

On Being a Research Computer Scientist

or what it's like to be a lifelong learner

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University of Hawaii at Manoa

Slippery Rock University of Pennsylvania

Introduction

What People Think I Do

COMPUTER SCIENCE



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What my friends think I do



What my mom thinks I do



What society thinks I do



What clients think I do



What I think I do



How to java

Google Search

I'm Feeling Lucky

What I really 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

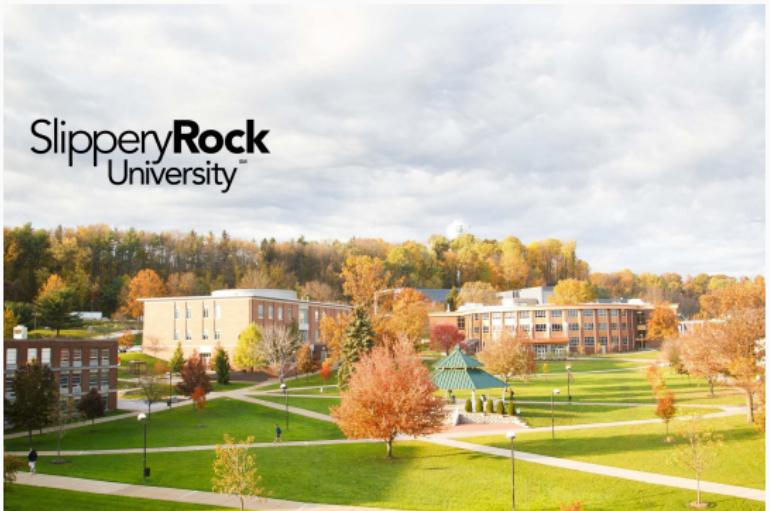
- No Formal Education in Computer Science
- Some self taught Python
- Web technologies for cool AIM profiles
- Band Geek
- Theater Geek

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

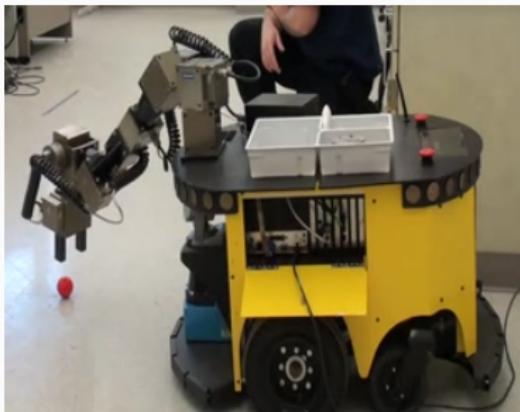


Slippery Rock University of Pennsylvania



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...*

Other Undergrad Activities

- Vice-president of ΥΠΕ
- President of Computer Technology Club
- Student Advisor to the Dean
- Minor in Theatre



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

Teaching Assistantship (TA)

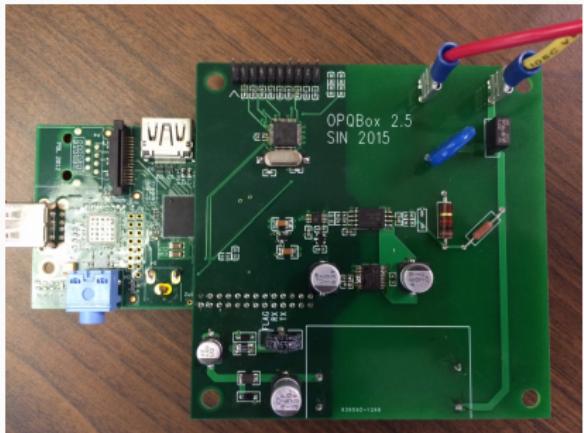
- ICS 211 - Intro. to Programming II
 - 5 Semesters
 - Run programming lab
 - Design homework assignments (sometimes)
 - Grade homework assignments
 - Run lecture (when needed)

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

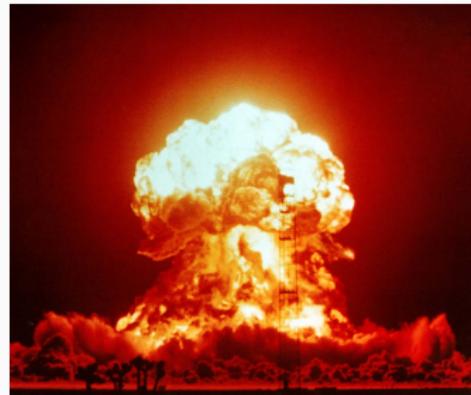
OpenPowerQuality (OPQ)

- Open source distributed sensors and framework
 - Detects PQ problems
 - Stores raw data in cloud
 - Performs analytics
 - Reports PQ info to users



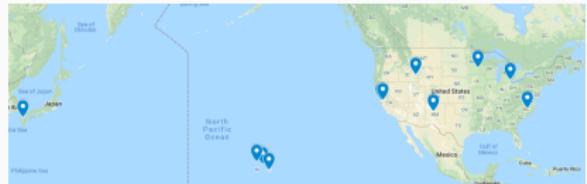
Infrasound Laboratory

- Sound <20 Hz
- Generated by large movements of air
 - Volcanoes
 - Explosions
 - Storms
 - Aircraft
 - Rockets



Travel Opportunities

- Research Experiments
- Conferences
- National Laboratories



- Requires novel contributions to science
- Strictly research
- A lot of writing and presenting

Computer Science

Is Computer Science Right for You?

- Strong communication skills?
- Enjoy working in a team?
- Want to work in multiple disciplines?
- Like solving puzzles?
- Mathematically minded?
- Enjoy learning?



Computer Science is not...

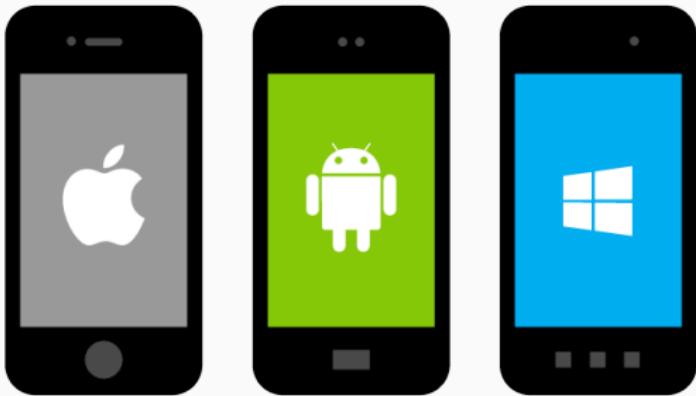


A Brief Tour of Computer Science

- Computer science is a broad subject consisting of many and varied subfields....
- Computer science is
 - Part theory
 - Part application
 - A lot of art

Mobile Applications

- iOS, Android development
- VR / AR
- Mobile gaming



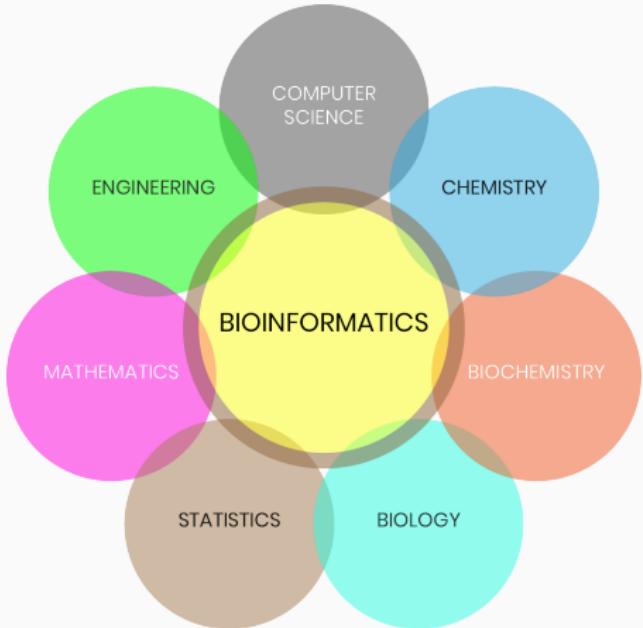
Artificial Intelligence (AI)

- Teaching computers how to learn
- Automatically recognizing patterns in images, sounds, data sets
- Deep learning / neural networks
- Autonomous robots



Bioinformatics

- Study of biological data
- Cyberphysical systems



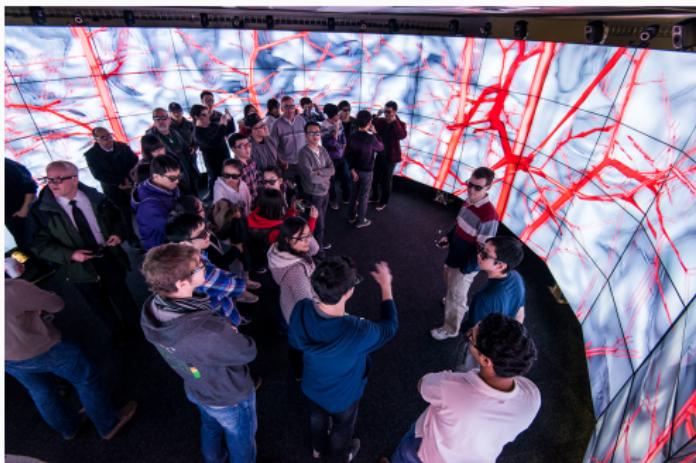
Computer Architecture

- Hardware design
- Processor design
- Microcontrollers
- Electronics



Computer Graphics and Visualization

- Design plots and other visualizations for large data sets
- Virtual Reality / Augmented Reality
- Video games



Computer Networks

- How computers communicate with each other
- Secure communications
- The design of the internet
- Distributed sensor networks / mobile networks



Computer Security

- Both theoretical and practical
- Penetration testing
- Security protocols
- Cryptography
(encryption / decryption)



Databases

- How data is stored and structured
- How data is efficiently looked up
- More often dealing with Big Data



Data Science

- Extract knowledge and insights from both structured and unstructured data
- Make sense of the large amounts of data being produced



Game Design

- Multidisciplinary
- Software engineering, art design, sound design, networking, testing, graphics design
- *A lot* of math (mainly linear algebra)



High Performance Computing (HPC)

- Parallel algorithm design
- Distributed computations and optimizations
- Distributed data storage and access
- Simulations
- U.H. Manoa is really good in this



Human Computer Interaction (HCI)

- Study of how humans interact with technology
- UI/UX Design
- Psychology
- Sociology



Robotics

- Multidisciplinary
 - Computer vision / image processing
 - A.I.
 - Computer architecture
 - Data science
 - Very math heavy!



Software Engineering

- Design and structure of large software systems
- Building reliable systems
- Methods and best practices for designing software



Web Design

- Website design
- Web servers
- Web applications
- Artistic design



And so much more...

- Simulation and modeling
- Programming language design
- Operating systems
- Image processing
- Formal methods
- Distributed systems
- Compiler design
- Data structures and algorithms
- Theory of computation

Picking a career

- Computer science is very multidisciplinary
- If you don't know what subfield you're interested in
 - Pick a school with a large computer science department
- If you do know what subfield you're interested in
 - Pick a school that is known for your subfield of choice
- If you're interested in staying in Hawaii
 - Department of Defense
 - NSA
 - Other federal agencies
- Military opportunities

Thank You!

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