CS 320
Introduction to Software Engineering
Spring 2017

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CS320
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Today
● My background
● What is Software Engineering?
● Why is Software Engineering important?
● Your expectations
● Course overview
● My expectations
● Logistics

My background

My research interests
● Software testing and debugging
● Static program analysis
● Software security
● Mining software repositories
● Empirical software engineering
What is Software Engineering?
What is Software Engineering?

More than just programming

- The complete process of specifying, designing, developing, analyzing, and maintaining a software system.

What are common tasks in Software Engineering?

- Requirements engineering
- Specification writing
- Software architecture and design
- Programming
- Software testing and debugging

All of the above and much more! It’s more than just programming.
What is Software Engineering?

More than just programming
- The complete process of specifying, designing, developing, analyzing, and maintaining a software system.
- Common Software Engineering tasks:
  - Requirements engineering
  - Specification writing
  - Software architecture and design
  - Programming
  - Software testing and debugging

Why is Software Engineering important?

Software is everywhere...

- ~15 million lines of code

Why is Software Engineering important?

Software is everywhere... and buggy!

Why is Software Engineering important?

Software is complex!

Why is Software Engineering important?
**Why is Software Engineering important?**

**Software is complex!**

- ~15 million lines of code
- Let’s say 50 lines per page (0.05 mm)
  - 300,000 pages
  - 15 m (49 ft)

**Infrastructure is software, too!**

Example: Design/configuration space exploration

- 150 configurations
- 85 hours per execution
- 25,000+ CPU hours (~3 CPU years)
- $10k in elastic computing credits

**Software development: the high-level problem**

**Specification**

Source code

**One solution: “Here happens a miracle”**

Source code

---

1 | 0.34 | 0.81
2 | 0.52 | 0.32
3 | 0.21 | 0.53
4 | 0.81 | 0.22
... | ... | ...
One solution: "Here happens a miracle"

Software development: the high-level problem

Ad-hoc or systematic?
Pros: Ad-hoc
- No formal process.
- Easy, quick, and flexible.

Can you think of any drawbacks?

Cons: Ad-hoc
- Might lack important tasks such as design or testing.
- Doesn’t scale to multiple developers.
- Impossible to measure effort and progress.
### Summary: Software Engineering

**What is Software Engineering?**
- The complete process of specifying, designing, developing, analyzing, and maintaining a software system.

**Why is it important?**
- Decomposes a complex engineering problem.
- Organizes processes and effort.
- Improves software reliability.
- Improves developer productivity.

### Course overview: the big picture

- **Software processes, requirements, and specification**
  - Learn about different software development processes.
  - Learn how to write a requirements document and a specification.

- **Software development**
  - Learn how to decompose a complex problem and build abstractions.
  - Improve your coding skills.

- **Software testing and debugging**
  - Learn how to write (unit) tests.
  - Hands-on experience, using testing and debugging techniques.

- **Class project**
  - Apply all of the above in a semester-long project, guided by CS529 students who have previously taken CS320.

### Course overview: grading

**Overall grading**
- 50% Semester-long class project *(in groups)*
- 20% In-class exercises *(4 lab sessions in groups)*
- 20% Midterm exam *(individual exam)*
- 10% Participation

### Your expectations

**Introduction and a brief (5 minute) survey**
- **Position**: What type of job are you looking for?
- **Top-3 tasks**: What do you think your tasks related to SE will be?
- **Top-3 expectations**: What do you expect from this course?
<table>
<thead>
<tr>
<th>Expectations</th>
<th>Logistics</th>
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<tbody>
<tr>
<td>● Programming experience and familiarity with one programming language (Java, C++, ...)</td>
<td>● Lectures: Mo/We, 2:30pm – 3:45pm</td>
</tr>
<tr>
<td>● Active participation in discussions.</td>
<td>Discussions: We 1:25pm – 2:15pm</td>
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<tr>
<td>● Teamwork and communication.</td>
<td>● Lectures, discussions, lab session, and presentations in room CS 142.</td>
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<tr>
<td>● Reflecting on submitted assignments and improving/resubmitting the work.</td>
<td>● Course material, policies, and schedule on web site:</td>
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<pre><code>                                                                     | http://people.cs.umass.edu/~rjust/courses/2017Spring/CS320                                            |
</code></pre>
<p>|                                                                          | ● Submission of assignments via Moodle:                                                              |
| <a href="https://moodle.umass.edu">https://moodle.umass.edu</a>                                                                          |
| No discussion session on 01/25!                                                                    |
| You must already know how to program!                                     |-----------------------------------------------------------------------------------------------------|</p>