





Projet Big Data

soutenance finale

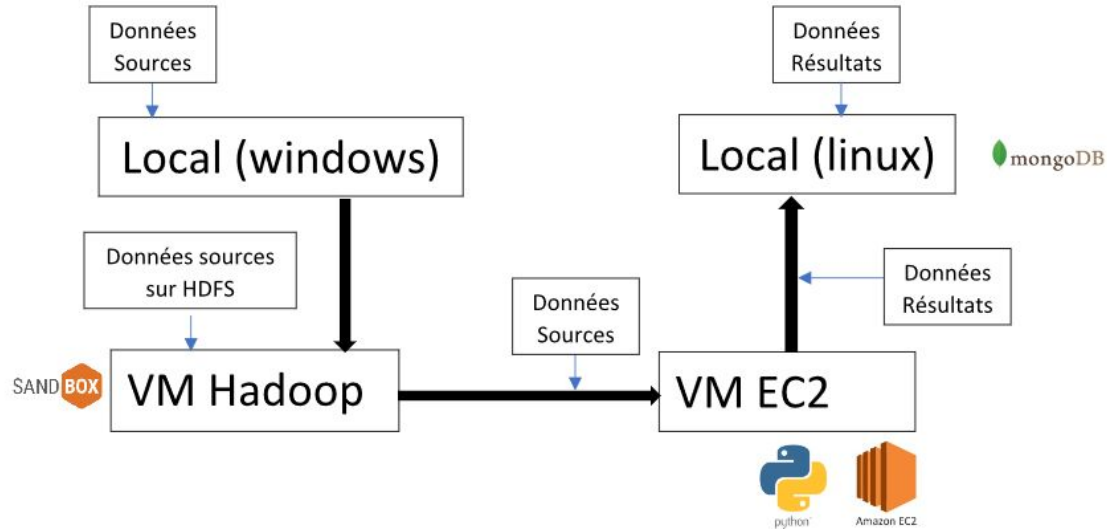
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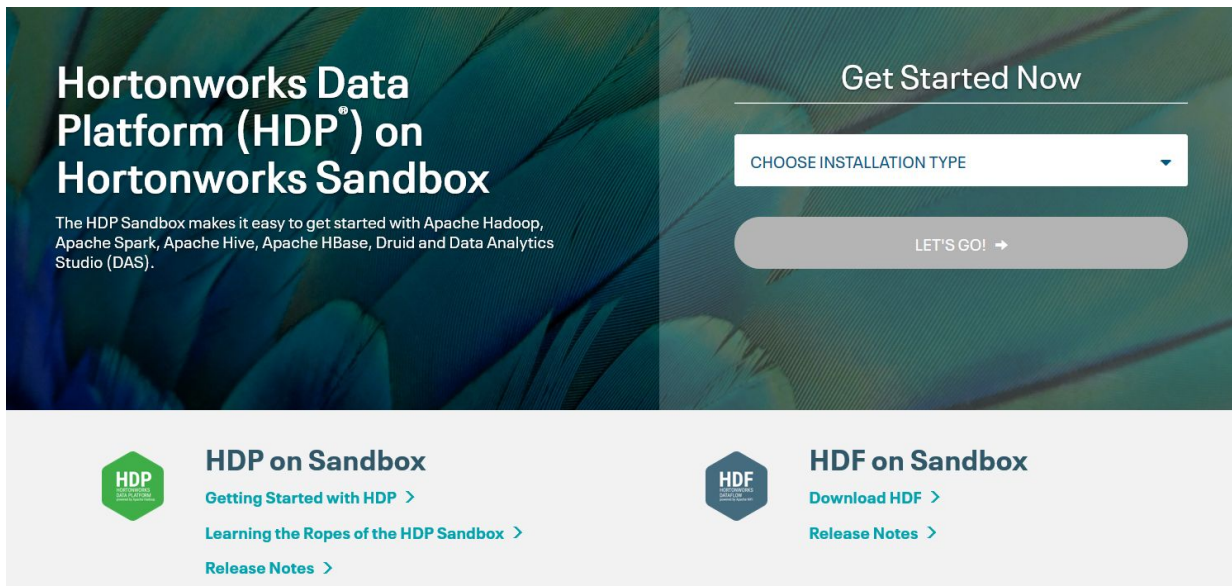
plan

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- Etape 2
- Etape 3
- Etape 4
- Etape 5
- Conclusion

Introduction



Etape 0 : Installation du VM hadoop



The screenshot shows the Hortonworks Data Platform (HDP) on Hortonworks Sandbox installation page. The page has a dark blue background with a feather pattern. The main heading is "Hortonworks Data Platform (HDP®) on Hortonworks Sandbox". Below it, a subheading reads: "The HDP Sandbox makes it easy to get started with Apache Hadoop, Apache Spark, Apache Hive, Apache HBase, Druid and Data Analytics Studio (DAS)." To the right, under the heading "Get Started Now", there is a dropdown menu labeled "CHOOSE INSTALLATION TYPE" and a button labeled "LET'S GO! →". At the bottom, there are two sections: "HDP on Sandbox" and "HDF on Sandbox". The "HDP on Sandbox" section includes links for "Getting Started with HDP", "Learning the Ropes of the HDP Sandbox", and "Release Notes". The "HDF on Sandbox" section includes links for "Download HDF" and "Release Notes".

Hortonworks Data Platform (HDP®) on Hortonworks Sandbox

The HDP Sandbox makes it easy to get started with Apache Hadoop, Apache Spark, Apache Hive, Apache HBase, Druid and Data Analytics Studio (DAS).

Get Started Now

CHOOSE INSTALLATION TYPE ▼

LET'S GO! →

HDP on Sandbox

- [Getting Started with HDP >](#)
- [Learning the Ropes of the HDP Sandbox >](#)
- [Release Notes >](#)

HDF on Sandbox

- [Download HDF >](#)
- [Release Notes >](#)

Etape 1 : Machine locale -> HDFS

1.

```
[root@sandbox-hdp ~]# sudo -u hdfs hadoop dfs -mkdir /input
WARNING: Use of this script to execute dfs is deprecated.
WARNING: Attempting to execute replacement "hdfs dfs" instead.
```

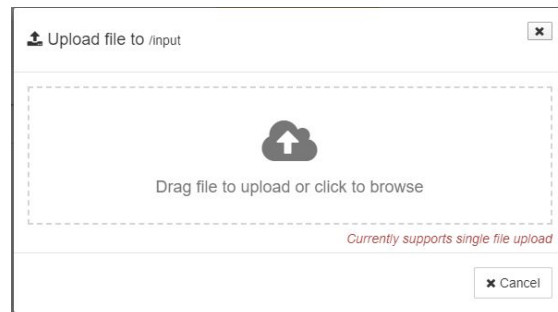
2.

```
[root@sandbox-hdp ~]# sudo -u hdfs hadoop fs -chmod 777 /input
```

```
[root@sandbox-hdp ~]# hadoop fs -ls /
Found 14 items
drwxrwxrwt - yarn   hadoop   0 2018-11-29 17:56 /app-logs
drwxr-xr-x - hdfs   hdfs    0 2018-11-29 19:01 /apps
drwxr-xr-x - yarn   hadoop   0 2018-11-29 17:25 /ats
drwxr-xr-x - hdfs   hdfs    0 2018-11-29 17:26 /atsv2
drwxr-xr-x - hdfs   hdfs    0 2018-11-29 17:26 /hdp
drwxr-xr-x - hdfs   hdfs    0 2020-01-30 14:40 /input
drwx----- - livy    hdfs    0 2018-11-29 17:55 /livy2-recovery
drwxr-xr-x - mapred  hdfs    0 2018-11-29 17:26 /mapred
drwxrwxrwx - mapred  hadoop   0 2018-11-29 17:26 /mr-history
drwxr-xr-x - hdfs   hdfs    0 2018-11-29 18:54 /ranger
drwxrwxrwx - spark   hadoop   0 2018-11-29 19:21 /spark2-history
drwxrwxrwx - hdfs   hdfs    0 2018-11-29 19:01 /tmp
drwxr-xr-x - hdfs   hdfs    0 2018-11-29 19:21 /user
drwxr-xr-x - hdfs   hdfs    0 2018-11-29 17:51 /warehouse
```

Modifier l'autorisation de dossier pour le rendre accessible à tous les utilisateurs

3.



Créer un dossier dans hdfs

Name >	Size >	Last Modified >	Owner >	Group >	Permission	Erasure Coding	Encrypted
predict.csv	175.6 kB	2020-01-30 11:33	admin	hdfs	-rw-r--r--		No
train.csv	20.1 MB	2020-01-30 11:33	admin	hdfs	-rw-r--r--		No

Etape 2 : Placer des données sur la VM dans le cloud AWS

HDFS -> VM locale -> Amazon EC2

HDFS -> VM locale

```
[root@sandbox-hdp ~]# hadoop fs -get /input/predict.csv ./
[root@sandbox-hdp ~]# hadoop fs -get /input/train.csv ./
[root@sandbox-hdp ~]# hadoop fs -get /input/key_bigdata ./
get: `/input/key_bigdata': No such file or directory
[root@sandbox-hdp ~]# hadoop fs -get /input/key_bigdata.pem ./
[root@sandbox-hdp ~]# ls
anaconda-ks.cfg
[root@sandbox-hdp ~]# cd ..
[root@sandbox-hdp /]# ls
```

```
apps  boot      dev  hadoop  kafka-logs  lib  media  mysql-connector-java-5.1.45  packer-files  proc  run  sandbox-flavour  srv  tmp  usr
bin   cgroups_test  etc  home    key_bigdata.pem  lib64  mnt  opt  predict.csv  root  sandbox  sbin  sys  train.csv  var
```

VM locale -> Amazon EC2

sudo chmod 400 key_bigdata.pem

Modifier l'autorisation du fichier pem. Si l'autorisation est trop ouverte, la clé n'a aucun sens.

The diagram illustrates the components of the `scp` command used to transfer files to an Amazon EC2 instance. The command is shown in two lines:

```
[root@sandbox-hdp /]# scp -i /key_bigdata.pem train.csv ec2-user@ec2-54-84-100-80.compute-1.amazonaws.com:~  
train.csv  
[root@sandbox-hdp /]# scp -i /key_bigdata.pem predict.csv ec2-user@ec2-54-84-100-80.compute-1.amazonaws.com:~  
predict.csv
```

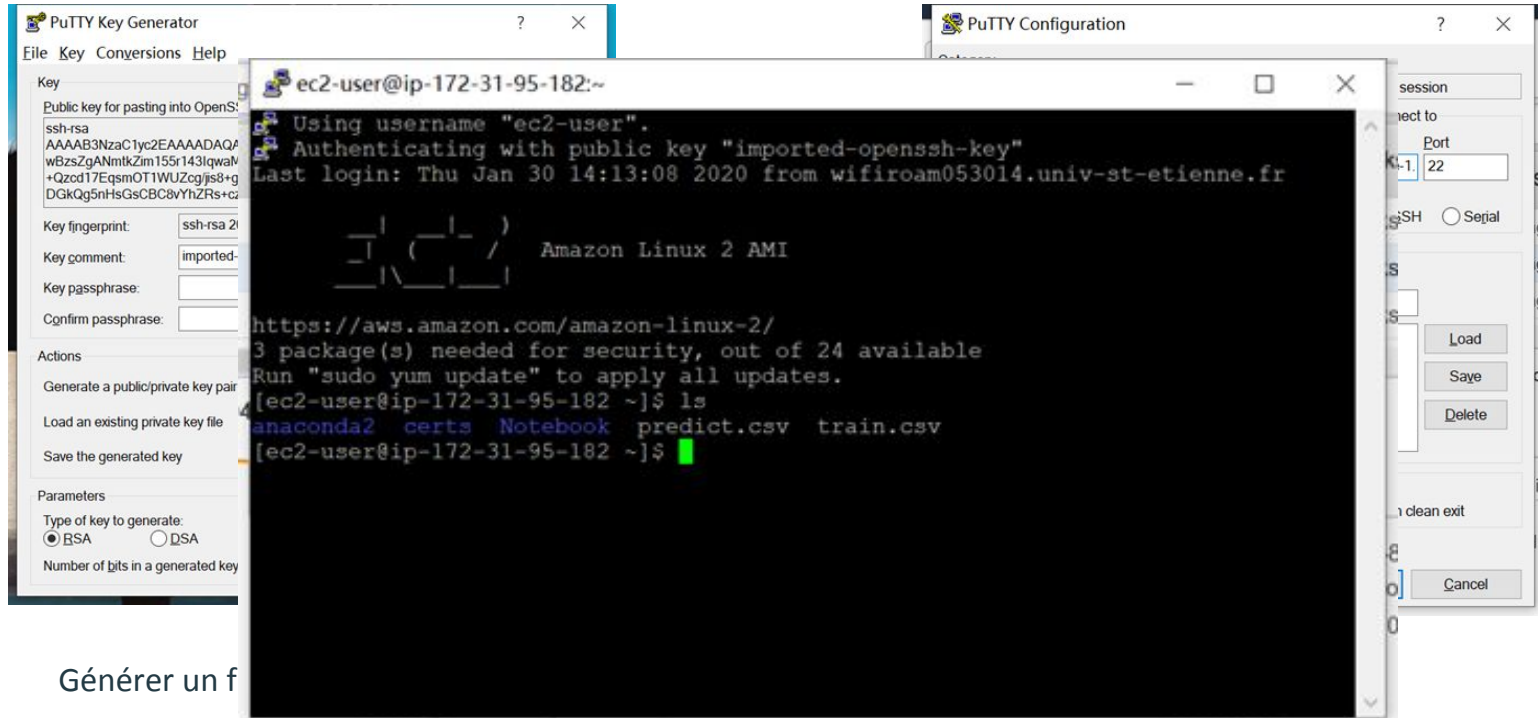
Annotations and their corresponding parts of the command:

- secure copy**: Points to the `scp` command.
- clé privée**: Points to the `-i` flag.
- Fichier transféré**: Points to the source file `/key_bigdata.pem`.
- nom d'utilisateur**: Points to the `ec2-user` part of the destination.
- Amazon Linux 2 AMI**: Points to the `compute-1` part of the destination.
- DNS public**: Points to the `amazonaws.com` part of the destination.

Transfer progress information:

Progress	Size	Speed	Time
100%	20MB	7.0MB/s	00:02
100%	176KB	426.5KB/s	00:00

Accéder à Amazon EC2 instance



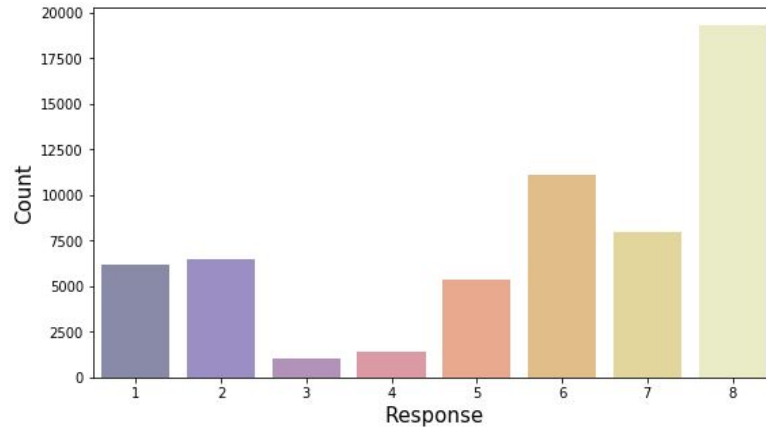
Générer un f

Etape 3: Analyse et traitement des données

- Analyse des données
- Que pouvons-nous savoir? Que pouvons-nous faire?
 - Labels
 - Type de données
 - Distribution de données
 - Informations numériques

- **Labels:**

- Des données discrètes avec des valeurs 1-8
 - Problème de multi-classification :
 - KNN / SVC / NN / Des modèles basé sur l'arbre de décision*



- **Type de données:**

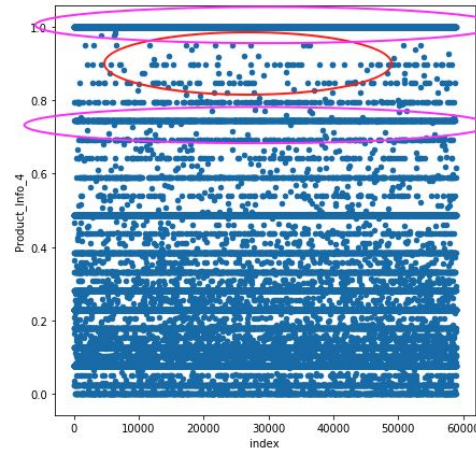
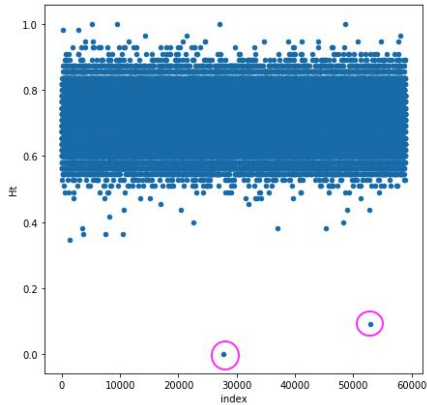
- Données non numériques :
 - Des données temporelles? - Non
 - Les significations des attributs? - Oui, une partie
 - **InsuredInfo_7 - Sexe (Male, Female)**
 - **InsuredInfo_8 - Race (e.g. Arabic, Asian, etc)**
 - **InsuredInfo_9 - La religion (e.g. Muslim, Jewish)**

```
X_train[X_train.columns[(X_train.dtypes == 'object')==True]].head(5)
```

	Product_Info_2	InsuredInfo_7	InsuredInfo_8	InsuredInfo_9
0	A8	Female	NaN	Muslim
1	D2	Male	NaN	NaN
2	D2	Male	Caucasian	Jewish
3	D4	Female	NaN	NaN
4	E1	Female	NaN	NaN

- **Type de données:**

- Données continues :
 - Normalisées? - les attributs de '**Medical_History**' ne sont pas Normalisées
 - Des valeurs aberrantes?
 - Les intervalles?

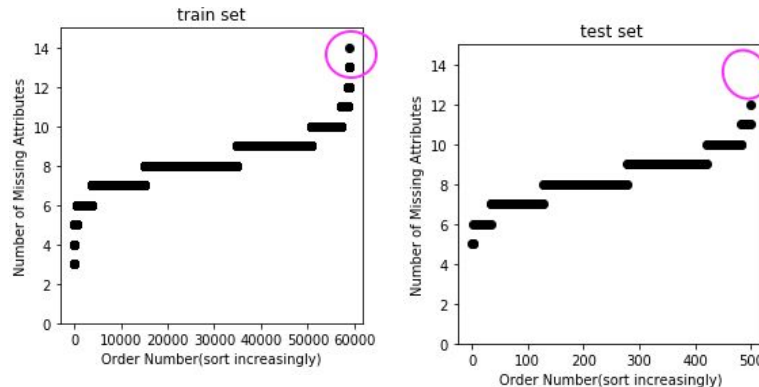


- **Distribution des données:**

- Les valeurs manquantes
 - Statistiques basées sur les attributs

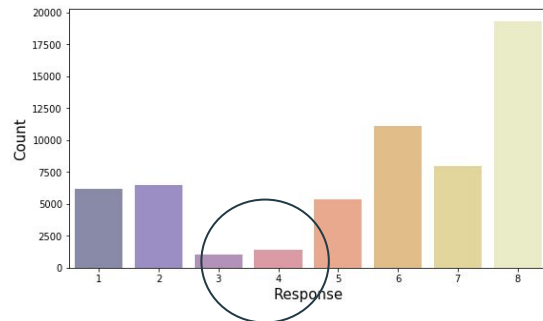
Name - Missing/Nb_row:		
	Name	Missing
48	Medical_History_10	0.990642
70	Medical_History_32	0.981318
62	Medical_History_24	0.935939
24	InsuredInfo_8	0.879197
53	Medical_History_15	0.750972
25	InsuredInfo_9	0.749410
38	Family_Hist_5	0.703996
36	Family_Hist_3	0.576621
35	Family_Hist_2	0.482702
30	Insurance_History_5	0.427642
37	Family_Hist_4	0.323177
16	Employment_Info_6	0.182623
39	Medical_History_1	0.149607
14	Employment_Info_4	0.114078
11	Employment_Info_1	0.000323

- Statistiques basées sur des échantillons entre le test et le training set



- **Distribution des données:**

- Statistiques sur des labels



- **Informations numériques:**

- Variance
- Corrélation

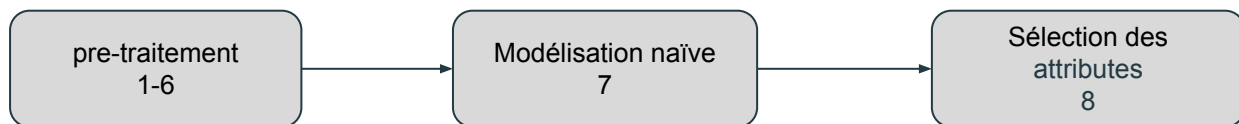
Insurance_History_5	0.000054
Employment_Info_4	0.001083
Medical_History_35	0.004106
Medical_History_38	0.004817
Ht	0.005513
Medical_Keyword_13	0.005892

Variance

	Response
Medical_Keyword_45	0.004952
Product_Info_7	0.004825
Medical_Keyword_8	0.004202
Family_Hist_3	0.003265
Product_Info_5	0.002011
Insurance_History_1	0.001034
History_26	0.000601
Medical_History_36	0.000580
Insurance_History_4	0.000567
Medical_History_25	0.000428

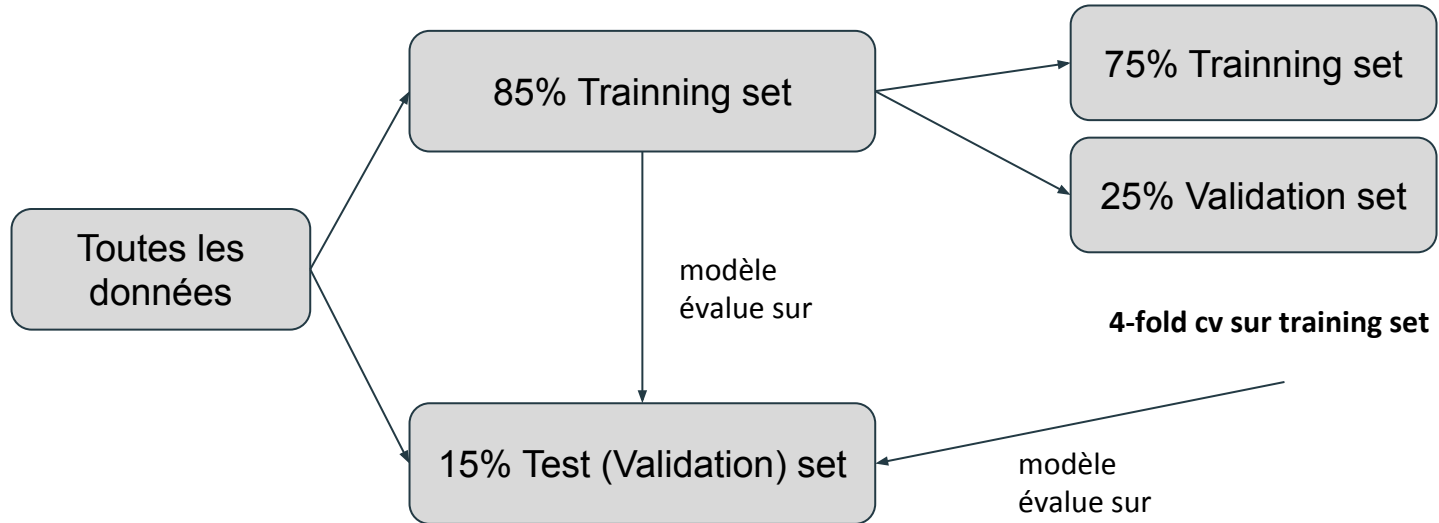
Corrélation

● Traitement global des données



1. Supprimer les échantillons avec 14 et 15 valeurs manquantes;
2. Supprimer directement les attributs qui ont plus de 70% de valeurs manquantes;
3. Encoder les données de type objet;
 - Après avoir suivi les étapes ci-dessus, on trouve que on a seulement besoin de coder 'sexe'
 - One-hot encoding
4. Remplissez les valeurs manquantes en **moyenne/médiane** pour d'autres attributs; (* **comparison**)
5. Supprimer les top 5 attributs avec la variance la plus faible;
6. Supprimer les top 5 attributs avec la plus faible corrélation avec le label;
7. Former **certains modèles** pour voir le 'baseline';(* **comparison**)
8. * Sélectionner **un nombre de** attributs importantes pour tester les performances du modèle;(* **comparison**)
 - Modèle arborescent - random forest + xgboost -> feature_importance_

- Pour l'ensemble de l'apprentissage, l'ensemble de validation et l'ensemble de test:



- Comparisons:

- moyenne/médiane - modèles différents

In using median, the accuracy result on validation set is:

```
rf model: 0.5131400090620752
knn: 0.3194381513366561
xgboost0 0.5445174444947893
xgboost1 0.5425917535115542
xgboost2 0.5434979610330766
xgboost3 0.54066062528319
4 xgboost hard voting: 0.5423652016311735
4 xgboost+rf hard voting: 0.5434979610330766
```

In using mean, the accuracy result on validation set is:

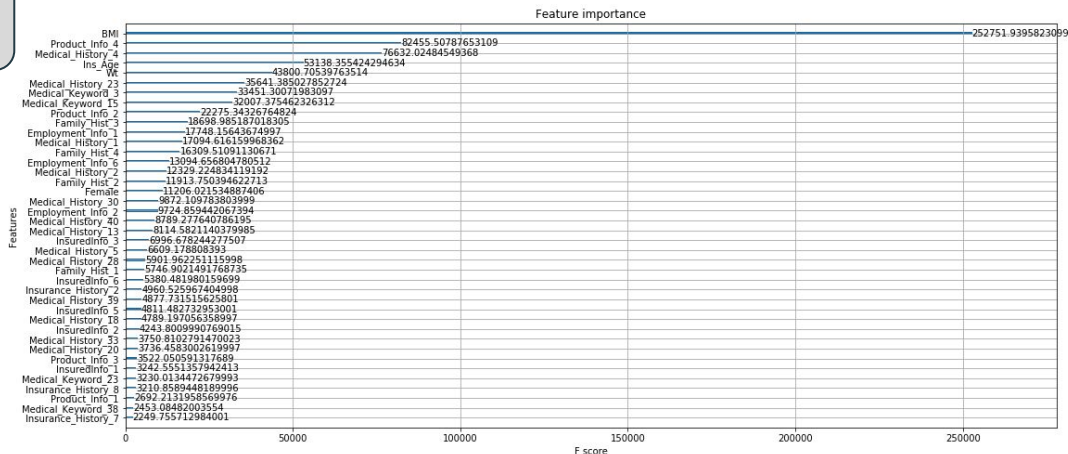
```
rf model: 0.5131400090620752
knn: 0.3192115994562755
xgboost0 0.544404168554599
xgboost1 0.5425917535115542
xgboost2 0.542931581332125
xgboost3 0.5424784775713638
4 xgboost hard voting: 0.5437245129134571
4 xgboost+rf hard voting: 0.542931581332125
```

model	mean	median
rf	0.513	0.513
knn	0.319	0.319
xgboost1	0.544	0.544
xgboost2	0.543	0.543
xgboost3	0.543	0.543
xgboost4	0.542	0.541
4xgb_voting	0.544	0.542
4xgb+rf_voting	0.543	0.543

- Hard voting:

- Pour les résultats de classification de chaque échantillon, le résultat majoritaire est sélectionné comme résultat final.
[1,1,3,1,5] -> [1]

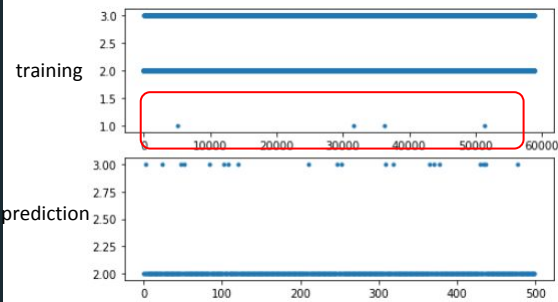
Sélection des attributs 8



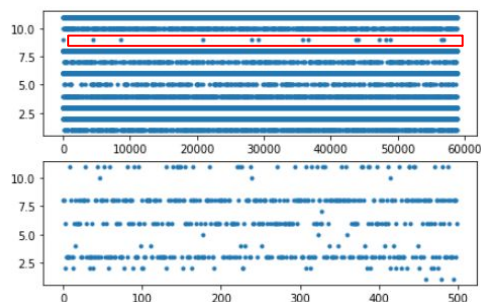
- Sélectionnez les top 50 attributs parmi les cinq modèles (1 RF, 4 Xgb via 4 fold CV), puis prenez leur intersection:
- TOP 35 attributes: ['BMI', 'Product_Info_4', 'Medical_History_4', 'Ins_Age', 'Wt', 'Medical_History_23', 'Medical_Keyword_3', 'Medical_Keyword_15', 'Product_Info_2', 'Employment_Info_1', 'Family_Hist_3', 'Medical_History_1', 'Family_Hist_4', 'Employment_Info_6', 'Medical_History_2', 'Family_Hist_2', 'Employment_Info_2', 'Medical_History_30', 'Female', 'InsuredInfo_3', 'Medical_History_40', 'Medical_History_13', 'Medical_History_39', 'Medical_History_28', 'Insurance_History_2', 'Family_Hist_1', 'InsuredInfo_5', 'InsuredInfo_6', 'InsuredInfo_2', 'Medical_History_18', 'InsuredInfo_1', 'Product_Info_3', 'Insurance_History_8', 'Medical_History_33', 'Medical_Keyword_23']

• Traitement détaillé des données

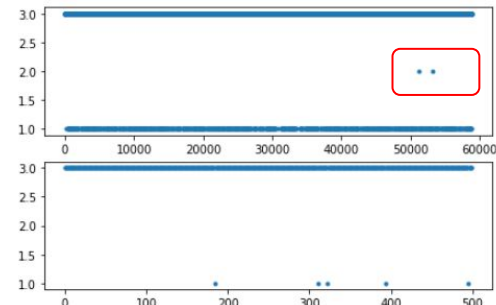
58881 -> 58776



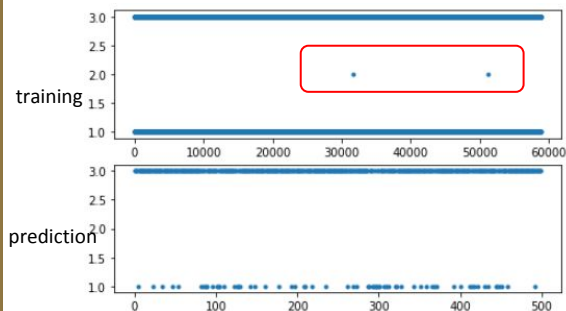
Medical_History_30



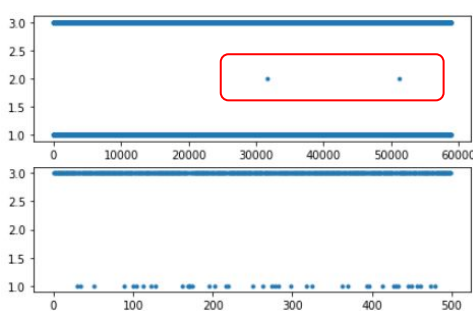
InsuredInfo_3



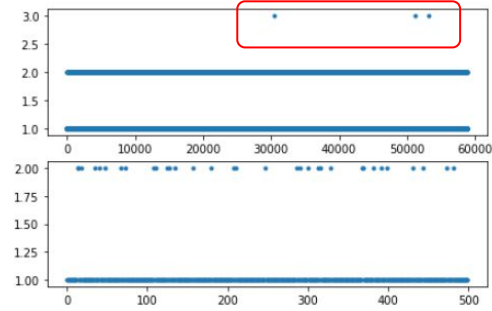
Medical_History_40



Medical_History_13



Medical_History_39



Medical_History_28

- **Comparisons - models:**

- SVM

validation set presicion: 0.32822955653850516
training set precision: 0.328189115074361

10 attributes

validation set presicion: 0.459906997845072
training set precision: 0.45301146940491205

5 attributes 

validation set presicion: 0.445956674605875
training set precision: 0.43687824015692867

3 attributes 

- Random forest



(49959, 35)

(8817, 35)

validation set presicion: 0.5353294771464217

35 attributes

(49959, 15)

(8817, 15)

validation set presicion: 0.5136667800839287

15 attributes 

(49959, 10)

(8817, 10)

validation set presicion: 0.47794034252013157

10 attributes 

- **Comparisons - models:**

- La distribution des étiquettes est différente :
 - Over-sampling - Under-sampling - Inchangé sur training set
(Évaluation sur un ensemble de test inchangé)

over-sampling:
SMOTE

```
xgboost0 0.544743109901327
xgboost1 0.5456504479981853
xgboost2 0.5461041170466145
xgboost3 0.5436089372802541
test set precision 4 models hard voting: 0.543949189066576
test set precision 5 models hard voting: 0.5453101962118635
```

under-sampling:
Random

```
xgboost0 0.4411931495973687
xgboost1 0.4417602359079052
xgboost2 0.43574912101621865
xgboost3 0.44414199841215835
test set precision 4 models hard voting: 0.4384711353067937
test set precision 5 models hard voting: 0.44085289781104686
```

Inchangé

```
xgboost0 0.5542701599183396
xgboost1 0.553249404559374
xgboost2 0.5485992968129749
xgboost3 0.5525689009867302
test set precision 4 models hard voting: 0.5557445843257344
test set precision 5 models hard voting: 0.554043325394125
```

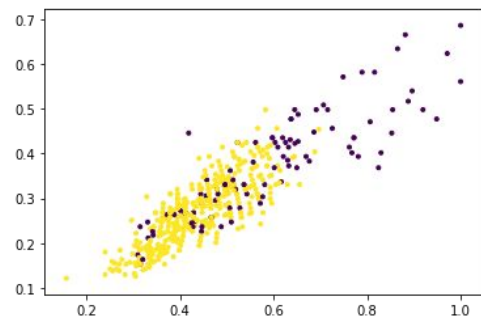
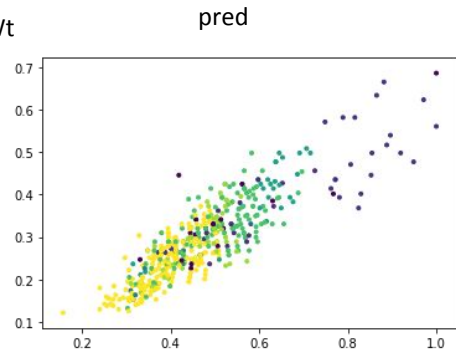
- **Resultat final:**

- La précision maximale sur l'ensemble de test (15% de données): 56%

	precision	recall	f1-score	support
1	0.47	0.27	0.35	923
2	0.48	0.25	0.33	972
3	0.36	0.05	0.09	151
4	0.38	0.13	0.19	213
5	0.62	0.56	0.59	807
6	0.43	0.56	0.49	1667
7	0.47	0.37	0.41	1190
8	0.66	0.88	0.76	2894
accuracy			0.56	8817
macro avg	0.48	0.38	0.40	8817
weighted avg	0.54	0.56	0.53	8817

- **Resultat final:**

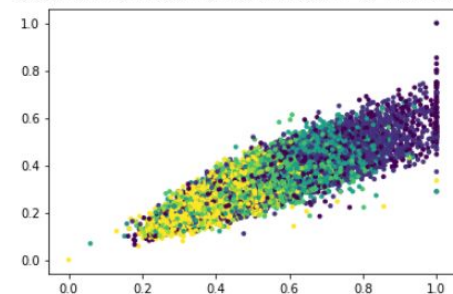
BMI - Wt



training

```
plt.scatter(data['BMI'][:,], data['Wt'][:,], c=y_data, mar
```

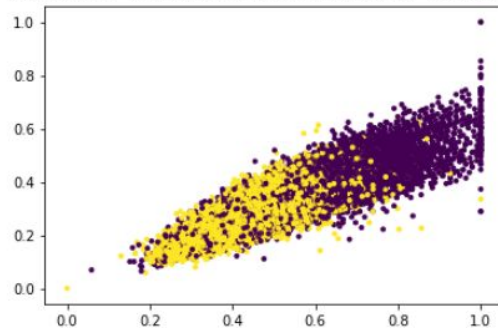
```
<matplotlib.collections.PathCollection at 0x7f9e8421
```



8 labels

```
plt.scatter(data['BMI'][:,], data['Wt'][:,], c=y_data2, mar
```

```
<matplotlib.collections.PathCollection at 0x7f9e842aa16
```

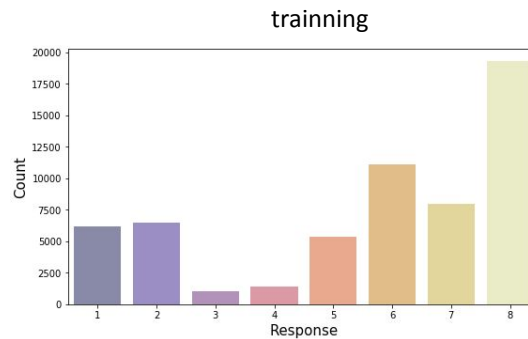
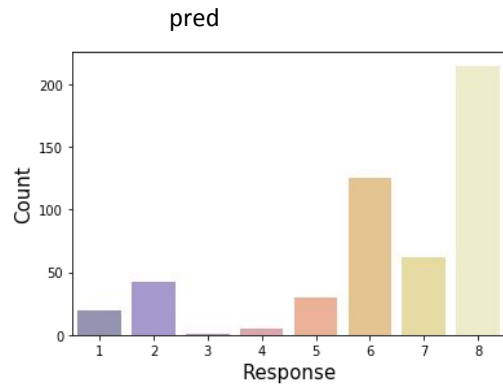


2 labels

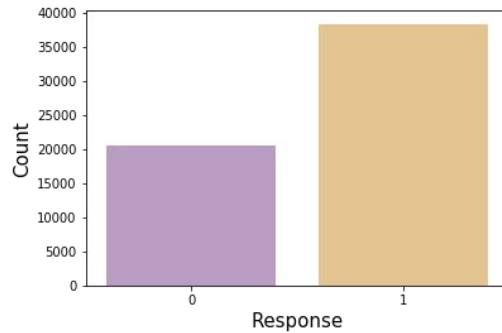
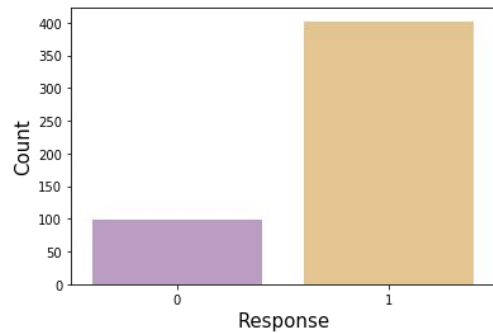
1-5: 0

6-8: 1

- Resultat final:



8 labels



2 labels

1-5: 0

6-8: 1

Exécution d'algorithmes sur le cloud AWS

- Installer du Python 3.7 sur l'instance EC2.
 - Installer du Python 3.7 sur l'instance EC2.

```
sudo yum install python3 -y
```

- Créer un environnement virtuel dans le répertoire de base ec2-user.

```
python3 -m venv my_app/env
```

- Activer l'environnement virtuel

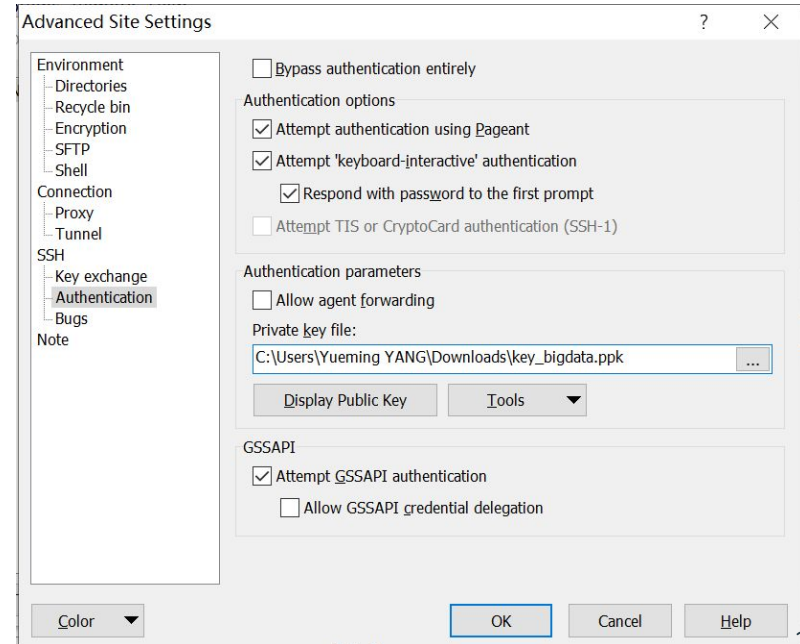
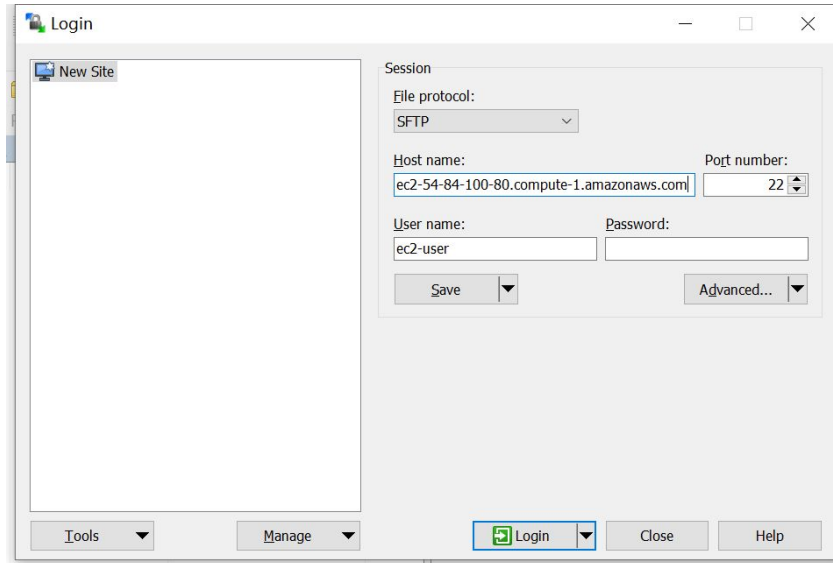
```
(python3) [ec2-user@ip-172-31-95-182 ~]$ python --version  
Python 3.7.4
```

```
source ~/my_app/env/bin/activate;
```

```
echo "source ${HOME}/my_app/env/bin/activate" >> ${HOME}/.bashrc;
```

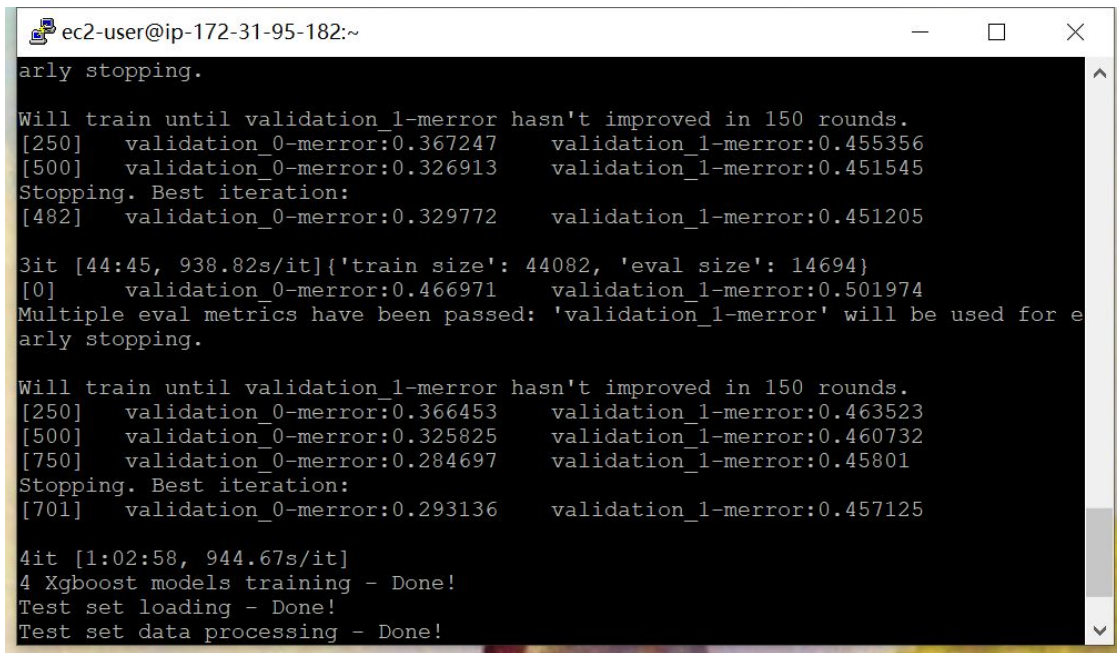
```
source ~/.bashrc
```

- Le transfert du fichier python de la machine locale vers l'instance EC2 : WinSCP
 - User Name : ec2-user
 - Host Name: le DNS public
 - Private Key File



- Exécution du fichier python par la commande:

python big_data_project.py



```
ec2-user@ip-172-31-95-182:~
arly stopping.

Will train until validation_1-merror hasn't improved in 150 rounds.
[250]   validation_0-merror:0.367247   validation_1-merror:0.455356
[500]   validation_0-merror:0.326913   validation_1-merror:0.451545
Stopping. Best iteration:
[482]   validation_0-merror:0.329772   validation_1-merror:0.451205

3it [44:45, 938.82s/it]{'train size': 44082, 'eval size': 14694}
[0]     validation_0-merror:0.466971   validation_1-merror:0.501974
Multiple eval metrics have been passed: 'validation_1-merror' will be used for e
arly stopping.

Will train until validation_1-merror hasn't improved in 150 rounds.
[250]   validation_0-merror:0.366453   validation_1-merror:0.463523
[500]   validation_0-merror:0.325825   validation_1-merror:0.460732
[750]   validation_0-merror:0.284697   validation_1-merror:0.45801
Stopping. Best iteration:
[701]   validation_0-merror:0.293136   validation_1-merror:0.457125

4it [1:02:58, 944.67s/it]
4 Xgboost models training - Done!
Test set loading - Done!
Test set data processing - Done!
```

Etape 4: Créer et sauvegarder le fichier résultats

```
X_test = pd.read_csv('predict.csv')
X_test['Response'] = pred
X_test.to_csv("submission.csv", index=False)
```



→ Création d'une bucket → Téléchargement du fichier.CSV

mybucket960324

Overview

Properties

Permissions

Management

Access points

🔍 Type a prefix and press Enter to search. Press ESC to clear.

📶 Upload

➕ Create folder

Download

Actions ▾

Versions

Hide

Show

US East (N. Virginia) 🔁

Viewing 1 to 1

☐ Name ▾

Last modified ▾

Size ▾

Storage class ▾


☐ 📄 submission.csv

Feb 14, 2020 2:20:44 PM
GMT+0100

172.3 KB

Standard

Etape 5: Recupération des données dans MongoDB

- Installer :  mongoDB.
- Transférer le fichier python de l'instance EC2 vers VM MongoDB avec la commande suivante:

```
scp -i /home/yym/Downloads/key_bigdata.pem  
ec2-user@ec2-54-84-100-80.compute-1.amazonaws.com:/home/ec2-user/predict.csv /home/yym/Downloads
```

Créer une base de données et une collection dans MongoDB

- Créer une base de données :

use bigdata



```
> show dbs
admin      0.000GB
bigdata    0.000GB
config     0.000GB
local      0.000GB
```

- Créer une collection :

db.createCollection(submission)



```
> show collections
myCollection
predict
submission
```

Importer le fichier csv dans MongoDB

Par la commande:

```
mongoimport --db bigdata --collection submission --type csv --headerline --file  
/home/yym/Downloads/submission.csv
```

```
yym@yym-VirtualBox:~/Downloads$ mongoimport --db bigdata --collection predict --  
type csv --headerline --file /home/yym/Downloads/predict.csv  
2020-02-13T15:57:59.251+0100    connected to: mongodb://localhost/  
2020-02-13T15:57:59.858+0100    500 document(s) imported successfully. 0 documen  
t(s) failed to import.
```


Pour ouvrir et voir le fichier dans MongoDB et dans l'outil GUI 'MongoDB Compass'

```
> db.submission.find().pretty()
{
  "_id" : ObjectId("5e469750bb666955a976cb72"),
  "Product_Info_1" : 1,
  "Product_Info_2" : "D4",
  "Product_Info_3" : 26,
  "Product_Info_4" : 0.230769231,
  "Product_Info_5" : 2,
  "Product_Info_6" : 1,
  "Product_Info_7" : 1,
  "Ins_Age" : 0.358208955,
  "Ht" : 0.709090909,
  "Wt" : 0.349372385,
  "BMI" : 0.569404716,
  "Employment_Info_1" : 0.075,
  "Employment_Info_2" : 9,
  "Employment_Info_3" : 1,
  "Employment_Info_4" : 0,
  "Employment_Info_5" : 2,
  "Employment_Info_6" : 0.4,
  "InsuredInfo_1" : 2,
  "InsuredInfo_2" : 2,
  "InsuredInfo_3" : 8,
  "InsuredInfo_4" : 3,
  "InsuredInfo_5" : 1,
  "InsuredInfo_6" : 1,
  "InsuredInfo_7" : "Male",
  "InsuredInfo_8" : "",
  "InsuredInfo_9" : "",
  "Insurance_History_1" : 2,
  "Insurance_History_2" : 1,
  "Insurance_History_3" : 1,
  "Insurance_History_4" : 3,
  "Insurance_History_5" : "",
  "Insurance_History_6" : 3,
  "Insurance_History_7" : 3,
  "Insurance_History_8" : 2,
  "Insurance_History_9" : 3,
  "Family_Hist_1" : 2,
  "Family_Hist_2" : 0.47826087,
  "Family_Hist_3" : "",
  "Family_Hist_4" : 0.549295775,
  "Family_Hist_5" : "",
  "Medical_History_1" : 7,
  "Medical_History_2" : 112,
  "Medical_History_3" : 2,
  "Medical_History_4" : 2,
  "Medical_History_5" : 1,
```

The screenshot shows the MongoDB Compass interface. On the left, the 'Local' sidebar lists the database 'bigdata' and its collections: 'admin', 'bigdata', 'myCollection', 'predict', 'submission', 'config', and 'local'. The 'bigdata' collection is selected. The main panel displays the 'bigdata.submission' collection with a list of documents. Each document has fields 'Medical_Keyword_32' through 'Medical_Keyword_48', all of which are set to 0. A red box highlights the 'Response: 0' field. Below the list, there is a 'HIDE 105 FIELDS' button. The bottom panel shows a detailed view of a document with the following fields: '_id: ObjectId("5e469750bb666955a976cb72")', 'Product_Info_1: 1', 'Product_Info_2: "D4"', 'Product_Info_3: 26', 'Product_Info_4: 1', 'Product_Info_5: 2', 'Product_Info_6: 3', 'Product_Info_7: 1', 'Ins_Age: 0.104477612', 'Ht: 0.830363636', 'Wt: 0.665271967', 'BMI: 0.8817620000000000', and 'Employment_Info_1: 0.075'.

Query dans MongoDB

```
> db.submission.find({Response:{$gte:6}})
{ "_id" : ObjectId("5e42b96419b819e1b2479017"), "Response" : 6 }
{ "_id" : ObjectId("5e42b96419b819e1b247901a"), "Response" : 6 }
{ "_id" : ObjectId("5e42b96419b819e1b247901b"), "Response" : 8 }
{ "_id" : ObjectId("5e42b96419b819e1b247901c"), "Response" : 7 }
{ "_id" : ObjectId("5e42b96419b819e1b247901d"), "Response" : 8 }
{ "_id" : ObjectId("5e42b96419b819e1b247901f"), "Response" : 6 }
{ "_id" : ObjectId("5e42b96419b819e1b2479020"), "Response" : 8 }
{ "_id" : ObjectId("5e42b96419b819e1b2479021"), "Response" : 6 }
{ "_id" : ObjectId("5e42b96419b819e1b2479022"), "Response" : 8 }
{ "_id" : ObjectId("5e42b96419b819e1b2479023"), "Response" : 8 }
{ "_id" : ObjectId("5e42b96419b819e1b2479024"), "Response" : 6 }
{ "_id" : ObjectId("5e42b96419b819e1b2479025"), "Response" : 8 }
{ "_id" : ObjectId("5e42b96419b819e1b2479026"), "Response" : 8 }
{ "_id" : ObjectId("5e42b96419b819e1b2479027"), "Response" : 8 }
{ "_id" : ObjectId("5e42b96419b819e1b2479028"), "Response" : 8 }
{ "_id" : ObjectId("5e42b96419b819e1b2479029"), "Response" : 6 }
{ "_id" : ObjectId("5e42b96419b819e1b247902a"), "Response" : 6 }
{ "_id" : ObjectId("5e42b96419b819e1b247902b"), "Response" : 8 }
{ "_id" : ObjectId("5e42b96419b819e1b247902c"), "Response" : 8 }
{ "_id" : ObjectId("5e42b96419b819e1b247902e"), "Response" : 8 }
Type "it" for more
quit()
```

Conclusion

- + Différentes disciplines intégrées
- Répartition inégale de la gravité spécifique de chaque partie

Merci pour votre attention