EGM722 – Programming for GIS and Remote Sensing

Week 2, Part 3: Errors and Debugging

A universal truth

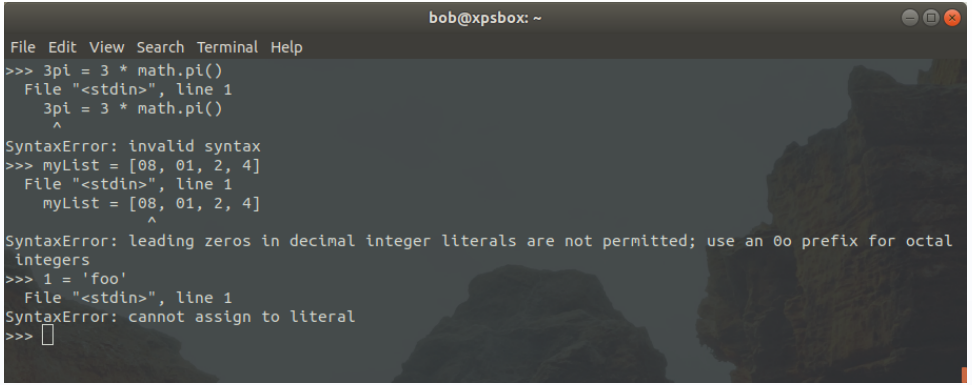
When writing code, you will have errors

Bugs! Everywhere, bugs!

- Three main types of errors:
  - Syntax errors: produced when interpreter translates code
  - Runtime errors (exceptions): produced by interpreter if something goes wrong while the program is running
  - Semantic errors: no error message produced, but the program doesn't do what you expected
- Debugging: the process of identifying and fixing errors

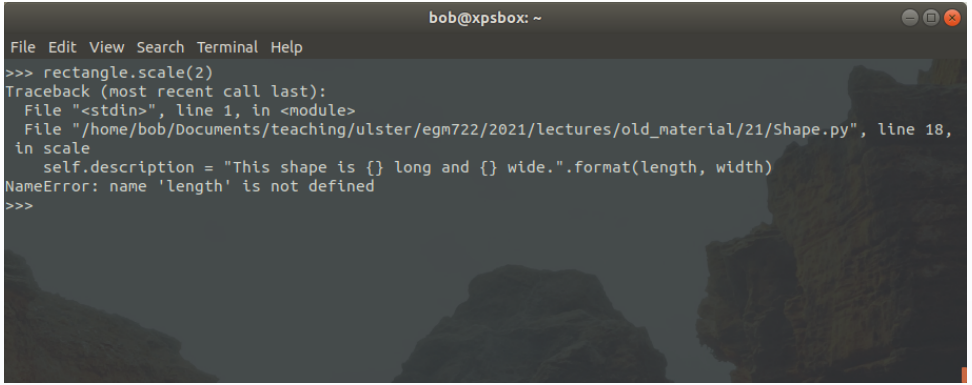
Syntax Errors

- Common messages:
  - Invalid syntax
  - Cannot assign to <something>
- Tips:
  - Avoid python keywords
  - Headers should end with colon
  - Check quotation marks, parentheses, brackets
  - Check indentation
- Most IDEs will alert you to syntax errors



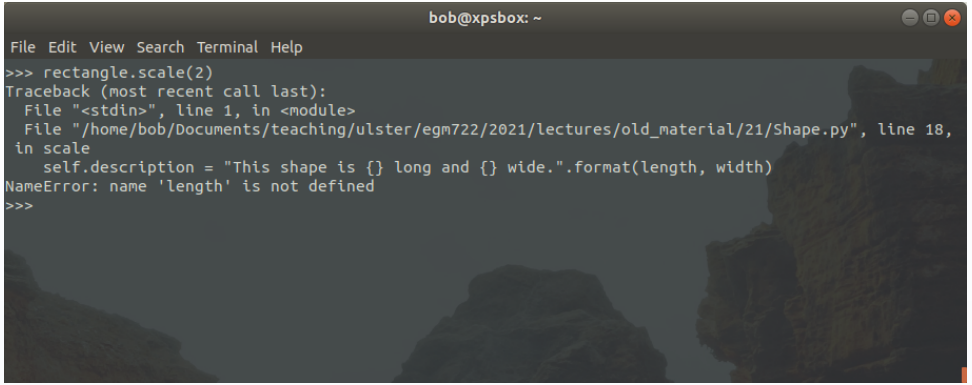
Runtime Errors

- Runtime error:
  - Program passes syntax checks (syntactically correct)
  - Fails during execution
- Also called exceptions
- Common causes:
  - Wrong variable names
  - Index/Key errors
  - Attribute errors



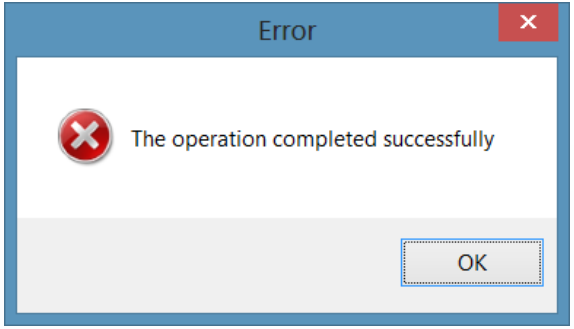
Traceback

- Interpreter keeps track of function calls (Traceback)
- When an exception is raised, this prints to the screen
  - Provides function, line number, file where error occurred
  - Traces back through sequence of function calls
- Use this to examine where the error occurred



Semantic errors

- Hardest errors to have to debug
- Program runs “successfully”
  - Interpreter provides no errors
  - Something isn’t right
- The issue: you did not write the program you wanted to write
- To debug, you have to work backward from the output



Out! Out, damned bug!

- Break complicated expressions into series of variables
- Use parentheses when unsure of order of operations
- Use a debugger to help pause the program
- Take a step back, grab a soda
- Call Joe.

Summary

- You will have to deal with errors/bugs
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- Different kinds of errors require different kinds of troubleshooting
- Debugging errors can require a fresh look
- You will have to deal with errors/bugs