Programming in Python[1]

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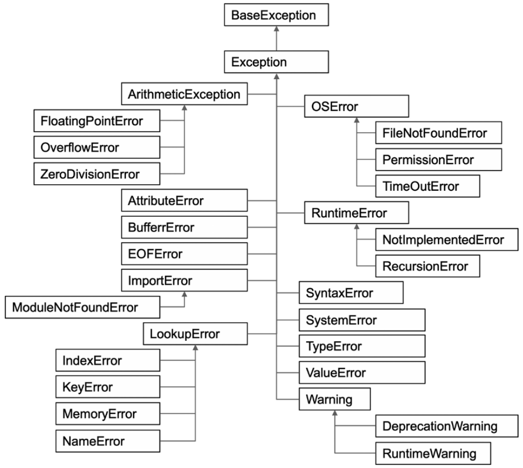
Lecture XVII: Exception handling, Iterators

Exceptions

- Exceptions and Errors are object **raised** (or thrown) in the middle of an anomalous computation.
- Exceptions change the control flow: the control passes to the “closer” handler, if it exists: otherwise it **aborts**.



BaseException
Exception
ArithmeticException
FloatingPointError
OverflowError
ZeroDivisionError
AttributeError
BufferrError
EOFError
ImportError
ModuleNotFoundError
LookupError
IndexError
KeyError
MemoryError
NameError
OSError
FileNotFoundError
PermissionError
TimeOutError
RuntimeError
NotImplementedError
RecursionError
SyntaxError
SystemError
TypeError
ValueError
Warning
DeprecationWarning
RuntimeWarning

Exception handling

Exceptions can be handled: the strategy is normally an “organized panic” in which the programmer tidies up the environment and exits.

```
danger()
# An exception in danger
# aborts the program
```

```
try:
  danger()
except:
  # An exception in danger
  # it's handled here
```

```
try:
  danger()
except OverflowError as e:
  # An exception in danger
  # it's handled here
  # The object is referred
  ↪  by e
finally:
  # This is executed in any
  ↪  case
```

Raising an exception

To explicitly raise an exception, use the `raise` statement

```
if something == WRONG:
   raise ValueError(f'The value {something} is wrong!')
```

Assertions are a disciplined way to raise exceptions.

Iterators

Object can be iterable. Python defines the iterator protocol as:

- `iterator.__iter__()` Return the iterator object itself. This is required to allow both containers and iterators to be used with the for and in statements.
- `iterator.__next__()` Return the next item from the container. If there are no further items, raise the StopIteration exception.

Notable iterators

Built-in lists, tuples, ranges, sets, dicts are iterators.

- Numpy arrays
- Pandas Series and DataFrames

Pandas DataFrame

Be careful: the default iteration is on **column names** (similar to dicts, which iterate on keys).

- `iterrows()`: Iterate over the rows of a DataFrame as `(index, Series)` pairs. This converts the rows to Series objects, which can change the dtypes and has some performance implications.
- `itertuples()`: Iterate over the rows of a DataFrame as namedtuples of the values. This is a lot faster than `iterrows()`, and is in most cases preferable to use to iterate over the values of a DataFrame.

Iterating is **slow**: whenever possibile try to use vectorized operation or **function application**.

Pandas function application

```
# apply the function to each column
df.apply(lambda col: col.mean() + 3)

# apply the function to each row
df.apply(lambda row: row + 3, axis=1)
```

Pandas query

```
df[df['A A'] > 3]

# equivalent to this (backticks because of the space)
df.query('`A A` > 3')

# query can also refer to the index
df.query('index >= 15')

# same as
df[15:]
```