SNS COLLEGE OF ENGINEERING

Kurumbapalayam(Po), Coimbatore – 641 107
Accredited by NAAC-UGC with 'A' Grade
Approved by AICTE, Recognized by UGC & Affiliated to Anna University, Chennai

Department of Artificial Intelligence and Data Science

23ITT203 Object Oriented Software Engineering

Program Analysis

What is Program Analysis?

- → *Program Analysis* means checking and studying a program carefully to find mistakes (bugs), improve performance, and make sure the program is working correctly — either *without running* or *while running* the program.

Static Analysis = *Check without running*

Dynamic Analysis = *Check while running*

Both help us to make our programs: → Correct + Clean + Safe + Fast

Types of Program Analysis

1. Static Program Analysis (Without Running the Program)

- → In this method, we check the program without executing it.
- Example:→ You wrote a program and forgot to use a variable properly.
- **x = 10**
- **y = 20**
- **print(x) # y is never used → Warning in static analysis**
- Static Analysis Tool will show:
- Warning: Variable 'y' is assigned but never used.

Types of Program Analysis

2. Dynamic Program Analysis (While Running the Program)

→ In this method, the program is executed with different inputs and its behavior is analyzed.

Example:→ Program to divide two numbers:

```
a = 10

b = 0

print(a / b)   # This will give an error while running
```

→ Dynamic Analysis will catch this error:

Error: Division by Zero

Another Simple Example for Both Types

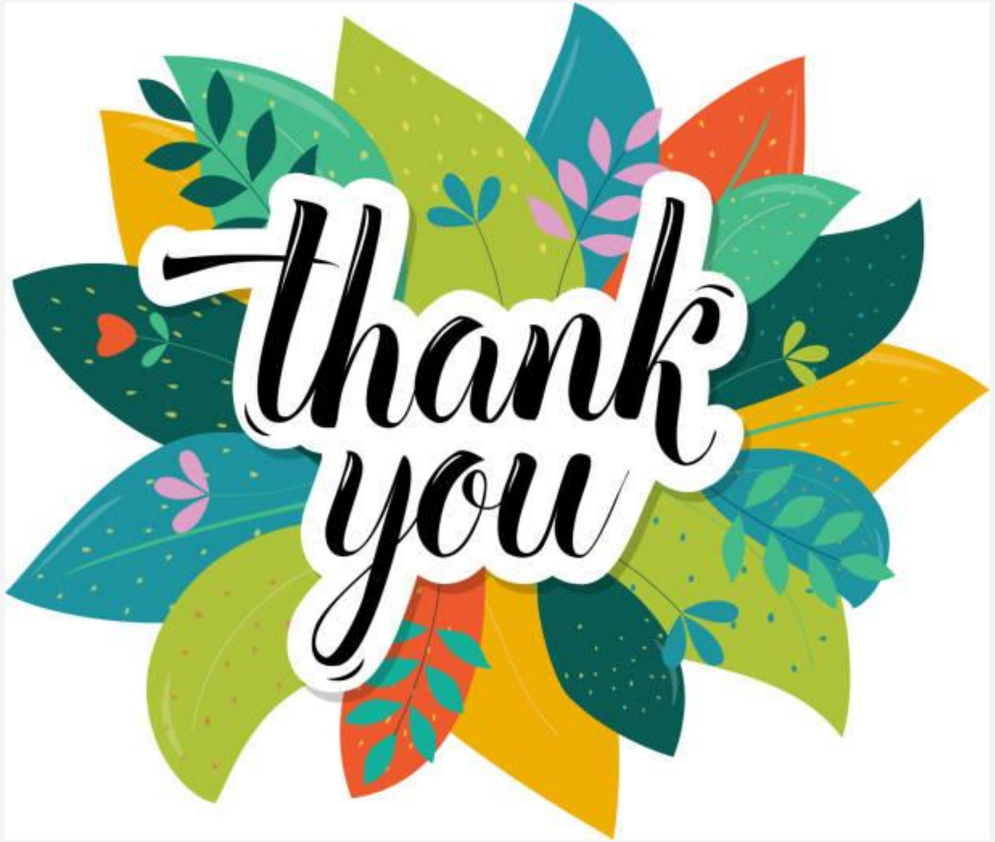
Check	Static Analysis (Before Running)	Dynamic Analysis (While Running)
Problem	Unused variable found	Division by zero error when user enters b=0
Tool's Suggestion	Remove unused variable	Add condition to check if b==0 before dividing

Tools Used for Program Analysis

Tool Name	What it Does	Example
PyLint	Finds errors without running	Python code checker
SonarQube	Checks code quality	For many languages
Valgrind	Finds memory errors while running	C/C++ programs
Debugger	Helps to check values step by step	In IDE like PyCharm, Eclipse

Benefits of Program Analysis

- Catch errors early.
- Save time and effort.
- Improve program quality.
- Make the code safe and correct.


thank
you