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Python

Errors and Exceptions

Errors

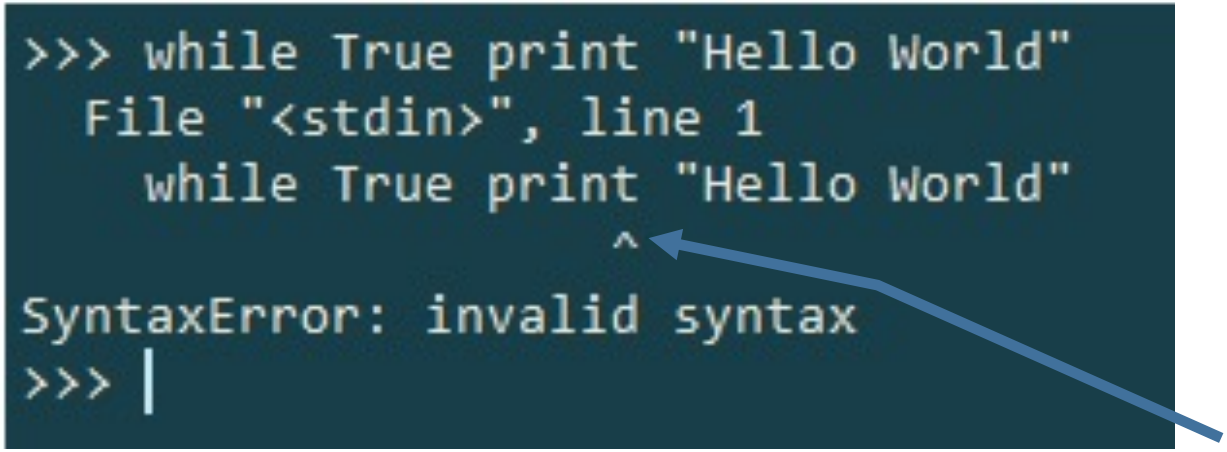
Computer programmes break. It's a fact of life.

There are (at least) two distinguishable kinds of errors:

syntax errors and ***exceptions***.

Syntax Errors

- Syntax errors, or *parsing errors*, are very common when learning:



Error here was not using brackets in `print()`

The arrow tells you where the error was located

Exceptions

- Even if a statement or expression is syntactically correct, it may cause an error on execution.
- Errors detected during execution are called *exceptions* and are not unconditionally fatal.
- You can *catch* an exception and decide how to *handle* it.

```
>>> '2' + 2
Traceback (most recent call last):
  File "<stdin>", line 1, in <module>
TypeError: can only concatenate str (not "int") to str
>>>
```

Types of exception

- Exceptions come in different types, and the type is printed as part of the message, e.g.:
  - ZeroDivisionError
  - NameError
  - TypeError
- And **you can define your own exceptions**, e.g.:
  - MyAppBadUserInputError

Catching exceptions

- You can catch errors and decide how to handle them using: `try` and `except`

```
try:
    result = run_my_climate_model(experiment)
except:
    # It failed, so do something sensible
    email_me("No results I'm afraid!")
    print("It's not a good model")
```

- By handling errors appropriately you can change the flow of your programme accordingly.

Raising exceptions

- You can even trigger your own exceptions using: **raise**

```
if validate(input) == False:
    raise Exception("Bad input provided")
    # Programme will stop here unless this
    # exception is caught
else:
    print("Great input")
```

...processing input here...

An example please

In this example, I have written some code to read the content from a number of simple text files. Each file should contain a numeric code.

There are two exceptions that I am interested in:

1. File does not have content
2. Contents of the file cannot be converted to an integer.

An example continued

```
def read_int_from_file(fname):
    "Returns an integer from a file. "
    with open(fname) as f:
        my_int = int(f.read(10))

    return my_int
```

An example continued

```
for file in ("a.txt", "b.txt", "c.txt"):
    try:
        print(read_int_from_file(file))
    except IOError:
        print(f"There is nothing in file: {file}")
    except ValueError:
        print(f"Could not convert to int: {file}")
    except Exception as err:
        print(f"Really unexpected error: {err}")

# But the script keeps processing all the good files!
```

Further Reading

Much of this presentation was taken from the python documentation pages:

https://docs.python.org/3/tutorial/errors.html