Foundations and Applications of Program Analysis – an Overview

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"Science attempts to find logics and simplicity in nature; mathematics attempts to establish order and simplicity in human thoughts"

- Edward Teller

The Instructor

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Research Area: program analysis, trustworthy AI and software

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Program Analysis

Analyzing *programs* to predict values and identify properties; programs exist in the following format:

- ▶ source code
- ▶ binary code
- ▶ execution traces
- ▶ runtime products: e.g., data structure access pattern in the heap memory
- ▶ software repositories: e.g., bugs, patches, makefile, tests
- ▶ machine learning code and trained models

This area interfaces with discrete maths, AI algorithms, graph algorithms, programming languages and compilers, security

Course content and syllabus

▶ terminologies and concepts in program analysis and software engineering
▶ program representations
▶ program analysis algorithms
▶ big ideas: abstraction (e.g.,group values) - to address state space issues
▶ applications: quality assurance of software engineering and AI-engineering
▶ dataset and tools
▶ examples
▶ research frontier and problem solving

How do I run the course

Syllabus