UNIVERSITY OF NICE, SOPHIA ANTIPOLIS

Project in Spark 2017

Adrianna Janik

Ion Mosnoi

Lei Guo

October 23, 2017

1 TASK

Firstly we uncompressed the data stored in ling-spam.zip folder with *Extract all* command. Secondly we open Virtual Box machine with Hortonworks, we signed in with maria_dev username and maria_dev password on Ambari available under 127.0.0.1:8080 ip address. We have selected *Files view*, than navigated to */tmp* folder and created directories *tmp/ling-spam/ham* and *ling-spam/spam*. Following that we logged in with ssh credentials to Hortonworks machine

```
$ssh root@127.0.0.1 -p 2222
```

In the meantime upload to the virtual machine ling-spam.zip with:

```
$sudo scp -P 2222 ../ling-spam.zip root@127.0.0.1:/tmp/
```

We unzipped ling-spam.zip with:

```
$unzip ling-spam.zip -d /tmp/ling-spam
```

We putted files into /tmp/ling-spam/ folder in hdfs with:

```
$hdfs dfs -put ./ling-spam/ham /tmp/ling-spam/ham
$hdfs dfs -put ./ling-spam/spam /tmp/ling-spam/spam
```

2 TASK

Installation of sbt:

```
$wget http://dl.bintray.com/sbt/rpm/sbt-0.13.12.rpm
```

Edit file /etc/yum.repos.d/sandbox.repo:

```
~[sandbox]
~name=Sandbox repository (tutorials)
~gpgcheck=0
~enabled=0
~baseurl=http://dev2.hortonworks.com.s3.amazonaws.com/repo/dev/master/utils/
```

```
$yum clean all
$yum update
$sudo yum localinstall sbt-0.13.12.rpm
$sbt -update
$sudo scp -P 2222 -r ../spamTopWords/*  root@127.0.0.1:/tmp/spamTopWords/
$sbt package
```

3 TASK

Firstly we created Spark Context with:

```
val conf = new SparkConf(.setAppName(``Spam Filter Application'').setMaster(``local'')
val sc = new SparkContext(conf))<++>
```

Than we called function *probaWordDir* with defined spark context as well as folder name for which we want to count words.

```
val (probaHW, nbHFiles) = probaWordDir(sc)(args(0)+"ham/*.txt")
print("number␣of␣files␣in␣"+ args(0)+"ham/*.txt" +":")
println(nbHFiles)


//process spam files
val (probaSW, nbSFiles) = probaWordDir(sc)(args(0)+"span/*.txt")
print("number␣of␣files␣in␣"+ args(0)+"spam/*.txt" +":")
println(nbSFiles)

val rdd = sc.wholeTextFiles(filesDir)
// The number of files is counted and stored in a variable nbFiles
val nbFiles = rdd.count()
// Non informative words must be removed from the set of unique words.
val stopWords = Set(".", ":", ",", "␣", "/", "\\", "-", "'", "(", ")", "@")
// Each text file must be splitted into a set of unique words
//(if a word occurs several times, it is saved only one time in the set).
val wordBagRdd: RDD[(String, Set[String])] = rdd.map(textTuple =>
        (textTuple.\_1, textTuple.\_2.trim().
```

```
        split("\\s+").toSet.diff(stopWords)))
// Get the Number of occurrences amongst all files
val wordDirOccurency: RDD[(String, Int)] = wordBagRdd.flatMap(
x => x.\_2.map(y => (y, 1))).reduceByKey(\_ + \_)
val probaWord: RDD[(String, Double)] = wordDirOccurency.map(
x => (x.\_1, x.\_2.toDouble / nbFiles))
return (probaWord, nbFiles)
```

4 TASK

5 TASK

6 SCALA USEFUL FUNCTIONS

- wholeTextFiles - lets you read a directory containing multiple small text files, and returns each of them as (filename, content) pairs. This is in contrast with textFile, which would return one record per line in each file.
- map(func) - return a new distributed dataset formed by passing each element of the source through a function func.
- flatMapValues -

  rdd.flatMapValues(x => (x to 5))

  It is applied on an rdd (1,2),(3,4),(3,6) and the output of the transformation is (1,2),(1,3),(1,4),(1,5),(3,4),(3,5)

  faltMapValues works on each value associated with key. In above case x to 5 means each value will be incremented till 5.

  Taking first pair where you have 1,2 , here key is 1 and value is 2 so there after applying transformation it will become (1,2),(1,3),(1,4),(1,5).
- mapValues -

```
val m = Map( ''a'' -> 2, ''b'' -> 3 )

// both

m.mapValues(\_ * 5)
m.transform( (k,v) => v * 5 )
// deliver the same result.
```

- filter(func) - return a new dataset formed by selecting those elements of the source on which func returns true.
- case -

```
import scala.util.Random

val x: Int = Random.nextInt(10)

x match {
  case 0 => "zero"
  case 1 => "one"
  case 2 => "two"
  case \_ => "many"
}


def matchTest(x: Int): String = x match {
  case 1 => "one"
  case 2 => "two"
  case \_ => "many"
}
matchTest(3)   // many
matchTest(1)   // one
```

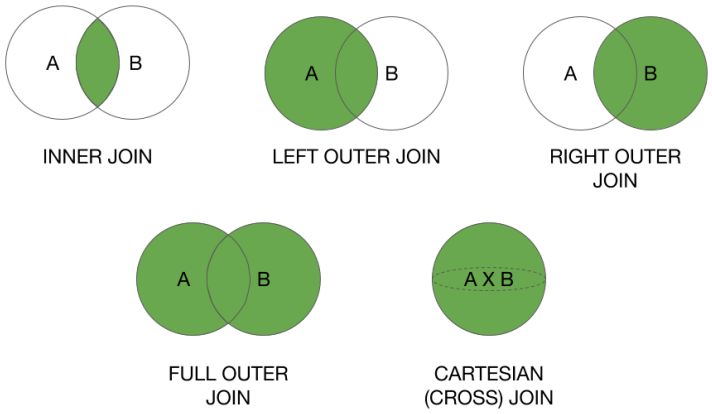
- reduce - aggregate the elements of the dataset using a function func (which takes two arguments and returns one). The function should be commutative and associative so that it can be computed correctly in parallel.
- reduceByKey - when called on a dataset of (K, V) pairs, returns a dataset of (K, V) pairs where the values for each key are aggregated using the given reduce function func, which must be of type (V,V) => V. Like in groupByKey, the number of reduce tasks is configurable through an optional second argument.
- Ordering.by - Ordering is a trait whose instances each represent a strategy for sorting instances of a type. Ordering's companion object defines many implicit objects to deal with subtypes of AnyVal (e.g. Int, Double), String, and others. To sort instances by one or more member variables, you can take advantage of these built-in orderings using Ordering.by and Ordering.on:

```
import scala.util.Sorting
val pairs = Array(( ``a'', 5, 2), (``c'', 3, 1), (``b'', 1, 3))

// sort by 2nd element
Sorting.quickSort(pairs)(Ordering.by[(String, Int, Int), Int](\_.\_2))

// sort by the 3rd element, then 1st
Sorting.quickSort(pairs)(Ordering[(Int, String)].on[
                        (String, Int, Int)](( \_.\_3, \_.\_1)))
```

- fullOuterJoin -
- join - when called on datasets of type (K, V) and (K, W), returns a dataset of (K, (V, W)) pairs with all pairs of elements for each key. Outer joins are supported through leftOuterJoin, rightOuterJoin, and fullOuterJoin.
- leftOuterJoin -



- getOrElse -
- math.log - The object Math contains methods for performing basic numeric operations such as the elementary exponential, logarithm, square root, and trigonometric functions.

```
def log (x: Double): Double
```

- toDouble -

```
scala> "100".toDouble
res1: Double = 100.0
```

- toSet -

```
scala> val arr = Array("a", "b", "c")
arr: Array[java.lang.String] = Array(a, b, c)

scala> arr.toSet
res1: scala.collection.immutable.Set[java.lang.String] = Set(a, b, c)
```

- takeOrdered - return the first n elements of the RDD using either their natural order or a custom comparator.

- foreach - run a function func on each element of the dataset. This is usually done for side effects such as updating an accumulator variable (see below) or interacting with external storage systems.

- swap -

```
scala> val pair = (1,2)
pair: (Int,Int) = (1,2)

scala> val swappedPair = pair.swap
swappedPair: (Int,Int) = (2,1)
```