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# IT3180 – Introduction to Software Engineering

## 1 – Introduction to Software Engineering

ONE LOVE. ONE FUTURE.

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### FYI

- Teacher: Dr. Bui Thi Mai Anh
- Research domains:
  - Software Engineering
  - Applied AI in Software Engineering: **Software Defect Prediction, Fault/Bug Localization**
  - Search-based Software Engineering: **evolutionary computing, reinforcement learning, deep learning**
- Lab: **Intelligent Software Engineering – BK AI Center**

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## What is Software Engineering?

- **Systematic approach** for developing software
- **Methods** and **techniques** to develop and maintain quality software to solve problems
- Study of the **principles** and **methodologies** for developing and maintaining software systems

## Questions addressed by Software Engineering?

- How do we **ensure the quality** of the software that we produce?
- How do we **meet growing demand** and still **maintain budget** control?
- How do we **avoid** disastrous **time delays**?

## Why apply Software Engineering to Systems?

- Provide an **understandable process** for system development
- Develop systems and software that are **maintainable** and **easily changed**
- Develop **robust** software system
- Allow the process of creating computing based systems to be **repeatable** and **manageable**



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## Historical Perspective

- 1940s: computers invented
- 1950s: assembly language, Fortran
- 1960s: COBOL, ALGOL, PL/1, Operating System  
    **1969**: First Conference on Software Engineering
- 1970s: multi-user systems, databases, structured programming



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## Historical Perspective (cont.)

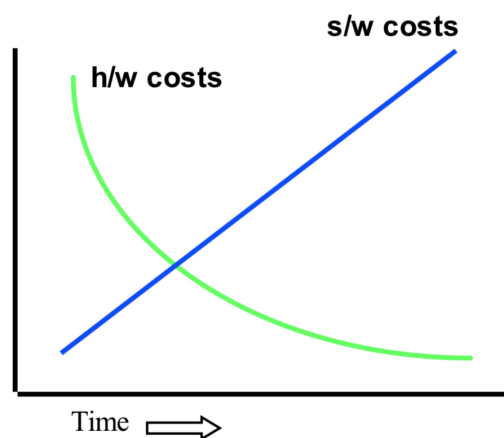
- 1980s: networking, personal computing, embedded systems, parallel architectures
- 1990s: information superhighway, distributed systems, OO in widespread use
- 2000s: virtual reality, voice recognition, video conferencing, global computing, pervasive computing,...
- 2010s: autonomos vehicles, new security awareness
- 2020s: AI everywhere



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## Hardware costs vs Software costs (% of overall cost)



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## Why is software so expensive?

Hardware has made great advances

But software too...



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## Why is software so expensive?

We need softwares because they help us save money...

*Imagine: a software system could save a company \$10,000/year*

*So, why couldn't it charge \$9,000?*

- Most popular software suites out are software solutions that companies **cannot go without**
  - Productivity software, marketing, logistics, finance ...



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## Why is software so expensive?

Software is **Expensive** to **Produce**

- Labor costs to host hundreds of talented people
- Utilities have to be paid
- Software for software development costs money
- Extensive Q&A process
- Engage in marketing after release
- ... and the most important thing:

*Software has to be supported 24/7*  
*Software needs to be updated*



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## Variety of Software Products

- **2 big categories: Application Software vs System Software**
- Web sites
- Operating systems, compilers
- Routers, telephone switchers : communication software
- Telephone billings, Financial Market Predictions: data processing
- Air traffic control, autonomous vehicles: Real time apps
- Device drivers, controllers: Embedded Software
- Digital camera, GPS, sensors: mobile devices
- Information systems: database management, digital libraries
- Offices: word processing, spreadsheet, video conferences
- Scientific: simulations, weather forecasting...



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## The craft of software development

- Client requirements are very different
- There is no standard process for software engineering
- There is no best language, operating system, platform, database system, development environment...
- The craft of software development is  
to select **appropriate methods** for each project  
and to **apply them effectively**



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## 1. Introduction to Software Engineering

(end of lecture)

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