

Objectives

- Security Considerations
- What is Computer Science?
- Final Exam questions

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Questions about Lab 11?

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Lab11 Search Review

- What does your implemented binary search algorithm become in “the worst case”?
- Assumption: only a few people in a given network
 - Otherwise, maybe just as well to use linear search

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SECURITY CONSIDERATIONS

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Security Considerations

- We've been trying to make our programs very flexible, general
 - E.g., User specifies input (file names)
- Must validate user input
 - We have done some of this
 - Need to improve, restrict user input
 - Microsoft security/reliability architect recommends that you restrict the sources of input (gets rid of trust issues)

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Simple Example of Security Bug

- Example from a real web site
 - [Simulated here](#)
- More fundamental than a security bug
 - [Hopefully, CS111 students would know better](#)
 - May not always check user input but know paid programmers should do it!
- How to address this security issue?

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Another Example

- Modifying URL parameters

```
http://network.domain.com/login.jsp?room=4531&rate=9.99
```

```
http://network.domain.com/login.jsp?room=4531&rate=0.00
```

Learn more in CSCI335!

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Security Bug in Python

- Demonstrate with security_bug.py

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Why the Security Bug?

- `eval(input(prompt))`
- Example:
 - `val = eval(input("Enter a value: "))`
 - In terminal:
 - Enter a value: `1 + 5 + 6`
 - `val` is assigned `12`
- Example:
 - `total += eval(input("Enter deposit: "))`
 - Enter deposit: `total * 3`
 - `total` is assigned `total+total*3`

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Handling the Security Bug

- Cast `input` to an integer
 - ```
user_input = input("Enter a deposit")
total += int(user_input)
```
  - Casting to an `int` will throw an exception if we try to input `total`
  - Use `try/except` to handle error

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`fixed_input.py`

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## More on `input` function

- Explains the error message we got if we tried to input `B6`
  - Looks for variable named `B6`

```
Enter your age: B6
Traceback (most recent call last):
 File "currentAge.py", line 22, in <module>
 main()
 File "currentAge.py", line 9, in main
 age=input("Enter your age: ")
 File "<string>", line 1, in <module>
NameError: name 'B6' is not defined
```

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## File Input from User

- Alternative 1:
  - Prompt user: What file do you want the program to process?
  - Prompt user: What file do you want the program to write/output?

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## File Input from User

- Alternative 1:
  - Prompt user: What file do you want the program to process?
  - Prompt user: What file do you want the program to write/output?
- **Issues:**
  - What if bad input file? (not just bad name)
  - What if output file writes over existing file?
    - May or may not be malicious; could just be careless

How to address issues?

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## File Input from User

- **Issues:**
  - What if bad input file? (not just bad name)
  - What if output file writes over existing file?
    - May or may not be malicious; could just be dippy
- **How to address issues?**
  - Check if (input/output) file exists first
    - Use the **os** module
  - Permission problems should be handled by OS

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## File Input from User

- Alternative 2:
  - Prompt user: Which of x files do you want the program to process?
    - The files are known to be "good" files
  - Automatically create (valid) file name
    - Again, check that file does not already exist

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file\_input.py

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## Handling Security

- Prevention
  - Don't allow bad stuff
  - Examples: validate input, restrict input files
- Detection
  - After see bad, stop it
  - Example: Microsoft's Halo
  - Example: network usage

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## COMPLEXITY SCIENCE

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## CS == Complexity Science

- How can it be done?
  - Based on **information**
  - Managing, manipulating data
  - Possible algorithms
- How well can it be done?
  - Most **efficient** algorithm in terms of time and/or space
- Can it be done at all?
  - Often, proof is a program—an implementation of the above

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## Computer Science != Programming

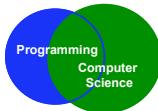
programming : CS ::

machining : engineering

grammar : literature

equations : mathematics

walking : W&L



a vehicle, not a destination

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## Computer Science Fields

### Systems

- Architecture
- Operating systems
- Networks
- Distributed and parallel systems
- Databases
- Security
- ...

### Software

- Compilers
- Graphics
- Software engineering
- Software testing and verification
- ...

### Theory

- Algorithms
- Theory of computation
- ...

### Other

- Artificial intelligence
- Robotics
- Natural language processing
- Bioinformatics
- Visualization
- Numerical analysis
- ...

- Often research involves combinations of these fields
- Not just programming!
  - But programming is a tool to do much, much more!

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## Computer Science Fields

### Systems

- Architecture \*
- Operating systems \*
- Networks \*
- Distributed \* and parallel systems
- Databases \*
- Security \*
- ...

### Software

- Compilers \*
- Graphics \*
- Software engineering \*
- Software testing \* and verification \*
- ...

### Theory

- Algorithms \*
- Theory of computation
- ...

### Other

- Artificial intelligence \*
- Robotics \*
- Natural language processing \*
- Bioinformatics
- Visualization \*
- Numerical analysis
- ...

\* = field we discussed or did a problem in

➢ Some are a stretch :)

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## Final Exam Take Home Questions

- 2 essay questions about the Broader Issues
- **Due before end of exam period**
  - 5 p.m. Friday
- Each essay should be about 1/2 a page
- Goal: answer the question clearly, precisely, and convincingly
  - Not too wordy
  - Evidence/examples to support your argument
  - Correct spelling, grammar, punctuation

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## Final Exam Review

- Focus on object-oriented programming
- New content: 2D lists, exceptions, security issues, complexity science
- Cumulative:
  - Functions, data types, common methods & operations
  - How to model data

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## Final Exam Review

- What do you need to do to be able to use methods from a class?
- What are the different ways to iterate through a list?
- How can you iterate through a dictionary?

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## Reminders

- Broader Issue: One Laptop Per Child
- Final exam envelopes!
- Finish Lab 11
- Study for Exam
- Do ConnectFour extra credit (additional 2D practice)
- Course Evaluations
  - [Sakai – tests & quizzes](#)