Projet Noté
Algorithmes Avancés

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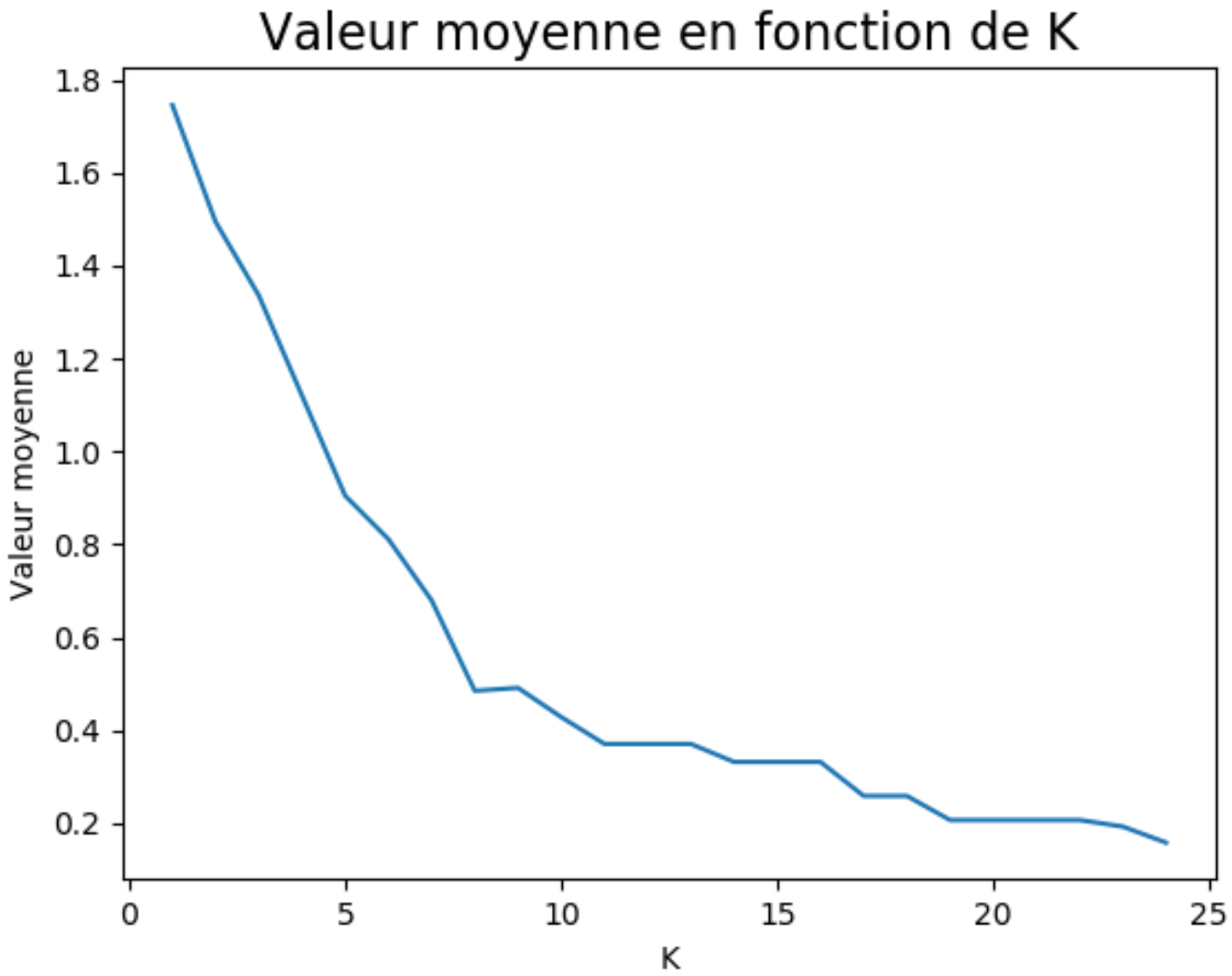
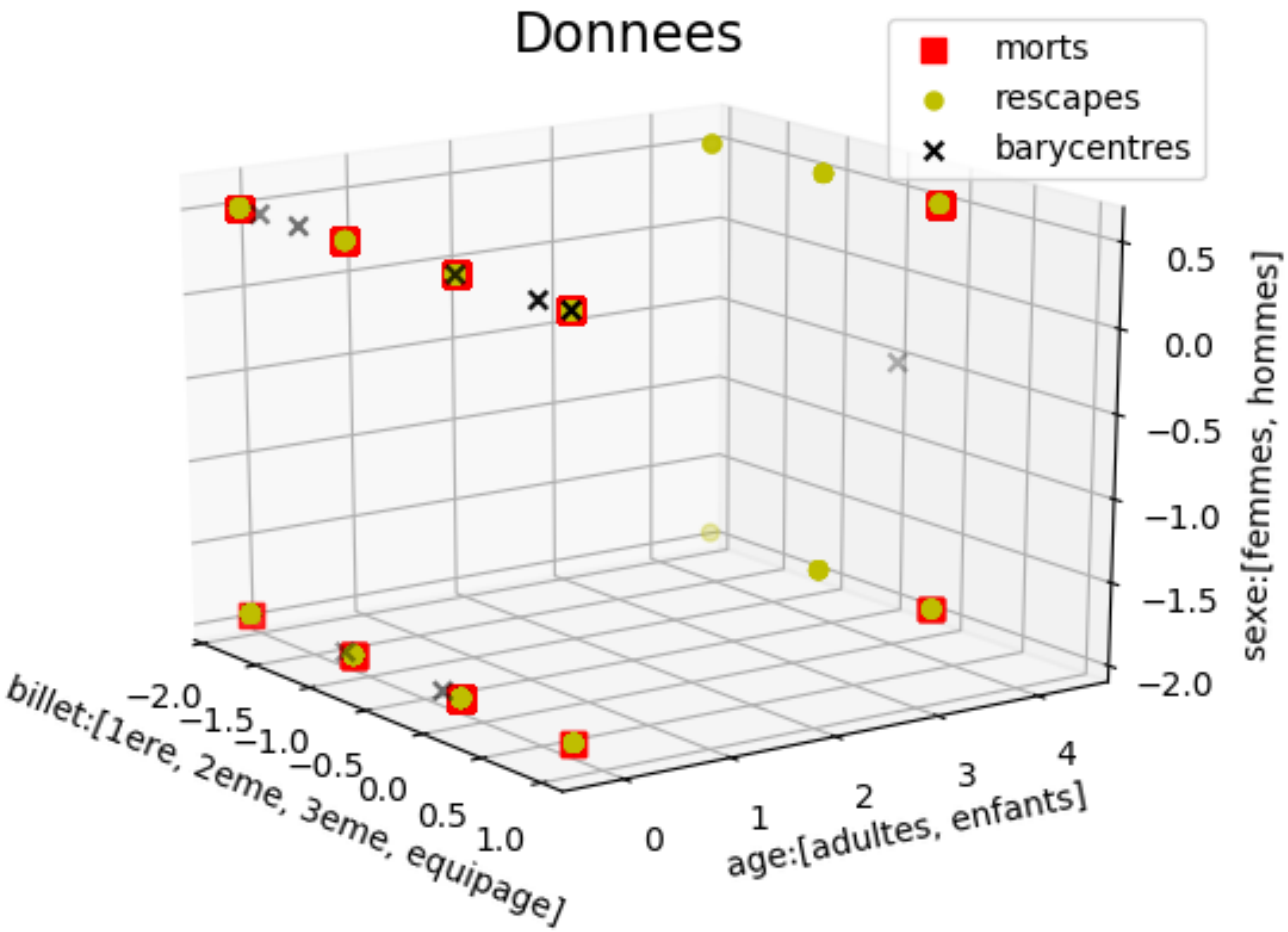
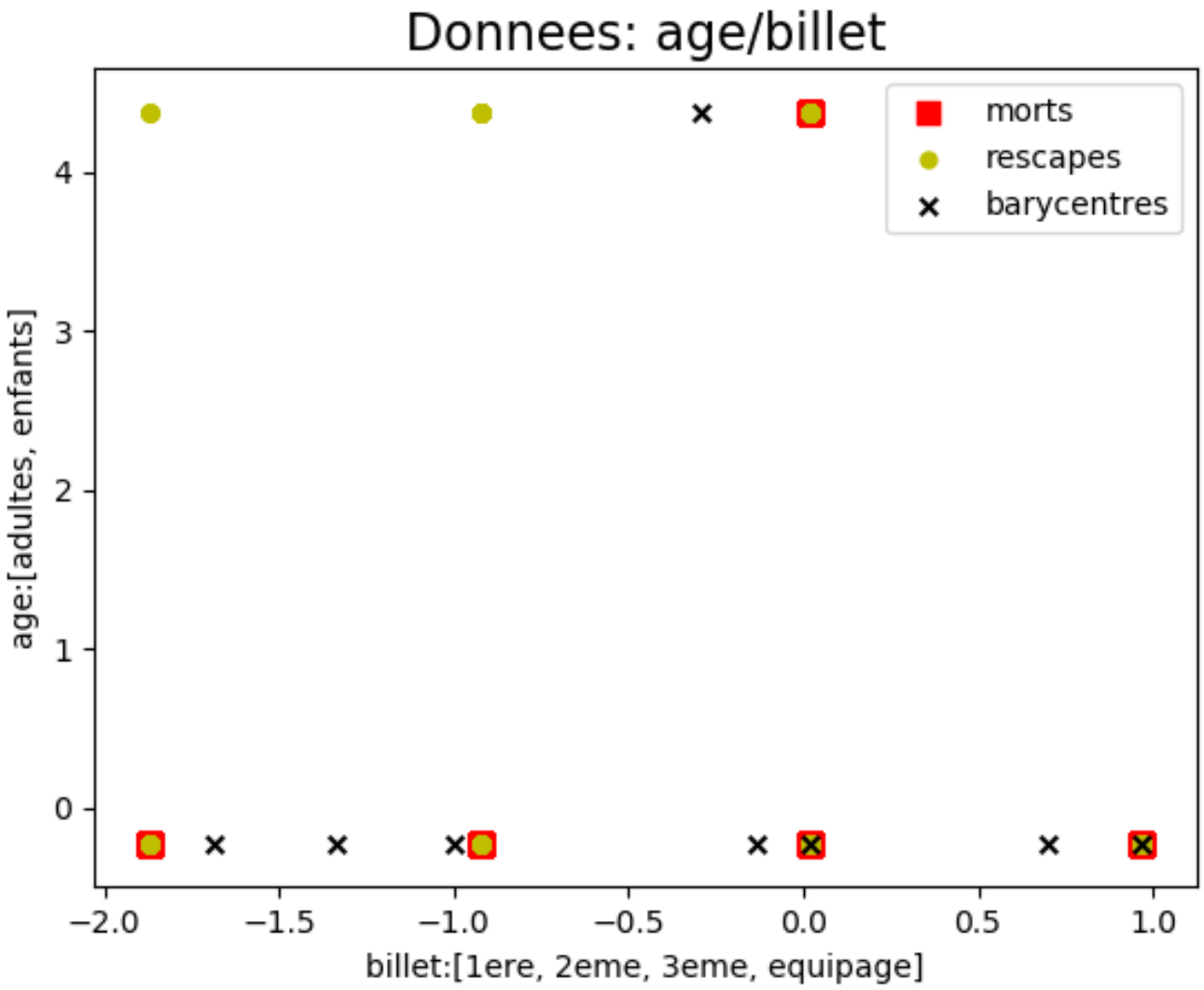
Titanic :

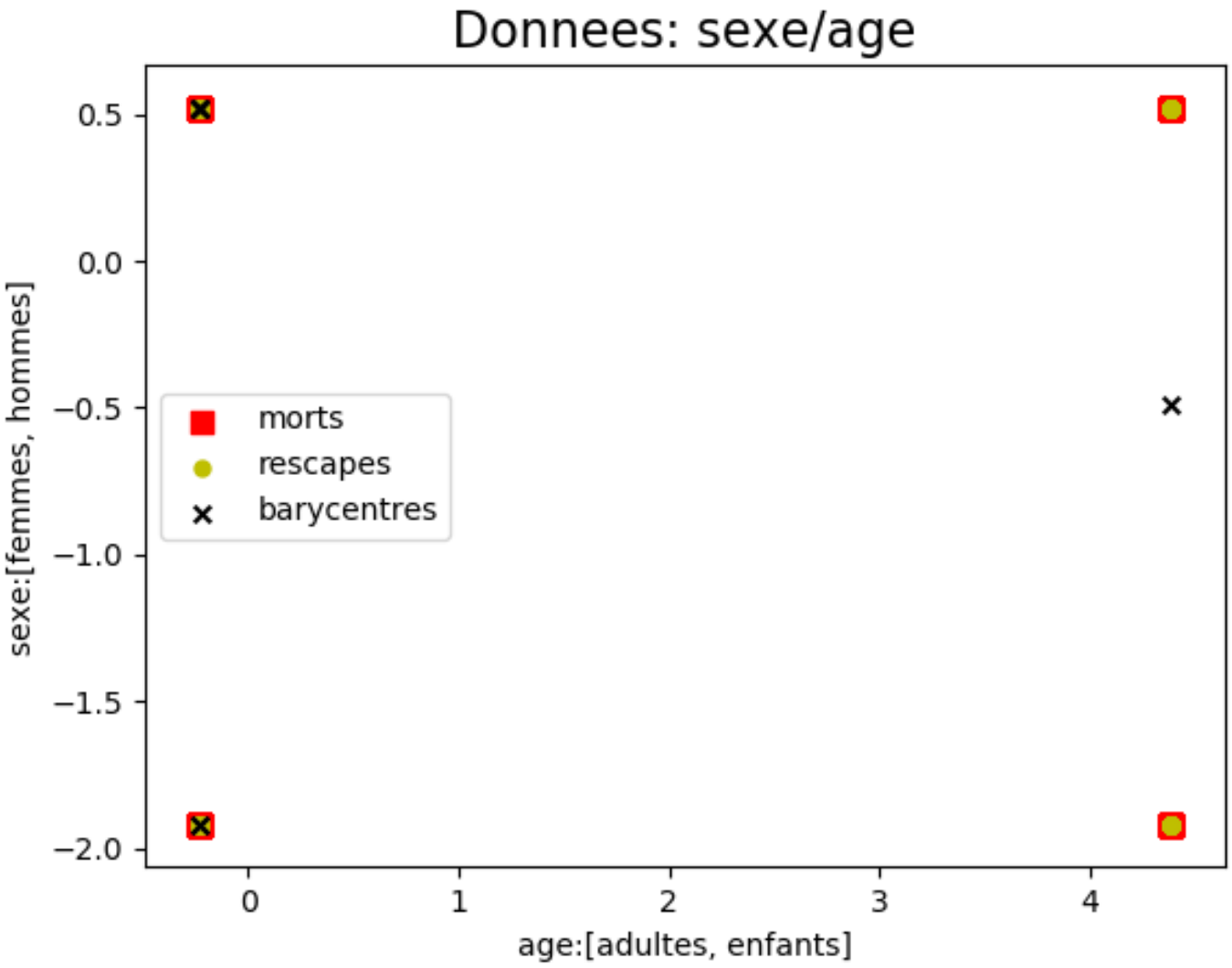
- Nombre de données : 2201
- Nombre de classes : 2 (Survived or Died)
- Dimensionalité : 3 (billet, âge, sexe)

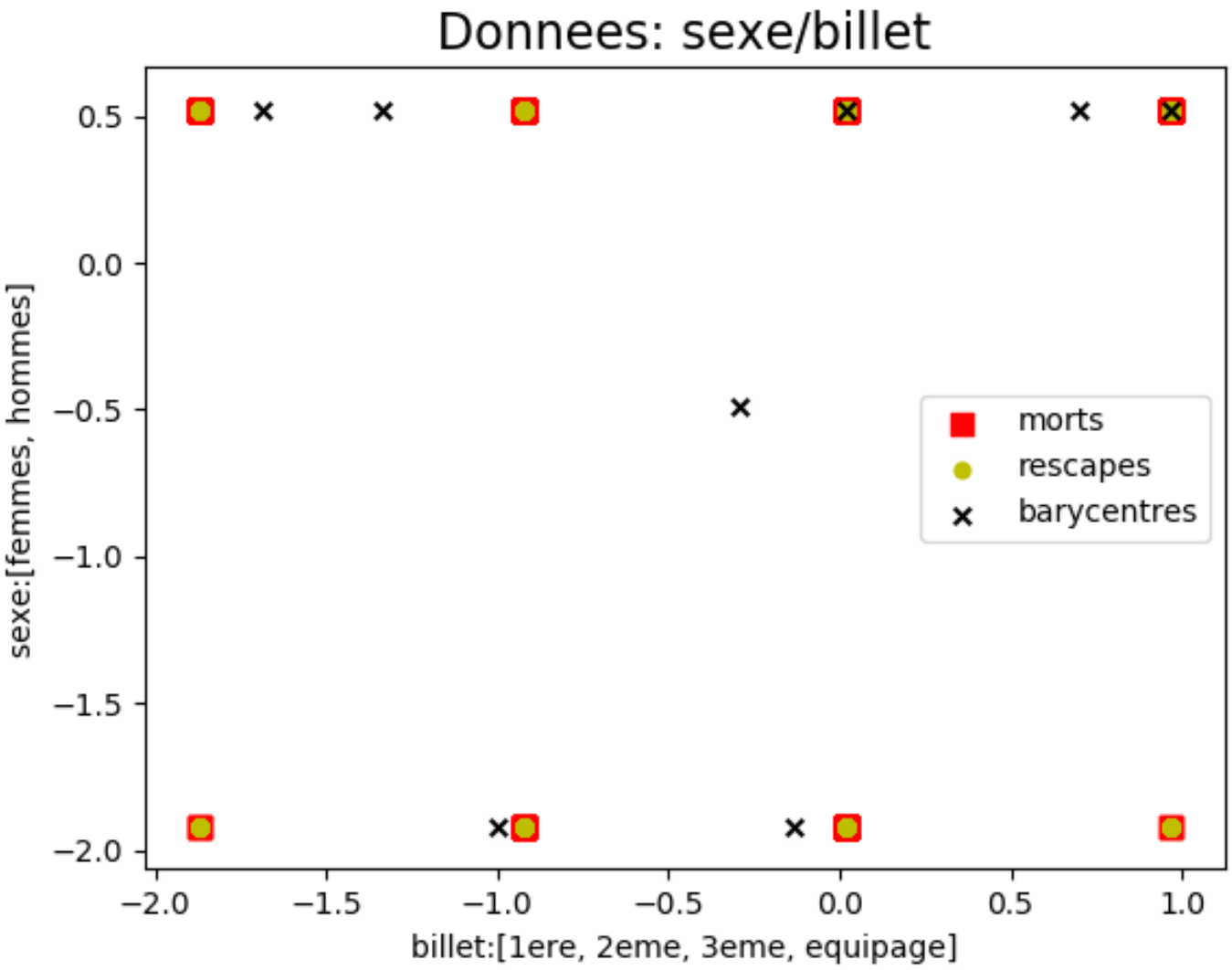
- `KMeans`
- Paramètres fixes : `init='random'`, `random_state=0`
- Paramètre variable : `n_clusters` nombre de clusters [1,25] avec un pas de 1


Valeur moyenne en fonction de K
Valeur moyenne
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0
5
10
15
20
25
K


Donnees
morts
rescapes
barycentres
billet:[1ere, 2eme, 3eme, equipage]
−2.0
−1.5
−1.0
−0.5
0.0
0.5
1.0
age:[adultes, enfants]
0
1
2
3
4
sexe:[femmes, hommes]
0.5
0.0
−0.5
−1.0
−1.5
−2.0


Donnees: age/billet
morts
rescapes
barycentres
age:[adultes, enfants]
billet:[1ere, 2eme, 3eme, equipage]
0
1
2
3
4
−2.0
−1.5
−1.0
−0.5
0.0
0.5
1.0


Donnees: sexe/age
sexe:[femmes, hommes]
age:[adultes, enfants]
morts
rescapes
barycentres
0.5
0.0
−0.5
−1.0
−1.5
−2.0
0
1
2
3
4


Donnees: sexe/billet
sexe:[femmes, hommes]
billet:[1ere, 2eme, 3eme, equipage]
morts
rescapes
barycentres
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.0
−1.5
−1.0
−0.5
0.0
0.5
1.0

Cancer du sein du Wisconsin :

- Nombre de données : 569
- Nombre de classes : 2 (Malignant or Benign)
- Dimensionalité : 30

Vin :

- Nombre de données : 178
- Nombre de classes : 3
- Dimensionalité : 13

Le programme se passe en 4 boucles intriquées :

1. Pour chacun des datasets
2. Pour chacun des classificateurs
3. Pour chacun des paramètres
4. Pour chacune des étapes de la validation croisée

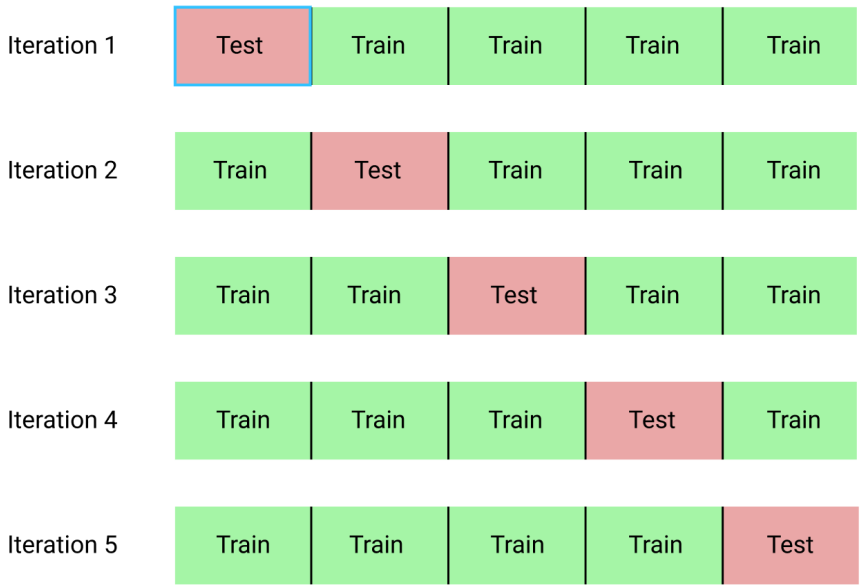
- `KNeighborsClassifier`
- Paramètre variable : `n_neighbors` nombre de voisins pris en compte : [1,51] avec un pas de 5

- `DecisionTreeClassifier`
- Paramètre variable : `min_samples_leaf` Nombre d'objets à partir duquel on comptabilise une feuille [2, 52] avec un pas de 5

- `MLPClassifier`
- Paramètres fixes : `solver='sgd'`, `activation='logistic'`, `max_iter=1000`, `verbose=False`, `learning_rate_init=0.1`, `tol=0.`, `early_stopping=True`
- Paramètre variable : `hidden_layer_sizes=(nodes,)` donc une couche et nodes varie entre 2 et 20 par pas de 3.

- `MLPClassifier`
- Paramètres fixes : `solver='adam'`, `activation='logistic'`, `max_iter=1000`, `verbose=False`, `learning_rate_init=0.1`, `tol=0.`, `early_stopping=True`
- Paramètre variable : `hidden_layer_sizes=(nodes,)` donc une couche et nodes varie entre 2 et 20 par pas de 3.

- `MLPClassifier`
- Paramètres fixes : `solver='adam'`, `activation='logistic'`, `max_iter=1000`, `verbose=False`, `learning_rate_init=0.1`, `tol=0.`, `early_stopping=True`
- Paramètre variable : `hidden_layer_sizes=(nodes, 5)` donc deux couches et nodes varie entre 2 et 20 par pas de 3.



Utilisation de

```
RepeatedKFold(n_splits=5, n_repeats=10, random_state=None)
```

```
Breast Cancer data of size 569 :
KNeighborsClassifier
        mean is 0.9156607528475251 with 0.005261918472447842 as standard deviation.
        Worked for 58.37147793300028 seconds
DecisionTreeClassifier
        mean is 0.918515193857532 with 0.007526398539306361 as standard deviation.
        Worked for 1.9232283050005208 seconds
MLPClassifier one layer sgd_solver
        mean is 0.727365574703721 with 0.012868801670619141 as standard deviation.
        Worked for 29.68843971000024 seconds
MLPClassifier one layer adam_solver
        mean is 0.8277927857993066 with 0.01944967972932608 as standard deviation.
        Worked for 6.480671232000532 seconds
MLPClassifier two layers, second layer 5 nodes, sgd_solver
        mean is 0.7151894115820524 with 0.017601386032980122 as standard deviation.
        Worked for 204.33885359600026 seconds
MLPClassifier two layers, second layer 5 nodes, adam_solver
        mean is 0.8806233504114266 with 0.007611351937622535 as standard deviation.
        Worked for 19.824140925999927 seconds
```

```
Wine data of size 178 :
KNeighborsClassifier
        mean is 0.7270447330447332 with 0.05395925687595904 as standard deviation.
        Worked for 58.24855370300065 seconds
DecisionTreeClassifier
        mean is 0.8258658008658007 with 0.06566382345753549 as standard deviation.
        Worked for 0.2911996069997258 seconds
MLPClassifier one layer sgd_solver
        mean is 0.511431216931217 with 0.013653796940041013 as standard deviation.
        Worked for 52.15133309700013 seconds
MLPClassifier one layer adam_solver
        mean is 0.46363756613756607 with 0.04200778922986875 as standard deviation.
        Worked for 4.492833305000204 seconds
MLPClassifier two layers, second layer 5 nodes, sgd_solver
        mean is 0.37066137566137564 with 0.013903555873703817 as standard deviation.
        Worked for 113.28683143299986 seconds
MLPClassifier two layers, second layer 5 nodes, adam_solver
        mean is 0.49454232804232806 with 0.011857834905633243 as standard deviation.
        Worked for 7.685992364000413 seconds
```

- Echantillonnage plus grand (569 vs 178) $\Rightarrow$ meilleurs résultats
  - score moyen général : 0.830857845 vs 0.565530503
  - écart-type moyen général : 0.011719923 vs 0.033507676
- Moins échantillon $\Rightarrow$ plus rapide
- Plus lent $\not\Rightarrow$ meilleurs résultats

Letter Image Recognition Data [1]

- Nombre de données : 20000
- Nombre de classes : 26 (1 par lettre)
- Dimensionalité : 16

1. https://archive.ics.uci.edu/ml/datasets/Letter+Recognition

- Transformation de lettres vers numéro
- import des données avec `numpy.genfromtxt()`
- Reprise du travail de la partie 2

```
KNeighborsClassifier
        mean is 0.9203122727272728 with 0.020939017447170083 as standard deviation.
        Worked for 360.20789452599956 seconds
DecisionTreeClassifier
        mean is 0.733379090909091 with 0.04240275735128243 as standard deviation.
        Worked for 174.38097832700032 seconds
MLPClassifier one layer sgd_solver
        mean is 0.5157916666666665 with 0.17533825530163752 as standard deviation.
        Worked for 700.9990525189996 seconds
MLPClassifier one layer adam_solver
        mean is 0.6683058333333333 with 0.16247980283245123 as standard deviation.
        Worked for 254.53706921899993 seconds
MLPClassifier two layers, second layer 5 nodes, sgd_solver
        mean is 0.039465 with 0.0011532309684823187 as standard deviation.
        Worked for 102.64895842199985 seconds
MLPClassifier two layers, second layer 5 nodes, adam_solver
        mean is 0.319565 with 0.07064751617478612 as standard deviation.
        Worked for 232.7630711769998 seconds
```

- Résultats beaucoup plus variables
- Perceptron travaille longtemps pour un résultat pas très probant ($\sim$0.66)
- Arbre de décision ($\sim$0.73)
- K-plus proches voisins ($\sim$0.92)