Projet-ArchiBigData (5)

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1 Projet Architecture Big Data

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```
In [4]: # ElasticSearch v6.5.1
        import pandas as pd
        import elasticsearch as ES
        import pyspark
        import pymongo
        import sklearn as skl
        import sklearn.model_selection as skl_model_selection
        import sklearn.linear_model as skl_linear_mdl
        import sklearn.ensemble as skl_ensemble_mdl
        import sklearn.discriminant_analysis as skl_discriminant_analysis
        from sklearn.model_selection import cross_val_score
        import sklearn.metrics as skl_metrics
        from sklearn.feature_selection import SelectKBest
        from sklearn.feature_selection import chi2
        import numpy as np
        import seaborn as sns
        import matplotlib.pyplot as plt
        import subprocess
        import os
        import time
        import json
        import requests
        import webbrowser
        import getpass
        import time
        import datetime
        import platform
        import hdfs
        import csv
        #from sklearn.metrics import roc_curve,auc

        # Mongo DB Constants
        MONGO_PATH = "C:/Program Files/MongoDB/Server/4.0/bin/mongod"
        MONGO_PORT = "27017"
        MONGO_HOST = "localhost"
        MONGO_URI = MONGO_HOST + ":" + MONGO_PORT
        MONGO_URL = "http://" + MONGO_URI

        # ElasticSearch Constants
        ES_PATH = "C:/Users/Alexandre/elasticsearch-6.5.1/bin/elasticsearch.bat"
        ES_PORT = "9200"
        ES_HOST = "localhost"
        ES_URI = ES_HOST + ":" + ES_PORT
        ES_URL = "http://" + ES_URI

        # Kibana Constants
        KIBANA_PATH = "C:/Users/Alexandre/kibana-6.5.1-windows-x86_64/bin/kibana.bat"
        KIBANA_PORT = "5601"
        KIBANA_HOST = "localhost"
        KIBANA_URI = KIBANA_HOST + ":" + KIBANA_PORT
        KIBANA_URL = "http://" + KIBANA_URI

        # Universal Constants
        DB_NAME = "archi_big_data_db"
        BITCOIN_DATASET_PATH = "cryptocurrencypricehistory/bitcoin_price.csv"
```

2 Import et Traitement des Données

2.1 1) Import des données

2.1.1 Lancement du serveur MongoDB

In [5]:

```
# Starting MongoDB Process
print("Starting MongoDB ...")

if platform.system() == "Darwin":
    # Asking For Password, Then pipe it's value to mongo process
    passwd = getpass.getpass("Please enter administrator password : ")
    pass_proc = subprocess.Popen(["echo", str(passwd)],
                                 stdout=subprocess.PIPE)
    mongo_proc = subprocess.Popen(["sudo", "-S", "mongod"],
                                  stdin=pass_proc.stdout,
                                  stdout=subprocess.PIPE)
    pass_proc.terminate()
elif platform.system() == "Windows":
    mongo_proc = subprocess.Popen([MONGO_PATH],
                                  stdout=subprocess.PIPE)

elif platform.system() == "Linux":
    mongo_proc = subprocess.Popen(["mongod"],stdout=subprocess.PIPE)

else:
    print("ERROR : PLATFORM NOT RECOGNIZED")
    sys.exit(0)

time.sleep(5)

# Check If MongoDB Process is alright
try:
    check_mongod_status = requests.get(MONGO_URL)
    check_mongod_status = check_mongod_status.text
except Exception as e:
    check_mongod_status = "ERROR"
    print(e)

if "MongoDB" in check_mongod_status:
    print("MongoDB OK.")
else:
    print("ERROR WHILE CONNECTION TO MONGO DB")
```

```
Starting MongoDB ...
MongoDB OK.
```

2.1.2 Connection au Client MongoDB

```
In [6]: # Connection to MongoDB
        conn = pymongo.MongoClient(MONGO_URI)
        dbs = conn.list_database_names()
        dbs
        # Connect to MongoDB Database
        db = conn[DB_NAME]
        collections_list = db.list_collection_names()
        collections_list
```

```
Out[6]: ['Bitcoin.DailyPrice', 'Test', 'Train']
```

2.1.3 Connection au Cluster Hadoop pour lire le fichier CSV (Pandas)

```
In [10]: NAMENODE_DNS = "http://ec2-35-180-138-173.eu-west-3.compute.amazonaws.com"
         NAMENODE_IP = "http://35.180.138.173"

         NAMENODE_WEBUI_PORT = "50070"

         # Connection au cluster namenode HDFS
```

```
client_url = str(NAMENODE_DNS + ":" + NAMENODE_WEBUI_PORT)
client = hdfs.InsecureClient(client_url, user="ubuntu")

# lecture du fichier
list_csv = []
HDFS_PATH_DATASET = '/home/Projet-ArchitectureBigData/Kaggle-Titanic/complete_dataset
with client.read(HDFS_PATH_DATASET) as reader:
    raw_csv = reader.read()
raw_csv = raw_csv.decode('utf-8')
csv_list = raw_csv.split("\n")

# parsing du CSV
reader = csv.reader(csv_list)
csv_list = []
for line in reader:
    csv_list.append(line)

# création du dataframe
df = pd.DataFrame(csv_list[1:],
                  columns=csv_list[0])

# Dealing with empty values
df["Age"][df["Age"] == ""] = -1
df["Age"] = df["Age"].apply(lambda x: float(x))
df["SibSp"][df["SibSp"] == ""] = -1
df["SibSp"] = df["SibSp"].apply(lambda x: float(x))
df["Parch"][df["Parch"] == ""] = -1
df["Parch"] = df["Parch"].apply(lambda x: float(x))
df["Fare"][df["Fare"] == ""] = -1
df["Fare"] = df["Fare"].apply(lambda x: float(x))

df.head(20)
```

```
/home/matthieu/anaconda3/lib/python3.7/site-packages/ipykernel_launcher.py:31: SettingWithCopy
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: http://pandas.pydata.org/pandas-docs/stable/indexing.html
/home/matthieu/anaconda3/lib/python3.7/site-packages/ipykernel_launcher.py:33: SettingWithCopy
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: http://pandas.pydata.org/pandas-docs/stable/indexing.html
/home/matthieu/anaconda3/lib/python3.7/site-packages/ipykernel_launcher.py:35: SettingWithCopy
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: http://pandas.pydata.org/pandas-docs/stable/indexing.html
```

```
Out[10]:    PassengerId Survived Pclass  \
        0             1        0      3
```

```
1            2        1      1
2            3        1      3
3            4        1      1
4            5        0      3
5            6        0      3
6            7        0      1
7            8        0      3
8            9        1      3
9           10        1      2
10          11        1      3
11          12        1      1
12          13        0      3
13          14        0      3
14          15        0      3
15          16        1      2
16          17        0      3
17          18        1      2
18          19        0      3
19          20        1      3

                                                 Name     Sex   Age  SibSp  \
0                             Braund, Mr. Owen Harris    male  22.0    1.0
1   Cumings, Mrs. John Bradley (Florence Briggs Th...  female  38.0    1.0
2                              Heikkinen, Miss. Laina  female  26.0    0.0
3        Futrelle, Mrs. Jacques Heath (Lily May Peel)  female  35.0    1.0
4                            Allen, Mr. William Henry    male  35.0    0.0
5                                    Moran, Mr. James    male  -1.0    0.0
6                             McCarthy, Mr. Timothy J    male  54.0    0.0
7                      Palsson, Master. Gosta Leonard    male   2.0    3.0
8   Johnson, Mrs. Oscar W (Elisabeth Vilhelmina Berg)  female  27.0    0.0
9                 Nasser, Mrs. Nicholas (Adele Achem)  female  14.0    1.0
10                    Sandstrom, Miss. Marguerite Rut  female   4.0    1.0
11                           Bonnell, Miss. Elizabeth  female  58.0    0.0
12                     Saundercock, Mr. William Henry    male  20.0    0.0
13                        Andersson, Mr. Anders Johan    male  39.0    1.0
14               Vestrom, Miss. Hulda Amanda Adolfina  female  14.0    0.0
15                   Hewlett, Mrs. (Mary D Kingcome)   female  55.0    0.0
16                               Rice, Master. Eugene    male   2.0    4.0
17                       Williams, Mr. Charles Eugene    male  -1.0    0.0
18  Vander Planke, Mrs. Julius (Emelia Maria Vande...  female  31.0    1.0
19                            Masselmani, Mrs. Fatima  female  -1.0    0.0

    Parch            Ticket     Fare Cabin Embarked
0     0.0         A/5 21171   7.2500              S
1     0.0          PC 17599  71.2833   C85        C
2     0.0  STON/O2. 3101282   7.9250              S
3     0.0            113803  53.1000  C123        S
4     0.0            373450   8.0500              S
```

```
5     0.0            330877   8.4583              Q
6     0.0             17463  51.8625   E46        S
7     1.0            349909  21.0750              S
8     2.0            347742  11.1333              S
9     0.0            237736  30.0708              C
10    1.0           PP 9549  16.7000    G6        S
11    0.0            113783  26.5500  C103        S
12    0.0         A/5. 2151   8.0500              S
13    5.0            347082  31.2750              S
14    0.0            350406   7.8542              S
15    0.0            248706  16.0000              S
16    1.0            382652  29.1250              Q
17    0.0            244373  13.0000              S
18    0.0            345763  18.0000              S
19    0.0              2649   7.2250              C
```

2.1.4 Sauvegarde des données sur le serveur MongoDB

```
In [11]: # Create collection in MongoDB
         # If it already exists, just use it
         if not "collection" in locals():
             collection = db["Kaggle_Titanic"]

         # Create a list of dictionnaries representing rows to insert
         # Befor adding to the list, check if the record exists in the database
         rows_to_insert = list()
         for i, row in enumerate(df.iterrows()):
             row = dict(row[1])
             record = collection["Datas"].find_one(row)
             if record is None:
                 rows_to_insert.append(row)
             if i%100 == 0:
                 print(str(i) + " row processed")

         # Insert all rows, if doesn't exists
         if not len(rows_to_insert) == 0:
             collection["Datas"].insert_many(rows_to_insert)
             print(str(len(rows_to_insert)) + " rows was inserted")
         else:
             print("No new lines to insert")
```

```
0 row processed
100 row processed
200 row processed
300 row processed
400 row processed
500 row processed
600 row processed
```

```
700 row processed
800 row processed
900 row processed
1000 row processed
1100 row processed
1200 row processed
1300 row processed
No new lines to insert
```

2.2 2) Traitement des données

2.2.1 Lecture des données de la base MongoDB

- Pandas

```
In [88]: # Connect to MongoDB Collection
         collection = db["Kaggle_Titanic"]
         all_prices = collection["Datas"].find({})
         df = pd.DataFrame(list(all_prices))
         df = df.drop("_id", axis=1)
         # MongoDB sometimes include a None at the end of the dataset ... remove it
         df = df.dropna()

         # Mongo sometimes convert integer to string

         df_titanic_train = df[df["Survived"] != "TO_PREDICT"]
         df_titanic_test = df[df["Survived"] == "TO_PREDICT"]
         df_titanic = df_titanic_train

         # Dealing with categorical variables
         #sex_categorical = pd.Categorical(df["Sex"])
         #sex_dummy = pd.get_dummies(sex_categorical)

         #embarked_categorical = pd.Categorical(df["Embarked"])
         #embarked_dummy = pd.get_dummies(embarked_categorical)

         # categorical variables one-hot encoding
         #df = df.drop("Sex", axis=1)
         #df[sex_dummy.columns] = sex_dummy
         #df = df.drop("Embarked", axis=1)
         #df[["Embarked_" + col if col != "" else "Embarked_nothing" for col in embarked_dummy
         #     embarked_dummy

         df_titanic.head(20)
```

```
---------------------------------------------------------------------------
```

```
        NameError                                 Traceback (most recent call last)

        <ipython-input-88-05a206a3ca08> in <module>()
          1 # Connect to MongoDB Collection
    ----> 2 collection = db["Kaggle_Titanic"]
          3 all_prices = collection["Datas"].find({})
          4 df = pd.DataFrame(list(all_prices))
          5 df = df.drop("_id", axis=1)


        NameError: name 'db' is not defined
```

2.3 lecture de données et machine learning avec Spark

```
In [2]: from pyspark.sql import SparkSession
        from pyspark.ml import Pipeline
        from pyspark.sql.functions import mean,col,split, col, regexp_extract, when, lit
        from pyspark.ml.feature import StringIndexer
        from pyspark.ml.feature import VectorAssembler
        from pyspark.ml.evaluation import MulticlassClassificationEvaluator
        from pyspark.ml.feature import QuantileDiscretizer
```

```
In [3]: # on crée une session Spark
        ss = SparkSession \
            .builder \
            .appName("Spark ML example on titanic data ") \
            .getOrCreate()
```

```
In [4]: #from pyspark.mllib.regression import LabeledPoint

        # On crée notre RDD
        trainTitanic = ss.read.csv("/home/matthieu/Documents/Projet-ArchitectureBigData/Titani
```

```
In [5]: trainTitanic.show(10)
```

```
+-----------+--------+------+--------------------+------+----+-----+-----+----------------+----
|PassengerId|Survived|Pclass|                Name|   Sex| Age|SibSp|Parch|          Ticket|
+-----------+--------+------+--------------------+------+----+-----+-----+----------------+----
|          1|       0|     3|Braund, Mr. Owen ...|  male|22.0|    1|    0|       A/5 21171|   7
|          2|       1|     1|Cumings, Mrs. Joh...|female|38.0|    1|    0|        PC 17599|71.
|          3|       1|     3|Heikkinen, Miss. ...|female|26.0|    0|    0|STON/O2. 3101282|  7
|          4|       1|     1|Futrelle, Mrs. Ja...|female|35.0|    1|    0|          113803|   5
|          5|       0|     3|Allen, Mr. Willia...|  male|35.0|    0|    0|          373450|   8
|          6|       0|     3|    Moran, Mr. James|  male|null|    0|    0|          330877| 8.
|          7|       0|     1|McCarthy, Mr. Tim...|  male|54.0|    0|    0|           17463|51.
|          8|       0|     3|Palsson, Master. ...|  male| 2.0|    3|    1|          349909| 21
|          9|       1|     3|Johnson, Mrs. Osc...|female|27.0|    0|    2|          347742|11.
|         10|       1|     2|Nasser, Mrs. Nich...|female|14.0|    1|    0|          237736|30.
```

```
+-----------+--------+------+--------------------+------+----+-----+-----+----------------+---
only showing top 10 rows
```

```
In [6]: #on regarde le nombre de survivants en fonctions des sexes
        trainTitanic.groupBy("Sex","Survived").count().show()
```

```
+------+--------+-----+
|   Sex|Survived|count|
+------+--------+-----+
|  male|       0|  468|
|female|       1|  233|
|female|       0|   81|
|  male|       1|  109|
+------+--------+-----+
```

```
In [7]: #1 signifie qu'ils ont survécu, il y a eu plus de survivants femme que homme alors que
```

```
In [8]: #on remarque que beaucoup de données d'age sont manquantes, il est plus intéressant po
        meanage = round(trainTitanic.select(mean('Age')).collect()[0][0])
        print("age moyen:",meanage)
```

```
age moyen: 30
```

```
In [9]: #on comble chaque colone vide par l'age moyen
```

```
In [10]: trainTitanic = trainTitanic.withColumn("Age",when (trainTitanic["Age"].isNull(),meanag
```

```
In [11]: # On vérifie qu'il n'y a plus de colonnes d'âge vide
```

```
In [12]: trainTitanic.select("Age").show()
```

```
+----+
| Age|
+----+
|22.0|
|38.0|
|26.0|
|35.0|
|35.0|
|30.0|
|54.0|
| 2.0|
|27.0|
|14.0|
| 4.0|
|58.0|
|20.0|
|39.0|
|14.0|
|55.0|
| 2.0|
|30.0|
|31.0|
|30.0|
+----+
only showing top 20 rows
```

```
In [13]: #on retire la colonne "Cabin" qui possède beaucoup de valeurs nulles
         trainTitanic = trainTitanic.drop("Cabin")

In [15]: #on enleve egalement les colonnes non requises
         trainTitanic = trainTitanic.drop("PassengerId","Name","Ticket","Cabin","Embarked","Se

In [16]: trainTitanic.show()
```

```
+--------+------+----+-----+-----+-------+
|Survived|Pclass| Age|SibSp|Parch|   Fare|
+--------+------+----+-----+-----+-------+
|       0|     3|22.0|    1|    0|   7.25|
|       1|     1|38.0|    1|    0|71.2833|
|       1|     3|26.0|    0|    0|  7.925|
|       1|     1|35.0|    1|    0|   53.1|
|       0|     3|35.0|    0|    0|   8.05|
|       0|     3|30.0|    0|    0| 8.4583|
|       0|     1|54.0|    0|    0|51.8625|
|       0|     3| 2.0|    3|    1| 21.075|
|       1|     3|27.0|    0|    2|11.1333|
|       1|     2|14.0|    1|    0|30.0708|
|       1|     3| 4.0|    1|    1|   16.7|
|       1|     1|58.0|    0|    0|  26.55|
|       0|     3|20.0|    0|    0|   8.05|
|       0|     3|39.0|    1|    5| 31.275|
|       0|     3|14.0|    0|    0| 7.8542|
|       1|     2|55.0|    0|    0|   16.0|
|       0|     3| 2.0|    4|    1| 29.125|
|       1|     2|30.0|    0|    0|   13.0|
|       0|     3|31.0|    1|    0|   18.0|
|       1|     3|30.0|    0|    0|  7.225|
+--------+------+----+-----+-----+-------+
only showing top 20 rows
```

```
In [17]: #on envoie les features dans un vecteur
         feature = VectorAssembler(inputCols=trainTitanic.columns[1:],outputCol="features")
         feature_vector= feature.transform(trainTitanic)
```

```
In [18]: feature_vector.show()
```

```
+--------+------+----+-----+-----+-------+--------------------+
|Survived|Pclass| Age|SibSp|Parch|   Fare|            features|
+--------+------+----+-----+-----+-------+--------------------+
|       0|     3|22.0|    1|    0|   7.25|[3.0,22.0,1.0,0.0...|
|       1|     1|38.0|    1|    0|71.2833|[1.0,38.0,1.0,0.0...|
|       1|     3|26.0|    0|    0|  7.925|[3.0,26.0,0.0,0.0...|
|       1|     1|35.0|    1|    0|   53.1|[1.0,35.0,1.0,0.0...|
|       0|     3|35.0|    0|    0|   8.05|[3.0,35.0,0.0,0.0...|
|       0|     3|30.0|    0|    0| 8.4583|[3.0,30.0,0.0,0.0...|
|       0|     1|54.0|    0|    0|51.8625|[1.0,54.0,0.0,0.0...|
|       0|     3| 2.0|    3|    1| 21.075|[3.0,2.0,3.0,1.0,...|
|       1|     3|27.0|    0|    2|11.1333|[3.0,27.0,0.0,2.0...|
|       1|     2|14.0|    1|    0|30.0708|[2.0,14.0,1.0,0.0...|
|       1|     3| 4.0|    1|    1|   16.7|[3.0,4.0,1.0,1.0,...|
|       1|     1|58.0|    0|    0|  26.55|[1.0,58.0,0.0,0.0...|
|       0|     3|20.0|    0|    0|   8.05|[3.0,20.0,0.0,0.0...|
|       0|     3|39.0|    1|    5| 31.275|[3.0,39.0,1.0,5.0...|
|       0|     3|14.0|    0|    0| 7.8542|[3.0,14.0,0.0,0.0...|
|       1|     2|55.0|    0|    0|   16.0|[2.0,55.0,0.0,0.0...|
|       0|     3| 2.0|    4|    1| 29.125|[3.0,2.0,4.0,1.0,...|
|       1|     2|30.0|    0|    0|   13.0|[2.0,30.0,0.0,0.0...|
|       0|     3|31.0|    1|    0|   18.0|[3.0,31.0,1.0,0.0...|
|       1|     3|30.0|    0|    0|  7.225|[3.0,30.0,0.0,0.0...|
+--------+------+----+-----+-----+-------+--------------------+
only showing top 20 rows
```

```
In [26]:  #on split les données
         (trainingData, testData) = feature_vector.randomSplit([0.75, 0.25],seed = 11)
```

Méthode de régression logistique avec pyspark

```
In [27]: from pyspark.ml.classification import LogisticRegression
         lr = LogisticRegression(labelCol="Survived", featuresCol="features")
         #On verifie nos predictions sur l'algo de test
         lrModel = lr.fit(trainingData)
         lr_prediction = lrModel.transform(testData)
         lr_prediction.select("prediction", "Survived", "features").show(30)
         evaluator = MulticlassClassificationEvaluator(labelCol="Survived", predictionCol="pre
+----------+--------+--------------------+
|prediction|Survived|            features|
+----------+--------+--------------------+
|       1.0|       0|[1.0,19.0,1.0,0.0...|
|       1.0|       0|[1.0,19.0,3.0,2.0...|
|       1.0|       0|[1.0,27.0,0.0,2.0...|
|       1.0|       0|[1.0,28.0,0.0,0.0...|
|       1.0|       0|[1.0,28.0,1.0,0.0...|
|       1.0|       0|[1.0,29.0,0.0,0.0...|
|       1.0|       0|[1.0,30.0,0.0,0.0...|
|       1.0|       0|[1.0,30.0,0.0,0.0...|
|       1.0|       0|[1.0,30.0,0.0,0.0...|
|       1.0|       0|[1.0,38.0,0.0,1.0...|
|       1.0|       0|(5,[0,1],[1.0,40.0])|
|       1.0|       0|[1.0,40.0,0.0,0.0...|
|       1.0|       0|[1.0,45.0,1.0,0.0...|
|       1.0|       0|[1.0,46.0,0.0,0.0...|
|       0.0|       0|[1.0,47.0,0.0,0.0...|
|       1.0|       0|[1.0,51.0,0.0,1.0...|
|       1.0|       0|[1.0,54.0,0.0,1.0...|
|       0.0|       0|[1.0,58.0,0.0,0.0...|
|       0.0|       0|[1.0,64.0,0.0,0.0...|
|       0.0|       0|[1.0,71.0,0.0,0.0...|
|       1.0|       0|[2.0,16.0,0.0,0.0...|
|       1.0|       0|[2.0,18.0,0.0,0.0...|
|       1.0|       0|[2.0,19.0,0.0,0.0...|
|       1.0|       0|[2.0,21.0,0.0,0.0...|
|       0.0|       0|[2.0,21.0,1.0,0.0...|
|       0.0|       0|[2.0,24.0,2.0,0.0...|
|       0.0|       0|[2.0,25.0,1.0,0.0...|
|       0.0|       0|[2.0,26.0,0.0,0.0...|
|       0.0|       0|[2.0,26.0,1.0,1.0...|
|       0.0|       0|[2.0,29.0,1.0,0.0...|
+----------+--------+--------------------+
only showing top 30 rows
```

```
In [28]: lr_accuracy = evaluator.evaluate(lr_prediction)
         print("score régression logistique = %g"% (lr_accuracy))
```

```
score régression logistique = 0.711009
```

Méthode de forêt aléatoire avec pyspark

```
In [29]: from pyspark.ml.classification import RandomForestClassifier
         from pyspark.ml.classification import DecisionTreeClassifier
         rf = DecisionTreeClassifier(labelCol="Survived", featuresCol="features")
         rf_model = rf.fit(trainingData)
         rf_prediction = rf_model.transform(testData)
         rf_prediction.select("prediction", "Survived", "features").show()
```

```
+----------+--------+--------------------+
|prediction|Survived|            features|
+----------+--------+--------------------+
|       1.0|       0|[1.0,19.0,1.0,0.0...|
|       1.0|       0|[1.0,19.0,3.0,2.0...|
|       1.0|       0|[1.0,27.0,0.0,2.0...|
|       0.0|       0|[1.0,28.0,0.0,0.0...|
|       1.0|       0|[1.0,28.0,1.0,0.0...|
|       0.0|       0|[1.0,29.0,0.0,0.0...|
|       0.0|       0|[1.0,30.0,0.0,0.0...|
|       0.0|       0|[1.0,30.0,0.0,0.0...|
|       0.0|       0|[1.0,30.0,0.0,0.0...|
|       1.0|       0|[1.0,38.0,0.0,1.0...|
|       0.0|       0|(5,[0,1],[1.0,40.0])|
|       0.0|       0|[1.0,40.0,0.0,0.0...|
|       1.0|       0|[1.0,45.0,1.0,0.0...|
|       1.0|       0|[1.0,46.0,0.0,0.0...|
|       0.0|       0|[1.0,47.0,0.0,0.0...|
|       1.0|       0|[1.0,51.0,0.0,1.0...|
|       1.0|       0|[1.0,54.0,0.0,1.0...|
|       0.0|       0|[1.0,58.0,0.0,0.0...|
|       0.0|       0|[1.0,64.0,0.0,0.0...|
|       0.0|       0|[1.0,71.0,0.0,0.0...|
+----------+--------+--------------------+
only showing top 20 rows
```

```
In [30]: rf_accuracy = evaluator.evaluate(rf_prediction)
         print("score pour la méthode de forêt aléatoire = %g"% (rf_accuracy))
```

```
score pour la méthode de forêt aléatoire = 0.724771
```

Méthode de boosting avec pyspark

```
In [31]: from pyspark.ml.classification import GBTClassifier
         gbt = GBTClassifier(labelCol="Survived", featuresCol="features",maxIter=10)
         gbt_model = gbt.fit(trainingData)
         gbt_prediction = gbt_model.transform(testData)
         gbt_prediction.select("prediction", "Survived", "features").show(30)
```

```
+----------+--------+--------------------+
|prediction|Survived|            features|
+----------+--------+--------------------+
|       1.0|       0|[1.0,19.0,1.0,0.0...|
|       1.0|       0|[1.0,19.0,3.0,2.0...|
|       1.0|       0|[1.0,27.0,0.0,2.0...|
|       1.0|       0|[1.0,28.0,0.0,0.0...|
|       1.0|       0|[1.0,28.0,1.0,0.0...|
|       1.0|       0|[1.0,29.0,0.0,0.0...|
|       0.0|       0|[1.0,30.0,0.0,0.0...|
|       1.0|       0|[1.0,30.0,0.0,0.0...|
|       1.0|       0|[1.0,30.0,0.0,0.0...|
|       1.0|       0|[1.0,38.0,0.0,1.0...|
|       0.0|       0|(5,[0,1],[1.0,40.0])|
|       1.0|       0|[1.0,40.0,0.0,0.0...|
|       1.0|       0|[1.0,45.0,1.0,0.0...|
|       1.0|       0|[1.0,46.0,0.0,0.0...|
|       1.0|       0|[1.0,47.0,0.0,0.0...|
|       1.0|       0|[1.0,51.0,0.0,1.0...|
|       1.0|       0|[1.0,54.0,0.0,1.0...|
|       0.0|       0|[1.0,58.0,0.0,0.0...|
|       0.0|       0|[1.0,64.0,0.0,0.0...|
|       0.0|       0|[1.0,71.0,0.0,0.0...|
|       1.0|       0|[2.0,16.0,0.0,0.0...|
|       0.0|       0|[2.0,18.0,0.0,0.0...|
|       0.0|       0|[2.0,19.0,0.0,0.0...|
|       0.0|       0|[2.0,21.0,0.0,0.0...|
|       0.0|       0|[2.0,21.0,1.0,0.0...|
|       0.0|       0|[2.0,24.0,2.0,0.0...|
|       1.0|       0|[2.0,25.0,1.0,0.0...|
|       0.0|       0|[2.0,26.0,0.0,0.0...|
|       1.0|       0|[2.0,26.0,1.0,1.0...|
|       0.0|       0|[2.0,29.0,1.0,0.0...|
+----------+--------+--------------------+
only showing top 30 rows
```

```
In [32]: gbt_accuracy = evaluator.evaluate(gbt_prediction)
         print("score avec gradient boosting = %g"% (gbt_accuracy))
```

```
score avec gradient boosting = 0.711009
```

```
In [157]: sc.stop()
```

2.4 3) Analyse des Données

Dans cette partie nous allons faire du machine learning sur les données récupérées depuis la base mongo DB

2.4.1 Feature Engineering

```
In [14]: df_titanic = df_titanic.drop("Ticket", axis=1)
         df_titanic = pd.get_dummies(df_titanic, columns = ["Sex"])
         df_titanic["Embarked"] = df_titanic["Embarked"].fillna("S")
         df_titanic = pd.get_dummies(df_titanic, columns = ["Embarked"], prefix="Emb")
         cpt_row=0

         # On génère un indicateur de la "Classe" de la cabine, 0 étant la moins bien et 7 la
         for row_titanic in df_titanic["Cabin"]:
             if str(row_titanic)=="":
                 df_titanic.loc[[cpt_row], ['Cabin']]=0
             elif str(row_titanic)[0]=="A":
                     df_titanic.loc[[cpt_row], ['Cabin']]=1
             elif str(row_titanic)[0]=="B":
                     df_titanic.loc[[cpt_row], ['Cabin']]=2
             elif str(row_titanic)[0]=="C":
                     df_titanic.loc[[cpt_row], ['Cabin']]=3
             elif str(row_titanic)[0]=="D":
                     df_titanic.loc[[cpt_row], ['Cabin']]=4
             elif str(row_titanic)[0]=="E":
                     df_titanic.loc[[cpt_row], ['Cabin']]=5
             elif str(row_titanic)[0]=="F":
                     df_titanic.loc[[cpt_row], ['Cabin']]=6
             elif str(row_titanic)[0]=="G":
                     df_titanic.loc[[cpt_row], ['Cabin']]=7
             else:
                 df_titanic.loc[[cpt_row], ['Cabin']]=0

             cpt_row=cpt_row+1

         cpt_row=0
         df_titanic["Fare"] = df_titanic["Fare"].astype("float")
         #df_titanic["Fare"] = df_titanic["Fare"].fillna(df_titanic["Fare"].median())

         for row_titanic in df_titanic["Fare"]:
             if row_titanic<10:
                 df_titanic.loc[[cpt_row], ['Fare']]=0
             elif row_titanic>=10 and  row_titanic<50 :
                     df_titanic.loc[[cpt_row], ['Fare']]=1
             elif row_titanic>50:
                     df_titanic.loc[[cpt_row], ['Fare']]=2
             else:
                     df_titanic.loc[[cpt_row], ['Fare']]=0

         # On utilise la variable nom pour créer des variables indicatives
         # Certains nom contiennt "comptesse" "capitaine", etc ...
         df_titanic["FamiliySize"] = df_titanic["SibSp"] + df_titanic["Parch"] + 1
```

```
salutation = [i.split(",")[1].split(".")[0].strip() for i in df_titanic["Name"]]
df_titanic["Title"] = pd.Series(salutation)
df_titanic["Title"].unique()
df_titanic["Title"] = df_titanic["Title"].replace(['Lady', 'the Countess','Countess',
df_titanic["Title"] = df_titanic["Title"].map({"Master":0, "Miss":1, "Ms" : 1 , "Mme"
df_titanic["Title"] = df_titanic["Title"].astype(int)
df_titanic=df_titanic.drop("Name", axis=1)

df_titanic["Age"] = df_titanic["Age"].fillna(df_titanic["Age"].median())
for row_titanic in df_titanic["Age"]:
    if str(row_titanic)=="":
        df_titanic.loc[[cpt_row], ['Age']]= 1
    elif row_titanic<10 :
        df_titanic.loc[[cpt_row], ['Age']]= 0
    elif row_titanic>=10 and row_titanic<40:
        df_titanic.loc[[cpt_row], ['Age']]= 1
    else:
        df_titanic.loc[[cpt_row], ['Age']]=2
    cpt_row=cpt_row+1

df_titanic=df_titanic.dropna()

df_titanic["Survived"] = df_titanic["Survived"].astype("float")

# Reindexing
target = df_titanic["Survived"]
df_titanic = df_titanic.drop("Survived", axis=1)
ids = df_titanic["PassengerId"]
df_titanic = df_titanic.drop("PassengerId", axis=1)

df_titanic["Survived"] = target
df_titanic["PassengerId"] = ids
df_titanic = df_titanic.reindex(np.concatenate((["PassengerId", "Survived"],
                                                df_titanic.columns[:-2].values)),
                                axis=1)

df_titanic.head(20)
```

```
Out[14]:    PassengerId  Survived  Age  Cabin     Fare  Parch Pclass  SibSp  \
         0            1       0.0  1.0      0   0.0000    0.0      3    1.0
         1            2       1.0  1.0      3  71.2833    0.0      1    1.0
         2            3       1.0  1.0      0   7.9250    0.0      3    0.0
         3            4       1.0  1.0      3  53.1000    0.0      1    1.0
         4            5       0.0  1.0      0   8.0500    0.0      3    0.0
         5            6       0.0  0.0      0   8.4583    0.0      3    0.0
         6            7       0.0  2.0      5  51.8625    0.0      1    0.0
         7            8       0.0  0.0      0  21.0750    1.0      3    3.0
         8            9       1.0  1.0      0  11.1333    2.0      3    0.0
```

```
9           10       1.0  1.0      0  30.0708    0.0      2    1.0
10          11       1.0  0.0      7  16.7000    1.0      3    1.0
11          12       1.0  2.0      3  26.5500    0.0      1    0.0
12          13       0.0  1.0      0   8.0500    0.0      3    0.0
13          14       0.0  1.0      0  31.2750    5.0      3    1.0
14          15       0.0  1.0      0   7.8542    0.0      3    0.0
15          16       1.0  2.0      0  16.0000    0.0      2    0.0
16          17       0.0  0.0      0  29.1250    1.0      3    4.0
17          18       1.0  0.0      0  13.0000    0.0      2    0.0
18          19       0.0  1.0      0  18.0000    0.0      3    1.0
19          20       1.0  0.0      0   7.2250    0.0      3    0.0

    Sex_female  Sex_male  Emb_  Emb_C  Emb_Q  Emb_S  FamiliySize  Title
0            0         1     0      0      0      1          2.0      2
1            1         0     0      1      0      0          2.0      1
2            1         0     0      0      0      1          1.0      1
3            1         0     0      0      0      1          2.0      1
4            0         1     0      0      0      1          1.0      2
5            0         1     0      0      1      0          1.0      2
6            0         1     0      0      0      1          1.0      2
7            0         1     0      0      0      1          5.0      0
8            1         0     0      0      0      1          3.0      1
9            1         0     0      1      0      0          2.0      1
10           1         0     0      0      0      1          3.0      1
11           1         0     0      0      0      1          1.0      1
12           0         1     0      0      0      1          1.0      2
13           0         1     0      0      0      1          7.0      2
14           1         0     0      0      0      1          1.0      1
15           1         0     0      0      0      1          1.0      1
16           0         1     0      0      1      0          6.0      0
17           0         1     0      0      0      1          1.0      2
18           1         0     0      0      0      1          2.0      1
19           1         0     0      1      0      0          1.0      1
```

2.4.2 Estimation des modèle

- Séparation Train set / Test set

```
In [15]: df_train, df_test = skl_model_selection.train_test_split(df_titanic)

         X = df_titanic.iloc[:, 2:]
         Y = df_titanic["Survived"]
         df_train = df_train.reset_index(drop=True)
         df_test = df_test.reset_index(drop=True)

         # On split le dataset en train-set et test-set
         X_train = df_train.iloc[:, 2:]
         Y_train = df_train["Survived"].astype("float")
```

```
        X_test = df_test.iloc[:, 2:]
        Y_test = df_test["Survived"].astype("float")
```

- Fonction d'affichage de la Matrice de Confusion

```
In [16]: def print_confusion_matrix(confusion_matrix, score):
             plt.figure()
             sns.heatmap(confusion_matrix, annot=True, fmt=".3f", linewidths=0.3, cmap = 'Blue
             plt.ylabel('True Label');
             plt.xlabel('Predicted Label');
             plt.title("Score de Prediction : " + str(score))
             plt.show()
```

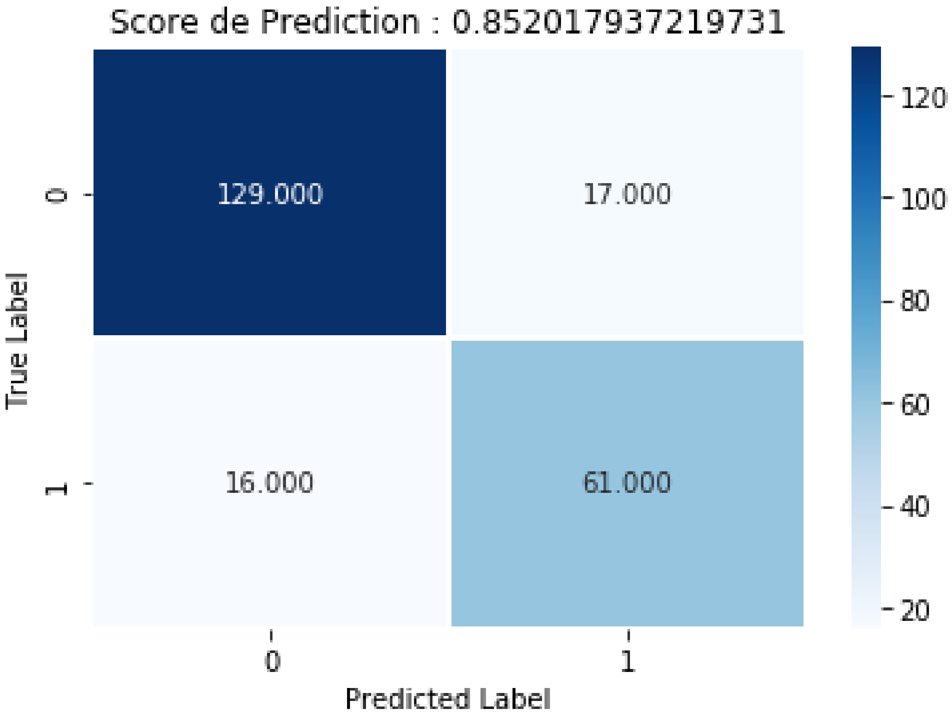
- Fonction de calcul du ROC

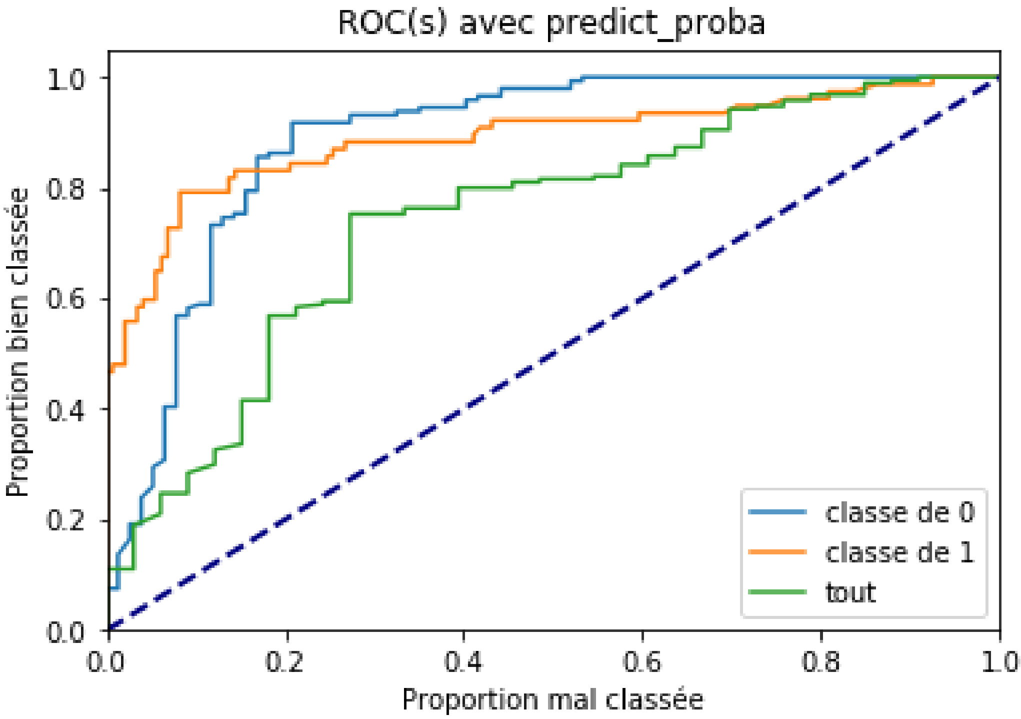
```
In [17]: def get_roc_curve(Y_test, proba_Y, predicted_Y, classe_name):
             # False Positive Rate
             fpr_cl = dict()
             # True Positive Rate
             tpr_cl = dict()
             fpr_cl[classe_name[0]], tpr_cl[classe_name[0]], _ = \
                 skl_metrics.roc_curve(Y_test == 0, proba_Y[:, 0].ravel())
             fpr_cl[classe_name[1]], tpr_cl[classe_name[1]], _ = \
                 skl_metrics.roc_curve(Y_test, proba_Y[:, 1].ravel())

             prob_pred = np.array([proba_Y[i, 1 if c else 0]
                                  for i, c in enumerate(predicted_Y)])

             fpr_cl[classe_name[2]], tpr_cl[classe_name[2]], _ = \
             skl_metrics.roc_curve((predicted_Y == Y_test).ravel(), prob_pred)

             # Affichage de la Courbe ROC
             plt.figure()
             for key in fpr_cl:
                 plt.plot(fpr_cl[key], tpr_cl[key], label=key)
             lw = 2
             plt.plot([0, 1], [0, 1], color='navy', lw=lw, linestyle='--')
             plt.xlim([0.0, 1.0])
             plt.ylim([0.0, 1.05])
             plt.xlabel("Proportion mal classée")
             plt.ylabel("Proportion bien classée")
             plt.title('ROC(s) avec predict_proba')
             plt.legend(loc="lower right")

             return(fpr_cl[classe_name[2]], tpr_cl[classe_name[2]])
```

Modèle 1) Régression Logistique

```
In [18]: df_confusion_matrix = pd.DataFrame(index=["Classe_0", "Classe_1"])
         all_scores = pd.DataFrame()
```

```
In [19]: log_reg = skl_linear_mdl.LogisticRegression()
         log_reg.fit(X_train, Y_train)
         score = log_reg.score(X_test, Y_test)
         predicted_Y = log_reg.predict(X_test)
         proba_Y = log_reg.predict_proba(X_test)

         scores = cross_val_score(log_reg, X, Y, cv=10)

         confusion_matrix = skl_metrics.confusion_matrix(Y_test, predicted_Y)
         print_confusion_matrix(confusion_matrix,score)
         frp_global=[]
         tpr_global=[]
         AUC_global=dict()

         fpr_global=dict()
         tpr_global=dict()
         fpr_global["Regression Logistique"],tpr_global["Regression Logistique"] =  \
             get_roc_curve(Y_test, proba_Y, predicted_Y, ["classe de 0","classe de 1","tout"])
         AUC_global["Regression Logistique"] = \
             skl_metrics.auc(fpr_global["Regression Logistique"],tpr_global["Regression Logist
         df_confusion_matrix["Logit_Classe_0"] = confusion_matrix[:, 0]
         df_confusion_matrix["Logit_Classe_1"] = confusion_matrix[:, 1]
         all_scores.loc[1, "logit"]  = score
```

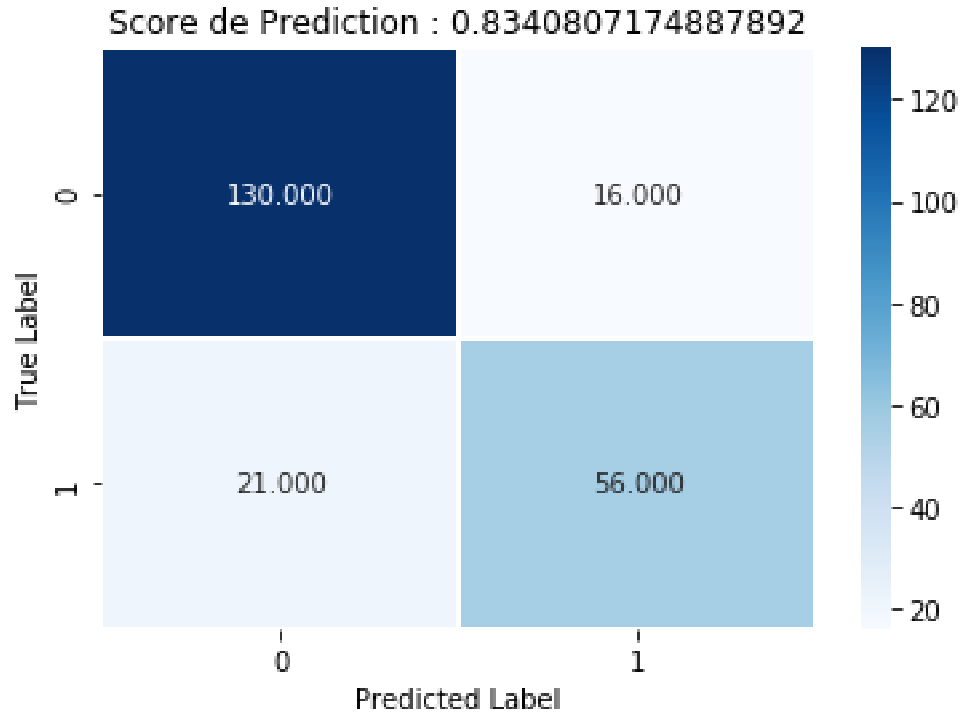




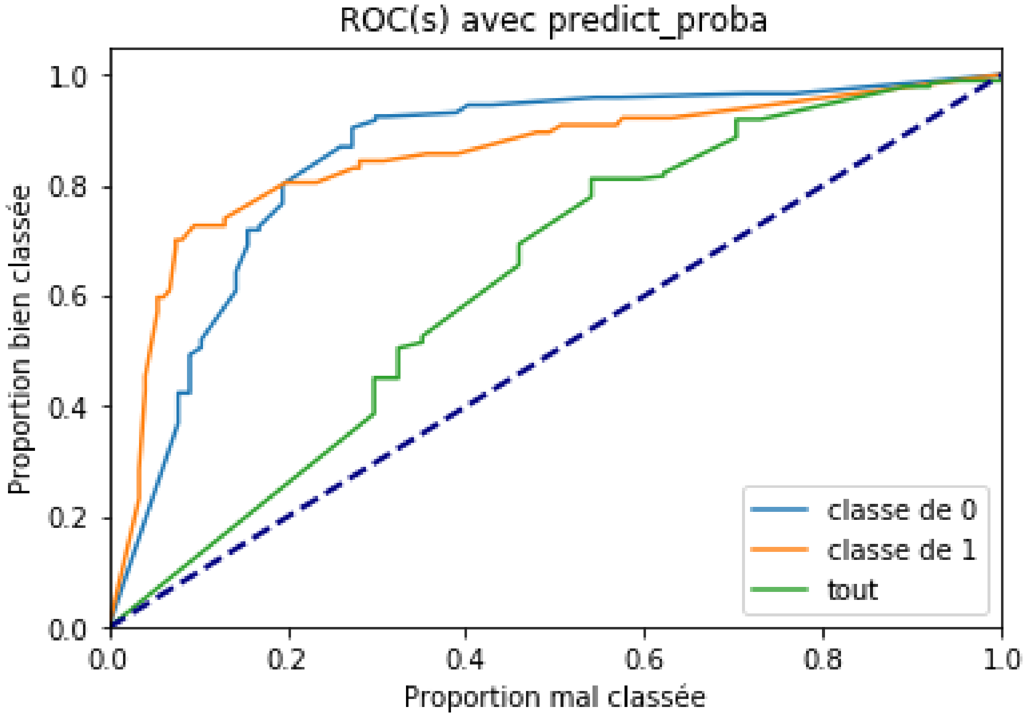
Modèle 2) Forêts aléatoires

```
In [20]: random_forest = skl_ensemble_mdl.RandomForestClassifier()
         random_forest.fit(X_train, Y_train)
         score = random_forest.score(X_test, Y_test)
         predicted_Y = random_forest.predict(X_test)
         proba_Y = random_forest.predict_proba(X_test)
         true_Y = Y_test


         feature_importances = pd.DataFrame(random_forest.feature_importances_,
                                            index = X_train.columns,
                                             columns=['importance']).sort_values('importance',a

         scores = cross_val_score(random_forest, X, Y, cv=10)
         confusion_matrix = skl_metrics.confusion_matrix(true_Y, predicted_Y)
         print_confusion_matrix(confusion_matrix,score)

         fpr_global["Random Forest"], tpr_global["Random Forest"] = \
             get_roc_curve(Y_test, proba_Y, predicted_Y, ["classe de 0","classe de 1","tout"])
         AUC_global["Random Forest"] = \
             skl_metrics.auc(fpr_global["Random Forest"], tpr_global["Random Forest"])
         df_confusion_matrix["Random_Forest_Classe_0"] = confusion_matrix[:, 0]
```

```
df_confusion_matrix["Random_Forest_Classe_1"] = confusion_matrix[:, 1]
all_scores.loc[1, "rf"]  = score
```



Score de Prediction : 0.8340807174887892



ROC(s) avec predict_proba

Modèle 3) Analyse linéaire discriminante

```
In [21]: lda = skl_discriminant_analysis.LinearDiscriminantAnalysis()
         lda.fit(X_train, Y_train)
         score = lda.score(X_test, Y_test)
         predicted_Y = lda.predict(X_test)
         proba_Y=lda.predict_proba(X_test)
         true_Y = Y_test

         scores = cross_val_score(lda, X, Y, cv=10)

         confusion_matrix = skl_metrics.confusion_matrix(true_Y, predicted_Y)
         print_confusion_matrix(confusion_matrix,score)

         fpr_global["ald"],tpr_global["ald"]=get_roc_curve(Y_test,proba_Y,predicted_Y,["classe
         AUC_global["ald"]=skl_metrics.auc(fpr_global["ald"],tpr_global["ald"])
         df_confusion_matrix["ALD_Classe_0"] = confusion_matrix[:, 0]
         df_confusion_matrix["ALD_Classe_1"] = confusion_matrix[:, 1]
         all_scores.loc[1, "ald"]  = score
```

```
/home/matthieu/anaconda3/lib/python3.7/site-packages/sklearn/discriminant_analysis.py:388: Use
  warnings.warn("Variables are collinear.")
/home/matthieu/anaconda3/lib/python3.7/site-packages/sklearn/discriminant_analysis.py:388: Use
  warnings.warn("Variables are collinear.")
/home/matthieu/anaconda3/lib/python3.7/site-packages/sklearn/discriminant_analysis.py:388: Use
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  warnings.warn("Variables are collinear.")
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  warnings.warn("Variables are collinear.")
/home/matthieu/anaconda3/lib/python3.7/site-packages/sklearn/discriminant_analysis.py:388: Use
  warnings.warn("Variables are collinear.")
/home/matthieu/anaconda3/lib/python3.7/site-packages/sklearn/discriminant_analysis.py:388: Use
  warnings.warn("Variables are collinear.")
/home/matthieu/anaconda3/lib/python3.7/site-packages/sklearn/discriminant_analysis.py:388: Use
  warnings.warn("Variables are collinear.")
/home/matthieu/anaconda3/lib/python3.7/site-packages/sklearn/discriminant_analysis.py:388: Use
  warnings.warn("Variables are collinear.")
```
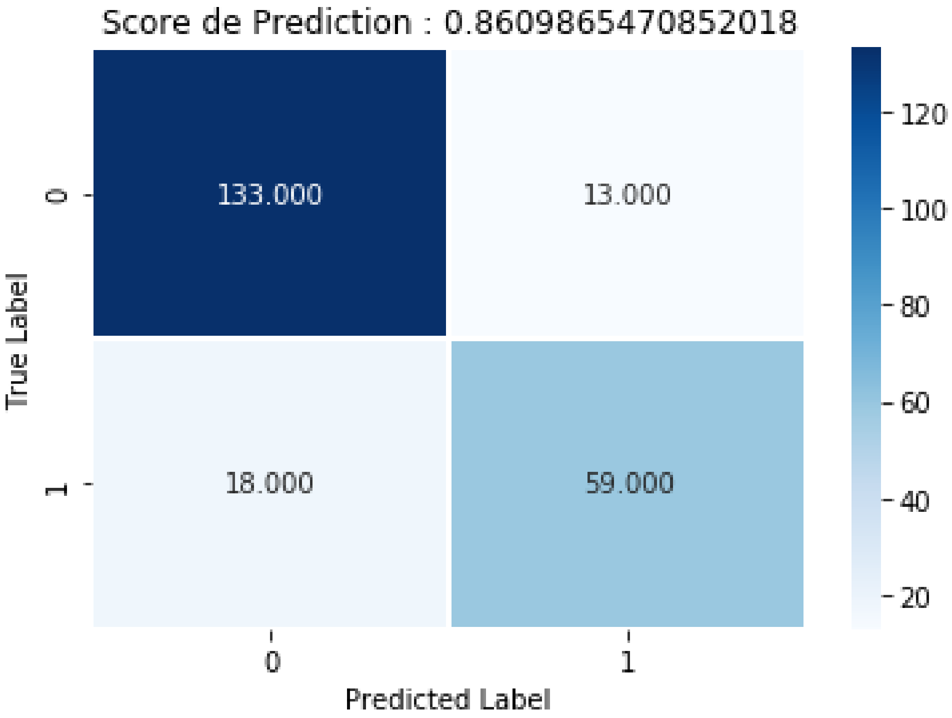
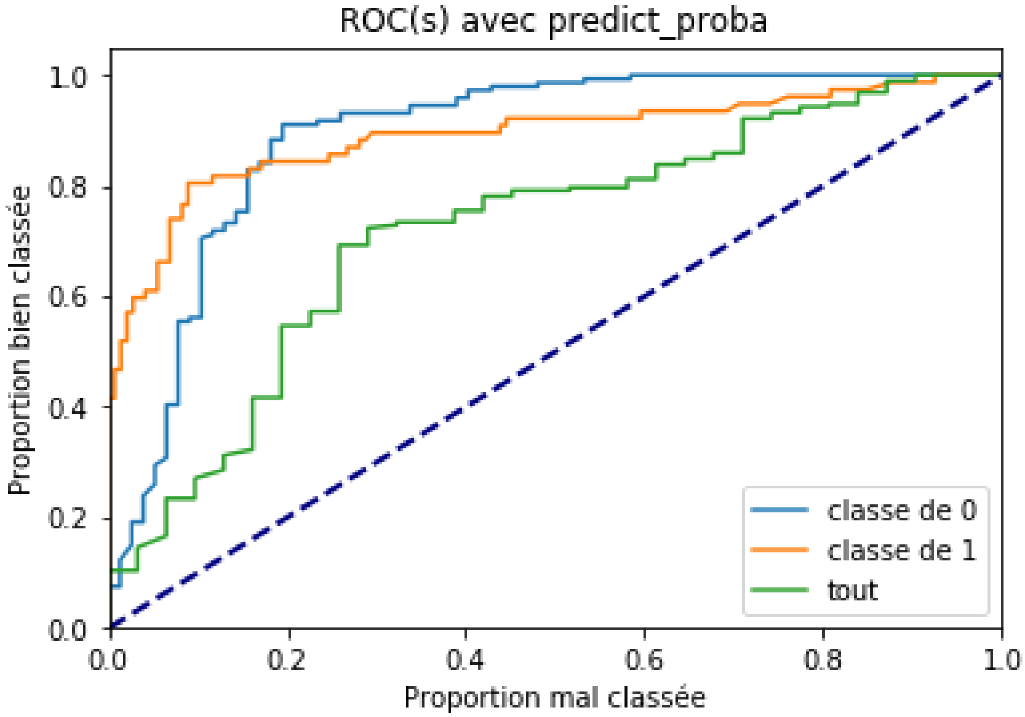
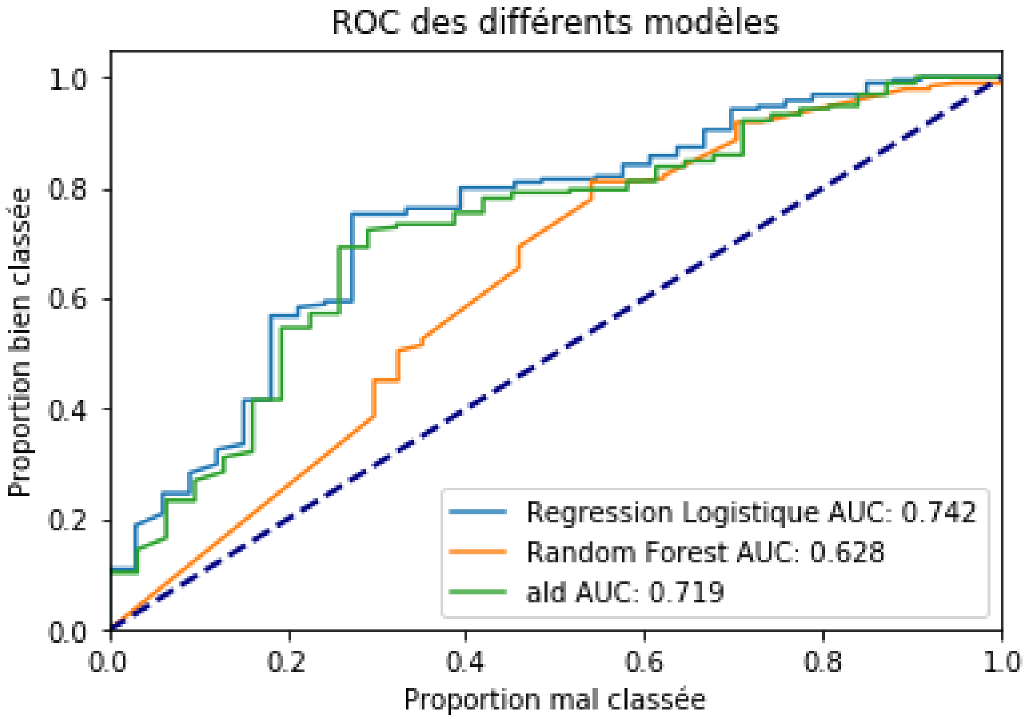


Score de Prediction : 0.8609865470852018
133.000
13.000
18.000
59.000
True Label
0
1
0
1
Predicted Label
120
100
80
60
40
20


ROC(s) avec predict_proba
Proportion bien classée
Proportion mal classée
0.0
0.2
0.4
0.6
0.8
1.0
0.0
0.2
0.4
0.6
0.8
1.0
classe de 0
classe de 1
tout

2.4.3 Récapitulation des Modèles Estimés

```
In [22]: ###Print des 3 ROC sur un même graph
         for key in fpr_global:
             plt.plot(fpr_global[key], tpr_global[key], label=key +" AUC: " + str(round(AUC_gl

         lw = 2

         plt.plot([0, 1], [0, 1], color='navy', lw=lw, linestyle='--')
         plt.xlim([0.0, 1.0])
         plt.ylim([0.0, 1.05])
         plt.xlabel("Proportion mal classée")
         plt.ylabel("Proportion bien classée")
         plt.title('ROC des différents modèles')
         plt.legend(loc="lower right")
```

```
Out[22]: <matplotlib.legend.Legend at 0x7fae77682b70>
```



2.4.4 Construction d'un Datset ROC pour visualiser les résultats dans Kibana

```
In [23]: df_roc_rf = pd.DataFrame()
         df_roc_logit = pd.DataFrame()
         df_roc_ald = pd.DataFrame()
         fpr = list(fpr_global.values())
```

```
fpr_logit = fpr[0]
fpr_rf = fpr[1]
fpr_ald = fpr[2]

tpr = list(tpr_global.values())
tpr_logit = tpr[0]
tpr_rf = tpr[1]
tpr_ald = tpr[2]

df_roc_logit["FPR_LOGIT"] = fpr_logit
df_roc_logit["TPR_LOGIT"] = tpr_logit
df_roc_rf["FPR_RF"] = fpr_rf
df_roc_rf["TPR_RF"] = tpr_rf
df_roc_ald["FPR_ALD"] = fpr_ald
df_roc_ald["TPR_ALD"] = tpr_ald

df_roc = df_roc_logit.join(df_roc_rf).join(df_roc_ald)

# On remplace les NaN à la fin de certaines colonnes par 1 :
# c'est la dernière valeur de chaque colonne
df_roc = df_roc.fillna(1)

df_roc.head(10)
```

```
Out[23]:    FPR_LOGIT  TPR_LOGIT    FPR_RF    TPR_RF   FPR_ALD   TPR_ALD
         0   0.000000   0.005263  0.000000  0.000000  0.000000  0.005208
         1   0.000000   0.110526  0.297297  0.387097  0.000000  0.104167
         2   0.030303   0.110526  0.297297  0.419355  0.032258  0.104167
         3   0.030303   0.189474  0.297297  0.435484  0.032258  0.145833
         4   0.060606   0.210526  0.297297  0.446237  0.064516  0.166667
         5   0.060606   0.247368  0.297297  0.451613  0.064516  0.234375
         6   0.090909   0.247368  0.324324  0.451613  0.096774  0.234375
         7   0.090909   0.257895  0.324324  0.456989  0.096774  0.244792
         8   0.090909   0.268421  0.324324  0.505376  0.096774  0.255208
         9   0.090909   0.278947  0.351351  0.516129  0.096774  0.265625
```

2.4.5 Sélection des Features les plus importantes pour Kibana

```
In [24]: # feature extraction
         select_k_best = SelectKBest(score_func=chi2, k=8)
         select_k_best_opt = select_k_best.fit(X_train, Y_train)

         best_features_index = select_k_best_opt.get_support()
         best_features_names = list(X_train.columns[best_features_index])
         best_features_scores = pd.DataFrame(list(select_k_best_opt.scores_))

         df_best_features = pd.DataFrame()
         df_best_features["Feature_Name"] = best_features_names
```

```
        df_best_features["Score"] = best_features_scores[best_features_index].reset_index(drop
        df_best_features = df_best_features.sort_values(by="Score", ascending=False)
        df_best_features = df_best_features.reset_index(drop=True)

        df_best_features
```

```
Out[24]:   Feature_Name        Score
        0          Fare  2960.439060
        1         Cabin   182.859457
        2    Sex_female   117.699090
        3      Sex_male    66.429697
        4         Title    35.124157
        5        Pclass    25.541000
        6         Emb_C    12.798378
        7         SibSp     5.559077
```

2.5 4) Visualisation des données

2.5.1 On lance les processus : ElasticSearch, Kibana . . .

```
In [25]: ## EN CAS DE PROBLEMES AVEC KIBANA
         try:
             requests.delete(ES_URL + "/.kibana")
             requests.delete(ES_URL + "/.kibana_1")
             requests.delete(ES_URL + "/.kibana_2")
             requests.delete(ES_URL + "/.kibana_3")
         except Exception as e:
             pass
```

```
In [26]: # Start elastic search process
         print("Starting ElasticSearch on " + ES_URL + "...")

         if platform.system() == "Darwin":
             es_proc = subprocess.Popen(["elasticsearch"])
         elif platform.system() == "Windows":
             es_proc = subprocess.Popen([ES_PATH])
         elif platform.system() == "Linux":
             es_proc = subprocess.Popen([ES_PATH])
         else:
             print("ERROR : PLATFORM NOT RECOGNIZED")
             sys.exit(0)

         time.sleep(30)
         try:
             # Check if Elastic Search server is running
             check_es_status = requests.get(ES_URL)
             check_es_status = check_es_status.json()
         except Exception as e:
             check_es_status = dict()
```

```
    es_proc.terminate()
    print("ERROR WHILE GET REQUEST ELASTIC SEARCH : " + str(e))

if "cluster_name" in check_es_status.keys():
    print("ElasticSearch OK")
    print("connected on " + ES_URL + ", cluster : " + check_es_status["cluster_name"]]
else:
    # Terminate elastic search process
    es_proc.terminate()
    check_es_status = dict()
    print("ERROR RUNNING ELASTICSEARCH")

# Before starting Kibana, check if elastic search is correctly launched
if "cluster_name" in check_es_status.keys():
    print("Starting Kibana on " + KIBANA_URL + "...")

    if platform.system() == "Darwin":
        kibana_proc = subprocess.Popen(["kibana"])
    elif platform.system() == "Windows":
        kibana_proc = subprocess.Popen([KIBANA_PATH])
    elif platform.system() == "Linux":
        kibana_proc = subprocess.Popen([KIBANA_PATH])
    else:
        print("ERROR : PLATFORM NOT RECOGNIZED")
        es_proc.terminate()
        sys.exit(0)

    time.sleep(10)
    try:
        # Check if Elastic Search server is running
        check_kibana_status = requests.get(KIBANA_URL)
        check_kibana_status = check_kibana_status.text
    except Exception as e:
        check_kibana_status = ""
        print("ERROR WHILE GET REQUEST KIBANA : " + str(e))

    # Check if Kibana server is correctly launched
    if not check_kibana_status == "":
        print("Kibana OK")
    else:
        # Terminate Kibana process
        kibana_proc.terminate()
        print("ERROR RUNNING KIBANA")
else:
    print("ERROR RUNNING KIBANA : ELASTIC SEARCH ISN'T COORECTLY STARTED")
    check_kibana_status = ""

if "cluster_name" in check_es_status:
    print("Opening ElasticSearch in the browser at address " + ES_URL)
    webbrowser.open(ES_URL, new=2)
else:
    print("ERROR RUNNING ELASTIC SEARCH, SO NOT OPENING IT IN WEB BROWSER")
if not check_kibana_status == "":
    print("Opening Kibana in the browser at address " + KIBANA_URL)
    webbrowser.open(KIBANA_URL, new=2)
else:
    print("ERROR RUNNING KIBANA, SO NOT OPENING IT IN WEB BROWSER")
```

```
Starting ElasticSearch on http://localhost:9200...
ElasticSearch OK
connected on http://localhost:9200, cluster : elasticsearch
Starting Kibana on http://localhost:5601...
Kibana OK
Opening ElasticSearch in the browser at address http://localhost:9200
Opening Kibana in the browser at address http://localhost:5601
```

2.5.2 Export des données (création des Index) dans ElasticSearch

- Creation de l'index ElasticSearch pour le Dataset entier

In [26]:
```
# If Elastic Search Index already Exists, delete it
requests.delete(ES_URL + "/titanic_all")
requests.delete(ES_URL + "/titanic_train")
requests.delete(ES_URL + "/titanic_test")
requests.delete(ES_URL + "/machine_learning")
requests.delete(ES_URL + "/confusion_matrix")
requests.delete(ES_URL + "/machine_learning_scores")
requests.delete(ES_URL + "/machine_learning_AUC")

# Create Elastic Search index : "test_index"
#index_mapping_json = json.dumps({"daily_prices" : {
#                                        "dynamic": "true",
#                                        "properties": {
#                                        "Date" : {"type": "date"}
#                                    }
#                                }}
#                               )
#create_index_headers = {"mappings": index_mapping_json}
#r = requests.put(ES_URL + "/bitcoin", headers=create_index_headers)
r = requests.put(ES_URL + "/titanic_all")
print(r.json())

# On remplit l'index Elastic search nouvellement crée
for i, df_row in enumerate(df.iterrows()):
    row_to_dict = dict(df_row[1])
    try:
        r = requests.put(ES_URL + "/titanic_all/dataset_all/" + str(i),
                         data=json.dumps(row_to_dict),
                         headers={"content-type":"application/json"})
        jresp = r.json()
        if ("error" in jresp):
            print(jresp)
    except Exception as e:
        print(e)
        print("Error on this row : " + str(row_to_dict))


# Exemple Requête de données dans Elastic Search
#str_request = "_id:1"
#r = requests.get(ES_URL + "/bitcoin/_search?q=" + str_request)
#r.json()
```

```
{'acknowledged': True, 'shards_acknowledged': True, 'index': 'titanic_all'}
```

- Creation de l'index ElasticSearch pour le Dataset d'entrainement

In [27]:
```
# If Elastic Search Index already Exists, delete it
requests.delete(ES_URL + "/titanic_train")

# Create Elastic Search index : "test_index"
#index_mapping_json = json.dumps({"daily_prices" : {
#                                         "dynamic": "true",
#                                         "properties": {
#                                         "Date" : {"type": "date"}
#                                     }
#                                 }}
#                                )
#create_index_headers = {"mappings": index_mapping_json}
#r = requests.put(ES_URL + "/bitcoin", headers=create_index_headers)
r = requests.put(ES_URL + "/titanic_train")
print(r.json())

# On remplit l'index Elastic search nouvellement crée
for i, df_row in enumerate(df_titanic.iterrows()):
    row_to_dict = dict(df_row[1])
    try:
        r = requests.put(ES_URL + "/titanic_train/dataset_train/" + str(i),
                         data=json.dumps(row_to_dict),
                         headers={"content-type":"application/json"})
        jresp = r.json()
        if ("error" in jresp):
            print(jresp)
```

```
             except Exception as e:
                 print(e)
                 print("Error on this row : " + str(row_to_dict))


         # Exemple Requête de données dans Elastic Search
         #str_request = "_id:1"
         #r = requests.get(ES_URL + "/bitcoin/_search?q=" + str_request)
         #r.json()
```

```
{'acknowledged': True, 'shards_acknowledged': True, 'index': 'titanic_train'}
```

- Creation de l’index ElasticSearch pour le Dataset de test

```
In [28]: # If Elastic Search Index already Exists, delete it
         requests.delete(ES_URL + "/titanic_test")

         # Create Elastic Search index : "test_index"
         #index_mapping_json = json.dumps({"daily_prices" : {
         #                                        "dynamic": "true",
         #                                        "properties": {
         #                                        "Date" : {"type": "date"}
         #                                    }
         #                                }}
         #                               )
         #create_index_headers = {"mappings": index_mapping_json}
         #r = requests.put(ES_URL + "/bitcoin", headers=create_index_headers)
         r = requests.put(ES_URL + "/titanic_test")
         print(r.json())

         # On remplit l'index Elastic search nouvellement crée
         for i, df_row in enumerate(df_titanic_test.iterrows()):
             row_to_dict = dict(df_row[1])
             try:
                 r = requests.put(ES_URL + "/titanic_test/dataset_test/" + str(i),
                                  data=json.dumps(row_to_dict),
                                  headers={"content-type":"application/json"})
                 jresp = r.json()
                 if ("error" in jresp):
                     print(jresp)
             except Exception as e:
                 print(e)
                 print("Error on this row : " + str(row_to_dict))


         # Exemple Requête de données dans Elastic Search
         #str_request = "_id:1"
         #r = requests.get(ES_URL + "/bitcoin/_search?q=" + str_request)
         #r.json()
```

```
{'acknowledged': True, 'shards_acknowledged': True, 'index': 'titanic_test'}
```

- Creation de l'index ElasticSearch pour les résultats d'estimation (Courbe Roc)

```
In [29]: # If Elastic Search Index already Exists, delete it
         requests.delete(ES_URL + "/machine_learning")

         # Create Elastic Search index : "test_index"
         index_mapping_json = json.dumps({"results" : {
                                                 "dynamic": "true",
                                         }}
                                        )
         create_index_headers = {"mappings": index_mapping_json}
         r = requests.put(ES_URL + "/machine_learning")
         print(r.json())

         # On remplit l'index Elastic search nouvellement crée
         for i, df_row in enumerate(df_roc.iterrows()):
             row_to_dict = dict(df_row[1])
             try:
                 r = requests.put(ES_URL + "/machine_learning/results/" + str(i),
                                  data=json.dumps(row_to_dict),
                                  headers={"content-type":"application/json"})
                 jresp = r.json()
                 if ("error" in jresp):
                     print(jresp)
             except Exception as e:
                 print(e)
                 print("Error on this row : " + str(row_to_dict))
```

```
{'acknowledged': True, 'shards_acknowledged': True, 'index': 'machine_learning'}
```

- Creation de l'index ElasticSearch pour les résultats d'estimation (Confusion Matrix)

```
In [30]: # If Elastic Search Index already Exists, delete it
         requests.delete(ES_URL + "/confusion_matrix")

         # Create Elastic Search index : "test_index"
         index_mapping_json = json.dumps({"results" : {
                                                 "dynamic": "true",
                                         }}
                                        )
         create_index_headers = {"mappings": index_mapping_json}
         r = requests.put(ES_URL + "/confusion_matrix")
```

```
print(r.json())

# On remplit l'index Elastic search nouvellement crée
for i, df_row in enumerate(df_confusion_matrix.iterrows()):
    row_to_dict = dict(df_row[1])
    row_to_dict = {key: float(it) for key, it in row_to_dict.items()}
    try:
        r = requests.put(ES_URL + "/confusion_matrix/results/" + str(i),
                         data=json.dumps(row_to_dict),
                         headers={"content-type":"application/json"})
        jresp = r.json()
        if ("error" in jresp):
            print(jresp)
    except Exception as e:
        print(e)
        print("Error on this row : " + str(row_to_dict))
```

```
{'acknowledged': True, 'shards_acknowledged': True, 'index': 'confusion_matrix'}
```

- Creation de l’index ElasticSearch pour les résultats d’estimation (Prediction Scores)

```
In [204]: # If Elastic Search Index already Exists, delete it
          requests.delete(ES_URL + "/machine_learning_scores")

          # Create Elastic Search index : "test_index"
          index_mapping_json = json.dumps({"results" : {
                                                  "dynamic": "true",
                                          }}
                                         )
          create_index_headers = {"mappings": index_mapping_json}
          r = requests.put(ES_URL + "/machine_learning_scores")
          print(r.json())

          # On remplit l'index Elastic search nouvellement crée
          for i, df_row in enumerate(all_scores.iterrows()):
              row_to_dict = dict(df_row[1])
              row_to_dict = {key: float(it) for key, it in row_to_dict.items()}
              try:
                  r = requests.put(ES_URL + "/machine_learning_scores/results/" + str(i),
                                   data=json.dumps(row_to_dict),
                                   headers={"content-type":"application/json"})
                  jresp = r.json()
                  if ("error" in jresp):
                      print(jresp)
              except Exception as e:
                  print(e)
                  print("Error on this row : " + str(row_to_dict))
```

```
{'acknowledged': True, 'shards_acknowledged': True, 'index': 'machine_learning_scores'}
```

- Creation de l’index ElasticSearch pour les résultats d’estimation (AUC)

```
In [205]: # If Elastic Search Index already Exists, delete it
          requests.delete(ES_URL + "/machine_learning_auc")

          # Create Elastic Search index : "test_index"
          index_mapping_json = json.dumps({"results" : {
                                                  "dynamic": "true",
                                          }}
                                         )
          create_index_headers = {"mappings": index_mapping_json}
          r = requests.put(ES_URL + "/machine_learning_auc")
          print(r.json())

          # On remplit l'index Elastic search nouvellement crée
          df_AUC = pd.DataFrame(AUC_global,
                                columns=["Random Forest", "Regression Logistique", "ald"],
                                index=[1])
          for i, df_row in enumerate(df_AUC.iterrows()):
              row_to_dict = dict(df_row[1])
              row_to_dict = {key: float(it) for key, it in row_to_dict.items()}
              try:
                  r = requests.put(ES_URL + "/machine_learning_auc/results/" + str(i),
                                   data=json.dumps(row_to_dict),
                                   headers={"content-type":"application/json"})
                  jresp = r.json()
                  if ("error" in jresp):
                      print(jresp)
              except Exception as e:
                  print(e)
                  print("Error on this row : " + str(row_to_dict))
```

```
{'acknowledged': True, 'shards_acknowledged': True, 'index': 'machine_learning_auc'}
```

- Creation de l’index ElasticSearch pour les résultats d’estimation (Feature Selection)

```
In [308]: # If Elastic Search Index already Exists, delete it
          requests.delete(ES_URL + "/machine_learning_best_features")

          # Create Elastic Search index : "test_index"
          index_mapping_json = json.dumps({"results" : {
                                                  "dynamic": "true",
                                          }}
                                         )
          create_index_headers = {"mappings": index_mapping_json}
```

```
r = requests.put(ES_URL + "/machine_learning_best_features")
print(r.json())

# On remplit l'index Elastic search nouvellement crée
for i, df_row in enumerate(df_best_features.iterrows()):
    row_to_dict = dict(df_row[1])
    print(row_to_dict)
    #row_to_dict = {key: float(it) for key, it in row_to_dict.items()}
    try:
        r = requests.put(ES_URL + "/machine_learning_best_features/results/" + str(i
                         data=json.dumps(row_to_dict),
                         headers={"content-type":"application/json"})
        jresp = r.json()
        if ("error" in jresp):
            print(jresp)
    except Exception as e:
        print(e)
        print("Error on this row : " + str(row_to_dict))
```

```
{'acknowledged': True, 'shards_acknowledged': True, 'index': 'machine_learning_best_features'}
{'Feature_Name': 'Fare', 'Score': 2900.1885064412554}
{'Feature_Name': 'Cabin', 'Score': 195.1578891072212}
{'Feature_Name': 'Sex_female', 'Score': 120.81587903594252}
{'Feature_Name': 'Sex_male', 'Score': 68.18882165728837}
{'Feature_Name': 'Title', 'Score': 32.97188439551437}
{'Feature_Name': 'Pclass', 'Score': 20.640591774475183}
{'Feature_Name': 'Emb_C', 'Score': 11.642411227854897}
{'Feature_Name': 'Emb_S', 'Score': 4.574614862394901}
```

2.5.3 Création des Index-Pattern dans Kibana

- On overwrite l'index .Kibana dans ElasticSearch pour autoriser la création d'index dans Kibana

```
In [336]: requests.delete(ES_URL + "/.kibana")

          data_json = {
              "index.mapper.dynamic": "true"
          }
          data_json = data_json

          r = requests.put("http://localhost:9200/.kibana/", headers=data_json)

          data_json = {"dynamic": "true"}
          r = requests.put("http://localhost:9200/.kibana/_mapping/doc",
                           headers={"content-type":"application/json",
                                    'kbn-xsrf': 'anything'},
                           data=json.dumps(data_json))
          r.json()

Out[336]: {'acknowledged': True}
```

- création du titanic_train index-pattern

```
In [337]: data_json = {
              "title": "titanic_train",
              #"timeFieldName": "Date"
          }

          data_json = '{"attributes" : ' + json.dumps(data_json) + '}'

          r = requests.post("http://localhost:5601/api/saved_objects/index-pattern/titanic_tra
                            data=data_json,
                            headers={"content-type":"application/json",
                                     'kbn-xsrf': 'anything'}
                           )
          r.json()

Out[337]: {'attributes': {'title': 'titanic_train'},
           'id': 'titanic_train',
           'type': 'index-pattern',
           'updated_at': '2018-12-17T17:02:54.874Z',
           'version': 12}
```

- création du machine_learing index-pattern

```
In [338]: data_json = {
              "title": "machine_learning",
          }

          data_json = '{"attributes" : ' + json.dumps(data_json) + '}'

          r = requests.post("http://localhost:5601/api/saved_objects/index-pattern/machine_lea
                            data=data_json,
                            headers={"content-type":"application/json",
                                     'kbn-xsrf': 'anything'}
                           )
          r.json()

Out[338]: {'attributes': {'title': 'machine_learning'},
           'id': 'machine_learning',
           'type': 'index-pattern',
           'updated_at': '2018-12-17T17:02:55.266Z',
           'version': 12}
```

- Création du confusion_matrix index-pattern

```
In [339]: data_json = {
              "title": "confusion_matrix",
          }

          data_json = '{"attributes" : ' + json.dumps(data_json) + '}'

          r = requests.post("http://localhost:5601/api/saved_objects/index-pattern/confusion_ma
                            data=data_json,
                            headers={"content-type":"application/json",
                                     'kbn-xsrf': 'anything'}
                           )
          r.json()
```

```
Out[339]: {'attributes': {'title': 'confusion_matrix'},
           'id': 'confusion_matrix',
           'type': 'index-pattern',
           'updated_at': '2018-12-17T17:02:56.284Z',
           'version': 12}
```

- Création du machine_learning_scores index-pattern

```
In [340]: data_json = {
              "title": "machine_learning_scores",
          }

          data_json = '{"attributes" : ' + json.dumps(data_json) + '}'

          r = requests.post("http://localhost:5601/api/saved_objects/index-pattern/machine_lea
                            data=data_json,
                            headers={"content-type":"application/json",
                                     'kbn-xsrf': 'anything'}
                           )
          r.json()
```

```
Out[340]: {'attributes': {'title': 'machine_learning_scores'},
           'id': 'machine_learning_scores',
           'type': 'index-pattern',
           'updated_at': '2018-12-17T17:02:57.308Z',
           'version': 13}
```

- Création du machine_learning_auc index-pattern

```
In [341]: data_json = {
              "title": "machine_learning_auc",
          }

          data_json = '{"attributes" : ' + json.dumps(data_json) + '}'

          r = requests.post("http://localhost:5601/api/saved_objects/index-pattern/machine_lea
                            data=data_json,
                            headers={"content-type":"application/json",
                                     'kbn-xsrf': 'anything'}
                           )
          r.json()
```

```
Out[341]: {'attributes': {'title': 'machine_learning_auc'},
           'id': 'machine_learning_auc',
           'type': 'index-pattern',
           'updated_at': '2018-12-17T17:02:58.353Z',
           'version': 13}
```

- Création du machine_learning_best_features index-pattern

```
In [342]: data_json = {
              "title": "machine_learning_best_features",
          }

          data_json = '{"attributes" : ' + json.dumps(data_json) + '}'

          r = requests.post("http://localhost:5601/api/saved_objects/index-pattern/machine_lea
                            data=data_json,
                            headers={"content-type":"application/json",
                                     'kbn-xsrf': 'anything'}
                           )
          r.json()
```

```
Out[342]: {'attributes': {'title': 'machine_learning_best_features'},
           'id': 'machine_learning_best_features',
           'type': 'index-pattern',
           'updated_at': '2018-12-17T17:02:59.356Z',
           'version': 4}
```

- Définition du Default Index

```
In [343]: data_json = {
              "value": "titanic_train",
          }

          data_json = json.dumps(data_json)

          r = requests.post("http://localhost:5601/api/kibana/settings/defaultIndex",
                            data=data_json,
                            headers={"content-type":"application/json",
                                     'kbn-xsrf': 'anything'}
                           )
          r.json()
```

```
Out[343]: {'settings': {'buildNum': {'userValue': 1},
            'defaultIndex': {'userValue': 'titanic_train'}}}
```

2.5.4 Creations des Visualisation dans Kibana

- Visualizations

```
In [344]: all_visualizations = \
              ["Age_VS_Survived",
               "Title_VS_Survived",
               "Family_Size_VS_Survived",
               "ALD_Classe_0_predictions",
               "ALD_Classe_1_predictions",
               "ALD_ROC",
               "ALD_AUC",
               "ALD_SCORE",
               "Logisitc_Regression_Classe_0_predictions",
               "Logisitic_Regression_Classe_1_predictions",
               "LOGIT_ROC",
               "LOGIT_AUC",
               "LOGIT_SCORE",
               "Random_Forest_Classe_0_predictions",
               "Random_Forest_Classe_1_predictions",
               "RF_ROC",
               "RF_AUC",
               "RF_SCORE"
              ]

          for vizu in all_visualizations:
              with open("Kibana_SavedObjects/" + vizu + ".json", "r") as f:
                  c = f.read()
                  c = c.replace(" ", "") \
                      .replace("\\n", "").replace("\n", "").replace("\\", "") \
                      .replace('"{"', '{"').replace('"}"', '}"') \
                      .replace(']}"', ']}').replace('}}"', '}}')
                  data_json = c
              data_json = data_json.replace("_id", "id") \
                                        .replace("_type", "type") \
                                        .replace("_source", "attributes")

              d = json.loads(data_json)

              visState = json.dumps(d[0]["attributes"]["visState"])
              searchSourceJSON = json.dumps(d[0]["attributes"]["kibanaSavedObjectMeta"]["searc
              if type(d[0]["attributes"]["uiStateJSON"]) == type(dict()):
                  uiStateJSON = json.dumps(d[0]["attributes"]["uiStateJSON"])
                  d[0]["attributes"]["uiStateJSON"] = uiStateJSON

              d[0]["attributes"]["visState"] = visState
              d[0]["attributes"]["kibanaSavedObjectMeta"]["searchSourceJSON"] = searchSourceJS

              data_json = json.dumps(d)
```

```
    if "SCORE" in vizu or "AUC" in vizu:
        data_json = data_json.replace("GreentoRed", "Green to Red")

    if "RegressionLogistique" in data_json:
        data_json = data_json.replace("RegressionLogistique", "Regression Logistique"

    if "RandomForest" in data_json:
        data_json = data_json.replace("RandomForest", "Random Forest")

    request_json =  '{"objects": ' + data_json + '}'

    r = requests.post("http://localhost:5601/api/kibana/dashboards/import?exclude=in
                     data=request_json,
                     headers={"content-type":"application/json",
                             'kbn-xsrf': 'anything'})
    dic_rep = r.json()["objects"][0]

    if "error" in dic_rep.keys():
        print("ERROR : ")
        print(dic_rep["error"]["message"])
    else:
        print("Visualization " + vizu + " was correclty created in Kibana !")
```

```
Visualization Age_VS_Survived was correclty created in Kibana !
Visualization Title_VS_Survived was correclty created in Kibana !
Visualization Family_Size_VS_Survived was correclty created in Kibana !
Visualization ALD_Classe_0_predictions was correclty created in Kibana !
Visualization ALD_Classe_1_predictions was correclty created in Kibana !
Visualization ALD_ROC was correclty created in Kibana !
Visualization ALD_AUC was correclty created in Kibana !
Visualization ALD_SCORE was correclty created in Kibana !
Visualization Logisitc_Regression_Classe_0_predictions was correclty created in Kibana !
Visualization Logisitic_Regression_Classe_1_predictions was correclty created in Kibana !
Visualization LOGIT_ROC was correclty created in Kibana !
Visualization LOGIT_AUC was correclty created in Kibana !
Visualization LOGIT_SCORE was correclty created in Kibana !
Visualization Random_Forest_Classe_0_predictions was correclty created in Kibana !
Visualization Random_Forest_Classe_1_predictions was correclty created in Kibana !
Visualization RF_ROC was correclty created in Kibana !
Visualization RF_AUC was correclty created in Kibana !
Visualization RF_SCORE was correclty created in Kibana !
```

- Feature Importances

```
In [358]: all_visualizations = \
              ["Feature_Importances",]
```

```
for vizu in all_visualizations:
    with open("Kibana_SavedObjects/" + vizu + ".json", "r") as f:
        c = f.read()
        c = c.replace(" ", "") \
            .replace("\\n", "").replace("\n", "").replace("\\", "") \
            .replace('"{"', '{"').replace('"}"', '"}').replace('}"', '}')
        data_json = c
    data_json = data_json.replace("_id", "id") \
                            .replace("_type", "type") \
                            .replace("_source", "attributes")
    d = json.loads(data_json)

    visState = json.dumps(d[0]["attributes"]["visState"])
    searchSourceJSON = json.dumps(d[0]["attributes"]["kibanaSavedObjectMeta"]["searc
    if type(d[0]["attributes"]["uiStateJSON"]) == type(dict()):
        uiStateJSON = json.dumps(d[0]["attributes"]["uiStateJSON"])
        d[0]["attributes"]["uiStateJSON"] = uiStateJSON

    d[0]["attributes"]["visState"] = visState
    d[0]["attributes"]["kibanaSavedObjectMeta"]["searchSourceJSON"] = searchSourceJS

    data_json = json.dumps(d)

    if 'field\\": \\"id' in data_json :
        data_json = data_json.replace('field\\": \\"id', 'field\\": \\"_id')

    request_json =  '{"objects": ' + data_json + '}'

    r = requests.post("http://localhost:5601/api/kibana/dashboards/import?exclude=in
                     data=request_json,
                     headers={"content-type":"application/json",
                             'kbn-xsrf': 'anything'})
    dic_rep = r.json()["objects"][0]

    if "error" in dic_rep.keys():
        print("ERROR : ")
        print(dic_rep["error"]["message"])
    else:
        print("Visualization " + vizu + " was correclty created in Kibana !")
```

```
Visualization Feature_Importances was correclty created in Kibana !
```

- Dashboard

```
In [347]: all_visualizations = [
              "Dashboard_ALD",
              "Dashboard_Global",
              "Dashboard_Logistic_Regression",
              "Dashboard_Random_Forest"
          ]

          for vizu in all_visualizations:
              with open("Kibana_SavedObjects/" + vizu + ".json", "r") as f:
                  c = f.read()
                  c = c.replace(" ", "") \
                      .replace("\\n", "").replace("\n", "").replace("\\", "").replace('"[', "[
                      .replace('"{"', '{"').replace('"}"', '}"').replace('}"', "}")
                  data_json = c
              data_json = data_json.replace("_id", "id") \
                                      .replace("_type", "type") \
                                      .replace("_source", "attributes")
              d = json.loads(data_json)
              panelsJSON = json.dumps(d[0]["attributes"]["panelsJSON"])
              d[0]["attributes"]["panelsJSON"] = panelsJSON
              optionsJSON = json.dumps(d[0]["attributes"]["optionsJSON"])
              d[0]["attributes"]["optionsJSON"] = optionsJSON
              searchSourceJSON = json.dumps(d[0]["attributes"]["kibanaSavedObjectMeta"]["searc
              d[0]["attributes"]["kibanaSavedObjectMeta"]["searchSourceJSON"] = searchSourceJS

              data_json = json.dumps(d)

              request_json =  '{"objects": ' + data_json + '}'

              r = requests.post("http://localhost:5601/api/kibana/dashboards/import?exclude=in
                               data=request_json,
                               headers={"content-type":"application/json",
                                       'kbn-xsrf': 'anything'})
              dic_rep = r.json()["objects"][0]

              if "error" in dic_rep.keys():
                  print("ERROR : ")
                  print(dic_rep["error"]["message"])
              else:
                  print("Visualization " + vizu + " was correclty created in Kibana !")
```

```
Visualization Dashboard_ALD was correclty created in Kibana !
Visualization Dashboard_Global was correclty created in Kibana !
Visualization Dashboard_Logistic_Regression was correclty created in Kibana !
Visualization Dashboard_Random_Forest was correclty created in Kibana !
```

On termine les processus de MongoDB, Kibana et Elastic Search

```
In [59]: # Ending MondoDB
         print("Ending MongoDB Process ...")
```

```
    if platform.system() == "Darwin":
        pass_proc = subprocess.Popen(["echo", str(passwd)],
                                    stdout=subprocess.PIPE)
        mongod_pid = subprocess.check_output(["pgrep", "mongod"])
        mongod_pid = mongod_pid.decode('utf-8')
        mongod_pid = mongod_pid.replace("\n", "")
        kill_proc = subprocess.Popen(["sudo", "-S", "kill", str(mongod_pid)],
                                      stdin=pass_proc.stdout,
                                      stdout=subprocess.PIPE)
        kill_proc.communicate()
        pass_proc.terminate()
        kill_proc.terminate()

    if platform.system() == "Windows":
        mongo_proc.kill

    print("Ended MongoDB Process.")

    # Ending ElasticSearch
    print("Ending ElasticSearch Process...")
    es_proc.terminate()
    print("Ended ElasticSearch Process.")

    # Ending Kibana
    print("Ending Kibana Process...")
    kibana_proc.terminate()
    print("Ended Kibana Process.")
```

```
Ending MongoDB Process ...
Ended MongoDB Process.
Ending ElasticSearch Process...
Ended ElasticSearch Process.
Ending Kibana Process...
Ended Kibana Process.
```

2.5.5 Administration du cluster Hadoop (Au besoin)

```
In [3]: NAMENODE_DNS = "http://ec2-35-180-138-173.eu-west-3.compute.amazonaws.com"
        NAMENODE_IP ="http://35.180.138.173"

        DATANODE_1_DNS = "http://ec2-35-180-128-32.eu-west-3.compute.amazonaws.com"
        DATANODE_1_IP = "http://35.180.128.32"

        NAMENODE_WEBUI_PORT = "50070"
        DATANODE_1_WEBUI_PORT = "50075"

        client_url = str(NAMENODE_DNS + ":" + NAMENODE_WEBUI_PORT)
        client = hdfs.InsecureClient(client_url, user="ubuntu")
```

- List HDFS directories

```
In [5]: # Liste Files and Directories
        for onedir in client.walk("/"):
            print(onedir)
```

```
('/', ['home'], [])
('/home', ['Projet-ArchitectureBigData', 'Projet2_Simulations&Copules'], [])
('/home/Projet-ArchitectureBigData', ['.ipynb_checkpoints', 'Kaggle-TwoSigma', 'Kibana_SavedOb
('/home/Projet-ArchitectureBigData/.ipynb_checkpoints', [], ['Projet-ArchiBigData-checkpoint.i
('/home/Projet-ArchitectureBigData/Kaggle-TwoSigma', [], ['marketdata_sample.csv', 'news_sampl
('/home/Projet-ArchitectureBigData/Kibana_SavedObjects', [], ['Close_Return_Visualization.json
('/home/Projet-ArchitectureBigData/cryptocurrencypricehistory', [], ['bitcoin_cash_price.csv',
('/home/Projet2_Simulations&Copules', ['.ipynb_checkpoints'], ['.DS_Store', 'DEPARTEMENT.cpg',
('/home/Projet2_Simulations&Copules/.ipynb_checkpoints', [], ['Projet2-Simulations&Copules-che
```

- Upload file to HDFS

```
In [7]: client.upload(hdfs_path="/home/Projet-ArchitectureBigData",
                      local_path="/Users/virgileamato/Desktop/Projet-ArchitectureBigData/Kaggl
                      overwrite=True)

        def upload_file(path_to_file):
            client.upload(hdfs_path="/home", local_path=path_to_file, overwrite=True)
```

- Download file from HDFS

```
In [ ]: #client.download("/home/", local_path="/Users/virgileamato/Desktop")

        def download_file(hdfs_path, local_path):
            client.download(hdfs_path, local_path=local_path)
```

- Read file from HDFS

```
In [ ]: def read_file(hdfs_path):
            with client.read(hdfs_path) as reader:
                raw_file = reader.read()

            raw_file = raw_file.decode('utf-8')

            return raw_file
```

- Write from to HDFS

```
In [ ]: def write_file(hdfs_path, str_to_write):
            with client.write(hdfs_path, overwrite=True) as writer:
                writer.write(str_to_write.encode())
```

- Delete file from HDFS

```
In [ ]: #client.delete("/home/core-site.xml")

        def delete_file(hdfs_path):
            client.delete(hdfs_path)
```