

# Python For Data Science Cheat Sheet

## PySpark - RDD Basics

BecomingHuman.AI



PySpark is the Spark Python API that exposes the Spark programming model to Python.

### Initializing Spark

#### SparkContext

```
>>> from pyspark import SparkContext
>>> sc = SparkContext(master = 'local[2]')
```

#### Calculations With Variables

>>> sc.version	Retrieve SparkContext version
>>> sc.pythonVer	Retrieve Python version
>>> sc.master	Master URL to connect to
>>> str(sc.sparkHome)	Path where Spark is installed on worker nodes
>>> str(sc.sparkUser())	Retrieve name of the Spark User running SparkContext
>>> sc.appName	Return application name
>>> sc.applicationId	Retrieve application ID
>>> sc.defaultParallelism	Return default level of parallelism
>>> sc.defaultMinPartitions	Default minimum number of partitions for RDDs

#### Configuration

```
>>> from pyspark import SparkConf, SparkContext
>>> conf = (SparkConf()
...         .setMaster('local')
...         .setAppName('My app')
...         .set('spark.executor.memory', '1g'))
>>> sc = SparkContext(conf = conf)
```

#### Configuration

In the PySpark shell, a special interpreter-aware SparkContext is already created in the variable called `sc`.

```
$ ./bin/spark-shell --master local[2]
$ ./bin/pyspark --master local[4] --py-files code.py
```

Set which master the context connects to with the `--master` argument, and add Python `.zip`, `.egg` or `.py` files to the runtime path by passing a comma-separated list to `--py-files`.

### Loading Data

#### Parallelized Collections

```
>>> rdd = sc.parallelize([('a','7'),('a','2'),('b','2')])
>>> rdd2 = sc.parallelize([('a','2'),('d','1'),('b','1')])
>>> rdd3 = sc.parallelize(range(100))
>>> rdd4 = sc.parallelize([('a','x','y','z'],
...                       ('b',['p','r'])))
```

#### External Data

Read either one text file from HDFS, a local file system or or any Hadoop-supported file system URI with `textFile()`, or read in a directory of text files with `wholeTextFiles()`.

```
>>> textFile = sc.textFile('/my/directory/*txt')
>>> textFile2 = sc.wholeTextFiles('/my/directory/')
```

### Selecting Data

#### Getting

>>> rdd.collect()	Return a list with all RDD elements
[('a', 7), ('a', 2), ('b', 2)]	
>>> rdd.take(2)	Take first 2 RDD elements
[('a', 7), ('a', 2)]	
>>> rdd.first()	Take first RDD element
('a', 7)	
>>> rdd.top(2)	Take top 2 RDD elements
[('b', 2), ('a', 7)]	

#### Sampling

```
>>> rdd3.sample(False, 0.15, 81).collect()
[3,4,27,31,40,41,42,43,60,76,79,80,86,97]
```

#### Filtering

>>> rdd.filter(lambda x: "a" in x)	Filter the RDD
.collect()	Return distinct RDD values
[('a',7),('a',2)]	Return (key,value) RDD's keys
>>> rdd5.distinct().collect()	
[a,2,b,7]	
>>> rdd.keys().collect()	
[a, a, b]	

### Iterating

#### Getting

```
>>> def g(x): print(x)
>>> rdd.foreach(g)
('a', 7)
('b', 2)
('a', 2)
```

### Retrieving RDD Information

#### Basic Information

>>> rdd.getNumPartitions()	List the number of partitions
>>> rdd.count()	Count RDD instances
3	
>>> rdd.countByKey()	Count RDD instances by key
defaultdict(<type 'int'>, {'a':2,'b':1})	
>>> rdd.countByValue()	Count RDD instances by value
defaultdict(<type 'int'>, {('b',2):1,('a',2):1,('a',7):1})	
>>> rdd.collectAsMap()	Return (key,value) pairs as a dictionary
{a: 2,b: 2}	
>>> rdd3.sum()	Sum of RDD elements
4950	
>>> sc.parallelize([]).isEmpty()	Check whether RDD is empty
true	

#### Summary

>>> rdd3.max()	Maximum value of RDD elements
99	
>>> rdd3.min()	Minimum value of RDD elements
0	
>>> rdd3.mean()	Mean value of RDD elements
49.5	
>>> rdd3.stdev()	Standard deviation of RDD elements
28.866070047722118	
>>> rdd3.variance()	Compute variance of RDD elements
833.25	
>>> rdd3.histogram(3)	Compute histogram by bins
[(0,33,66,99),[33,33,34)]	
>>> rdd3.stats()	Summary statistics (count, mean, stdev, max & min)

### Applying Functions

>>> rdd.map(lambda x: x+(x[1],x[0]))	Apply a function to each RDD element
.collect()	
[('a',7,7,'a'),(a,2,2,a),('b',2,2,b)]	
>>> rdd5 = rdd.flatMap(lambda x: x+(x[1],x[0]))	Apply a function to each RDD element and flatten the result
>>> rdd5.collect()	
[a,7,7,a,a,2,2,a,b,2,2,b]	
>>> rdd4.flatMapValues(lambda x: x)	Apply a flatMap function to each (key,value) pair of rdd4 without changing the keys
.collect()	
[('a','x'),('a','y'),('a','z'),('b','p'),('b','r')]	

### Mathematical Operations

>>> rdd.subtract(rdd2)	Return each rdd value not contained
.collect() in rdd2	
[('b',2),('a',7)]	
>>> rdd2.subtractByKey(rdd)	Return each (key,value) pair of rdd2 with no matching key in rdd
.collect()	
[('d',1)]	
>>> rdd.cartesian(rdd2).collect()	Return the Cartesian product of rdd and rdd2

### Sort

>>> rdd2.sortBy(lambda x: x[1])	Sort RDD by given function
.collect()	
[('d',1),('b',1),('a',2)]	
>>> rdd2.sortByKey() Sort (key, value)	RDD by key
.collect()	
[('a',2),('b',1),('d',1)]	

### Reshaping Data

#### Reducing

>>> rdd.reduceByKey(lambda x,y: x+y)	Merge the rdd values for
.collect() each key	
[('a',9),('b',2)]	
>>> rdd.reduce(lambda a, b: a + b)	Merge the rdd values
('a,7,a,2,b,2)	

#### Grouping by

>>> rdd3.groupBy(lambda x: x % 2)	Return RDD of grouped values
.mapValues(list)	
.collect()	
>>> rdd.groupByKey()	Group rdd by key
.mapValues(list)	
.collect()	
[('a',[7,2]),('b',[2])]	

#### Aggregating

>>> seqOp = (lambda x,y: (x[0]+y,x[1]+1))	Aggregate RDD elements of each partition and then the results
>>> combOp = (lambda x,y:(x[0]+y[0],x[1]+y[1]))	
>>> rdd3.aggregate((0,0),seqOp,combOp)	Aggregate values of each RDD key
(4950,100)	
>>> rdd.aggregateByKey((0,0),seqOp,combOp)	Aggregate the elements of each 4950 partition, and then the results
.collect()	Merge the values for each key
[('a,(9,2), ('b,(2,1))]	
>>> rdd3.fold(0,add)	
4950	
>>> rdd.foldByKey(0, add)	
.collect()	
[('a,9),('b,2)]	
>>> rdd3.keyBy(lambda x: x+x)	Create tuples of RDD elements by applying a function
.collect()	

### Reshaping Data

>>> rdd.repartition(4)	New RDD with 4 partitions
>>> rdd.coalesce(1)	Decrease the number of partitions in the RDD to 1

### Saving

```
>>> rdd.saveAsTextFile('rdd.txt')
>>> rdd.saveAsHadoopFile('hdfs://namenodehost/parent/child',
...                      'org.apache.hadoop.mapred.TextOutputFormat')
```

### Stopping SparkContext

```
>>> sc.stop()
```

### Execution

```
$ ./bin/spark-submit examples/src/main/python/pi.py
```