On Being a Research Computer Scientist

or what it's like to be a lifelong learner

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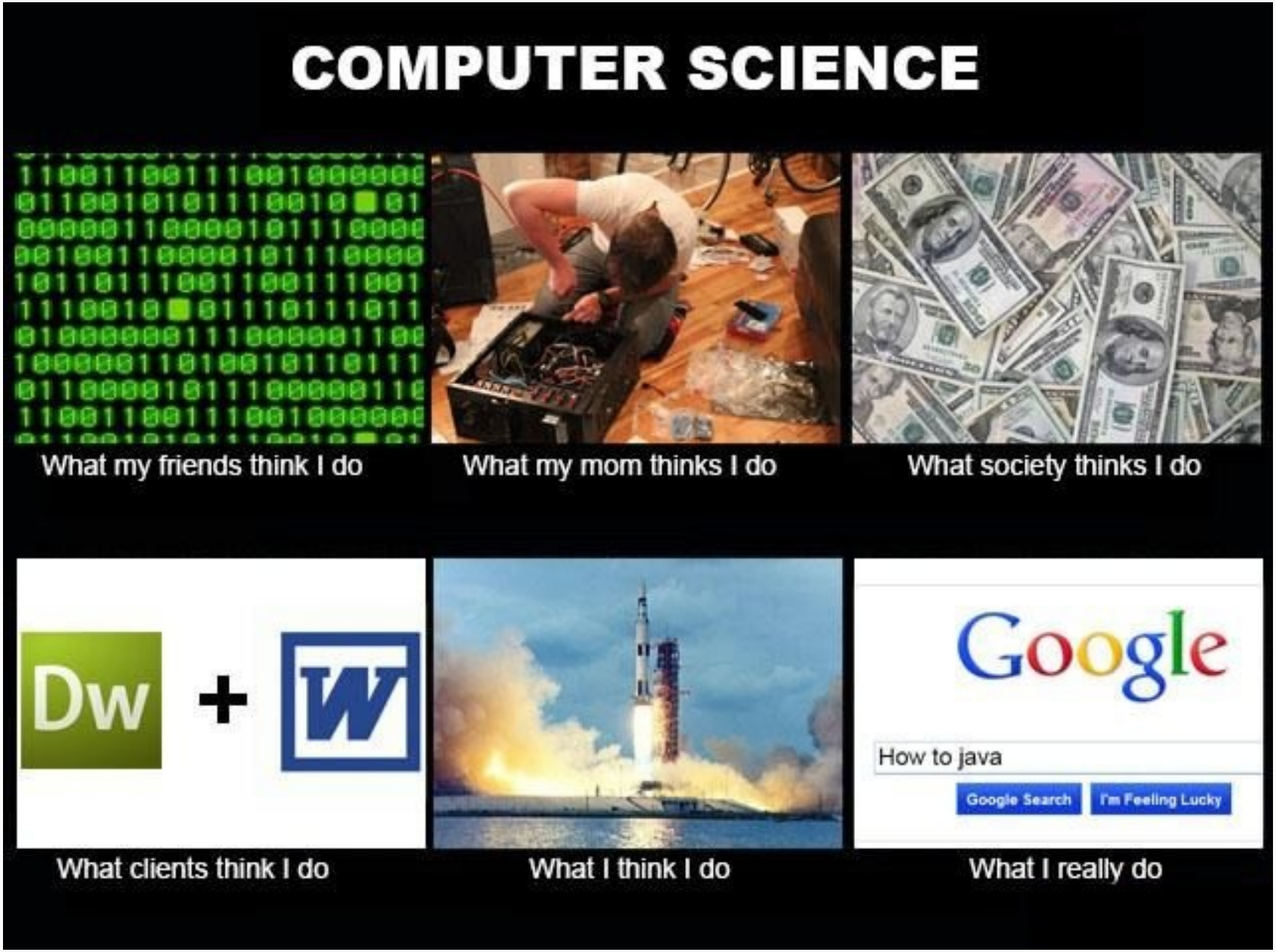
Introduction

What People Think I Do



What I actually do

- Working to obtain PhD in Computer Science
  - With an emphasis on Big Data
  - Distributed sensor networks
  - Distributed computing
- Research Assistant for Infrasound Laboratory
  - Design and develop systems for capture, analysis, and reporting of infrasonic signals of interest

How I Got Here

Summary of My Life Until Now

- Graduated High School
  - Somerset, PA 2007
- B.S. in Computer Science (w/ minor in Theatre)
  - Slippery Rock University of PA, 2011
- M.S. in Computer Science
  - University of Hawaii at Manoa, 2015
- Ph.D. in Computer Science
  - University of Hawaii at Manoa, Present

How I Got Here

High School

High School

- No Formal Education in Computer Science
- Some self taught Python
- Web technologies for cool AIM profiles
- Band Geek
- Theatre Geek

How I Got Here

Undergraduate Education

Slippery Rock University of Pennsylvania

- Small class sizes
- *Close* to home
- Ski slope
- State school

Slippery Rock University of Pennsylvania

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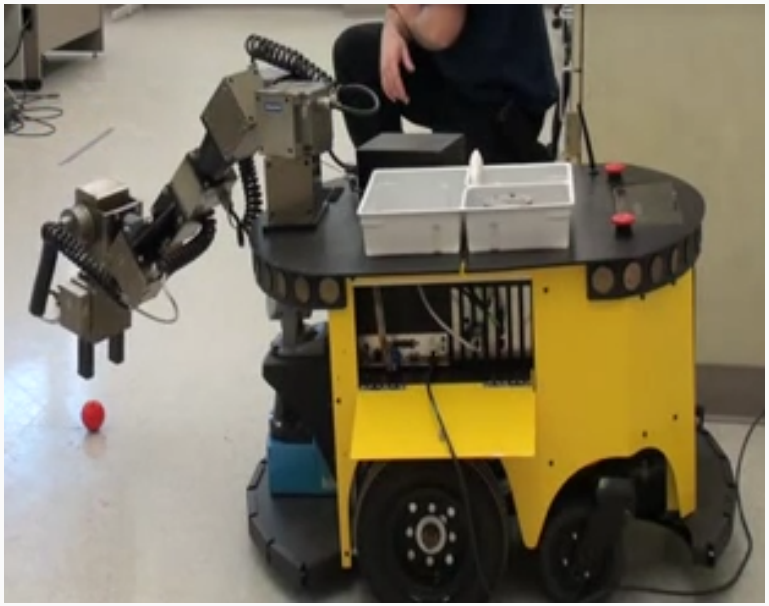
Undergraduate Computer Science

- Computer Science is NOT making video games
- Computer Science *is*
  - Algorithms
  - Data structures
  - Software Engineering
  - Operating Systems
  - Artificial Intelligence
  - Mathematical
  - ...
  - *Social*

Artificial Intelligence Robot

- Used genetic algorithms to *teach* a robot to pick up a ball
- Machine vision/image processing utilized to find the ball
- Wrote a script interpreter
  - Programming language for the robot
  - Could perform movements in parallel
- `https://www.youtube.com/watch?v=xoBVfaHHHcI`



Boulders Computer Cluster

- Used 8 recycled Intel blade servers to build a computer cluster
- A single master server managed all slave nodes
- Operating system loaded on each slave via PXE
- HPC via message passing interface (MPI)
  - MapReduce
  - Apache Spark
  - *...and many more...*

Minor in Theatre

Other Undergrad Activities

- Vice-president of ϒΠE
- President of Computer Technology Club
- Student Advisor to the Dean

After Graduation

How I Got Here

Graduate School

What is Graduate School?

- Education beyond your bachelor's degree
  - Masters, Ph.D, M.D., Ed.D., *etc*
- Generally funded through teaching/research assistantship
- Specialization of your field
- Research focused
- Expects publishing and attending conferences
- Novel contribution to the field (Ph.D.)

Master's Degree

- Specialization in your field
- Comprehensive project *or*
- Master's thesis
- Graduate classes
- *OPQ Cloud: A scalable software framework for the aggregation of distributed power quality data*

Teaching Assistantship (TA)

- ICS 211 - Intro. to Programming II
  - 5 Semesters
  - Run programming lab
  - Design homework assignments (sometimes)
  - Grade homework assignments
  - Run lecture (when needed)

How to get on your TA's good side?

- Show up to lab (and participate)
- Show up to office hours
- Ask questions

Research Assistantship (RA)

- Paid to perform research
  - Income ~$25,000/yr
  - Tuition waver ~$22,000/yr
- Many more opportunities than a TA
- OpenPowerQuality - 1 Semester
- Infrasound Laboratory - Current

Characteristics of Big Data

- Volume
- Variety
- Velocity
- Value

Just a Digital Plumber

OpenPowerQuality (OPQ)

- Open source distributed sensors and framework that
  - Detects PQ problems
  - Stores raw data in cloud
  - Performs higher level analysis
  - Reports PQ metrics to users

Infrasound Laboratory

content...

National Labs

- Lawrence Livermore National Laboratory
  - Internship
  - National Ignition Facility
- Idaho National Laboratory
  - Got to tour a nuclear reactor
  - Took measurements at Yellowstone National Park
- Sandia National Laboratory

Conferences

- Ann Arbor, Michigan
- Honolulu, Hawaii
- Minneapolis, Minnesota
- San Fransisco, California
- Raleigh, North Carolina

Ph.D.

It’s Not All Hard Work

Industry

Computer Science Fields

Computer Science Fields I

- Artificial Intelligence
- Computer Architecture
- Compiler Design
- Computer Graphics and Visualization
  - Augmented / Visual Realty
- Computer Networks
- Computer Security

Computer Science Fields II

- Concurrency
- Cryptography
- Databases
- Data Science
- Data Structures and Algorithms
- Distributed Systems
- Formal Methods

Computer Science Fields III

- High Performance Computing
- Human Computer Interaction (HCI)
- Image Processing
- Operating Systems
- Programming Languages
- Simulation Modeling
- Software Engineering
- Theory of Computation

Thank You!

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