



APPALACHIAN STATE UNIVERSITY

COLLEGE OF ARTS AND SCIENCES

Computer Science

Reaching Higher

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Today's presentation

- What is Data Science?
- Requirements for the Data Science Certificate?
- Growth projection and salary for Data Scientists
- University Honors Program
- Department Honors Program
- The Good and Bad of Honors
- How about a minor?
- Questions

What is Data Science?

- Data scientists extract meaningful insights from data using
 - statistics
 - algorithms
 - programming skills
- Data scientists use data to answer questions like:
 - Will this person renew their subscription?
 - What kind of car is this person likely to buy?
 - Is this a picture of a cat or a dog?



Requirements for Data Science Certificate

- Although the certificate is open to all majors, it is easier for CS majors to earn because of the significant overlap in requirements
- Requirements:
 - **CS 2435:** Introduction to Scientific Programming (Programming in Python)
 - **CS 2440: Computer Science II** can be a substitute
 - **Math 2240:** Linear Algebra
 - Required for CS major
 - **Stat 3850:** Statistics
 - Required for CS major
 - **CS 3435:** Data Acquisition and Visualization
 - *The one “extra” course, but it also contributes to the 120 hours needed to graduate*
 - **CS 4755:** Applied Machine Learning
 - Counts as CS elective (12 hours of CS electives required for CS major)

Growth Projection and Salary

- Because businesses are interested in obtaining data driven solutions, the demand for data scientists is growing significantly
- According to the Bureau of Labor Statistics:
 - Projected employment growth of 35% for data scientists between 2022-2032
 - Compared to 3% for all occupations
 - Median annual salary in May 2022 for data scientists was \$103,500

University Honors Program

- To graduate with University Honors, a student must:
 - Earn a minimum of 24 hours of honors credit:
 - 9 hours of interdisciplinary Honors courses
 - 3 hours of honors courses within the major
 - 9 hours of honors courses within any area
 - 3 hours of honors thesis/project
 - Possess a minimum GPA of 3.45 (cumulative and in honors courses)
- First year students in the honors program live together in an Honors residential community
- Students with less than 45 semester hours can apply to join the University Honors program
- <https://honors.appstate.edu/>

Department Honors Program

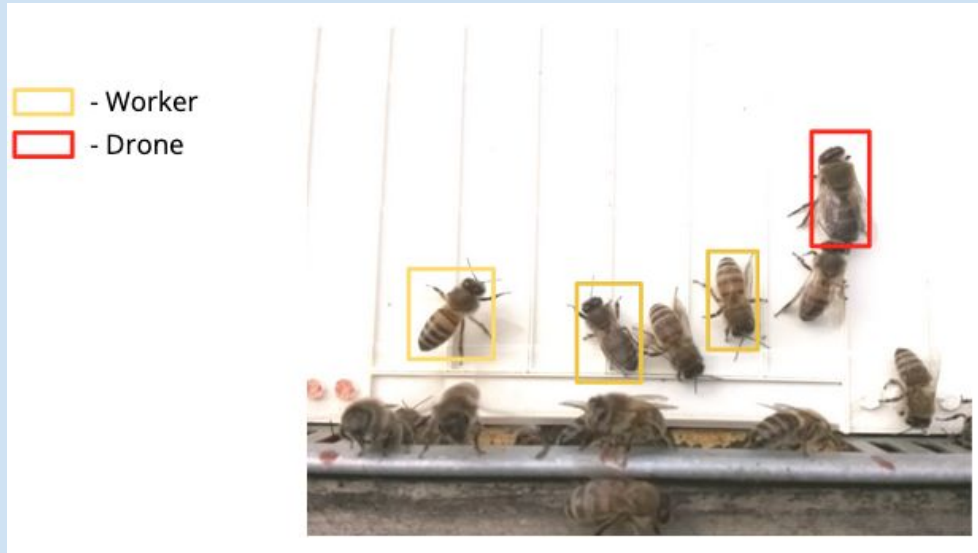
- To graduate with Honors in Computer Science, a student must:
 - Earn a minimum of 9 hours of honors credit:
 - 6 hours of honors courses in Computer Science
 - 3 hours of honors thesis/project
 - Possess a minimum GPA of 3.45 in the Computer Science major
- Graduate courses count as Honors courses
 - Take Graduate courses to graduate with honors and simultaneously work toward earning the Master's degree
- <https://compsci.appstate.edu/academics/honors>

The Good and Bad of Honors

- The bad - yes, it's more work
- The good
 - **Richer, more in-depth educational experience**
 - **Interested in becoming a faculty member in higher education?**
 - PhD required by most institutions
 - Honors provides the opportunity to write a thesis
 - **Interested in becoming a Researcher in academia or industry**
 - Honors provides the opportunity to perform research under the guidance of a faculty member

Recent Honors Thesis

Will O'Brien - A Framework for Neural Network Training on Honey Bee Image Data using Active Learning



Recent Honors Thesis

Jenny (Chau) Ly - LY86-64: Implementation and Evaluation of a Y86 Browser-Based Simulator

The screenshot displays the LY86-64 simulator interface. At the top, there are control buttons: 'loaduse' (dropdown), 'Continue', 'Step', 'Reset', 'Home', and 'Clock'. The main window is divided into several sections:

- DESCRIPTION:** A text block explaining a load use hazard. It states that in this example, multiple stalls and bubbles delay the execution of an instruction until an operand is read from memory. A specific example is given where a load use hazard between an MRRMOVQ instruction at address 0x015 and an RRRMOVQ instruction at address 0x01f causes the F register to be stalled, the D register to be stalled, and the E register to be bubbled.
- Assembly Code:** A list of instructions with their addresses. The instruction at address 0x01f is highlighted in yellow: `0x01f: 2012 rrmovq %rcx, %rdx # %rcx needs to be updated from memory`. Other instructions include `.pos 0x0`, `nop`, `irmovq stack, %rsp`, `irmovq num, %rax`, `mrmovq (%rax), %rcx # hardware should insert a bubble`, `rrmovq %rcx, %rdx # hardware should insert a bubble`, `rrmovq %rbx, %rsi # hardware should insert a bubble`, `popq %rdi # hardware should insert a bubble`, and `rrmovq %rdi, %r8 # hardware should insert a bubble`.
- Registers:** A table with columns for Name, Hex, and Decimal. It lists registers RAX through R14, with RSP containing the value 72.
- OF SF ZF:** A table showing the status of the overflow, sign, and zero flags, all currently set to 0.
- Stalled/Bubbled State:** A box containing the following information:
 - F (stalled): E_icode in [MRRMOVQ] && E_dstM in [d_srcA (RCX)]
 - D (stalled): E_icode in [MRRMOVQ] && E_dstM in [d_srcA (RCX)]
 - E (bubbled): E_icode in [MRRMOVQ] && E_dstM in [d_srcA (RCX)]
- Processor State Panels:** Four colored panels at the bottom showing the state of different registers:
 - F (STALL) - Yellow:** predPC: 21
 - D (STALL) - Orange:** addr: 0x01f, stat: 1 (SAOK), icode: 2 (CMOVXX), ifun: 0, rA: 1 (RCX), rB: 2 (RDX), valC: 0, valP: 21
 - E (BUBBLE) - Red:** addr: 0x000, dstE: F (RNONE), stat: 1 (SAOK), icode: 1 (NOP), ifun: 0, srcB: F (RNONE), valA: 0, valB: 0
 - M (NORMAL) - Green:** addr: 0x015, stat: 1 (SAOK), icode: 5 (MRRMOVQ), Cnd: 0, valE: 38, valA: 0, dstE: F (RNONE), dstM: 1 (RCX)
 - W (NORMAL) - Blue:** addr: 0x00b, stat: 1 (SAOK), icode: 3 (IRMOVQ), valE: 38, valM: 0, dstE: 0 (RAX), dstM: F (RNONE)

How about a math minor?

- Because of the overlap in CS and MAT requirements, **CS majors can earn a minor in Mathematics with as little as one extra course**
 - CS requires some math courses that can also count toward a math minor
 - MAT 1120: Calculus with Analytical Geometry II
 - MAT 2240: Introduction to Linear Algebra
 - MAT 4310: Numerical Methods counts as a CS elective and toward the math minor
 - MAT 2310: Computational Mathematics Prerequisites counts toward the math minor
 - This is the one “extra” course (but not really extra because it also counts toward the 120 hours to graduate)
- Other minors attractive to CS majors include
 - Cybersecurity
 - Physics
 - Business
 - Japanese

Department Fast Facts

- Academic Programs
 - Bachelor's of Science, ABET accredited, 600 students, 110 graduates/yr
 - Master's of Science, 25 students, 10 graduates/yr
 - Data Science Certificate, 30 students
- Engaged Faculty
 - 19 funded grants, > \$5 million over last 7 years
 - 20 faculty members
- Program began in mid 1970s, became department in 1998

Questions?

- Also don't forget to visit these rooms:
 - **Beyond the Bachelor's in room 318**
 - Earn a Master's degree with just one extra year of study!
 - **Undergraduate Program in room 310**
 - Learn why you should get your Bachelor's degree in CS here at App State
 - **Student Success in room 327**
 - Extra curricular activities help our students succeed!
 - Get the student perspective of our program!
 - **Student Research Lab in room 312-W**
 - See what research some of our students are working on!