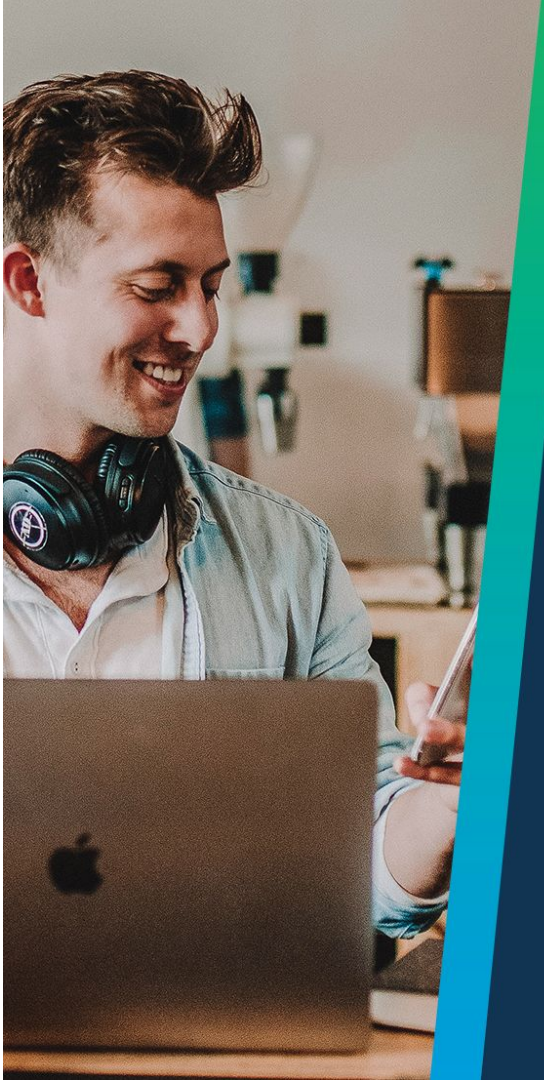

Cyber Security Bootcamp

Hyperiondev

Hypothesis-Driven Debugging using the Stack Trace

Welcome

Your Lecturer for this session

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Objectives

1. Learn about the stack trace
2. Gain skills for debugging failing code

What is the Stack Trace?

- When your code hits an error, you will see a large body of text with error messages.
- This is the stack trace (or traceback).
  - It shows each method that was called when the error occurred.
  - A “trail of breadcrumbs”.

An Example

```
def calling_function():
    another_function()

def another_function():
    last_function()

def last_function():
    return 5/0

result = calling_function()
```

```
Traceback (most recent call last):
  File "C:\Python310\debugging.py", line 10, in <module>
    result = calling_function()
  File "C:\Python310\debugging.py", line 2, in calling_function
    another_function()
  File "C:\Python310\debugging.py", line 5, in another_function
    last_function()
  File "C:\Python310\debugging.py", line 8, in last_function
    return 5/0
ZeroDivisionError: division by zero
```

Exceptions and Errors

- How to tell what caused the error?
  - It depends on what type of error was raised.
  - Multiple types of error.
- **ZeroDivisionError** - When you try to divide by zero.
- **NameError** - When you try to read the value of a variable that hasn't been created.
- Various others - can be found on official Python website.

How do we Fix these Bugs?

- Sometimes, these error messages can be vague and difficult to interpret.
- Without a good understanding of what is happening, debugging can be difficult.
- We need to follow a process.
    - Hypothesis-driven debugging.

Step 1: Make Observations

- Try to replicate the issue, and find out what causes the unexpected behaviour.
- Note the stack trace - inspect the code that is causing the error to occur.

Step 2: Question

- When did the problem start?
- Is this a recent problem?
- Could it have arisen from a recent change?
- Many other questions can be asked. This will help to narrow down the potential sources of the problem.

Step 3: Form a Hypothesis

- Based on your questioning, you can now make a guess of what is wrong.
- A hypothesis is like a guess, but something that can be tested.

Step 4: Make a Prediction

- “If I make this change, then we should see this change in the output”
- You can either guess that the change will completely fix the bug, or if it will cause some shift in the output.

Step 5: Test your Hypothesis

- Now it is time to test the hypothesis that you made.
- If your code changes as you have predicted, then your hypothesis is correct.
- If not, you will need to go back and change your hypothesis.

Gaining Visibility into your Code

- It is often useful to take a “look” at how your code is executing.
- Various debuggers are available for IDLE and VS Code.
- Print statements are used quite commonly.
- If you want to know the value of a variable at a certain point, just print it to console.

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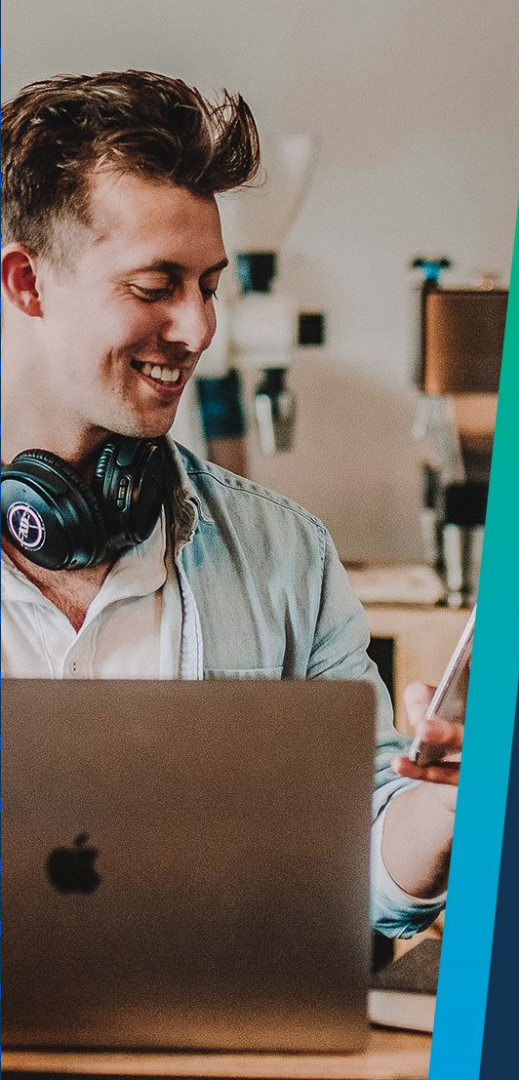
Q & A Section

Please use this time to ask any questions relating to the topic explained, should you have any



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Thank you for joining us