



Informatics 43

LECTURE 1-INTRO

“WHAT IS SE?”

Today's Lecture – What is this software engineering?

- Introduction to software engineering
 - Software is everywhere
 - Definitions

Today's Lecture – What is this class about?

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 - Software is everywhere
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Software is everywhere: cars



Hackers can cut the
brakes, shut down the
engine, drive it off the
road, or make all the
electronics go haywire.



 **CNNMoney** 
@CNNMoney

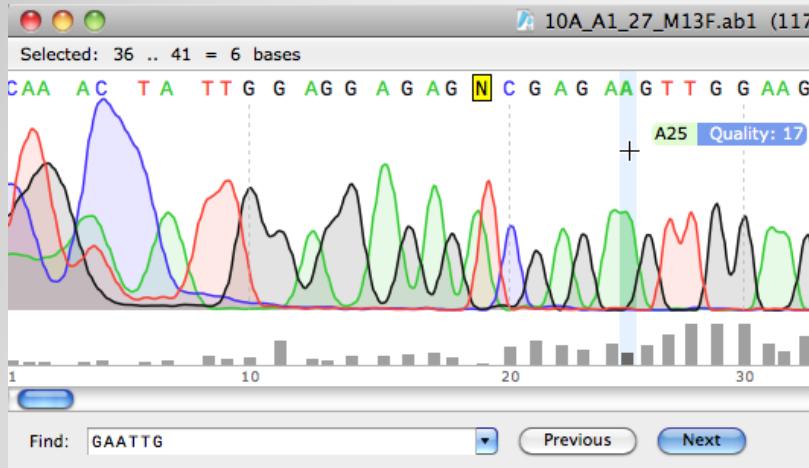


Recall Alert: Fiat Chrysler is recalling 1.4 million hackable vehicles. Check affected cars: cnnmon.ie/1OrrqGv

5:59 PM - 24 Jul 2015

◀ ▶ 56 ★ 25

Software is everywhere: medical field



Welcome to
Community Medical Center

H/R Status Name Patient Name Nurse PCT RN Ext. Advertising MD Comments

201	STEWART	RIVERS	BENSON	35426	SANTOS	SOCIAL SERVICE CONSULT	ISO ACTVY PALL OTHER
202	RIVERIA	KELLER	BENSON	35669	SUTTER		BR PP PUFF
MARO	203	PATR	RIVERS	35426	SANTOS	OR TODAY	ISO ISRP PP IV
204	ELLI	KELLER	ARNOLD	35669	VANEISTER	LEXINGTON HOSPITAL TODAY	ISO ASSIST PP VENT
205	PETERSON	WELCH	REID	35628	SUTTER	UP WITH 2 PERSON ASSIST	VRZ ASSIST PP
206	PALON	KELLER	ARNOLD	35669	VANEISTER	VP	UP
207							
208	ABUSHARIF	WELCH	REID	35628	THUKKAR	NO ENGLISH, NO FEMALE MD'S	ISRP
209	WEST	RIVERS	BENSON	35426	MUGHEE	PENDING DISCHARGE	
210	WOOD	RIVERS	RUSSEL	35426	GONZALEZ	WANDERS; MR TIAS DEMENTIA	NO PP
211	BARNES	RIVERS	BENSON	35426	SUTTER	DIABETIC	ACCU
212							
213	COX	WELCH	RUSSEL	35628	SANTOS	PENDING DISCHARGE W/FOLEY, HOME HEALTH F/U	TR/VR BR IV
PT	214	BENNET	KELLER	35669	NARANG	OT EVAL, PT TID	RR PUFF
215	FREEMAN	RIVERS	RUSSEL	35426	SUTTER	DISCHARGE TODAY	
216	MILLER	RIVERS	RUSSEL	35426	SUTTER	FINANCIAL CONSULT/NO INS	ISO BR PUFF
CARD	217	WARD	KELLER	35669	MUGHEE	NPO	ISO PP
218						UNAVAILABLE UNTIL 8/10/2010	
219	WEAVER	KELLER	REID	35669	MUGHEE	GARDEN CITY HOSPITAL - ADMISSION PENDING INS.	MRSA BR
220	CARR	RIVERS	REID	35426	VANEISTER	WANDERS	ASSIST PP

HOSPITAL NEWS:
Construction of new wing nearing completion,
please join us for the blessing the Sunday

SHIFT NOTES:
Make a difference in someone's life today
make our guests feel comfortable and rest well

Northstar Company



Software is everywhere: politics

“...the higher a politician ranks on a page of Internet search results, the more likely you are to vote for them.”



Info Source: <http://news.sciencemag.org/brain-behavior/2015/08/internet-search-engines-may-be-influencing-elections>

Image sources: By Michael Vadon - →This file has been extracted from another file: Donald Trump August 19, 2015.jpg, CC BY-SA 4.0, <https://commons.wikimedia.org/w/index.php?curid=49531274>

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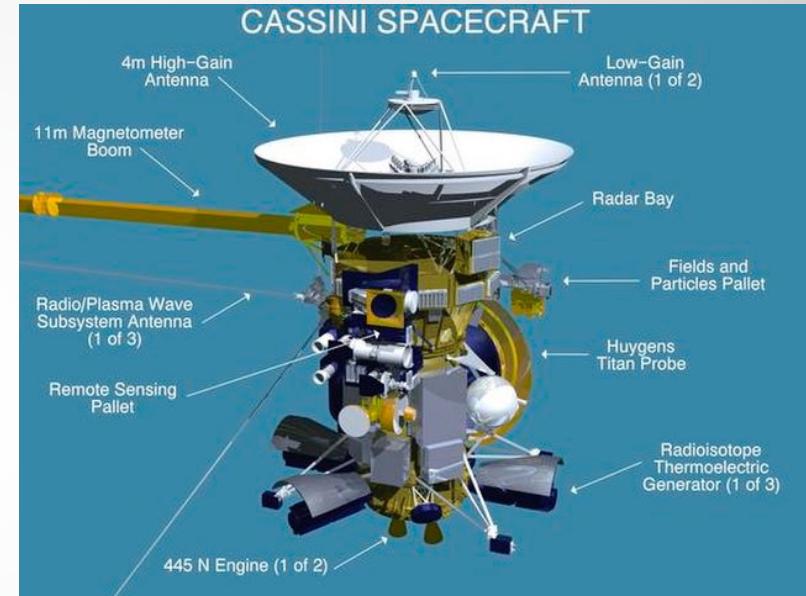
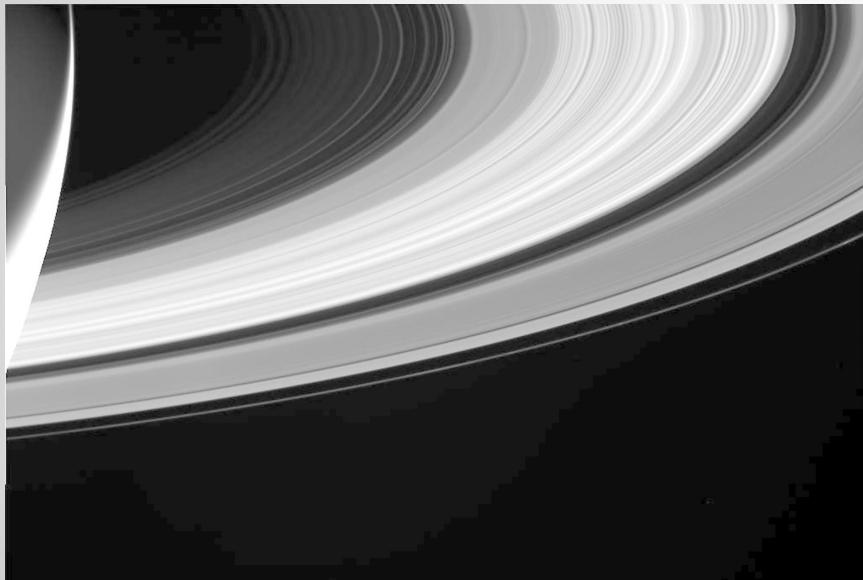
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Software is everywhere: the military



Pirate predictor: “The Navy’s new software creates models combining the best known conditions for pirating plus all available intel on the pirates in question. The name for these models? ‘Pirate replicates.’”

Software is everywhere: space



Software is everywhere: disaster response

The collage illustrates the widespread use of software in disaster response across different platforms:

- EAGLEVIEW HURRICANE HARVEY 2017 AERIAL IMAGERY:** A map showing Hurricane Harvey's path over Texas, specifically focusing on Houston and surrounding areas.
- WHO COVID-19 App:** Five screenshots of the World Health Organization's mobile application. The first screen shows the WHO logo and app title. Subsequent screens provide information on how COVID-19 spreads, instructions for handwashing, and guidance on avoiding close contact.
- FEMA App:** A screenshot of the FEMA mobile application interface. It features the FEMA logo at the top, followed by sections for "build a kit & ...", "locatio...", "Weather Service", "Shelters & ...", and a "Disaster Reporter" section where users can share GPS photos from disasters.
- Facebook Disaster Response:** A screenshot of the Facebook mobile interface, specifically the "Disaster Response" feature. It includes a "Quickly find and connect with friends in the area. Mark them safe if you know they're OK." message, a "Are you in the affected area? Yes, let my friends know." button, and a "Blog" section with a post from 21 days ago.

Software is everywhere: games



Software is everywhere: law enforcement



Source: <http://www.businessinsider.com/el-chapo-guzman-in-costa-rica-with-son-2015-9>

Software...

- is everywhere
- is exciting
- is versatile
- saves lives
- helps people
- harms people

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So how is all this software made?

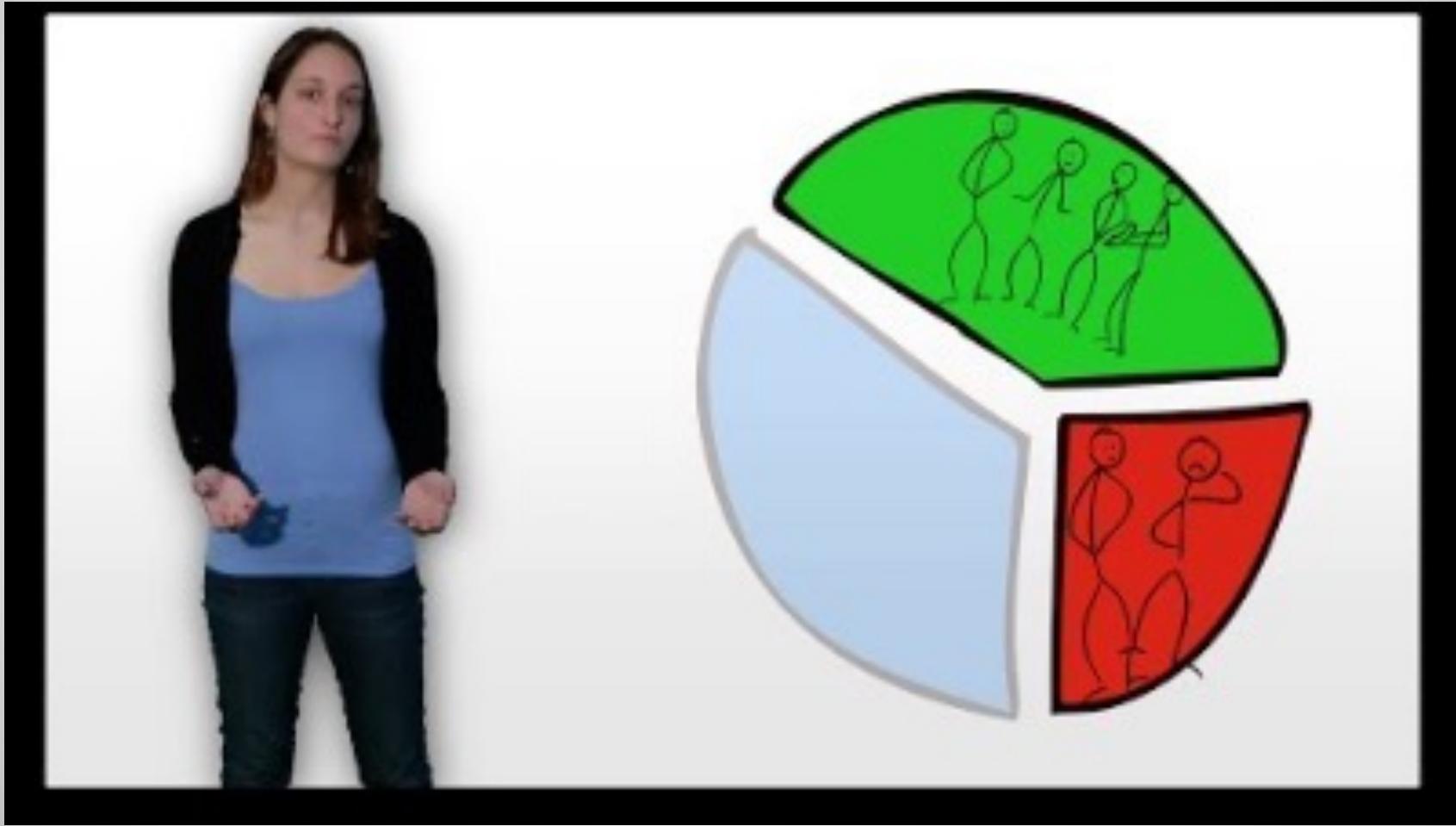
Today's Lecture – What is this class about?

- Introduction to software engineering
 - Software is everywhere
 - What is software engineering?

What is Software Engineering?

- Software –
 - Code
 - Documentation, user manuals
 - Designs, specifications
 - Test cases
 - Plans and schedules
- Engineering –
 - Creatively applying science and math
 - To designing and building things
 - Involves trade-offs, risk analysis, skill, and knowledge

What is Software Engineering?



<https://www.youtube.com/watch?v=ZNMbEbz2dys>





Definitions of “software engineering” by the experts

Software Engineering

*“A broad field that touches upon all aspects of **developing** and **supporting** a software system.” [Tsui, Karam, Bernal]*

Software Engineering

*“A discipline that deals with the building of software systems which are so **large** that they are built by a **team** or **teams** of engineers.” [Ghezzi, Jazayeri, Mandrioli]*

Software Engineering

“Multi-person construction of multi-version software.” [Parnas]

Software Engineering

“A discipline whose aim is the production of **fault-free** software, delivered **on-time** and **within budget**, that satisfies the **user's needs**. Furthermore, the software must be **easy to modify** when the user's needs change.” [Schach]

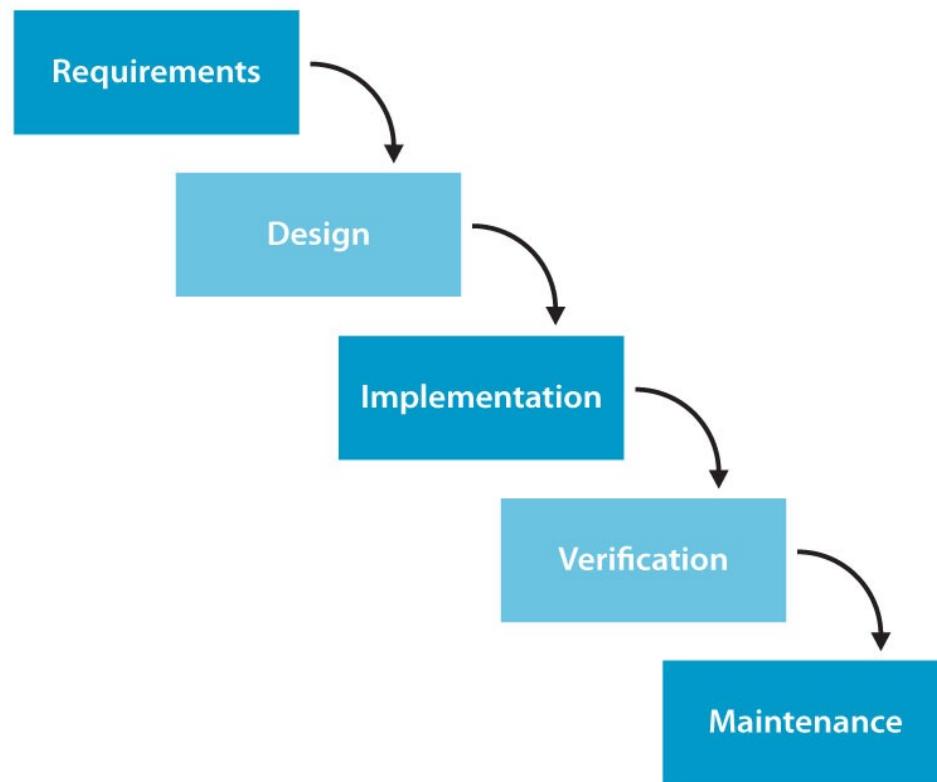
Software Engineering

- Informatics 43 definition
 - The process of constructing software
 - Phases of development other than programming
 - Principles and qualities of enduring value

Software Engineering

- Informatics 43 definition
 - The process of constructing software
 - Phases of development other than programming
 - Principles and qualities of enduring value
- Also of (lesser) interest in this course
 - Managing and scheduling software development teams
 - Making money – business models
 - Software's impact on users, organization, and society

The Process of Constructing Software

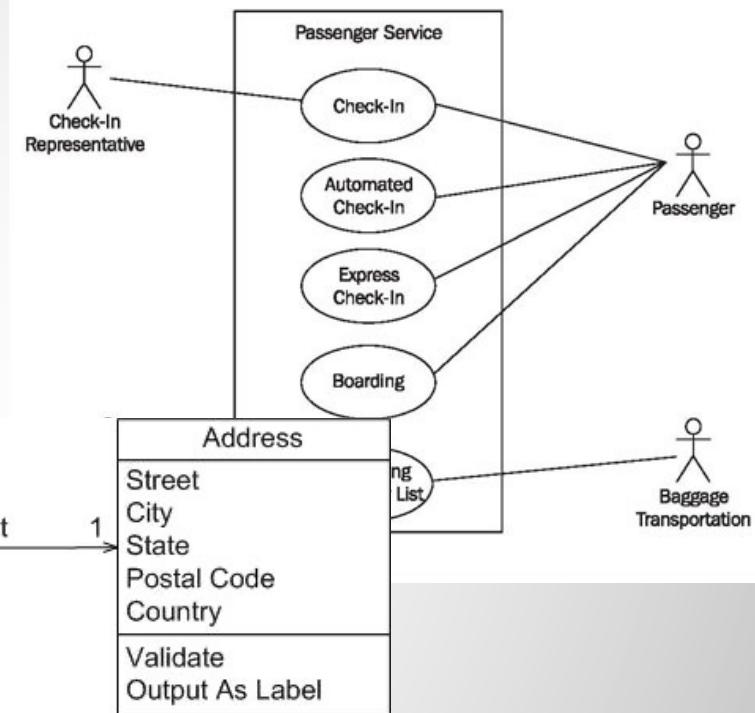
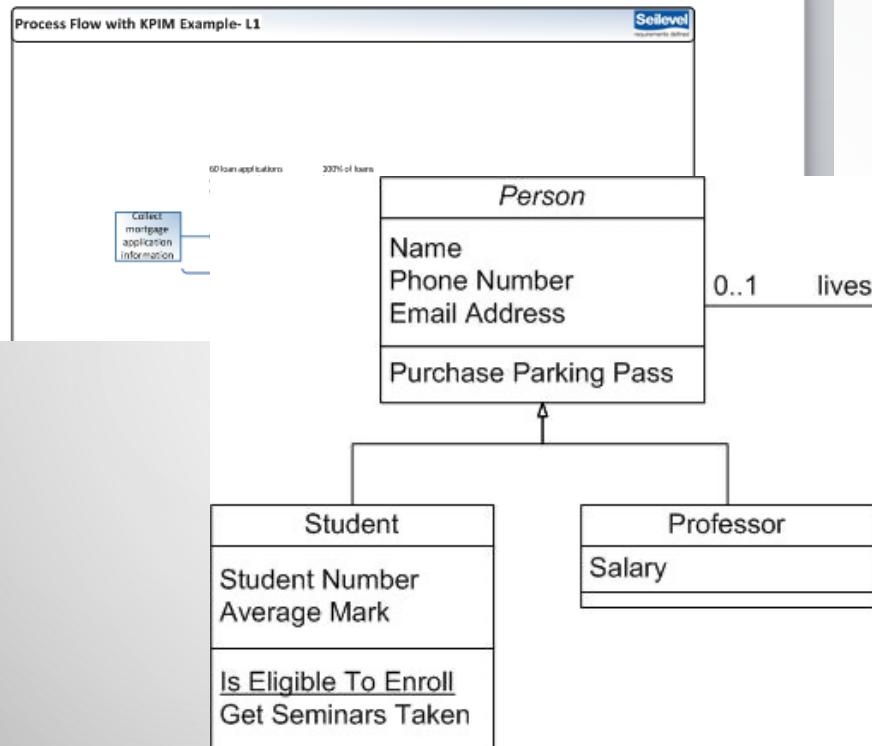


Phases of Development other than Programming

Requirements Document

1. Shopping Cart

100 loan applications
300% of loans
posuere, magna sed pulvinar ultricies, purus lectus malesuada libero, sit amet commodo magna eros quis urna.



Principles and qualities of enduring value

Correctness!

Reliability

Adaptability MODULARITY

Efficiency

Usability

Robustness

- ▶ SE is... “A broad field that touches upon all aspects of **developing** and **supporting** a software system.”
- ▶ SE is... “A discipline that deals with the building of software systems which are so **large** that they are built by a **team** or **teams** of engineers.”
- ▶ SE is... “**Multi-person** construction of **multi-version** software.”
- ▶ SE is... “A discipline whose aim is the production of **fault-free** software, delivered **on-time** and **within budget**, that satisfies the **user's needs**. Furthermore, the software must be **easy to modify** when the user's needs change.”
- ▶ SE is... “The process of constructing software. Phases of development other than programming. Principles and qualities of enduring value.”

“Big Questions”

- How do we know what to build?
- How do we structure the software?
- How do we make software that meets the users' needs?
- How do we know the software works?
- What steps do we follow to develop software?

Learning Objectives

- Describe the fundamental principles of SE
- Create a requirements document
- Create a use case model
- Describe what software architecture is
- Describe different software architectural styles
- Create a UML class diagram
- Create black-box and white-box testing plans
- Describe different software process models
- Identify the principles and practices of good user orientation

Other, more general objectives

- Equip you with good software engineering principles and practices to bring into your education and career
- Discover what area(s) of software engineering you are passionate about and want to learn more of

Summary

- Software is everywhere
 - Cars, medical field, politics, military, space, disaster response, games, law enforcement, ...
- Software is...
 - exciting, fun, versatile, helpful, harmful
 - large, built by teams, long-lived, multi-version, complex
- Informatics 43 definition of software engineering
 - The process of constructing software
 - Phases of development other than programming
 - Principles and qualities of enduring value

To Do + Next Time

- Attendance Quiz (by tomorrow 11:59pm)
- **Complete assigned readings before watching Thursday's lecture**
 - Brooks' "No Silver Bullet"
 - Seminal article on software engineering
 - Written by Turing Award winner Fred Brooks
 - Published in 1986, but most present-day software engineers know this article!
 - Guidance: Read first 4 ¼ pages thoroughly, and then you can skim over the remaining pages with less focus.
 - Next time: more on “what is software engineering?”, No Silver Bullet, Software Principles