Lecture 0 – Introduction

SWS128: Software Analysis

Jihyeok Park

2026 Fall

Course Information

- **Instructor:** Jihyeok Park (박지혁)
  - **Position:** Associate Professor in CS, Korea University
  - **Expertise:** Programming Languages, Software Analysis
  - **Office:** 507, 정운오IT교양관
  - **Email:** jihyeok_park@korea.ac.kr

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- **Lectures:** 20:20–21:50 Mondays @ B101, 우정정보관

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- **Homepage:** https://plrg.korea.ac.kr/courses/sws128/

Schedule

#	Date	Title
0	09/07	Introduction
1	09/14	Syntax and Semantics
2	09/21	Control Flow Graphs
3	09/28	Dataflow Analysis
4	10/05	Taint Analysis (recorded)
5	10/12	Abstract Interpretation (recorded)
10/19		Midterm Week (No Class)
6	10/26	Widening and Narrowing
7	11/02	Pointer Analysis
8	11/09	Inter-procedural Analysis
9	11/16	Constraint-based Analysis
10	11/23	Symbolic Execution
11	11/30	Dynamic Analysis
12	12/07	Real-World Tools and Practice
12/14		Final Week (No Class)

No offline class on **October 5** and **October 12**. Recorded lectures will be uploaded to the **LMS** instead.

Grading

- **3 Homework Assignments: 90%** (30% each)
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  - No attendance check today; it starts on September 14.

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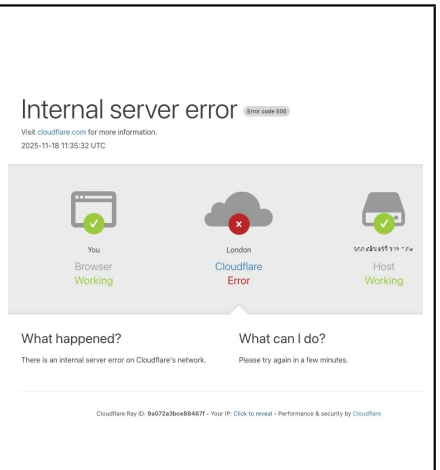
- No midterm, no final, no term project.

Errors in Software

Unexpected faults in software cause serious problems:

			
Rocket Ariane 5 (1996)	**Security** Heartbleed (2014)	**Global IT** CrowdStrike (2024)	**Cloud** Cloudflare (2025)

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			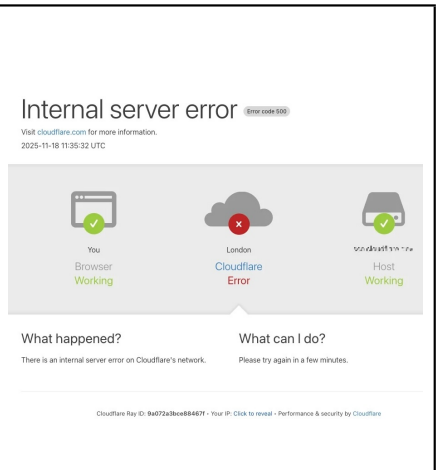
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Can we **automatically check** whether a program has a fault?

Detecting Software Faults

How do we know whether a software is correct?

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vs.

Empiricists (경험주의자)
Francis Bacon
It is correct because I **TESTED** *several times but no error was found!*

Rationalists (합리주의자)
René Descartes
It is correct because I formally **PROVED** *that no error exists!*

Software Analysis

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Dynamic Analysis	Static Analysis
Empiricists (경험주의자)	Rationalists (합리주의자)
Under-approximation	Over-approximation
False Negatives (Missed Errors)	False Positives (False Alarms)

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Every non-trivial semantic property of programs is **undecidable**.

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- No analyzer can be sound (no missed errors), complete (no false alarms), and always terminate.
- So every analysis gives something up. This course is about **which**, and **how**.

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- find an **input** that reaches a given point (symbolic execution, dynamic analysis);
- and judge how far each result can be **trusted**.

Next Lecture

- Syntax and Semantics

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