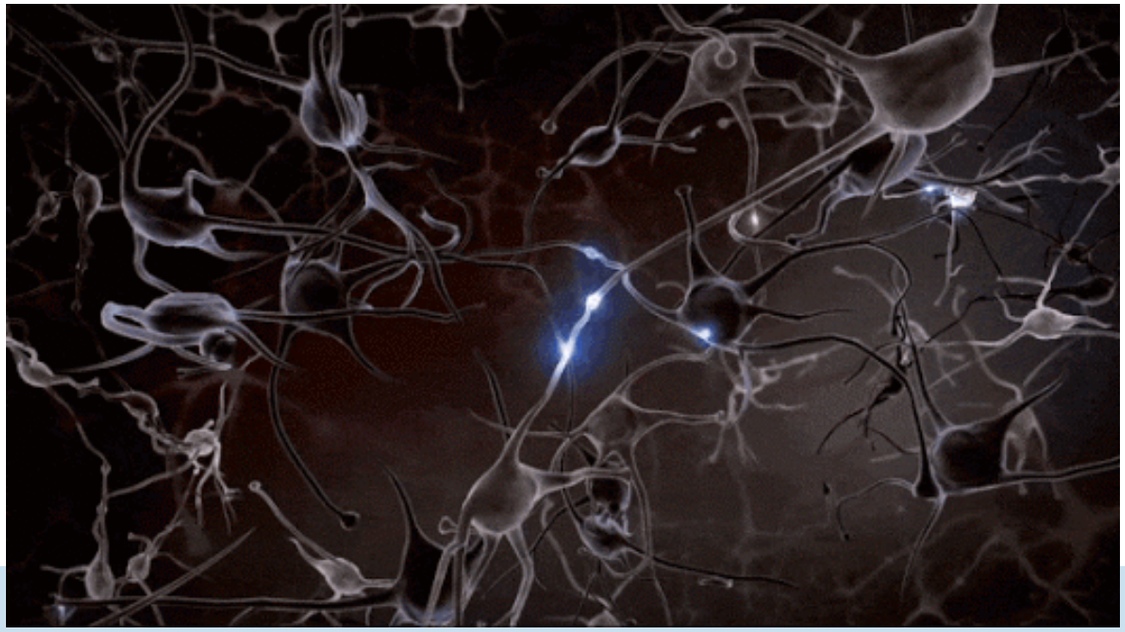
- You will likely have to program at some point if you enter the STEM field!
- If you go into:
  - Physics - MATLAB, C, Fortran
  - Chemistry - Fortran, C++, R
  - Biology/Bioinformatics - Stata, R, Python
  - Math - Mathematica, MATLAB
  - Statistics - SAS, R, Stata
  - Computer Science - Java, C++, Python

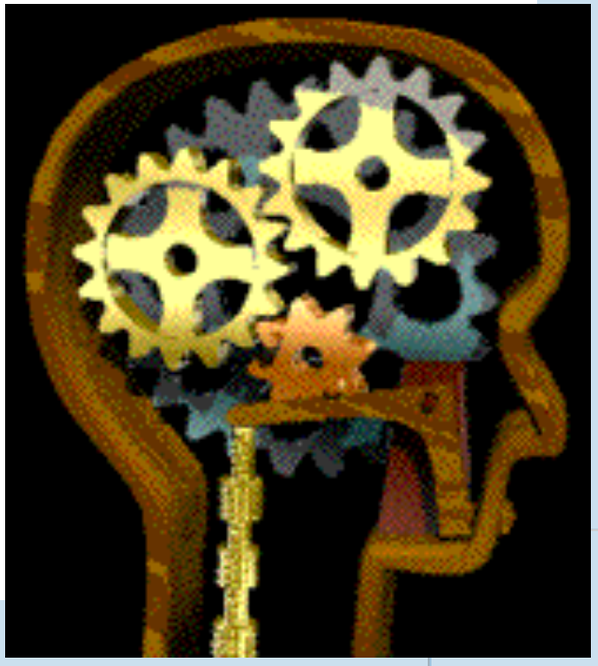
Alan Turing

- Regarded as the father of Computer Science
  - Most widely known for solving ‘Enigma’ encryption cipher
  - Popularized by “The Imitation game”
- Turing’s theory:
  - What if we can make *a machine* that can ‘think’ like a human?





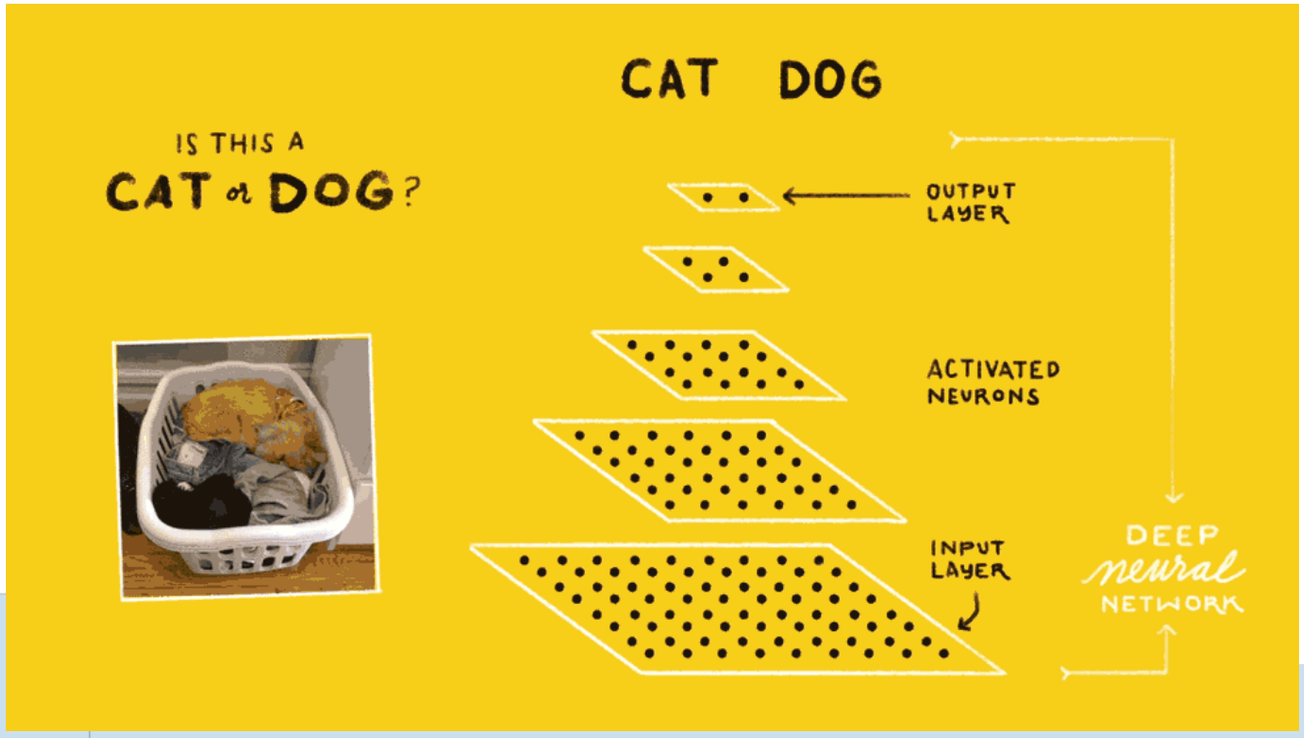


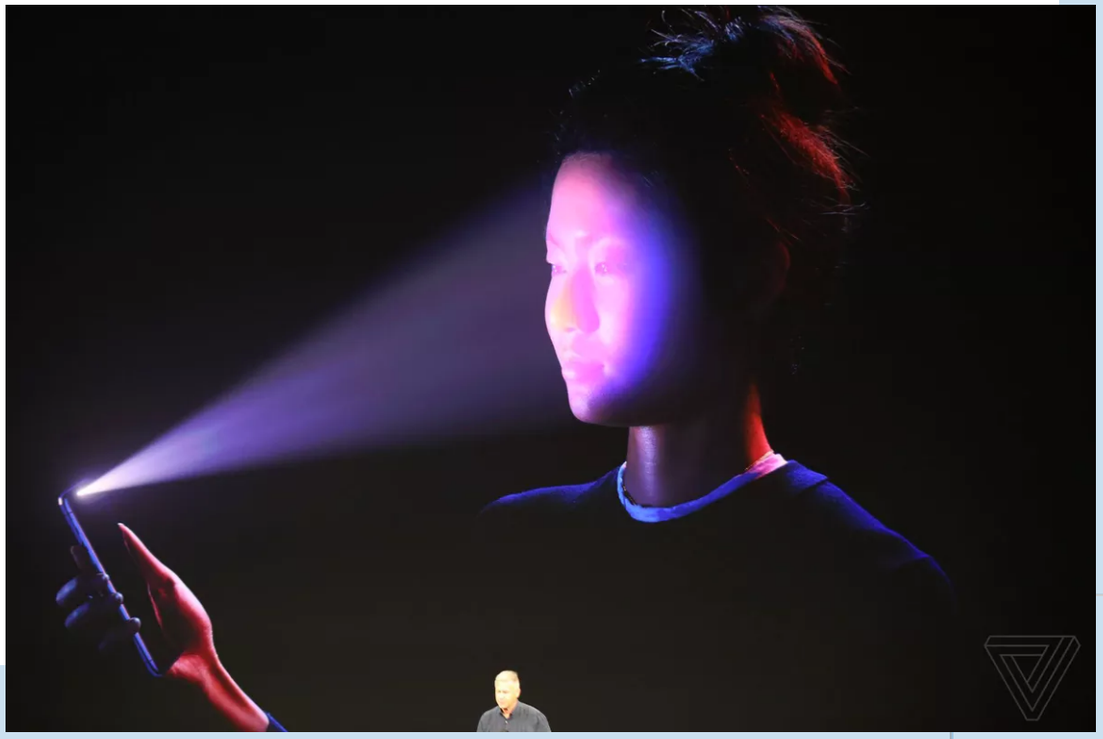


Deep Learning

Recall: The study of how to *solve problems logically*

- Most popular form of Machine Learning/Artificial Intelligence
  - Inspired by how neurons ‘connect’ in the brain
  - **Revolutionizing the world as we know it**
- Creates a (virtual) ***neural network*** to discriminate things
  - Ex. Object recognition: Classify cats vs. dogs in pictures
  - Ex. iPhone X face recognition: Classify you vs. (not you)

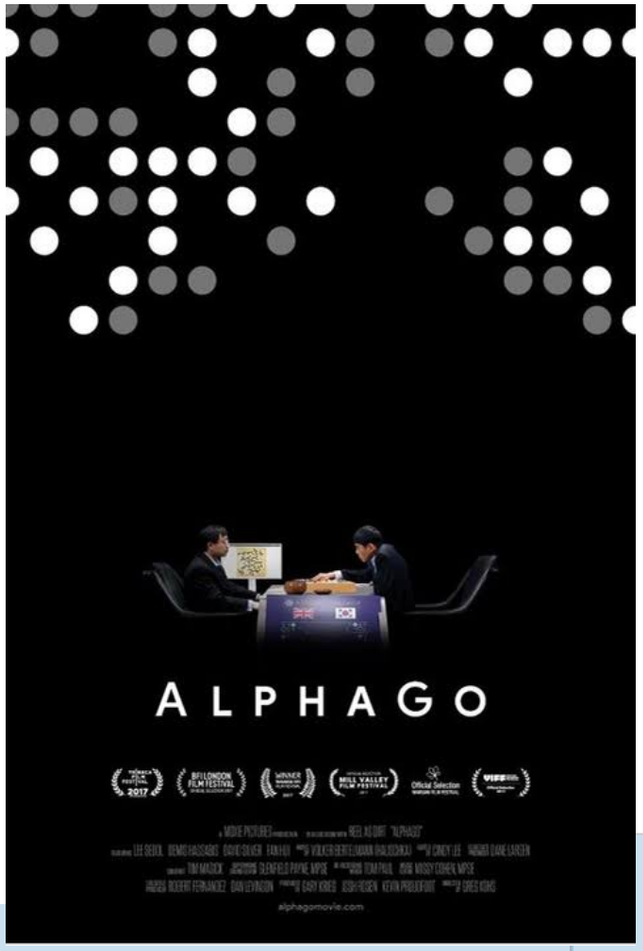




Deep Learning

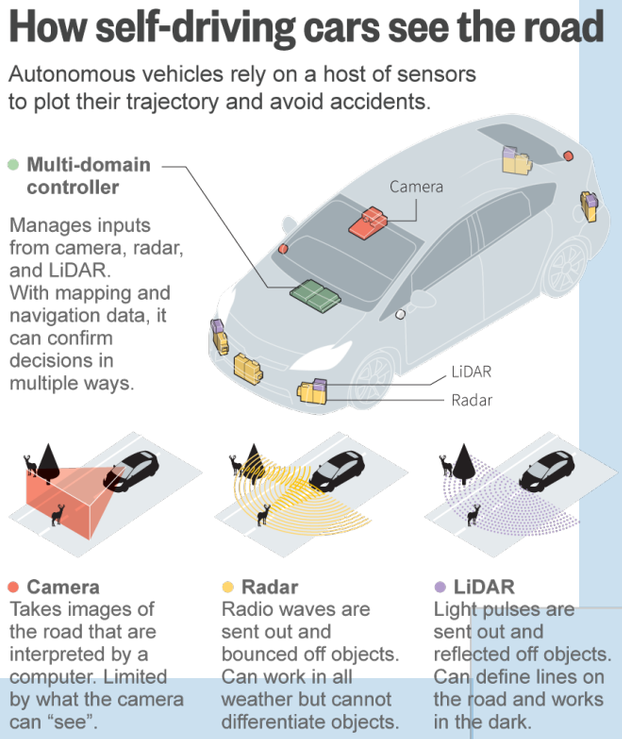
Recall: The study of how to *solve problems logically*

- **In the news:**
  - AI wins world-class poker tournament
    - *Trained itself:* Knowing nothing but the rules of poker, **played against itself for trillions of hands**
  - AI beats world-champion at Go
    - **Netflix** movie on the experience
    - Developed by **Google**
    - *Trained itself:* Knowing nothing but the rules of Go, **plays millions of games against itself**



Self-driving Cars

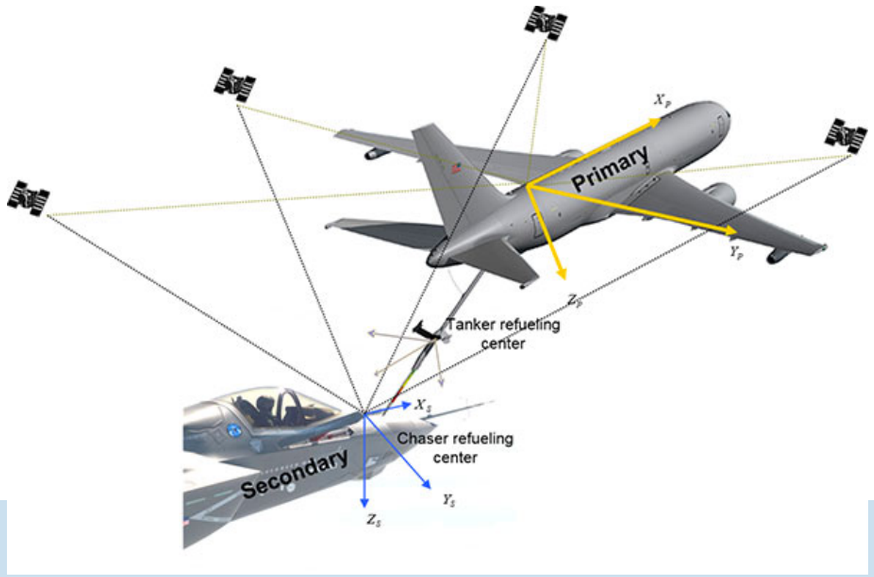
- Computer Science is at the heart of the self-driving cars TESLA uses
- Uses “sensors” to detect various forms of data
  - Data is ultimately processed by algorithms ***developed in Computer Science***
  - Pre-programmed rules + Image processing + AI = self-driving car

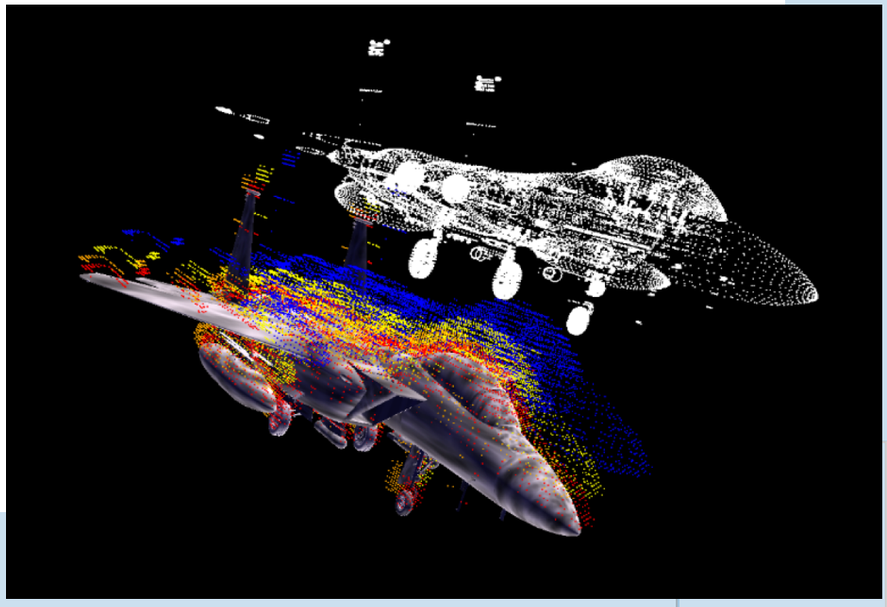


My work at the Air Force Institute

Recall: study of how to *automate problem-solving*

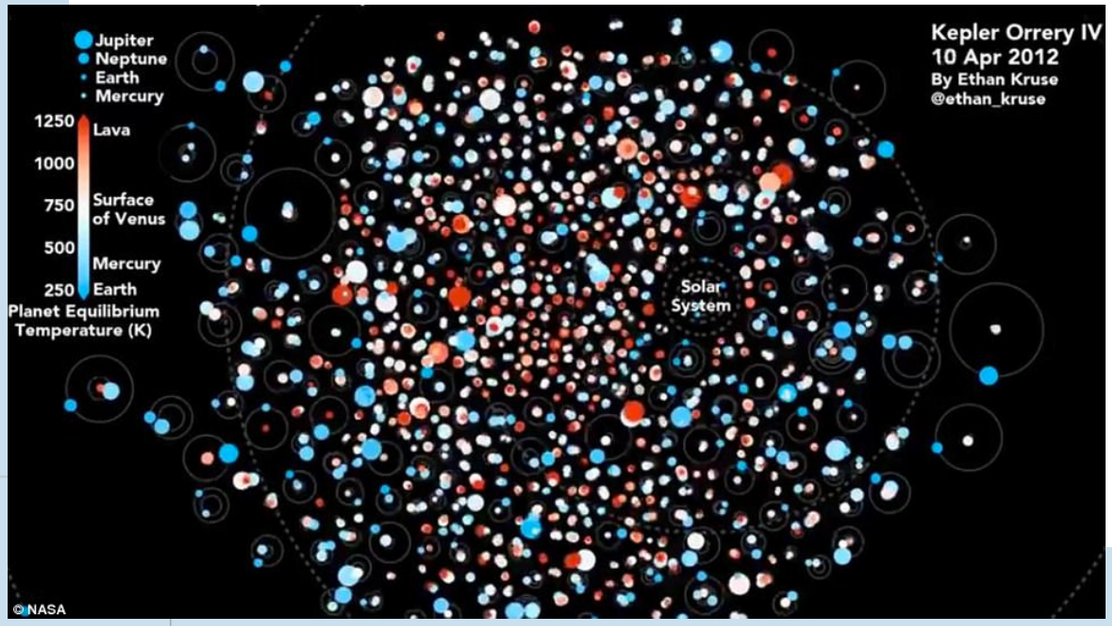
- Self-driving cars and Apple's facial recognition are cool… but reserved only if you work for massive companies???
- No! **Real world example**:
  - Worked on Autonomous Aerial Refueling at AFIT
  - D.o.D funded several research efforts to investigate viability of refueling military-grade aircraft *automatically*
  - Worked on team of five to provide real-time tracking capability for F/A-18A and X-47B

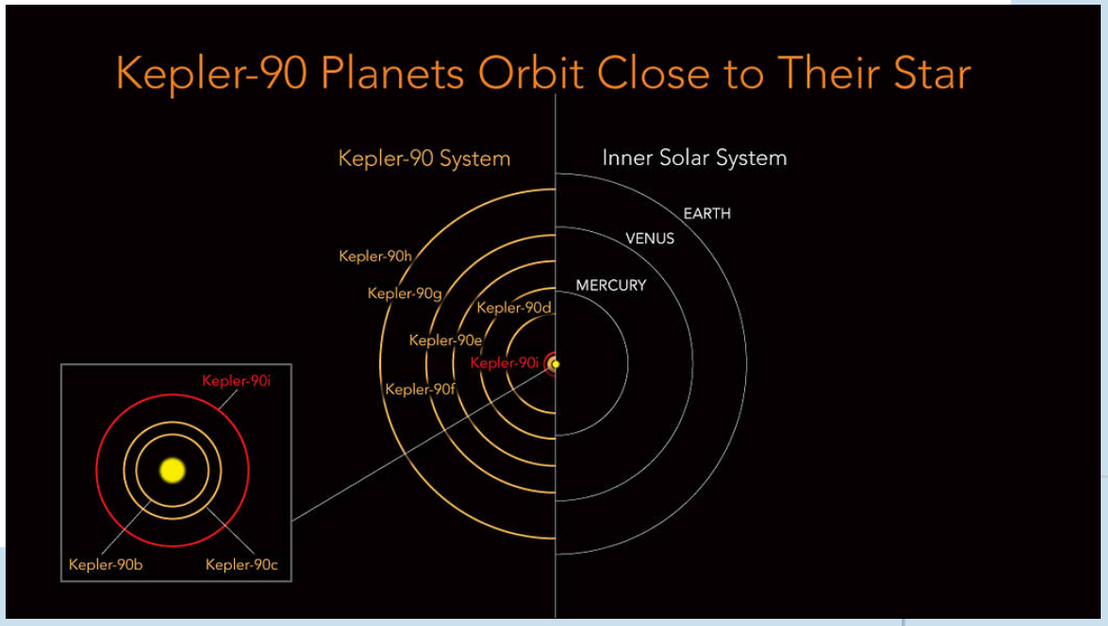




AI identifies new planet

- **NASA** has large data of observations from Kepler Space Telescope
  - 35,000 possible “signals”
  - **Humans can’t sift through all that data!**
- Google teamed with **NASA** and trained a neural network to identify **transiting exoplanets**
  - Used **15,000** previously-vetted signals
  - Discovered eighth planet **2,545 light-years away** (!!)

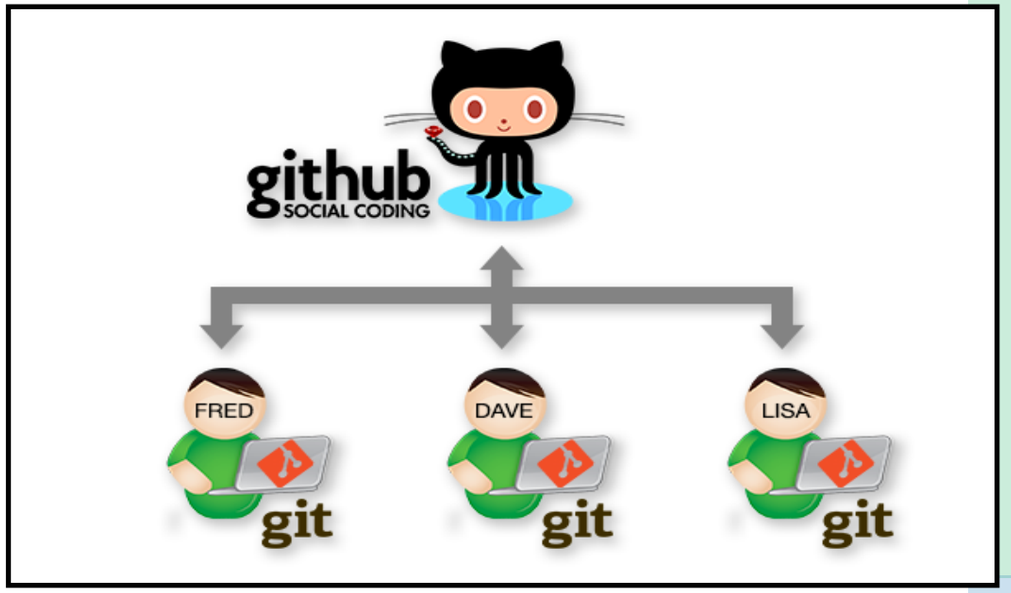




My work for Google

Recall: The study of how to *make machines learn to solve problems themselves*

- Proposed research project as part of **Google Summer of Code 2017 competition**
  - 20,651 students from 144 countries applied
  - Was 1 of 126 from the U.S. that fortunately got funded!
- My Proposal:
  - Mathematicians recently proved **new type of statistical theory**
  - Problem previously given, but not known how to solve, in **1981**!
  - Proposed a *novel* way of programming it
  - Developed open-source software package and ***shared it with the world***



Conclusion and Advice

- Computer Science is about learning *how* to solve problems, and how to automate problem-solving
- Computers can solve any solvable problem in the universe (it's been mathematically proven!)
- Computer Science is *accessible*
  - **Likely need to learn programming in any STEM field**
  - (possibly non-STEMM fields as well!)

Conclusion and Advice

- Get an **internship**!
  - Talk to professors you connect with
  - Go to career fairs!
- Give **statistics** a chance
- Re-take the Math entrance exam
- **YOU** determine your education
  - School
  - Courses take
  - Advisor
  - Internships

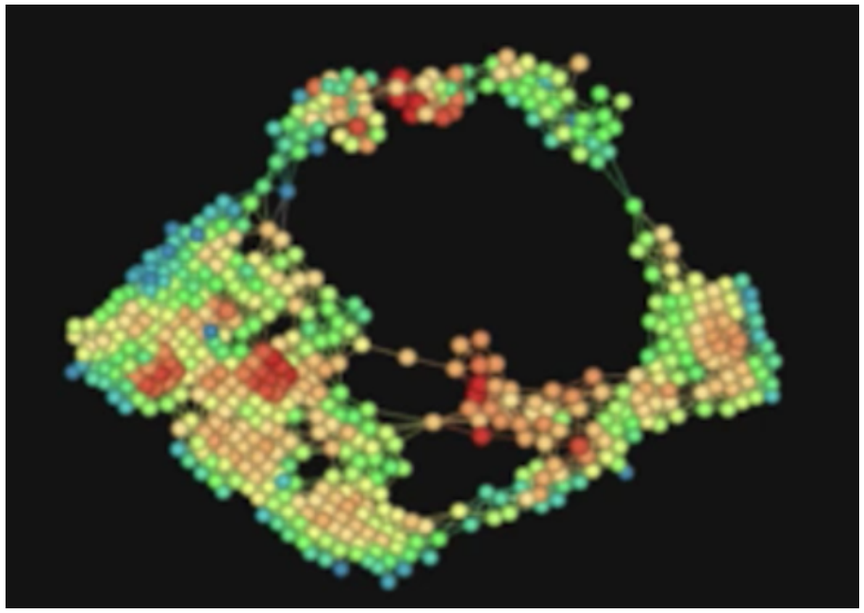
Questions?

My work at the Air Force Research Laboratory

Recall: The study of how to *solve problems logically*

- World Values Survey - Global research project to explore people's values and beliefs, and how *they evolve over time*
- Includes 290 questions related too:
  - Support for gender equality
  - Trust in religious, military, or political institutions
  - Attitudes towards culture, tolerance of minorities, etc.

		Very important	Rather important	Not very important	Not at all important
V4.	Family	1	2	3	4
V5.	Friends	1	2	3	4
V6.	Leisure time	1	2	3	4
V7.	Politics	1	2	3	4
V8.	Work	1	2	3	4
V9.	Religion	1	2	3	4



Data = points

My work at the Air Force Research Laboratory