

# Programming in Python[1]

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Academic year 2024/25, I semester







## Lecture XXI: More pandas



## Group by



Data can be grouped with `groupby`, then *summary* function (`sum`, `mean`, ...) can be applied to **each** group at the same time.

```
iris = pd.read_csv('https://tinyurl.com/iris-data')
```

```
iris.groupby('variety').mean()
```

Groups are special **lazy** types which generate data only when needed for the summary operation.



## 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



## Generators



```
def mygenerator() -> int:
   for i in [1, 6, 70, 2]:
      yield i
   print('Ended')  # Just to see when it reaches this
   ↪  point

g = mygenerator()

print(g)  # not useful
print(next(g))
print(next(g))
print(next(g))
print(next(g))
print(next(g))     # Exception
```



## 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:]
```





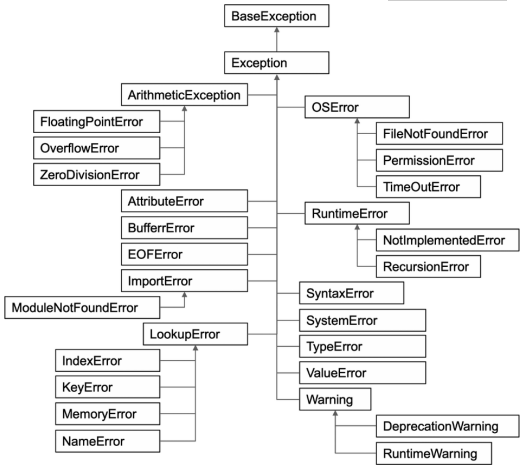
# Lecture XXII: Exception handling



## 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**.






## 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.