Mini-Lesson 5: Unit Testing

PPHA 30538 Data Analytics and Visualization for Public Policy

Agenda

Discussion Questions

▶ How to check that my code is working properly?
▶ How could you automate these checks?

What are Unit Tests?

Unit tests are small pieces of code that check if other code works correctly

▶ Each test focuses on one specific behavior
▶ Think of them as automated checkers

Why Write Tests?

Benefits:

1. **Catch errors early** - Find bugs before they cause problems
2. **Save time** - Automated testing is faster than manual checking
3. **Confidence** - Know your code still works after changes
4. **Documentation** - Tests show how code should work

For your assignments:

▶ Verify data quality (no missing values, correct columns)
▶ Ensure functions work correctly

The Assert Statement

The `assert` statement checks if something is True:

```python
# assert true_expression, "optional error message"

# Simple examples
assert 10 > 5        # Passes (nothing happens)
assert 2 + 2 == 4    # Passes
```

This will fail

```python
try:
    assert 3 + 3 == 7, "Math is broken!"
except AssertionError as e:
    print(e)
```

```
Math is broken!
```

Testing Functions

A simple function:

```python
def add_numbers(a, b):
    return a + b

# Test it
result = add_numbers(5, 3)
assert result == 8, f"Expected 8 but got {result}"
print("Test passed!")
```

```
Test passed!
```

We can also write functions for testing:

```python
def test_add_positive():
    assert add_numbers(5, 3) == 8

def test_add_negative():
    assert add_numbers(-2, -3) == -5
```

Testing Data Quality

```python
import pandas as pd

grades = pd.DataFrame({
    'id': [1, 2, 3],
    'grade': [85, 92, 88]
})

names = pd.DataFrame({
    'id': [2, 3, 4],
    'name': ['Alex', 'Yuri', 'Ralph']
})

# Merge the two DataFrames
students = grades.merge(names, on='id', how='left')

# Test: Check row count
assert len(students) == 3
print("Row count correct")
```

Hands-on Activity

Work in pairs!

Task: Test a Function and Data Quality (5 minutes)

Open `activity_unit_test.py` in VS Code

▶ Read the instructions
  ▶ Complete the TODO sections
  ▶ Run: `python activity_unit_test.py`

Recap & key takeaways

Questions?

Remember:

▶ Tests catch errors early and save time
▶ Test both functions and data quality

For PS5 and your final project:
Write tests to verify your data before analysis!

Additional resources:

▶ pytest is a popular open-source testing framework