**Rapport Avancement**

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Introduction

Dans ce bref rapport d’avancement, il est question de comparer l’aptitude de plusieurs modèles de risques, dont le modèle empirique avec différentes combinaison entre Qi (indicateurs de qualité intrinsèques) et métrique Orienté Objets, à prédire dans un premier temps l’existence de faute puis le niveau de sévérité des fautes si permis au cours de cette étude.

Présentation des Données

Dans le format d’un fichier Excel, nous disposons de données sur le système ANT ou chaque classe est décrite avec le nombre de bugs qu’elle contient, leur sévérité qui peut être soit : bloquante, critique, majeur, normal, mineur ou bien trivial. En suite dans ce qui nous intéresse le différente combinaison entre Qi (indicateurs de qualité intrinsèques) et combinaison d’autres métriques OO : d(LOC, FANIN), d(LOC, FANIN), d(WMC, FANIN) , d(WMC, CBO), d(Qi, CBO), d(LOC, CBO), d(LOC, Ce), d(LOC, Ca), d(WMC, Ce) et enfin d(WMC, Ca).

Le tableau suivant décrit les différents systèmes Ant utilisés et met en évidence le nombre de classes, nombre de classes fautives ainsi que le ratio des classes fautives.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***Système*** | ***#Classes*** | ***#Fautives*** | ***%Fautives*** | ***#ClassesD*** | ***#FautivesD*** | ***%FautivesD*** |
| Ant13 | 126 | 60 | 47.62% | 201 | 135 | 67.16% |
| Ant14 | 178 | 38 | 21.35% | 190 | 50 | 26.21% |
| Ant15 | 293 | 106 | 36.62% | 366 | 179 | 48.91% |
| Ant16 | 352 | 45 | 12.78% | 368 | 61 | 16.58% |
| Ant17 | 675 | 70 | 10.37% | 776 | 101 | 13.01% |

On constate que le ratio du nombre des classes fautives est très faible pour les deux derniers systèmes. Ce qui rend le problème de prédiction des classes fautives d’autant plus difficiles pour ces deux cas en particulier.

Hypothèse

H0 : Un des modèles citées précédemment peut permettre de prédire l’existence de fautes dans

une classe logicielle.

H1 : Une imbrication de modèles citées précédemment peut permettre de prédire l’existence

de fautes dans une classe logicielle.

H2 : Un des modèles citées précédemment peut permettre de prédire l’existence de fautes de

sévérité : élevé, normal ou faible dans une classe logicielle.

H3 : Une imbrication de modèles citées précédemment peut permettre de prédire l’existence

de fautes sévérité : élevé, normal ou faible dans une classe logicielle.

Pré-Processing

En termes de prétraitements des données les opérations suivantes ont été effectuées sur l’ensemble des données sur les différents systèmes ANT :

* Binarisation du nombre de fautes d’une classe  dans un nouvel attribut appelé *‘BugsBinary’*: i.e. 0 veut dire absence de faute et 1 veut dire présence d’une ou plusieurs fautes. En effet, on remarque que le nombre de classes qui comportent plus d’une faute n’est pas très significatif par conséquent on a préféré ignorer la prédiction du nombre exacte du nombre de faute d’une classe qui demeure encore hors de portée.
* Regroupement des fautes de sévérités Blocker, critical et major pour former les fautes de sévérité élevée. Normal seul pour former les fautes de sévérité normale. Minor et trivial pour former les fautes de sévérité faible.
* Par soucis de compatibilité lors de l’utilisation de certains algorithmes de Machines Learning, le filtre de transformation en type nominal a été appliqué sur l’attribut classe à prédire *‘Severity*.
* Dans le but d’améliorer les résultats de la prédiction une normalisation a été effectuée sur les modèles pour aboutir à des valeurs comprises dans l’intervalle [-1, 1].
* Nous explorons également l’apport de technique de stratification tel l’oversampling en appliquant le filtre Smote et la duplication des classes fautives.

Comparaison entre Différentes Approches

1. Existence de Faute :

Les tableaux suivants décrivent les résultats du taux de classification des algorithmes utilisés accompagné de leur accuracy et g-means respectifs. Naïve Bayes, la régression logistique, SVM, ANN (Multi-layer Perception), J48 et Random Forest pour les arbres de décisions en s’aidant de différentes combinaisons des modèles avec une 10 cross-validation ont été appliqué sur différentes versions du système ANT.

***Modèle d (LOC, Ca) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes | 0.754 | 0.567 | 0.924 | 0.731 | 0.796 | 0.741 | 0.909 | **0.821** |
| J48 | 0.754 | 0.733 | 0.773 | 0.753 | 0.811 | 0.852 | 0.727 | 0.787 |
| Random Forest | 0.651 | 0.633 | 0.667 | 0.650 | 0.836 | 0.919 | 0.667 | 0.783 |
| Régression Logistique | 0.746 | 0.667 | 0.818 | 0.739 | 0.821 | 0.837 | 0.788 | 0.812 |
| SVM | 0.690 | 0.400 | 0.955 | 0.618 | 0.687 | 1.000 | 0.045 | 0.212 |
| ANN | 0.778 | 0.733 | 0.818 | **0.774** | 0.826 | 0.881 | 0.712 | 0.792 |
| **ANT 14** | Naïve Bayes | 0.809 | 0.211 | 0.971 | 0.453 | 0.784 | 0.340 | 0.943 | 0.566 |
| J48 | 0.742 | 0.079 | 0.921 | 0.27 | 0.737 | 0.400 | 0.857 | 0.585 |
| Random Forest | 0.708 | 0.316 | 0.814 | *0.507* | 0.763 | 0.560 | 0.836 | **0.684** |
| Régression Logistique | 0.803 | 0.184 | 0.971 | 0.423 | 0.774 | 0.260 | 0.957 | 0.499 |
| SVM | 0.787 | 0.000 | 1.000 | 0.000 | 0.768 | 0.200 | 0.971 | 0.441 |
| ANN | 0.787 | 0.263 | 0.929 | 0.494 | 0.768 | 0.440 | 0.886 | 0.624 |
| **ANT 15** | Naïve Bayes | 0.686 | 0.226 | 0.947 | 0.463 | 0.697 | 0.464 | 0.920 | 0.653 |
| J48 | 0.700 | 0.708 | 0.695 | **0.701** | 0.768 | 0.765 | 0.770 | 0.767 |
| Random Forest | 0.669 | 0.519 | 0.754 | 0.626 | 0.768 | 0.799 | 0.738 | **0.768** |
| Régression Logistique | 0.696 | 0.292 | 0.925 | 0.52 | 0.740 | 0.615 | 0.861 | 0.728 |
| SVM | 0.652 | 0.075 | 0.979 | 0.271 | 0.683 | 0.436 | 0.920 | 0.633 |
| ANN | 0.727 | 0.585 | 0.807 | 0.687 | 0.765 | 0.754 | 0.775 | 0.764 |
| ANT 16 | Naïve Bayes | 0.858 | 0.111 | 0.967 | 0.328 | 0.823 | 0.131 | 0.961 | 0.355 |
| J48 | 0.872 | 0.000 | 1.000 | 0.000 | 0.834 | 0.000 | 1.000 | 0.000 |
| Random Forest | 0.798 | 0.267 | 0.876 | *0.484* | 0.821 | 0.557 | 0.873 | **0.697** |
| Régression Logistique | 0.864 | 0.044 | 0.984 | 0.208 | 0.834 | 0.115 | 0.977 | 0.335 |
| SVM | 0.872 | 0.000 | 1.000 | 0.000 | 0.834 | 0.000 | 1.000 | 0.000 |
| ANN | 0.872 | 0.000 | 1.000 | 0.000 | 0.823 | 0.049 | 0.977 | 0.219 |
| ANT 17 | Naïve Bayes | 0.899 | 0.229 | 0.969 | *0.471* | 0.887 | 0.366 | 0.964 | 0.594 |
| J48 | 0.905 | 0.000 | 0.999 | 0.000 | 0.896 | 0.248 | 0.993 | 0.496 |
| Random Forest | 0.854 | 0.200 | 0.921 | 0.429 | 0.852 | 0.465 | 0.910 | **0.650** |
| Régression Logistique | 0.911 | 0.143 | 0.991 | 0.376 | 0.889 | 0.248 | 0.985 | 0.494 |
| SVM | 0.906 | 0.000 | 1.000 | 0.000 | 0.876 | 0.089 | 0.994 | 0.297 |
| ANN | 0.905 | 0.014 | 0.997 | 0.118 | 0.889 | 0.347 | 0.970 | 0.580 |

***Modèle d (LOC, Cbo) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes | 0.754 | 0.567 | 0.924 | 0.724 | 0.791 | 0.807 | 0.758 | 0.782 |
| J48 | 0.754 | 0.733 | 0.773 | 0.753 | 0.811 | 0.852 | 0.727 | 0.787 |
| Random Forest | 0.659 | 0.633 | 0.682 | 0.657 | 0.841 | 0.919 | 0.682 | 0.792 |
| Régression Logistique | 0.746 | 0.667 | 0.818 | 0.739 | 0.821 | 0.837 | 0.788 | **0.812** |
| SVM | 0.690 | 0.400 | 0.955 | 0.618 | 0.687 | 1.000 | 0.045 | 0.212 |
| ANN | 0.778 | 0.733 | 0.818 | **0.774** | 0.826 | 0.881 | 0.712 | 0.792 |
| **ANT 14** | Naïve Bayes | 0.815 | 0.237 | 0.971 | 0.480 | 0.784 | 0.340 | 0.943 | 0.566 |
| J48 | 0.747 | 0.053 | 0.936 | 0.223 | 0.753 | 0.480 | 0.850 | 0.639 |
| Random Forest | 0.697 | 0.316 | 0.800 | *0.503* | 0.742 | 0.560 | 0.807 | **0.672** |
| Régression Logistique | 0.803 | 0.184 | 0.971 | 0.423 | 0.774 | 0.260 | 0.957 | 0.499 |
| SVM | 0.787 | 0.000 | 1.000 | 0.000 | 0.768 | 0.200 | 0.971 | 0.441 |
| ANN | 0.792 | 0.289 | 0.929 | 0.518 | 0.768 | 0.440 | 0.886 | 0.624 |
| **ANT 15** | Naïve Bayes | 0.686 | 0.226 | 0.947 | 0.463 | 0.697 | 0.464 | 0.920 | 0.653 |
| J48 | 0.700 | 0.708 | 0.695 | **0.701** | 0.768 | 0.765 | 0.770 | **0.767** |
| Random Forest | 0.652 | 0.509 | 0.733 | 0.611 | 0.765 | 0.804 | 0.727 | 0.765 |
| Régression Logistique | 0.696 | 0.292 | 0.925 | 0.520 | 0.740 | 0.615 | 0.861 | 0.728 |
| SVM | 0.652 | 0.075 | 0.979 | 0.271 | 0.686 | 0.441 | 0.920 | 0.637 |
| ANN | 0.727 | 0.585 | 0.807 | 0.687 | 0.765 | 0.754 | 0.775 | 0.764 |
| ANT 16 | Naïve Bayes | 0.858 | 0.111 | 0.967 | 0.328 | 0.823 | 0.131 | 0.961 | 0.355 |
| J48 | 0.872 | 0.000 | 1.000 | 0.000 | 0.834 | 0.000 | 1.000 | 0.000 |
| Random Forest | 0.798 | 0.267 | 0.876 | *0.484* | 0.823 | 0.557 | 0.876 | **0.699** |
| Régression Logistique | 0.864 | 0.044 | 0.984 | 0.208 | 0.834 | 0.115 | 0.977 | 0.335 |
| SVM | 0.872 | 0.000 | 1.000 | 0.000 | 0.834 | 0.000 | 1.000 | 0.000 |
| ANN | 0.872 | 0.000 | 1.000 | 0.000 | 0.823 | 0.049 | 0.977 | 0.219 |
| ANT 17 | Naïve Bayes | 0.899 | 0.229 | 0.969 | *0.471* | 0.887 | 0.366 | 0.964 | 0.594 |
| J48 | 0.905 | 0.000 | 0.999 | 0.000 | 0.896 | 0.248 | 0.993 | 0.496 |
| Random Forest | 0.846 | 0.214 | 0.911 | 0.442 | 0.856 | 0.535 | 0.904 | **0.695** |
| Régression Logistique | 0.911 | 0.143 | 0.991 | 0.376 | 0.889 | 0.248 | 0.985 | 0.494 |
| SVM | 0.906 | 0.000 | 1.000 | 0.000 | 0.875 | 0.089 | 0.993 | 0.297 |
| ANN | 0.905 | 0.014 | 0.997 | 0.118 | 0.889 | 0.347 | 0.970 | 0.580 |

***Modèle d (LOC, Ce) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes | 0.754 | 0.567 | 0.924 | 0.724 | 0.796 | 0.741 | 0.909 | **0.821** |
| J48 | 0.746 | 0.733 | 0.758 | 0.745 | 0.811 | 0.852 | 0.727 | 0.787 |
| Random Forest | 0.611 | 0.617 | 0.606 | 0.611 | 0.826 | 0.919 | 0.636 | 0.765 |
| Régression Logistique | 0.746 | 0.667 | 0.818 | 0.739 | 0.821 | 0.837 | 0.788 | 0.812 |
| SVM | 0.690 | 0.400 | 0.955 | 0.618 | 0.692 | 1.000 | 0.061 | 0.247 |
| ANN | 0.778 | 0.733 | 0.818 | **0.774** | 0.826 | 0.881 | 0.712 | 0.792 |
| **ANT 14** | Naïve Bayes | 0.815 | 0.237 | 0.971 | 0.480 | 0.784 | 0.340 | 0.943 | 0.566 |
| J48 | 0.747 | 0.053 | 0.936 | 0.223 | 0.753 | 0.480 | 0.850 | 0.639 |
| Random Forest | 0.708 | 0.342 | 0.807 | *0.525* | 0.753 | 0.580 | 0.814 | **0.687** |
| Régression Logistique | 0.803 | 0.184 | 0.971 | 0.423 | 0.779 | 0.260 | 0.964 | 0.501 |
| SVM | 0.787 | 0.000 | 1.000 | 0.000 | 0.763 | 0.180 | 0.971 | 0.418 |
| ANN | 0.787 | 0.263 | 0.929 | 0.494 | 0.768 | 0.440 | 0.886 | 0.624 |
| **ANT 15** | Naïve Bayes | 0.686 | 0.226 | 0.947 | 0.463 | 0.697 | 0.469 | 0.914 | 0.655 |
| J48 | 0.686 | 0.708 | 0.674 | **0.701** | 0.770 | 0.771 | 0.770 | **0.770** |
| Random Forest | 0.638 | 0.500 | 0.717 | 0.611 | 0.757 | 0.799 | 0.717 | 0.757 |
| Régression Logistique | 0.693 | 0.283 | 0.925 | 0.520 | 0.740 | 0.615 | 0.861 | 0.728 |
| SVM | 0.648 | 0.066 | 0.979 | 0.271 | 0.678 | 0.419 | 0.925 | 0.623 |
| ANN | 0.727 | 0.585 | 0.807 | 0.687 | 0.765 | 0.754 | 0.775 | 0.764 |
| ANT 16 | Naïve Bayes | 0.861 | 0.111 | 0.971 | 0.328 | 0.826 | 0.131 | 0.964 | 0.355 |
| J48 | 0.872 | 0.000 | 1.000 | 0.000 | 0.834 | 0.000 | 1.000 | 0.000 |
| Random Forest | 0.804 | 0.244 | 0.886 | *0.465* | 0.829 | 0.541 | 0.886 | **0.692** |
| Régression Logistique | 0.861 | 0.022 | 0.984 | 0.147 | 0.832 | 0.098 | 0.977 | 0.309 |
| SVM | 0.872 | 0.000 | 1.000 | 0.000 | 0.834 | 0.000 | 1.000 | 0.000 |
| ANN | 0.872 | 0.000 | 1.000 | 0.000 | 0.826 | 0.049 | 0.980 | 0.219 |
| ANT 17 | Naïve Bayes | 0.898 | 0.214 | 0.969 | *0.455* | 0.888 | 0.356 | 0.967 | 0.587 |
| J48 | 0.905 | 0.000 | 0.995 | 0.000 | 0.896 | 0.248 | 0.993 | 0.496 |
| Random Forest | 0.851 | 0.200 | 0.919 | 0.429 | 0.856 | 0.505 | 0.908 | **0.677** |
| Régression Logistique | 0.911 | 0.143 | 0.991 | 0.376 | 0.890 | 0.248 | 0.987 | 0.495 |
| SVM | 0.906 | 0.000 | 1.000 | 0.000 | 0.875 | 0.069 | 0.996 | 0.262 |
| ANN | 0.905 | 0.014 | 0.997 | 0.118 | 0.889 | 0.347 | 0.970 | 0.580 |

***Modèle d (LOC, FANIN) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes | 0.746 | 0.733 | 0.758 | 0.745 | 0.796 | 0.741 | 0.909 | **0.821** |
| J48 | 0.754 | 0.733 | 0.773 | 0.753 | 0.811 | 0.852 | 0.727 | 0.787 |
| Random Forest | 0.659 | 0.633 | 0.682 | 0.657 | 0.841 | 0.919 | 0.682 | 0.792 |
| Régression Logistique | 0.746 | 0.667 | 0.818 | 0.739 | 0.821 | 0.837 | 0.788 | 0.812 |
| SVM | 0.690 | 0.400 | 0.955 | 0.618 | 0.692 | 0.993 | 0.076 | 0.275 |
| ANN | 0.778 | 0.733 | 0.818 | **0.774** | 0.826 | 0.881 | 0.712 | 0.792 |
| **ANT 14** | Naïve Bayes | 0.815 | 0.237 | 0.971 | 0.480 | 0.784 | 0.340 | 0.943 | 0.566 |
| J48 | 0.747 | 0.053 | 0.936 | 0.223 | 0.753 | 0.480 | 0.850 | 0.639 |
| Random Forest | 0.697 | 0.289 | 0.807 | *0.525* | 0.753 | 0.560 | 0.821 | **0.678** |
| Régression Logistique | 0.803 | 0.184 | 0.971 | 0.423 | 0.774 | 0.260 | 0.957 | 0.499 |
| SVM | 0.787 | 0.000 | 1.000 | 0.000 | 0.774 | 0.220 | 0.971 | 0.462 |
| ANN | 0.781 | 0.263 | 0.921 | 0.494 | 0.768 | 0.440 | 0.886 | 0.624 |
| **ANT 15** | Naïve Bayes | 0.686 | 0.226 | 0.947 | 0.463 | 0.694 | 0.464 | 0.914 | 0.651 |
| J48 | 0.686 | 0.708 | 0.674 | **0.691** | 0.768 | 0.765 | 0.770 | **0.767** |
| Random Forest | 0.655 | 0.528 | 0.727 | 0.620 | 0.762 | 0.810 | 0.717 | 0.762 |
| Régression Logistique | 0.696 | 0.292 | 0.925 | 0.520 | 0.740 | 0.615 | 0.861 | 0.728 |
| SVM | 0.652 | 0.075 | 0.979 | 0.271 | 0.686 | 0.441 | 0.920 | 0.637 |
| ANN | 0.727 | 0.585 | 0.807 | 0.687 | 0.765 | 0.754 | 0.775 | 0.764 |
| ANT 16 | Naïve Bayes | 0.858 | 0.111 | 0.967 | 0.328 | 0.823 | 0.131 | 0.961 | 0.355 |
| J48 | 0.872 | 0.000 | 1.000 | 0.000 | 0.834 | 0.000 | 1.000 | 0.000 |
| Random Forest | 0.801 | 0.289 | 0.876 | *0.503* | 0.829 | 0.557 | 0.883 | **0.701** |
| Régression Logistique | 0.864 | 0.044 | 0.984 | 0.208 | 0.834 | 0.115 | 0.977 | 0.335 |
| SVM | 0.872 | 0.000 | 1.000 | 0.000 | 0.834 | 0.000 | 1.000 | 0.000 |
| ANN | 0.872 | 0.000 | 1.000 | 0.000 | 0.823 | 0.049 | 0.977 | 0.219 |
| ANT 17 | Naïve Bayes | 0.898 | 0.214 | 0.969 | 0.455 | 0.887 | 0.366 | 0.964 | 0.594 |
| J48 | 0.905 | 0.000 | 0.999 | 0.000 | 0.896 | 0.248 | 0.993 | 0.496 |
| Random Forest | 0.864 | 0.243 | 0.929 | *0.475* | 0.862 | 0.545 | 0.910 | **0.704** |
| Régression Logistique | 0.911 | 0.143 | 0.991 | 0.376 | 0.890 | 0.248 | 0.987 | 0.495 |
| SVM | 0.906 | 0.000 | 1.000 | 0.000 | 0.875 | 0.079 | 0.994 | 0.280 |
| ANN | 0.905 | 0.014 | 0.997 | 0.118 | 0.889 | 0.347 | 0.970 | 0.580 |

***Modèle d (Qi, CBO) : ???***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes | 0.627 | 0.650 | 0.606 | 0.628 | 0.642 | 0.933 | 0.045 | 0.205 |
| J48 | 0.690 | 0.833 | 0.561 | **0.684** | 0.801 | 0.919 | 0.561 | **0.718** |
| Random Forest | 0.548 | 0.483 | 0.606 | 0.541 | 0.776 | 0.874 | 0.576 | 0.710 |
| Régression Logistique | 0.563 | 0.167 | 0.924 | 0.393 | 0.682 | 0.993 | 0.045 | 0.211 |
| SVM | 0.508 | 0.000 | 0.970 | 0.000 | 0.672 | 1.000 | 0.000 | 0.000 |
| ANN | 0.595 | 0.500 | 0.682 | 0.584 | 0.761 | 0.911 | 0.455 | 0.644 |
| **ANT 14** | Naïve Bayes | 0.770 | 0.026 | 0.971 | 0.159 | 0.732 | 0.060 | 0.971 | 0.241 |
| J48 | 0.787 | 0.079 | 0.979 | 0.278 | 0.747 | 0.420 | 0.864 | 0.602 |
| Random Forest | 0.719 | 0.211 | 0.857 | 0.425 | 0.774 | 0.560 | 0.850 | **0.690** |
| Régression Logistique | 0.775 | 0.026 | 0.979 | 0.160 | 0.732 | 0.060 | 0.971 | 0.241 |
| SVM | 0.787 | 0.000 | 1.000 | 0.000 | 0.732 | 0.000 | 0.993 | 0.000 |
| ANN | 0.803 | 0.342 | 0.929 | *0.564* | 0.800 | 0.500 | 0.907 | 0.673 |
| **ANT 15** | Naïve Bayes | 0.635 | 0.028 | 0.979 | 0.166 | 0.552 | 0.128 | 0.957 | 0.350 |
| J48 | 0.717 | 0.547 | 0.813 | **0.667** | 0.735 | 0.654 | 0.813 | 0.729 |
| Random Forest | 0.669 | 0.434 | 0.802 | 0.590 | 0.732 | 0.665 | 0.797 | 0.728 |
| Régression Logistique | 0.628 | 0.038 | 0.963 | 0.191 | 0.697 | 0.525 | 0.861 | 0.672 |
| SVM | 0.635 | 0.000 | 0.995 | 0.000 | 0.530 | 0.050 | 0.989 | 0.222 |
| ANN | 0.683 | 0.368 | 0.861 | 0.563 | 0.746 | 0.687 | 0.802 | **0.742** |
| ANT 16 | Naïve Bayes | 0.866 | 0.000 | 0.993 | 0.000 | 0.821 | 0.000 | 0.984 | 0.000 |
| J48 | 0.872 | 0.000 | 1.000 | 0.000 | 0.834 | 0.000 | 1.000 | 0.000 |
| Random Forest | 0.838 | 0.156 | 0.938 | *0.383* | 0.851 | 0.443 | 0.932 | **0.643** |
| Régression Logistique | 0.869 | 0.022 | 0.993 | 0.148 | 0.829 | 0.016 | 0.990 | 0.126 |
| SVM | 0.872 | 0.000 | 1.000 | 0.000 | 0.834 | 0.000 | 1.000 | 0.000 |
| ANN | 0.872 | 0.000 | 1.000 | 0.000 | 0.834 | 0.000 | 1.000 | 0.000 |
| ANT 17 | Naïve Bayes | 0.898 | 0.014 | 0.990 | *0.118* | 0.870 | 0.079 | 0.988 | 0.279 |
| J48 | 0.906 | 0.000 | 1.000 | 0.000 | 0.870 | 0.000 | 1.000 | 0.000 |
| Random Forest | 0.883 | 0.014 | 0.973 | *0.117* | 0.885 | 0.376 | 0.961 | **0.601** |
| Régression Logistique | 0.906 | 0.014 | 0.999 | *0.118* | 0.872 | 0.050 | 0.996 | 0.223 |
| SVM | 0.906 | 0.000 | 1.000 | 0.000 | 0.869 | 0.000 | 0.999 | 0.000 |
| ANN | 0.906 | 0.000 | 1.000 | 0.000 | 0.860 | 0.050 | 0.981 | 0.221 |

***Modèle d (Qi, FANIN) : ???***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes | 0.468 | 0.867 | 0.106 | 0.303 | 0.612 | 0.881 | 0.061 | 0.232 |
| J48 | 0.579 | 0.733 | 0.439 | 0.567 | 0.756 | 0.919 | 0.424 | 0.624 |
| Random Forest | 0.651 | 0.567 | 0.727 | **0.642** | 0.806 | 0.867 | 0.682 | **0.769** |
| Régression Logistique | 0.508 | 0.017 | 0.955 | 0.127 | 0.672 | 1.000 | 0.000 | 0.000 |
| SVM | 0.524 | 0.000 | 1.000 | 0.000 | 0.672 | 1.000 | 0.000 | 0.000 |
| ANN | 0.492 | 0.233 | 0.727 | 0.412 | 0.672 | 1.000 | 0.000 | 0.000 |
| **ANT 14** | Naïve Bayes | 0.775 | 0.026 | 0.979 | 0.16 | 0.726 | 0.020 | 0.979 | 0.140 |
| J48 | 0.826 | 0.553 | 0.900 | **0.705** | 0.826 | 0.640 | 0.893 | **0.756** |
| Random Forest | 0.815 | 0.474 | 0.907 | 0.656 | 0.795 | 0.580 | 0.871 | 0.711 |
| Régression Logistique | 0.781 | 0.026 | 0.986 | 0.160 | 0.732 | 0.040 | 0.979 | 0.198 |
| SVM | 0.787 | 0.000 | 1.000 | 0.000 | 0.732 | 0.000 | 0.993 | 0.000 |
| ANN | 0.770 | 0.184 | 0.929 | 0.413 | 0.768 | 0.380 | 0.907 | 0.587 |
| **ANT 15** | Naïve Bayes | 0.628 | 0.000 | 0.984 | 0.000 | 0.555 | 0.134 | 0.957 | 0.358 |
| J48 | 0.584 | 0.387 | 0.695 | 0.519 | 0.683 | 0.765 | 0.604 | 0.680 |
| Random Forest | 0.669 | 0.453 | 0.791 | **0.599** | 0.732 | 0.715 | 0.749 | **0.732** |
| Régression Logistique | 0.628 | 0.000 | 0.984 | 0.000 | 0.571 | 0.179 | 0.947 | 0.412 |
| SVM | 0.635 | 0.000 | 0.995 | 0.000 | 0.522 | 0.034 | 0.989 | 0.183 |
| ANN | 0.625 | 0.019 | 0.968 | 0.136 | 0.626 | 0.419 | 0.824 | 0.588 |
| ANT 16 | Naïve Bayes | 0.869 | 0.000 | 0.997 | 0.000 | 0.826 | 0.000 | 0.990 | 0.000 |
| J48 | 0.872 | 0.000 | 1.000 | 0.000 | 0.829 | 0.000 | 0.993 | 0.000 |
| Random Forest | 0.830 | 0.044 | 0.945 | 0.204 | 0.845 | 0.377 | 0.938 | **0.595** |
| Régression Logistique | 0.869 | 0.000 | 0.997 | 0.000 | 0.829 | 0.000 | 0.993 | 0.000 |
| SVM | 0.872 | 0.000 | 1.000 | 0.000 | 0.834 | 0.000 | 1.000 | 0.000 |
| ANN | 0.872 | 0.000 | 1.000 | 0.000 | 0.823 | 0.000 | 0.987 | 0.000 |
| ANT 17 | Naïve Bayes | 0.899 | 0.000 | 0.993 | 0.000 | 0.870 | 0.069 | 0.990 | 0.261 |
| J48 | 0.906 | 0.000 | 1.000 | 0.000 | 0.870 | 0.000 | 1.000 | 0.000 |
| Random Forest | 0.887 | 0.014 | 0.978 | 0.117 | 0.865 | 0.168 | 0.969 | **0.403** |
| Régression Logistique | 0.905 | 0.000 | 0.999 | 0.000 | 0.866 | 0.000 | 0.996 | 0.000 |
| SVM | 0.906 | 0.000 | 1.000 | 0.000 | 0.870 | 0.000 | 1.000 | 0.000 |
| ANN | 0.906 | 0.000 | 1.000 | 0.000 | 0.870 | 0.030 | 0.996 | 0.173 |

***Modèle d (WMC, Ca) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes | 0.516 | 0.150 | 0.848 | 0.357 | 0.657 | 0.941 | 0.076 | 0.267 |
| J48 | 0.571 | 0.617 | 0.530 | *0.572* | 0.677 | 0.807 | 0.409 | 0.575 |
| Random Forest | 0.579 | 0.500 | 0.652 | *0.571* | 0.711 | 0.822 | 0.485 | **0.631** |
| Régression Logistique | 0.579 | 0.217 | 0.909 | 0.444 | 0.667 | 0.985 | 0.015 | 0.122 |
| SVM | 0.524 | 0.017 | 0.985 | 0.129 | 0.672 | 1.000 | 0.000 | 0.000 |
| ANN | 0.556 | 0.333 | 0.758 | 0.502 | 0.692 | 0.919 | 0.227 | 0.457 |
| **ANT 14** | Naïve Bayes | 0.775 | 0.079 | 0.964 | 0.276 | 0.742 | 0.120 | 0.964 | 0.340 |
| J48 | 0.787 | 0.000 | 1.000 | 0.000 | 0.716 | 0.140 | 0.921 | 0.359 |
| Random Forest | 0.753 | 0.263 | 0.886 | *0.483* | 0.784 | 0.520 | 0.879 | **0.676** |
| Régression Logistique | 0.781 | 0.053 | 0.979 | 0.228 | 0.737 | 0.080 | 0.971 | 0.279 |
| SVM | 0.787 | 0.000 | 1.000 | 0.000 | 0.732 | 0.000 | 0.993 | 0.000 |
| ANN | 0.758 | 0.079 | 0.943 | 0.273 | 0.784 | 0.420 | 0.914 | 0.620 |
| **ANT 15** | Naïve Bayes | 0.638 | 0.057 | 0.968 | 0.235 | 0.552 | 0.123 | 0.963 | 0.344 |
| J48 | 0.635 | 0.406 | 0.765 | *0.557* | 0.702 | 0.642 | 0.759 | **0.698** |
| Random Forest | 0.577 | 0.311 | 0.727 | 0.475 | 0.675 | 0.687 | 0.663 | 0.675 |
| Régression Logistique | 0.635 | 0.038 | 0.973 | 0.192 | 0.617 | 0.385 | 0.840 | 0.569 |
| SVM | 0.635 | 0.000 | 0.995 | 0.000 | 0.525 | 0.039 | 0.989 | 0.196 |
| ANN | 0.645 | 0.170 | 0.914 | 0.394 | 0.678 | 0.564 | 0.786 | 0.666 |
| ANT 16 | Naïve Bayes | 0.864 | 0.044 | 0.984 | 0.208 | 0.815 | 0.000 | 0.977 | 0.000 |
| J48 | 0.872 | 0.000 | 1.000 | 0.000 | 0.823 | 0.033 | 0.980 | 0.180 |
| Random Forest | 0.801 | 0.067 | 0.909 | 0.247 | 0.815 | 0.344 | 0.909 | **0.559** |
| Régression Logistique | 0.869 | 0.022 | 0.993 | 0.148 | 0.829 | 0.016 | 0.990 | 0.126 |
| SVM | 0.872 | 0.000 | 1.000 | 0.000 | 0.834 | 0.000 | 1.000 | 0.000 |
| ANN | 0.872 | 0.000 | 1.000 | 0.000 | 0.826 | 0.000 | 0.990 | 0.000 |
| ANT 17 | Naïve Bayes | 0.895 | 0.014 | 0.987 | 0.118 | 0.866 | 0.079 | 0.984 | 0.279 |
| J48 | 0.906 | 0.000 | 1.000 | 0.000 | 0.870 | 0.000 | 1.000 | 0.000 |
| Random Forest | 0.866 | 0.071 | 0.948 | 0.259 | 0.880 | 0.426 | 0.948 | **0.635** |
| Régression Logistique | 0.905 | 0.000 | 0.999 | 0.000 | 0.872 | 0.040 | 0.997 | 0.200 |
| SVM | 0.906 | 0.000 | 1.000 | 0.000 | 0.869 | 0.000 | 0.999 | 0.000 |
| ANN | 0.905 | 0.000 | 0.999 | 0.000 | 0.867 | 0.020 | 0.994 | 0.141 |

***Modèle d (WMC, CBO) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes | 0.579 | 0.250 | 0.879 | 0.469 | 0.652 | 0.933 | 0.076 | 0.266 |
| J48 | 0.667 | 0.633 | 0.697 | 0.664 | 0.756 | 0.889 | 0.485 | 0.657 |
| Random Forest | 0.619 | 0.667 | 0.576 | 0.620 | 0.786 | 0.896 | 0.561 | **0.709** |
| Régression Logistique | 0.643 | 0.433 | 0.833 | 0.601 | 0.741 | 0.948 | 0.318 | 0.549 |
| SVM | 0.524 | 0.033 | 0.970 | 0.179 | 0.672 | 1.000 | 0.000 | 0.000 |
| ANN | 0.698 | 0.733 | 0.667 | **0.699** | 0.781 | 0.919 | 0.500 | 0.678 |
| **ANT 14** | Naïve Bayes | 0.775 | 0.105 | 0.957 | 0.317 | 0.758 | 0.200 | 0.957 | 0.437 |
| J48 | 0.770 | 0.026 | 0.971 | 0.159 | 0.768 | 0.400 | 0.900 | 0.600 |
| Random Forest | 0.742 | 0.263 | 0.871 | *0.479* | 0.784 | 0.600 | 0.850 | **0.714** |
| Régression Logistique | 0.781 | 0.132 | 0.957 | 0.355 | 0.753 | 0.200 | 0.950 | 0.436 |
| SVM | 0.787 | 0.000 | 1.000 | 0.000 | 0.726 | 0.000 | 0.986 | 0.000 |
| ANN | 0.809 | 0.395 | 0.921 | **0.603** | 0.784 | 0.480 | 0.893 | 0.655 |
| **ANT 15** | Naïve Bayes | 0.662 | 0.132 | 0.963 | 0.357 | 0.604 | 0.223 | 0.968 | 0.465 |
| J48 | 0.689 | 0.575 | 0.754 | **0.658** | 0.724 | 0.715 | 0.733 | 0.724 |
| Random Forest | 0.638 | 0.443 | 0.749 | 0.576 | 0.724 | 0.726 | 0.722 | **0.724** |
| Régression Logistique | 0.662 | 0.160 | 0.947 | 0.389 | 0.730 | 0.615 | 0.840 | 0.719 |
| SVM | 0.638 | 0.009 | 0.995 | 0.095 | 0.587 | 0.190 | 0.968 | 0.429 |
| ANN | 0.717 | 0.481 | 0.850 | 0.639 | 0.727 | 0.665 | 0.786 | 0.723 |
| ANT 16 | Naïve Bayes | 0.858 | 0.044 | 0.977 | 0.207 | 0.815 | 0.016 | 0.974 | 0.125 |
| J48 | 0.872 | 0.000 | 1.000 | 0.000 | 0.834 | 0.997 | 0.016 | 0.126 |
| Random Forest | 0.813 | 0.178 | 0.906 | 0.402 | 0.837 | 0.475 | 0.909 | **0.657** |
| Régression Logistique | 0.866 | 0.022 | 0.990 | 0.148 | 0.829 | 0.016 | 0.990 | 0.126 |
| SVM | 0.872 | 0.000 | 1.000 | 0.000 | 0.834 | 0.000 | 1.000 | 0.000 |
| ANN | 0.872 | 0.000 | 1.000 | 0.000 | 0.818 | 0.000 | 0.980 | 0.000 |
| ANT 17 | Naïve Bayes | 0.898 | 0.043 | 0.987 | 0.206 | 0.869 | 0.079 | 0.987 | 0.279 |
| J48 | 0.906 | 0.000 | 1.000 | 0.000 | 0.865 | 0.168 | 0.969 | 0.403 |
| Random Forest | 0.874 | 0.229 | 0.941 | 0.464 | 0.883 | 0.535 | 0.935 | **0.707** |
| Régression Logistique | 0.905 | 0.014 | 0.997 | 0.118 | 0.875 | 0.079 | 0.994 | 0.280 |
| SVM | 0.906 | 0.000 | 1.000 | 0.000 | 0.869 | 0.000 | 0.999 | 0.000 |
| ANN | 0.906 | 0.000 | 1.000 | 0.000 | 0.865 | 0.089 | 0.981 | 0.295 |

***Modèle d (WMC, Ce) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes | 0.683 | 0.450 | 0.894 | 0.634 | 0.697 | 0.630 | 0.833 | 0.724 |
| J48 | 0.675 | 0.667 | 0.682 | **0.674** | 0.766 | 0.830 | 0.636 | 0.727 |
| Random Forest | 0.643 | 0.600 | 0.682 | 0.64 | 0.826 | 0.919 | 0.636 | **0.765** |
| Régression Logistique | 0.698 | 0.583 | 0.803 | 0.684 | 0.781 | 0.837 | 0.667 | 0.747 |
| SVM | 0.635 | 0.267 | 0.970 | 0.509 | 0.672 | 1.000 | 0.000 | 0.000 |
| ANN | 0.675 | 0.617 | 0.727 | 0.670 | 0.771 | 0.896 | 0.515 | 0.679 |
| **ANT 14** | Naïve Bayes | 0.809 | 0.263 | 0.957 | 0.502 | 0.800 | 0.360 | 0.957 | 0.587 |
| J48 | 0.758 | 0.132 | 0.929 | 0.35 | 0.789 | 0.400 | 0.929 | 0.610 |
| Random Forest | 0.708 | 0.263 | 0.829 | *0.467* | 0.753 | 0.560 | 0.821 | **0.678** |
| Régression Logistique | 0.809 | 0.211 | 0.971 | 0.453 | 0.800 | 0.360 | 0.957 | 0.587 |
| SVM | 0.787 | 0.000 | 1.000 | 0.000 | 0.753 | 0.060 | 1.000 | 0.245 |
| ANN | 0.792 | 0.211 | 0.950 | 0.448 | 0.789 | 0.400 | 0.929 | 0.610 |
| **ANT 15** | Naïve Bayes | 0.700 | 0.321 | 0.914 | 0.542 | 0.705 | 0.497 | 0.904 | 0.670 |
| J48 | 0.741 | 0.604 | 0.818 | **0.703** | 0.773 | 0.726 | 0.818 | **0.771** |
| Random Forest | 0.652 | 0.434 | 0.775 | 0.580 | 0.770 | 0.737 | 0.802 | 0.769 |
| Régression Logistique | 0.720 | 0.396 | 0.904 | 0.598 | 0.760 | 0.642 | 0.872 | 0.748 |
| SVM | 0.679 | 0.179 | 0.963 | 0.415 | 0.730 | 0.547 | 0.904 | 0.703 |
| ANN | 0.741 | 0.566 | 0.840 | 0.690 | 0.770 | 0.732 | 0.**807** | 0.769 |
| ANT 16 | Naïve Bayes | 0.861 | 0.133 | 0.967 | 0.359 | 0.834 | 0.197 | 0.961 | 0.435 |
| J48 | 0.872 | 0.000 | 1.000 | 0.000 | 0.834 | 0.000 | 1.000 | 0.000 |
| Random Forest | 0.813 | 0.089 | 0.919 | 0.286 | 0.823 | 0.393 | 0.909 | **0.598** |
| Régression Logistique | 0.875 | 0.044 | 0.997 | 0.209 | 0.829 | 0.082 | 0.977 | 0.283 |
| SVM | 0.872 | 0.000 | 1.000 | 0.000 | 0.834 | 0.000 | 1.000 | 0.000 |
| ANN | 0.869 | 0.000 | 0.997 | 0.000 | 0.829 | 0.000 | 0.993 | 0.000 |
| ANT 17 | Naïve Bayes | 0.897 | 0.229 | 0.966 | 0.470 | 0.876 | 0.327 | 0.959 | 0.560 |
| J48 | 0.909 | 0.129 | 0.990 | 0.357 | 0.901 | 0.317 | 0.988 | 0.560 |
| Random Forest | 0.885 | 0.200 | 0.956 | 0.437 | 0.876 | 0.455 | 0.939 | **0.654** |
| Régression Logistique | 0.914 | 0.143 | 0.994 | 0.377 | 0.901 | 0.317 | 0.988 | 0.560 |
| SVM | 0.906 | 0.000 | 1.000 | 0.000 | 0.871 | 0.010 | 1.000 | 0.100 |
| ANN | 0.913 | 0.129 | 0.994 | 0.358 | 0.894 | 0.287 | 0.985 | 0.532 |

***Modèle d (WMC, FANIN) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes | 0.579 | 0.283 | 0.848 | 0.490 | 0.637 | 0.911 | 0.076 | 0.263 |
| J48 | 0.643 | 0.817 | 0.485 | **0.629** | 0.736 | 0.881 | 0.439 | 0.622 |
| Random Forest | 0.571 | 0.533 | 0.606 | 0.568 | 0.741 | 0.852 | 0.515 | **0.662** |
| Régression Logistique | 0.532 | 0.133 | 0.894 | 0.345 | 0.672 | 0.985 | 0.030 | 0.172 |
| SVM | 0.508 | 0.000 | 0.970 | 0.000 | 0.672 | 1.000 | 0.000 | 0.000 |
| ANN | 0.603 | 0.500 | 0.697 | 0.590 | 0.731 | 0.926 | 0.333 | 0.555 |
| **ANT 14** | Naïve Bayes | 0.781 | 0.053 | 0.979 | 0.228 | 0.742 | 0.080 | 0.979 | 0.280 |
| J48 | 0.775 | 0.184 | 0.936 | 0.415 | 0.779 | 0.660 | 0.821 | **0.736** |
| Random Forest | 0.792 | 0.421 | 0.893 | **0.613** | 0.805 | 0.600 | 0.879 | 0.726 |
| Régression Logistique | 0.792 | 0.079 | 0.986 | 0.279 | 0.742 | 0.080 | 0.979 | 0.280 |
| SVM | 0.787 | 0.000 | 1.000 | 0.000 | 0.726 | 0.000 | 0.986 | 0.000 |
| ANN | 0.787 | 0.316 | 0.914 | 0.537 | 0.816 | 0.580 | 0.900 | 0.722 |
| **ANT 15** | Naïve Bayes | 0.625 | 0.000 | 0.979 | 0.000 | 0.566 | 0.140 | 0.973 | 0.369 |
| J48 | 0.679 | 0.679 | 0.679 | **0.679** | 0.727 | 0.765 | 0.690 | **0.727** |
| Random Forest | 0.662 | 0.434 | 0.791 | 0.586 | 0.721 | 0.737 | 0.706 | 0.721 |
| Régression Logistique | 0.625 | 0.019 | 0.968 | 0.136 | 0.615 | 0.313 | 0.904 | 0.532 |
| SVM | 0.635 | 0.000 | 0.995 | 0.000 | 0.519 | 0.034 | 0.984 | 0.183 |
| ANN | 0.669 | 0.226 | 0.920 | 0.456 | 0.694 | 0.642 | 0.743 | 0.691 |
| ANT 16 | Naïve Bayes | 0.869 | 0.000 | 0.997 | 0.000 | 0.826 | 0.000 | 0.990 | 0.000 |
| J48 | 0.872 | 0.000 | 1.000 | 0.000 | 0.834 | 0.016 | 0.997 | 0.126 |
| Random Forest | 0.807 | 0.111 | 0.909 | 0.318 | 0.815 | 0.426 | 0.893 | **0.617** |
| Régression Logistique | 0.866 | 0.000 | 0.993 | 0.000 | 0.826 | 0.000 | 0.990 | 0.000 |
| SVM | 0.872 | 0.000 | 1.000 | 0.000 | 0.834 | 0.000 | 1.000 | 0.000 |
| ANN | 0.872 | 0.000 | 1.000 | 0.000 | 0.832 | 0.033 | 0.990 | 0.181 |
| ANT 17 | Naïve Bayes | 0.898 | 0.014 | 0.990 | 0.118 | 0.863 | 0.069 | 0.982 | 0.260 |
| J48 | 0.906 | 0.000 | 1.000 | 0.000 | 0.870 | 0.000 | 1.000 | 0.000 |
| Random Forest | 0.867 | 0.071 | 0.950 | 0.260 | 0.880 | 0.406 | 0.951 | **0.621** |
| Régression Logistique | 0.903 | 0.000 | 0.997 | 0.000 | 0.871 | 0.040 | 0.996 | 0.200 |
| SVM | 0.906 | 0.000 | 1.000 | 0.000 | 0.870 | 0.000 | 1.000 | 0.000 |
| ANN | 0.906 | 0.000 | 1.000 | 0.000 | 0.869 | 0.000 | 0.999 | 0.000 |

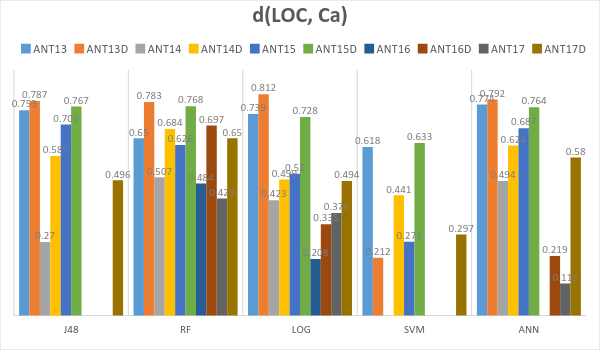
***Combinaison de Tous les Modèles :***

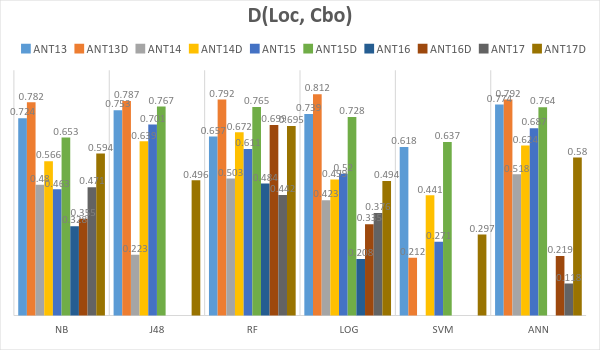
|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes | 0.706 | 0.550 | 0.848 | 0.683 | 0.756 | 0.696 | 0.879 | 0.782 |
| J48 | 0.738 | 0.633 | 0.833 | 0.726 | 0.791 | 0.852 | 0.667 | 0.754 |
| Random Forest | 0.738 | 0.717 | 0.758 | 0.737 | 0.866 | 0.919 | 0.758 | **0.835** |
| Régression Logistique | 0.778 | 0.733 | 0.818 | **0.774** | 0.806 | 0.852 | 0.712 | 0.779 |
| SVM | 0.738 | 0.550 | 0.909 | 0.707 | 0.826 | 0.830 | 0.818 | 0.824 |
| ANN | 0.762 | 0.700 | 0.818 | 0.757 | 0.821 | 0.874 | 0.712 | 0.789 |
| **ANT 14** | Naïve Bayes | 0.775 | 0.368 | 0.886 | 0.571 | 0.784 | 0.480 | 0.893 | 0.655 |
| J48 | 0.803 | 0.500 | 0.886 | **0.666** | 0.789 | 0.620 | 0.850 | 0.726 |
| Random Forest | 0.775 | 0.368 | 0.886 | 0.571 | 0.842 | 0.660 | 0.907 | **0.774** |
| Régression Logistique | 0.792 | 0.289 | 0.929 | 0.518 | 0.779 | 0.420 | 0.907 | 0.617 |
| SVM | 0.781 | 0.000 | 0.993 | 0.000 | 0.758 | 0.200 | 0.957 | 0.437 |
| ANN | 0.820 | 0.368 | 0.943 | 0.589 | 0.811 | 0.520 | 0.914 | 0.689 |
| **ANT 15** | Naïve Bayes | 0.689 | 0.349 | 0.882 | 0.555 | 0.675 | 0.413 | 0.925 | 0.618 |
| J48 | 0.734 | 0.566 | 0.829 | 0.685 | 0.787 | 0.743 | 0.829 | 0.785 |
| Random Forest | 0.775 | 0.651 | 0.845 | **0.742** | 0.820 | 0.810 | 0.829 | **0.819** |
| Régression Logistique | 0.754 | 0.500 | 0.898 | 0.670 | 0.781 | 0.693 | 0.866 | 0.775 |
| SVM | 0.696 | 0.302 | 0.920 | 0.527 | 0.735 | 0.587 | 0.877 | 0.717 |
| ANN | 0.717 | 0.453 | 0.866 | 0.626 | 0.773 | 0.704 | 0.840 | 0.769 |
| ANT 16 | Naïve Bayes | 0.821 | 0.222 | 0.909 | 0.449 | 0.791 | 0.328 | 0.883 | 0.538 |
| J48 | 0.866 | 0.000 | 0.993 | 0.000 | 0.834 | 0.443 | 0.912 | 0.636 |
| Random Forest | 0.849 | 0.044 | 0.967 | 0.206 | 0.861 | 0.443 | 0.945 | **0.647** |
| Régression Logistique | 0.861 | 0.044 | 0.980 | 0.208 | 0.823 | 0.213 | 0.945 | 0.449 |
| SVM | 0.872 | 0.000 | 1.000 | 0.000 | 0.834 | 0.000 | 1.000 | 0.000 |
| ANN | 0.866 | 0.044 | 0.987 | 0.208 | 0.840 | 0.262 | 0.954 | 0.500 |
| ANT 17 | Naïve Bayes | 0.867 | 0.300 | 0.926 | *0.527* | 0.869 | 0.376 | 0.942 | 0.595 |
| J48 | 0.917 | 0.143 | 0.997 | 0.378 | 0.897 | 0.307 | 0.985 | 0.550 |
| Random Forest | 0.906 | 0.143 | 0.985 | 0.375 | 0.918 | 0.475 | 0.984 | **0.684** |
| Régression Logistique | 0.905 | 0.186 | 0.979 | 0.427 | 0.894 | 0.356 | 0.975 | 0.589 |
| SVM | 0.906 | 0.000 | 1.000 | 0.000 | 0.888 | 0.188 | 0.993 | 0.432 |
| ANN | 0.910 | 0.100 | 0.994 | 0.315 | 0.899 | 0.297 | 0.990 | 0.542 |

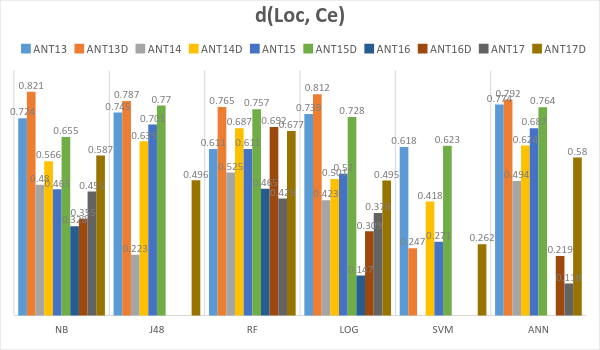
***Combinaison Sans les Qi:***

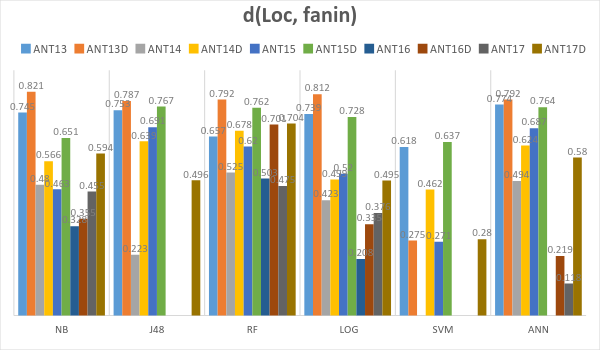
|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes | 0.722 | 0.567 | 0.864 | 0.700 | 0.761 | 0.704 | 0.879 | 0.787 |
| J48 | 0.746 | 0.733 | 0.758 | 0.745 | 0.811 | 0.874 | 0.682 | 0.772 |
| Random Forest | 0.698 | 0.717 | 0.682 | 0.699 | 0.861 | 0.933 | 0.712 | **0.815** |
| Régression Logistique | 0.762 | 0.683 | 0.833 | 0.754 | 0.811 | 0.844 | 0.742 | 0.791 |
| SVM | 0.738 | 0.550 | 0.909 | 0.707 | 0.811 | 0.800 | 0.833 | **0.816** |
| ANN | 0.770 | 0.717 | 0.818 | **0.766** | 0.821 | 0.881 | 0.697 | 0.784 |
| **ANT 14** | Naïve Bayes | 0.781 | 0.421 | 0.879 | **0.608** | 0.774 | 0.440 | 0.893 | 0.627 |
| J48 | 0.787 | 0.184 | 0.950 | 0.418 | 0.784 | 0.560 | 0.864 | 0.696 |
| Random Forest | 0.775 | 0.263 | 0.914 | 0.490 | 0.832 | 0.680 | 0.886 | **0.776** |
| Régression Logistique | 0.787 | 0.184 | 0.950 | 0.418 | 0.774 | 0.340 | 0.929 | 0.562 |
| SVM | 0.787 | 0.000 | 1.000 | 0.000 | 0.753 | 0.180 | 0.957 | 0.415 |
| ANN | 0.781 | 0.237 | 0.929 | 0.469 | 0.779 | 0.520 | 0.871 | 0.673 |
| **ANT 15** | Naïve Bayes | 0.706 | 0.396 | 0.882 | 0.591 | 0.686 | 0.464 | 0.898 | 0.646 |
| J48 | 0.754 | 0.604 | 0.840 | **0.712** | 0.806 | 0.726 | 0.882 | 0.800 |
| Random Forest | 0.717 | 0.594 | 0.786 | 0.683 | 0.801 | 0.816 | 0.786 | **0.801** |
| Régression Logistique | 0.727 | 0.472 | 0.872 | 0.642 | 0.760 | 0.687 | 0.829 | 0.755 |
| SVM | 0.696 | 0.302 | 0.920 | 0.527 | 0.746 | 0.609 | 0.877 | 0.731 |
| ANN | 0.720 | 0.509 | 0.840 | 0.654 | 0.776 | 0.737 | 0.813 | 0.774 |
| ANT 16 | Naïve Bayes | 0.824 | 0.267 | 0.906 | 0.492 | 0.807 | 0.377 | 0.893 | 0.580 |
| J48 | 0.872 | 0.000 | 1.000 | 0.000 | 0.823 | 0.098 | 0.967 | 0.308 |
| Random Forest | 0.844 | 0.067 | 0.958 | 0.253 | 0.856 | 0.443 | 0.938 | **0.645** |
| Régression Logistique | 0.872 | 0.089 | 0.987 | 0.296 | 0.829 | 0.131 | 0.967 | 0.356 |
| SVM | 0.872 | 0.000 | 1.000 | 0.000 | 0.834 | 0.000 | 1.000 | 0.000 |
| ANN | 0.872 | 0.022 | 0.997 | 0.148 | 0.834 | 0.197 | 0.961 | 0.435 |
| ANT 17 | Naïve Bayes | 0.808 | 0.557 | 0.834 | **0.682** | 0.870 | 0.455 | 0.932 | 0.651 |
| J48 | 0.918 | 0.157 | 0.997 | 0.396 | 0.902 | 0.287 | 0.994 | 0.534 |
| Random Forest | 0.903 | 0.157 | 0.981 | 0.392 | 0.911 | 0.505 | 0.972 | **0.701** |
| Régression Logistique | 0.910 | 0.186 | 0.985 | 0.428 | 0.896 | 0.356 | 0.976 | 0.589 |
| SVM | 0.906 | 0.000 | 1.000 | 0.000 | 0.890 | 0.208 | 0.993 | 0.454 |
| ANN | 0.909 | 0.100 | 0.993 | 0.315 | 0.898 | 0.287 | 0.990 | 0.533 |

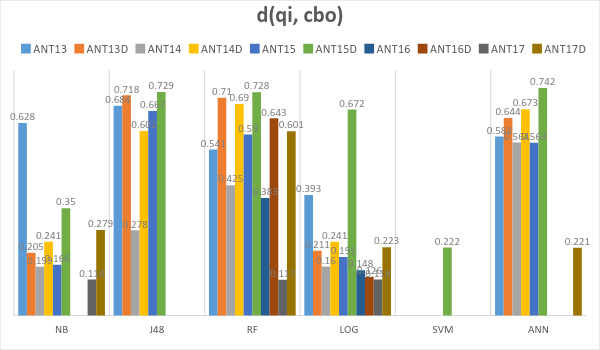
**Histogrammes**

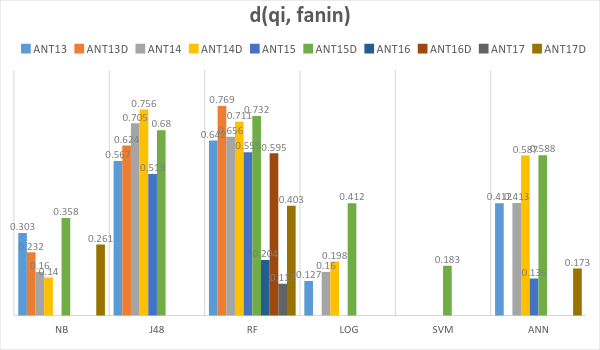


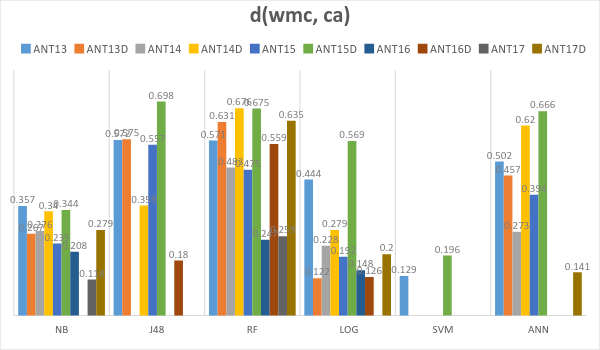


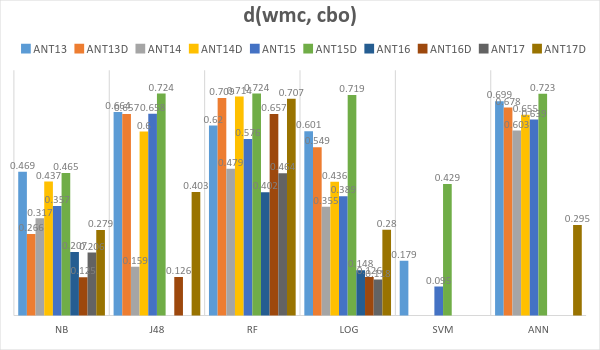


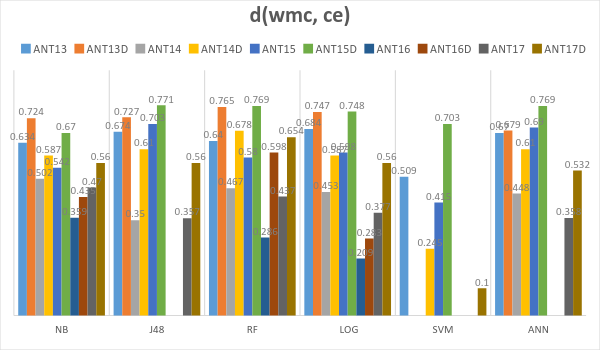


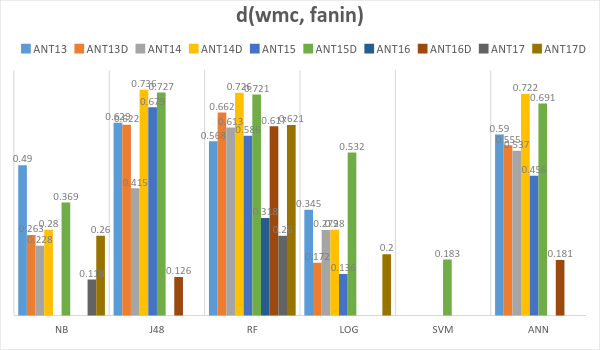


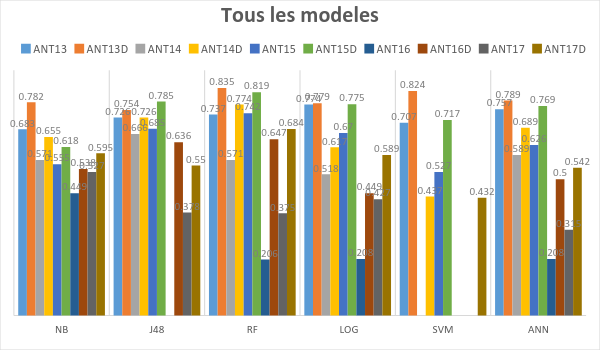


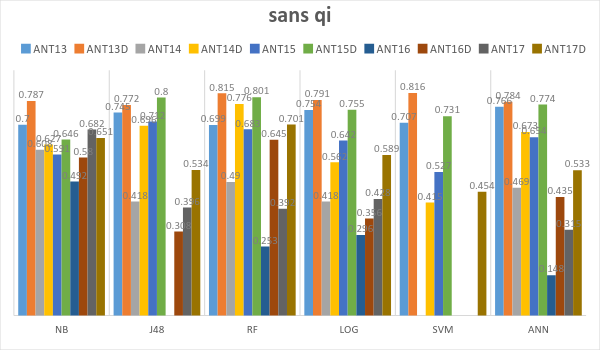


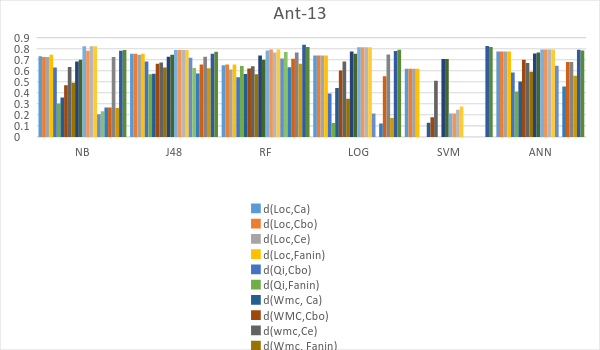


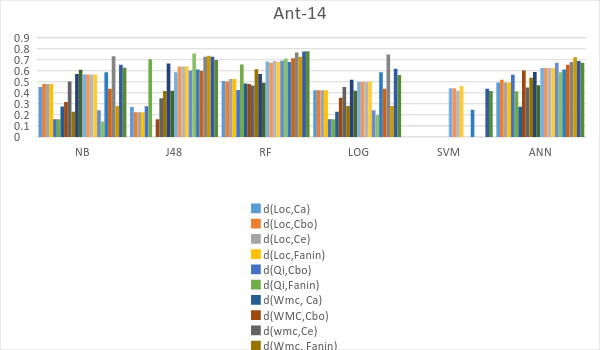


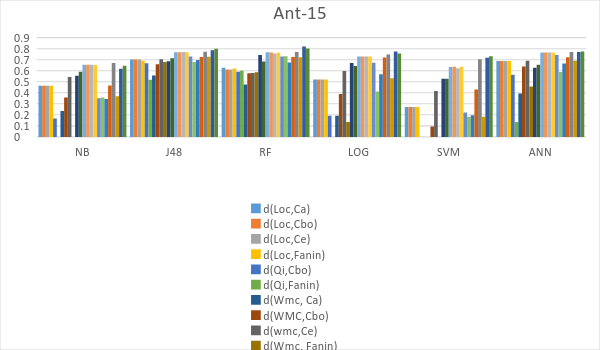


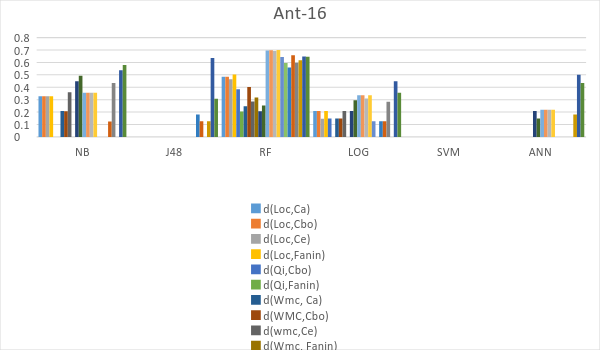


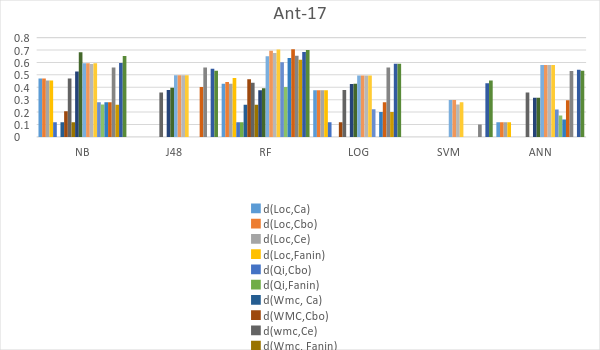












AnnMAx L

Ant 13

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| d(Loc, Ca) | 0.730 | 0.684 | 0.827 | 0.772 | 0.876 | 0.873 | 0.752 | 0.818 |
| d(Loc, Cbo) | 0.730 | 0.684 | 0.827 | 0.772 | 0.876 | 0.873 | 0.752 | 0.818 |
| d(Loc, Ce) | 0.731 | 0.686 | 0.826 | 0.772 | 0.876 | 0.873 | 0.752 | 0.818 |
| d(Loc, Fanin) | 0.731 | 0.686 | 0.826 | 0.772 | 0.873 | 0.875 | 0.732 | 0.817 |
| d(Qi, Cbo) | 0.273 | 0.184 | 0.849 | 0.567 | 0.820 | 0.949 | 0.258 | 0.643 |
| d(Qi, Fanin) | 0.120 | 0.069 | 0.920 | 0.316 | 0.804 | 1.000 | 0.000 | 0.000 |
| d(Wmc, Ca) | 0.309 | 0.210 | 0.867 | 0.532 | 0.794 | 0.947 | 0.100 | 0.436 |
| d(Wmc, Cbo) | 0.486 | 0.393 | 0.798 | 0.698 | 0.837 | 0.920 | 0.429 | 0.675 |
| d(Wmc, Ce) | 0.606 | 0.532 | 0.797 | 0.674 | 0.831 | 0.870 | 0.540 | 0.691 |
| d(Wmc, Fanin) | 0.279 | 0.193 | 0.829 | 0.510 | 0.816 | 0.965 | 0.179 | 0.560 |
| ALL | 0.617 | 0.510 | 0.871 | 0.768 | 0.868 | 0.874 | 0.717 | 0.795 |
| NoQi | 0.735 | 0.694 | 0.823 | 0.766 | 0.874 | 0.879 | 0.729 | 0.805 |

Ant 14

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| d(Loc, Ca) | 0.245 | 0.159 | 0.962 | 0.476 | 0.487 | 0.408 | 0.904 | 0.620 |
| d(Loc, Cbo) | 0.245 | 0.159 | 0.962 | 0.476 | 0.486 | 0.407 | 0.904 | 0.619 |
| d(Loc, Ce) | 0.245 | 0.159 | 0.962 | 0.476 | 0.487 | 0.408 | 0.904 | 0.620 |
| d(Loc, Fanin) | 0.243 | 0.158 | 0.961 | 0.474 | 0.487 | 0.408 | 0.904 | 0.620 |
| d(Qi, Cbo) | 0.131 | 0.077 | 0.970 | 0.518 | 0.473 | 0.376 | 0.923 | 0.662 |
| d(Qi, Fanin) | 0.030 | 0.016 | 0.982 | 0.276 | 0.254 | 0.165 | 0.952 | 0.492 |
| d(Wmc, Ca) | 0.083 | 0.048 | 0.971 | 0.315 | 0.387 | 0.287 | 0.931 | 0.545 |
| d(Wmc, Cbo) | 0.218 | 0.142 | 0.956 | 0.564 | 0.547 | 0.466 | 0.915 | 0.662 |
| d(Wmc, Ce) | 0.308 | 0.210 | 0.959 | 0.450 | 0.475 | 0.366 | 0.938 | 0.600 |
| d(Wmc, Fanin) | 0.151 | 0.092 | 0.966 | 0.440 | 0.450 | 0.358 | 0.917 | 0.662 |
| ALL | 0.369 | 0.273 | 0.943 | 0.539 | 0.520 | 0.444 | 0.905 | 0.669 |
| NoQi | 0.264 | 0.177 | 0.955 | 0.461 | 0.485 | 0.421 | 0.887 | 0.626 |

Ant 15

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| d(Loc, Ca) | 0.589 | 0.532 | 0.844 | 0.683 | 0.760 | 0.740 | 0.797 | 0.770 |
| d(Loc, Cbo) | 0.589 | 0.532 | 0.844 | 0.683 | 0.760 | 0.740 | 0.797 | 0.770 |
| d(Loc, Ce) | 0.584 | 0.522 | 0.850 | 0.685 | 0.760 | 0.740 | 0.797 | 0.770 |
| d(Loc, Fanin) | 0.593 | 0.539 | 0.841 | 0.681 | 0.760 | 0.740 | 0.797 | 0.770 |
| d(Qi, Cbo) | 0.267 | 0.175 | 0.923 | 0.562 | 0.683 | 0.616 | 0.820 | 0.741 |
| d(Qi, Fanin) | 0.000 | 0.000 | 0.986 | 0.000 | 0.334 | 0.227 | 0.874 | 0.541 |
| d(Wmc, Ca) | 0.086 | 0.048 | 0.961 | 0.347 | 0.583 | 0.493 | 0.811 | 0.665 |
| d(Wmc, Cbo) | 0.518 | 0.423 | 0.880 | 0.644 | 0.697 | 0.639 | 0.815 | 0.733 |
| d(Wmc, Ce) | 0.588 | 0.520 | 0.860 | 0.676 | 0.756 | 0.724 | 0.817 | 0.775 |
| d(Wmc, Fanin) | 0.099 | 0.055 | 0.970 | 0.400 | 0.559 | 0.457 | 0.830 | 0.697 |
| ALL | 0.558 | 0.484 | 0.859 | 0.656 | 0.748 | 0.713 | 0.815 | 0.769 |
| NoQi | 0.571 | 0.501 | 0.855 | 0.660 | 0.747 | 0.718 | 0.806 | 0.765 |

Ant 16

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| d(Loc, Ca) | 0.000 | 0.000 | 0.996 | 0.000 | 0.106 | 0.061 | 0.982 | 0.258 |
| d(Loc, Cbo) | 0.000 | 0.000 | 0.996 | 0.000 | 0.106 | 0.061 | 0.982 | 0.258 |
| d(Loc, Ce) | 0.000 | 0.000 | 0.996 | 0.000 | 0.116 | 0.067 | 0.982 | 0.266 |
| d(Loc, Fanin) | 0.000 | 0.000 | 0.996 | 0.000 | 0.106 | 0.061 | 0.982 | 0.254 |
| d(Qi, Cbo) | 0.007 | 0.003 | 0.999 | 0.101 | 0.000 | 0.000 | 0.993 | 0.000 |
| d(Qi, Fanin) | 0.000 | 0.000 | 1.000 | 0.000 | 0.000 | 0.000 | 0.996 | 0.000 |
| d(Wmc, Ca) | 0.000 | 0.000 | 1.000 | 0.000 | 0.000 | 0.000 | 0.995 | 0.000 |
| d(Wmc, Cbo) | 0.015 | 0.008 | 0.998 | 0.125 | 0.020 | 0.011 | 0.980 | 0.142 |
| d(Wmc, Ce) | 0.037 | 0.019 | 0.997 | 0.188 | 0.055 | 0.031 | 0.981 | 0.213 |
| d(Wmc, Fanin) | 0.000 | 0.000 | 1.000 | 0.000 | 0.000 | 0.000 | 0.995 | 0.000 |
| ALL | 0.000 | 0.000 | 0.998 | 0.000 | 0.167 | 0.102 | 0.976 | 0.412 |
| NoQi | 0.024 | 0.012 | 0.999 | 0.161 | 0.193 | 0.120 | 0.976 | 0.448 |

Ant 17

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| d(Loc, Ca) | 0.185 | 0.109 | 0.994 | 0.346 | 0.422 | 0.310 | 0.976 | 0.555 |
| d(Loc, Cbo) | 0.187 | 0.110 | 0.994 | 0.347 | 0.422 | 0.311 | 0.975 | 0.555 |
| d(Loc, Ce) | 0.190 | 0.112 | 0.993 | 0.350 | 0.422 | 0.311 | 0.975 | 0.555 |
| d(Loc, Fanin) | 0.185 | 0.109 | 0.994 | 0.346 | 0.421 | 0.310 | 0.976 | 0.555 |
| d(Qi, Cbo) | 0.000 | 0.000 | 0.999 | 0.000 | 0.129 | 0.0745 | 0.987 | 0.296 |
| d(Qi, Fanin) | 0.000 | 0.000 | 1.000 | 0.000 | 0.020 | 0.010 | 0.997 | 0.172 |
| d(Wmc, Ca) | 0.000 | 0.000 | 0.999 | 0.000 | 0.089 | 0.048 | 0.995 | 0.222 |
| d(Wmc, Cbo) | 0.000 | 0.000 | 0.998 | 0.000 | 0.164 | 0.102 | 0.979 | 0.341 |
| d(Wmc, Ce) | 0.153 | 0.086 | 0.996 | 0.360 | 0.417 | 0.282 | 0.990 | 0.531 |
| d(Wmc, Fanin) | 0.000 | 0.000 | 0.999 | 0.000 | 0.054 | 0.029 | 0.996 | 0.180 |
| ALL | 0.127 | 0.071 | 0.995 | 0.332 | 0.441 | 0.317 | 0.982 | 0.574 |
| NoQi | 0.188 | 0.112 | 0.992 | 0.345 | 0.449 | 0.323 | 0.983 | 0.582 |

Comparaison Avec Les Métriques

Après une utilisation de l’ACP ; RFC Ca et Loc ont étées retenus. Les résultats suivants sont obtenus à partir du système Ant15 :

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| Naïve Bayes | 0.737 | 0.425 | 0.914 | 0.623 | 0.746 | 0.570 | 0.914 | 0.722 |
| J48 | 0.785 | 0.623 | 0.877 | **0.739** | 0.817 | 0.749 | 0.882 | 0.813 |
| Random Forest | 0.761 | 0.623 | 0.840 | 0.723 | 0.822 | 0.804 | 0.840 | **0.822** |
| Régression Logistique | 0.765 | 0.491 | 0.920 | 0.672 | 0.809 | 0.737 | 0.877 | 0.804 |
| SVM | 0.734 | 0.368 | 0.941 | 0.588 | 0.779 | 0.615 | 0.936 | 0.759 |
| ANN | 0.775 | 0.594 | 0.877 | 0.722 | 0.820 | 0.788 | 0.850 | 0.818 |

Imbrication ACP ANT15

*d(Loc, d(RFC,Ca))* ????

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| Naïve Bayes | 0.655 | 0.142 | 0.947 | 0.367 | 0.675 | 0.402 | 0.936 | 0.613 |
| J48 | 0.703 | 0.764 | 0.668 | **0.714** | 0.781 | 0.799 | 0.765 | **0.782** |
| Random Forest | 0.645 | 0.491 | 0.733 | 0.600 | 0.743 | 0.804 | 0.684 | 0.742 |
| Régression Logistique | 0.672 | 0.189 | 0.947 | 0.423 | 0.732 | 0.570 | 0.888 | 0.711 |
| SVM | 0.638 | 0.038 | 0.979 | 0.193 | 0.631 | 0.296 | 0.952 | 0.531 |
| ANN | 0.514 | 0.418 | 0.881 | 0.624 | 0.726 | 0.675 | 0.824 | 0.759 |

*d(Loc,RFC,Ca)*

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| Naïve Bayes | 0.686 | 0.226 | 0.947 | 0.463 | 0.699 | 0.469 | 0.920 | 0.657 |
| J48 | 0.686 | 0.708 | 0.674 | **0.691** | 0.770 | 0.771 | 0.770 | **0.770** |
| Random Forest | 0.645 | 0.491 | 0.733 | 0.600 | 0.746 | 0.782 | 0.711 | 0.746 |
| Régression Logistique | 0.696 | 0.292 | 0.925 | 0.520 | 0.740 | 0.615 | 0.861 | 0.728 |
| SVM | 0.648 | 0.066 | 0.979 | 0.254 | 0.686 | 0.441 | 0.920 | 0.637 |
| ANN | 0.592 | 0.539 | 0.841 | 0.682 | 0.758 | 0.740 | 0.797 | **0.770** |

*d(d(Loc, Ce), d(RFC,Ca))*

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| Naïve Bayes | 0.689 | 0.226 | 0.952 | 0.464 | 0.697 | 0.464 | 0.920 | 0.653 |
| J48 | 0.686 | 0.708 | 0.674 | **0.691** | 0.776 | 0.788 | 0.765 | 0.776 |
| Random Forest | 0.662 | 0.519 | 0.743 | 0.621 | 0.754 | 0.799 | 0.776 | **0.787** |
| Régression Logistique | 0.693 | 0.283 | 0.925 | 0.512 | 0.738 | 0.609 | 0.861 | 0.724 |
| SVM | 0.648 | 0.066 | 0.979 | 0.254 | 0.678 | 0.413 | 0.930 | 0.620 |
| ANN | 0.586 | 0.527 | 0.847 | 0.683 | 0.758 | 0.739 | 0.798 | 0.770 |

*d(d(Loc, WMC), d(RFC,Ca))*

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| Naïve Bayes | 0.686 | 0.217 | 0.952 | 0.455 | 0.697 | 0.469 | 0.914 | 0.655 |
| J48 | 0.693 | 0.708 | 0.684 | **0.696** | 0.768 | 0.771 | 0.765 | 0.768 |
| Random Forest | 0.652 | 0.509 | 0.733 | 0.611 | 0.760 | 0.793 | 0.727 | 0.759 |
| Régression Logistique | 0.689 | 0.274 | 0.925 | 0.503 | 0.740 | 0.615 | 0.861 | 0.728 |
| SVM | 0.693 | 0.283 | 0.925 | 0.512 | 0.680 | 0.425 | 0.925 | 0.627 |
| ANN | 0.587 | 0.528 | 0.847 | 0.683 | 0.757 | 0.738 | 0.798 | **0.770** |

*d(d(Loc, RFC), d(Loc, Ca), d(RFC,Ca))*

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| Naïve Bayes | 0.703 | 0.321 | 0.920 | 0.543 | 0.705 | 0.497 | 0.904 | 0.670 |
| J48 | 0.693 | 0.679 | 0.701 | 0.690 | 0.768 | 0.771 | 0.765 | 0.768 |
| Random Forest | 0.631 | 0.481 | 0.717 | 0.587 | 0.760 | 0.788 | 0.733 | 0.760 |
| Régression Logistique | 0.703 | 0.340 | 0.909 | 0.556 | 0.749 | 0.637 | 0.856 | 0.738 |
| SVM | 0.662 | 0.151 | 0.952 | 0.379 | 0.735 | 0.581 | 0.882 | 0.716 |
| ANN | 0.649 | 0.650 | 0.800 | **0.728** | 0.764 | 0.751 | 0.794 | **0.778** |

ANT16

*d(Loc, d(RFC,Ca))*

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| Naïve Bayes | 0.861 | 0.111 | 0.971 | 0.328 | 0.826 | 0.131 | 0.964 | 0.356 |
| J48 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| Random Forest | 0.801 | 0.222 | 0.886 | 0.444 | 0.821 | 0.541 | 0.876 | **0.688** |
| Régression Logistique | 0.861 | 0.022 | 0.984 | 0.148 | 0.832 | 0.098 | 0.977 | 0.31 |
| SVM | 0.872 | 0 | 1 | 0 | 0.834 | 0 | 1 | 0 |
| ANN | 0.869 | 0 | 0.996 | 0 | 0.831 | 0.067 | 0.982 | 0.266 |

*d(Loc,RFC,Ca)*

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| Naïve Bayes | 0.858 | 0.111 | 0.967 | 0.328 | 0.823 | 0.131 | 0.961 | 0.355 |
| J48 | 0 | 0 | 1 | **0** | 0 | 0 | 1 | **0** |
| Random Forest | 0.79 | 0.267 | 0.866 | 0.481 | 0.813 | 0.541 | 0.866 | **0.685** |
| Régression Logistique | 0.864 | 0.044 | 0.984 | 0.209 | 0.834 | 0.115 | 0.977 | 0.335 |
| SVM | 0.872 | 0 | 1 | 0 | 0.834 | 0 | 1 | 0 |
| ANN | 0.869 | 0 | 0.996 | 0 | 0.829 | 0.059 | 0.982 | 0.258 |

*d(d(Loc, Ce), d(RFC,Ca))*

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| Naïve Bayes | 0.858 | 0.111 | 0.967 | 0.328 | 0.823 | 0.131 | 0.961 | 0.355 |
| J48 | 0 | 0 | 1 | **0** | 0 | 0 | 1 | 0 |
| Random Forest | 0.798 | 0.267 | 0.876 | 0.483 | 0.826 | 0.541 | 0.883 | **0.691** |
| Régression Logistique | 0.861 | 0.022 | 0.984 | 0.148 | 0.832 | 0.098 | 0.977 | 0.31 |
| SVM | 0.872 | 0 | 1 | 0 | 0.834 | 0 | 1 | 0 |
| ANN | 0.869 | 0 | 0.996 | 0 | 0.832 | 0.073 | 0.982 | 0.279 |

*d(d(Loc, WMC), d(RFC,Ca))*

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| Naïve Bayes | 0.858 | 0.111 | 0.967 | 0.328 | 0.826 | 0.131 | 0.964 | 0.356 |
| J48 | 0 | 0 | 1 | **0** | 0 | 0 | 1 | 0 |
| Random Forest | 0.798 | 0.267 | 0.876 | 0.483 | 0.826 | 0.541 | 0.883 | **0.691** |
| Régression Logistique | 0.861 | 0.022 | 0.984 | 0.148 | 0.832 | 0.098 | 0.977 | 0.31 |
| SVM | 0.872 | 0 | 1 | 0 | 0.834 | 0 | 1 | 0 |
| ANN | 0.869 | 0 | 0.996 | 0 | 0.832 | 0.071 | 0.983 | 0.28 |

*d(d(Loc, RFC), d(Loc, Ca), d(RFC,Ca))*

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| Naïve Bayes | 0.849 | 0.111 | 0.958 | 0.326 | 0.818 | 0.148 | 0.951 | 0.375 |
| J48 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| Random Forest | 0.81 | 0.267 | 0.889 | **0.487** | 0.837 | 0.557 | 0.893 | **0.705** |
| Régression Logistique | 0.866 | 0.067 | 0.984 | 0.256 | 0.837 | 0.131 | 0.977 | 0.358 |
| SVM | 0.872 | 0 | 1 | 0 | 0.834 | 0 | 1 | 0 |
| ANN | 0.871 | 0 | 0.999 | 0 | 0.826 | 0.025 | 0.986 | 0.172 |

ANT17

*d(Loc, d(RFC,Ca))*

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| Naïve Bayes | 0.898 | 0.214 | 0.969 | 0.455 | 0.887 | 0.347 | 0.967 | 0.579 |
| J48 | 0.906 | 0.000 | 1.000 | 0 | 0.896 | 0.248 | 0.993 | 0.496 |
| Random Forest | 0.836 | 0.200 | 0.902 | 0.425 | 0.852 | 0.515 | 0.902 | **0.682** |
| Régression Logistique | 0.910 | 0.129 | 0.991 | 0.358 | 0.890 | 0.248 | 0.987 | 0.495 |
| SVM | 0.906 | 0.000 | 1.000 | 0 | 0.874 | 0.059 | 0.996 | 0.242 |
| ANN | 0.195 | 0.116 | 0.993 | 0.368 | 0.423 | 0.312 | 0.976 | 0.555 |

*d(Loc,RFC,Ca)*

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| Naïve Bayes | 0.898 | 0.214 | 0.969 | 0.455 | 0.887 | 0.366 | 0.964 | 0.594 |
| J48 | 0.906 | 0.000 | 1.000 | 0 | 0.896 | 0.248 | 0.993 | 0.496 |
| Random Forest | 0.840 | 0.171 | 0.910 | 0.394 | 0.853 | 0.485 | 0.908 | **0.664** |
| Régression Logistique | 0.911 | 0.143 | 0.991 | 0.376 | 0.889 | 0.248 | 0.985 | 0.494 |
| SVM | 0.906 | 0.000 | 1.000 | 0 | 0.875 | 0.089 | 0.993 | 0.297 |
| ANN | 0.188 | 0.110 | 0.993 | 0.364 | 0.421 | 0.310 | 0.976 | 0.555 |

*d(d(Loc, Ce), d(RFC,Ca))*

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| Naïve Bayes | 0.906 | 0.000 | 1.000 | 0 | 0.887 | 0.347 | 0.967 | 0.579 |
| J48 | 0.906 | 0.000 | 1.000 | 0 | 0.893 | 0.248 | 0.990 | 0.495 |
| Random Forest | 0.847 | 0.229 | 0.911 | 0.457 | 0.860 | 0.554 | 0.905 | **0.708** |
| Régression Logistique | 0.910 | 0.129 | 0.991 | 0.358 | 0.890 | 0.248 | 0.987 | 0.495 |
| SVM | 0.906 | 0.000 | 1.000 | 0 | 0.874 | 0.059 | 0.996 | 0.242 |
| ANN | 0.91 | 0.115 | 0.993 | 0.368 | 0.421 | 0.309 | 0.976 | 0.555 |

*d(d(Loc, WMC), d(RFC,Ca))*

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| Naïve Bayes | 0.898 | 0.214 | 0.969 | 0.455 | 0.888 | 0.356 | 0.967 | 0.587 |
| J48 | 0.906 | 0.000 | 1.000 | **0** | 0.893 | 0.248 | 0.990 | 0.495 |
| Random Forest | 0.844 | 0.200 | 0.911 | 0.427 | 0.856 | 0.525 | 0.905 | **0.689** |
| Régression Logistique | 0.910 | 0.129 | 0.991 | 0.358 | 0.890 | 0.248 | 0.987 | 0.495 |
| SVM | 0.906 | 0.000 | 1.000 | 0 | 0.875 | 0.069 | 0.996 | 0.262 |
| ANN | 0.91 | 0.115 | 0.993 | 0.368 | 0.89 | 0.31 | 0.976 | **0.555** |

*d(d(Loc, RFC), d(Loc, Ca), d(RFC,Ca))*

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| Naïve Bayes | 0.897 | 0.271 | 0.961 | 0.51 | 0.884 | 0.386 | 0.959 | 0.608 |
| J48 | 0.906 | 0.000 | 1.000 | 0 | 0.893 | 0.248 | 0.990 | 0.495 |
| Random Forest | 0.852 | 0.229 | 0.917 | 0.458 | 0.858 | 0.505 | 0.911 | **0.678** |
| Régression Logistique | 0.910 | 0.143 | 0.990 | 0.376 | 0.889 | 0.277 | 0.981 | 0.521 |
| SVM | 0.906 | 0.000 | 1.000 | 0 | 0.876 | 0.099 | 0.993 | 0.314 |
| ANN | 0.909 | 0.095 | 0.994 | **0.345** | 0.889 | 0.31 | 0.975 | **0.555** |

Oversampling

Le tableau suivant décrit les différents systèmes Ant utilisés et met en évidence le nombre de classes, nombre de classes fautives ainsi que le ratio des classes fautives.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***Système*** | ***#ClassesD*** | ***#FautivesD*** | ***%FautivesD*** | ***#ClassesB*** | ***#FautivesB*** | ***%FautivesB*** |
| Ant13 | 201 | 135 | 67.16% | 132 | 66 | 50.00% |
| Ant14 | 190 | 50 | 26.21% | 280 | 140 | 50.00% |
| Ant15 | 366 | 179 | 48.91% | 374 | 187 | 50.00% |
| Ant16 | 368 | 61 | 16.58% | 614 | 307 | 50.00% |
| Ant17 | 776 | 101 | 13.01% | 1350 | 675 | 50.00% |

***Modèle d (LOC, Ca) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACCB** | **TPRB** | **TNRB** | **g-meanB** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes | 0.750 | 0.712 | 0.788 | 0,749 | 0.796 | 0.741 | 0.909 | **0.821** |
| J48 | 0.712 | 0.712 | 0.712 | 0,712 | 0.811 | 0.852 | 0.727 | 0.787 |
| Random Forest | 0.659 | 0.652 | 0.667 | 0,659 | 0.836 | 0.919 | 0.667 | 0.783 |
| Régression Logistique | 0.773 | 0.727 | 0.818 | 0,771 | 0.821 | 0.837 | 0.788 | 0.812 |
| SVM | 0.697 | 0.455 | 0.939 | 0,654 | 0.687 | 1.000 | 0.045 | 0.212 |
| ANN | 0.744 | 0.715 | 0.793 | **0.780** | 0.826 | 0.881 | 0.712 | 0.792 |
| **ANT 14** | Naïve Bayes | 0.668 | 0.471 | 0.864 | 0,638 | 0.784 | 0.340 | 0.943 | 0.566 |
| J48 | 0.686 | 0.579 | 0.793 | 0,678 | 0.737 | 0.400 | 0.857 | 0.585 |
| Random Forest | 0.657 | 0.671 | 0.643 | *0,657* | 0.763 | 0.560 | 0.836 | **0.684** |
| Régression Logistique | 0.696 | 0.636 | 0.757 | 0,694 | 0.774 | 0.260 | 0.957 | 0.499 |
| SVM | 0.693 | 0.557 | 0.829 | 0,680 | 0.768 | 0.200 | 0.971 | 0.441 |
| ANN | 0.629 | 0.614 | 0.662 | **0.699** | 0.768 | 0.440 | 0.886 | 0.624 |
| **ANT 15** | Naïve Bayes | 0.666 | 0.487 | 0.845 | 0,641 | 0.697 | 0.464 | 0.920 | 0.653 |
| J48 | 0.719 | 0.807 | 0.631 | 0,714 | 0.768 | 0.765 | 0.770 | 0.767 |
| Random Forest | 0.623 | 0.610 | 0.636 | 0,623 | 0.768 | 0.799 | 0.738 | **0.768** |
| Régression Logistique | 0.695 | 0.545 | 0.845 | 0,679 | 0.740 | 0.615 | 0.861 | 0.728 |
| SVM | 0.636 | 0.342 | 0.930 | 0,564 | 0.683 | 0.436 | 0.920 | 0.633 |
| ANN | 0.701 | 0.694 | 0.713 | **0.725** | 0.765 | 0.754 | 0.775 | 0.764 |
| ANT 16 | Naïve Bayes | 0.668 | 0.466 | 0.870 | 0,637 | 0.823 | 0.131 | 0.961 | 0.355 |
| J48 | 0.700 | 0.687 | 0.713 | **0,700** | 0.834 | 0.000 | 1.000 | 0.000 |
| Random Forest | 0.630 | 0.635 | 0.625 | *0,630* | 0.821 | 0.557 | 0.873 | **0.697** |
| Régression Logistique | 0.686 | 0.573 | 0.798 | 0,676 | 0.834 | 0.115 | 0.977 | 0.335 |
| SVM | 0.661 | 0.476 | 0.847 | 0,635 | 0.834 | 0.000 | 1.000 | 0.000 |
| ANN | 0.566 | 0.501 | 0.729 | 0.667 | 0.823 | 0.049 | 0.977 | 0.219 |
| ANT 17 | Naïve Bayes | 0.674 | 0.434 | 0.914 | *0.630* | 0.887 | 0.366 | 0.964 | 0.594 |
| J48 | 0.760 | 0.788 | 0.732 | **0.759** | 0.896 | 0.248 | 0.993 | 0.496 |
| Random Forest | 0.696 | 0.689 | 0.702 | 0.695 | 0.852 | 0.465 | 0.910 | **0.650** |
| Régression Logistique | 0.722 | 0.597 | 0.847 | 0.711 | 0.889 | 0.248 | 0.985 | 0.494 |
| SVM | 0.701 | 0.529 | 0.873 | 0.680 | 0.876 | 0.089 | 0.994 | 0.297 |
| ANN | 0.730 | 0.744 | 0.707 | 0.727 | 0.889 | 0.347 | 0.970 | 0.580 |

***Modèle d (LOC, Cbo) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes | 0.750 | 0.591 | 0.909 | 0,733 | 0.791 | 0.807 | 0.758 | 0.782 |
| J48 | 0.735 | 0.697 | 0.773 | 0,734 | 0.811 | 0.852 | 0.727 | 0.787 |
| Random Forest | 0.667 | 0.667 | 0.667 | 0,667 | 0.841 | 0.919 | 0.682 | 0.792 |
| Régression Logistique | 0.773 | 0.727 | 0.818 | 0,771 | 0.821 | 0.837 | 0.788 | **0.812** |
| SVM | 0.705 | 0.455 | 0.955 | 0,659 | 0.687 | 1.000 | 0.045 | 0.212 |
| ANN | 0.744 | 0.715 | 0.793 | **0.779** | 0.826 | 0.881 | 0.712 | 0.792 |
| **ANT 14** | Naïve Bayes | 0.686 | 0.507 | 0.864 | 0,662 | 0.784 | 0.340 | 0.943 | 0.566 |
| J48 | 0.696 | 0.600 | 0.793 | 0,690 | 0.753 | 0.480 | 0.850 | 0.639 |
| Random Forest | 0.657 | 0.664 | 0.650 | *0,657* | 0.742 | 0.560 | 0.807 | **0.672** |
| Régression Logistique | 0.7 | 0.643 | 0.757 | 0,698 | 0.774 | 0.260 | 0.957 | 0.499 |
| SVM | 0.696 | 0.557 | 0.836 | 0,682 | 0.768 | 0.200 | 0.971 | 0.441 |
| ANN | 0.631 | 0.614 | 0.669 | **0.705** | 0.768 | 0.440 | 0.886 | 0.624 |
| **ANT 15** | Naïve Bayes | 0.655 | 0.465 | 0.845 | 0,627 | 0.697 | 0.464 | 0.920 | 0.653 |
| J48 | 0.733 | 0.786 | 0.679 | 0,731 | 0.768 | 0.765 | 0.770 | **0.767** |
| Random Forest | 0.628 | 0.626 | 0.631 | 0,628 | 0.765 | 0.804 | 0.727 | 0.765 |
| Régression Logistique | 0.693 | 0.540 | 0.845 | 0,675 | 0.740 | 0.615 | 0.861 | 0.728 |
| SVM | 0.634 | 0.337 | 0.930 | 0,560 | 0.686 | 0.441 | 0.920 | 0.637 |
| ANN | 0.722 | 0.727 | 0.715 | **0.732** | 0.765 | 0.754 | 0.775 | 0.764 |
| ANT 16 | Naïve Bayes | 0.679 | 0.492 | 0.866 | 0,653 | 0.823 | 0.131 | 0.961 | 0.355 |
| J48 | 0.679 | 0.599 | 0.759 | **0,674** | 0.834 | 0.000 | 1.000 | 0.000 |
| Random Forest | 0.647 | 0.661 | 0.632 | *0,646* | 0.823 | 0.557 | 0.876 | **0.699** |
| Régression Logistique | 0.682 | 0.567 | 0.798 | 0,673 | 0.834 | 0.115 | 0.977 | 0.335 |
| SVM | 0.679 | 0.560 | 0.798 | 0,668 | 0.834 | 0.000 | 1.000 | 0.000 |
| ANN | 0.564 | 0.498 | 0.733 | 0.665 | 0.823 | 0.049 | 0.977 | 0.219 |
| ANT 17 | Naïve Bayes | 0.673 | 0.431 | 0.914 | *0.628* | 0.887 | 0.366 | 0.964 | 0.594 |
| J48 | 0.752 | 0.761 | 0.742 | 0.751 | 0.896 | 0.248 | 0.993 | 0.496 |
| Random Forest | 0.709 | 0.726 | 0.692 | 0.709 | 0.856 | 0.535 | 0.904 | **0.695** |
| Régression Logistique | 0.724 | 0.601 | 0.847 | 0.713 | 0.889 | 0.248 | 0.985 | 0.494 |
| SVM | 0.700 | 0.527 | 0.873 | 0.678 | 0.875 | 0.089 | 0.993 | 0.297 |
| ANN | 0.734 | 0.748 | 0.710 | **0.731** | 0.889 | 0.347 | 0.970 | 0.580 |

***Modèle d (LOC, Ce) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACCB** | **TPRB** | **TNRB** | **g-meanB** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes | 0.742 | 0.576 | 0.909 | 0,724 | 0.796 | 0.741 | 0.909 | **0.821** |
| J48 | 0.720 | 0.712 | 0.727 | 0,719 | 0.811 | 0.852 | 0.727 | 0.787 |
| Random Forest | 0.659 | 0.667 | 0.652 | 0,659 | 0.826 | 0.919 | 0.636 | 0.765 |
| Régression Logistique | 0.773 | 0.727 | 0.818 | 0,771 | 0.821 | 0.837 | 0.788 | 0.812 |
| SVM | 0.697 | 0.455 | 0.939 | 0,654 | 0.692 | 1.000 | 0.061 | 0.247 |
| ANN | 0.747 | 0.720 | 0.793 | **0.779** | 0.826 | 0.881 | 0.712 | 0.792 |
| **ANT 14** | Naïve Bayes | 0.668 | 0.471 | 0.864 | 0,638 | 0.784 | 0.340 | 0.943 | 0.566 |
| J48 | 0.689 | 0.557 | 0.821 | 0,676 | 0.753 | 0.480 | 0.850 | 0.639 |
| Random Forest | 0.646 | 0.657 | 0.636 | *0,646* | 0.753 | 0.580 | 0.814 | **0.687** |
| Régression Logistique | 0.693 | 0.629 | 0.757 | 0,690 | 0.779 | 0.260 | 0.964 | 0.501 |
| SVM | 0.700 | 0.557 | 0.843 | 0,685 | 0.763 | 0.180 | 0.971 | 0.418 |
| ANN | 0.626 | 0.606 | 0.671 | **0.706** | 0.768 | 0.440 | 0.886 | 0.624 |
| **ANT 15** | Naïve Bayes | 0.658 | 0.465 | 0.850 | 0,629 | 0.697 | 0.469 | 0.914 | 0.655 |
| J48 | 0.714 | 0.786 | 0.642 | 0,710 | 0.770 | 0.771 | 0.770 | **0.770** |
| Random Forest | 0.631 | 0.604 | 0.658 | 0,63 | 0.757 | 0.799 | 0.717 | 0.757 |
| Régression Logistique | 0.695 | 0.545 | 0.845 | 0,679 | 0.740 | 0.615 | 0.861 | 0.728 |
| SVM | 0.623 | 0.310 | 0.936 | 0,539 | 0.678 | 0.419 | 0.925 | 0.623 |
| ANN | 0.717 | 0.709 | 0.732 | **0.730** | 0.765 | 0.754 | 0.775 | 0.764 |
| ANT 16 | Naïve Bayes | 0.671 | 0.476 | 0.866 | 0,642 | 0.826 | 0.131 | 0.964 | 0.355 |
| J48 | 0.689 | 0.678 | 0.700 | **0,689** | 0.834 | 0.000 | 1.000 | 0.000 |
| Random Forest | 0.661 | 0.655 | 0.668 | *0,661* | 0.829 | 0.541 | 0.886 | **0.692** |
| Régression Logistique | 0.684 | 0.570 | 0.798 | 0,674 | 0.832 | 0.098 | 0.977 | 0.309 |
| SVM | 0.668 | 0.472 | 0.863 | 0,638 | 0.834 | 0.000 | 1.000 | 0.000 |
| ANN |  |  |  |  | 0.826 | 0.049 | 0.980 | 0.219 |
| ANT 17 | Naïve Bayes | 0.674 | 0.433 | 0.916 | 0.630 | 0.888 | 0.356 | 0.967 | 0.587 |
| J48 | 0.748 | 0.733 | 0.763 | **0.748** | 0.896 | 0.248 | 0.993 | 0.496 |
| Random Forest | 0.713 | 0.699 | 0.726 | 0.712 | 0.856 | 0.505 | 0.908 | **0.677** |
| Régression Logistique | 0.725 | 0.603 | 0.847 | 0.715 | 0.890 | 0.248 | 0.987 | 0.495 |
| SVM | 0.696 | 0.519 | 0.874 | 0.674 | 0.875 | 0.069 | 0.996 | 0.262 |
| ANN | 0.733 | 0.748 | 0.708 | 0.730 | 0.889 | 0.347 | 0.970 | 0.580 |

***Modèle d (LOC, FANIN) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACCB** | **TPRB** | **TNRB** | **g-meanB** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes | 0.750 | 0.591 | 0.909 | 0,733 | 0.796 | 0.741 | 0.909 | **0.821** |
| J48 | 0.712 | 0.712 | 0.712 | 0,712 | 0.811 | 0.852 | 0.727 | 0.787 |
| Random Forest | 0.689 | 0.682 | 0.697 | 0,689 | 0.841 | 0.919 | 0.682 | 0.792 |
| Régression Logistique | 0.773 | 0.727 | 0.818 | 0,771 | 0.821 | 0.837 | 0.788 | 0.812 |
| SVM | 0.705 | 0.470 | 0.939 | 0,664 | 0.692 | 0.993 | 0.076 | 0.275 |
| ANN | 0.747 | 0.719 | 0.794 | **0.779** | 0.826 | 0.881 | 0.712 | 0.792 |
| **ANT 14** | Naïve Bayes | 0.679 | 0.493 | 0.864 | 0,653 | 0.784 | 0.340 | 0.943 | 0.566 |
| J48 | 0.696 | 0.593 | 0.800 | 0,689 | 0.753 | 0.480 | 0.850 | 0.639 |
| Random Forest | 0.657 | 0.650 | 0.664 | *0,657* | 0.753 | 0.560 | 0.821 | **0.678** |
| Régression Logistique | 0.693 | 0.629 | 0.757 | 0,690 | 0.774 | 0.260 | 0.957 | 0.499 |
| SVM | 0.711 | 0.593 | 0.829 | 0,701 | 0.774 | 0.220 | 0.971 | 0.462 |
| ANN | 0.689 | 0.668 | 0.730 | **0.703** | 0.768 | 0.440 | 0.886 | 0.624 |
| **ANT 15** | Naïve Bayes | 0.658 | 0.465 | 0.850 | 0,629 | 0.694 | 0.464 | 0.914 | 0.651 |
| J48 | 0.717 | 0.738 | 0.695 | 0,716 | 0.768 | 0.765 | 0.770 | **0.767** |
| Random Forest | 0.623 | 0.615 | 0.631 | 0,623 | 0.762 | 0.810 | 0.717 | 0.762 |
| Régression Logistique | 0.695 | 0.545 | 0.845 | 0,679 | 0.740 | 0.615 | 0.861 | 0.728 |
| SVM | 0.628 | 0.326 | 0.930 | 0,551 | 0.686 | 0.441 | 0.920 | 0.637 |
| ANN | 0.720 | 0.719 | 0.720 | **0.730** | 0.765 | 0.754 | 0.775 | 0.764 |
| ANT 16 | Naïve Bayes | 0.673 | 0.476 | 0.870 | 0,644 | 0.823 | 0.131 | 0.961 | 0.355 |
| J48 | 0.710 | 0.651 | 0.769 | **0,708** | 0.834 | 0.000 | 1.000 | 0.000 |
| Random Forest | 0.678 | 0.668 | 0.687 | *0,677* | 0.829 | 0.557 | 0.883 | **0.701** |
| Régression Logistique | 0.687 | 0.577 | 0.798 | 0,679 | 0.834 | 0.115 | 0.977 | 0.335 |
| SVM | 0.666 | 0.489 | 0.844 | 0,642 | 0.834 | 0.000 | 1.000 | 0.000 |
| ANN |  |  |  |  | 0.823 | 0.049 | 0.977 | 0.219 |
| ANT 17 | Naïve Bayes | 0.673 | 0.431 | 0.914 | 0.628 | 0.887 | 0.366 | 0.964 | 0.594 |
| J48 | 0.708 | 0.800 | 0.754 | **0.777** | 0.896 | 0.248 | 0.993 | 0.496 |
| Random Forest | 0.699 | 0.702 | 0.695 | 0.698 | 0.862 | 0.545 | 0.910 | **0.704** |
| Régression Logistique | 0.722 | 0.597 | 0.847 | 0.711 | 0.890 | 0.248 | 0.987 | 0.495 |
| SVM | 0.701 | 0.529 | 0.873 | 0.680 | 0.875 | 0.079 | 0.994 | 0.280 |
| ANN |  |  |  |  | 0.889 | 0.347 | 0.970 | 0.580 |

***Modèle d (Qi, CBO) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACCB** | **TPRB** | **TNRB** | **g-meanB** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes | 0.500 | 0.788 | 0.212 | 0,409 | 0.642 | 0.933 | 0.045 | 0.205 |
| J48 | 0.697 | 0.833 | 0.561 | 0,684 | 0.801 | 0.919 | 0.561 | **0.718** |
| Random Forest | 0.606 | 0.591 | 0.621 | 0,606 | 0.776 | 0.874 | 0.576 | 0.710 |
| Régression Logistique | 0.621 | 0.409 | 0.833 | 0,584 | 0.682 | 0.993 | 0.045 | 0.211 |
| SVM | 0.515 | 0.455 | 0.576 | 0,512 | 0.672 | 1.000 | 0.000 | 0.000 |
| ANN | 0.529 | 0.549 | 0.475 | **0.560** | 0.761 | 0.911 | 0.455 | 0.644 |
| **ANT 14** | Naïve Bayes | 0.664 | 0.564 | 0.764 | 0,656 | 0.732 | 0.060 | 0.971 | 0.241 |
| J48 | 0.700 | 0.736 | 0.664 | 0,699 | 0.747 | 0.420 | 0.864 | 0.602 |
| Random Forest | 0.743 | 0.657 | 0.829 | **0,738** | 0.774 | 0.560 | 0.850 | **0.690** |
| Régression Logistique | 0.693 | 0.543 | 0.843 | 0,677 | 0.732 | 0.060 | 0.971 | 0.241 |
| SVM | 0.518 | 0.064 | 0.971 | 0,249 | 0.732 | 0.000 | 0.993 | 0.000 |
| ANN | 0.686 | 0.671 | 0.714 | 0.725 | 0.800 | 0.500 | 0.907 | 0.673 |
| **ANT 15** | Naïve Bayes | 0.567 | 0.219 | 0.914 | 0,447 | 0.552 | 0.128 | 0.957 | 0.350 |
| J48 | 0.695 | 0.578 | 0.813 | 0,686 | 0.735 | 0.654 | 0.813 | 0.729 |
| Random Forest | 0.717 | 0.626 | 0.807 | **0,711** | 0.732 | 0.665 | 0.797 | 0.728 |
| Régression Logistique | 0.682 | 0.540 | 0.824 | 0,667 | 0.697 | 0.525 | 0.861 | 0.672 |
| SVM | 0.508 | 0.037 | 0.979 | 0,190 | 0.530 | 0.050 | 0.989 | 0.222 |
| ANN | 0.633 | 0.615 | 0.672 | 0.682 | 0.746 | 0.687 | 0.802 | **0.742** |
| ANT 16 | Naïve Bayes | 0.577 | 0.355 | 0.798 | 0,532 | 0.821 | 0.000 | 0.984 | 0.000 |
| J48 | 0.634 | 0.430 | 0.837 | 0,6 | 0.834 | 0.000 | 1.000 | 0.000 |
| Random Forest | 0.785 | 0.691 | 0.879 | **0,779** | 0.851 | 0.443 | 0.932 | **0.643** |
| Régression Logistique | 0.625 | 0.472 | 0.779 | 0,606 | 0.829 | 0.016 | 0.990 | 0.126 |
| SVM | 0.505 | 0.023 | 0.987 | 0,151 | 0.834 | 0.000 | 1.000 | 0.000 |
| ANN |  |  |  |  | 0.834 | 0.000 | 1.000 | 0.000 |
| ANT 17 | Naïve Bayes | 0.564 | 0.170 | 0.959 | *0.404* | 0.870 | 0.079 | 0.988 | 0.279 |
| J48 | 0.859 | 0.898 | 0.821 | 0.859 | 0.870 | 0.000 | 1.000 | 0.000 |
| Random Forest | 0.893 | 0.830 | 0.956 | **0.891** | 0.885 | 0.376 | 0.961 | **0.601** |
| Régression Logistique | 0.647 | 0.473 | 0.821 | 0.623 | 0.872 | 0.050 | 0.996 | 0.223 |
| SVM | 0.507 | 0.033 | 0.982 | 0.180 | 0.869 | 0.000 | 0.999 | 0.000 |
| ANN | 0.667 | 0.659 | 0.683 | 0.685 | 0.860 | 0.050 | 0.981 | 0.221 |

***Modèle d (Qi, FANIN) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACCB** | **TPRB** | **TNRB** | **g-meanB** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes | 0.485 | 0.909 | 0.061 | 0,235 | 0.612 | 0.881 | 0.061 | 0.232 |
| J48 | 0.591 | 0.758 | 0.424 | 0,567 | 0.756 | 0.919 | 0.424 | 0.624 |
| Random Forest | 0.712 | 0.621 | 0.803 | **0,706** | 0.806 | 0.867 | 0.682 | **0.769** |
| Régression Logistique | 0.462 | 0.409 | 0.515 | 0,459 | 0.672 | 1.000 | 0.000 | 0.000 |
| SVM | 0.477 | 0.470 | 0.485 | 0,477 | 0.672 | 1.000 | 0.000 | 0.000 |
| ANN | 0.536 | 0.593 | 0.383 | 0.482 | 0.672 | 1.000 | 0.000 | 0.000 |
| **ANT 14** | Naïve Bayes | 0.654 | 0.664 | 0.643 | 0,653 | 0.726 | 0.020 | 0.979 | 0.140 |
| J48 | 0.782 | 0.686 | 0.879 | 0,777 | 0.826 | 0.640 | 0.893 | **0.756** |
| Random Forest | 0.821 | 0.757 | 0.886 | **0,819** | 0.795 | 0.580 | 0.871 | 0.711 |
| Régression Logistique | 0.664 | 0.414 | 0.914 | 0,615 | 0.732 | 0.040 | 0.979 | 0.198 |
| SVM | 0.525 | 0.064 | 0.986 | 0,251 | 0.732 | 0.000 | 0.993 | 0.000 |
| ANN | 0.657 | 0.626 | 0.720 | 0.745 | 0.768 | 0.380 | 0.907 | 0.587 |
| **ANT 15** | Naïve Bayes | 0.532 | 0.118 | 0.947 | 0,334 | 0.555 | 0.134 | 0.957 | 0.358 |
| J48 | 0.610 | 0.583 | 0.636 | **0,609** | 0.683 | 0.765 | 0.604 | 0.680 |
| Random Forest | 0.586 | 0.503 | 0.668 | 0,580 | 0.732 | 0.715 | 0.749 | **0.732** |
| Régression Logistique | 0.604 | 0.390 | 0.818 | 0,565 | 0.571 | 0.179 | 0.947 | 0.412 |
| SVM | 0.508 | 0.027 | 0.989 | 0,163 | 0.522 | 0.034 | 0.989 | 0.183 |
| ANN | 0.530 | 0.579 | 0.429 | 0.514 | 0.626 | 0.419 | 0.824 | 0.588 |
| ANT 16 | Naïve Bayes | 0.485 | 0.853 | 0.117 | 0,316 | 0.826 | 0.000 | 0.990 | 0.000 |
| J48 | 0.787 | 0.681 | 0.893 | 0,780 | 0.829 | 0.000 | 0.993 | 0.000 |
| Random Forest | 0.819 | 0.723 | 0.915 | **0,813** | 0.845 | 0.377 | 0.938 | **0.595** |
| Régression Logistique | 0.573 | 0.280 | 0.866 | 0,492 | 0.829 | 0.000 | 0.993 | 0.000 |
| SVM | 0.493 | 0.300 | 0.687 | 0,454 | 0.834 | 0.000 | 1.000 | 0.000 |
| ANN |  |  |  |  | 0.823 | 0.000 | 0.987 | 0.000 |
| ANT 17 | Naïve Bayes | 0.496 | 0.961 | 0.031 | *0.173* | 0.870 | 0.069 | 0.990 | 0.261 |
| J48 | 0.808 | 0.764 | 0.852 | 0.807 | 0.870 | 0.000 | 1.000 | 0.000 |
| Random Forest | 0.840 | 0.766 | 0.914 | **0.837** | 0.865 | 0.168 | 0.969 | **0.403** |
| Régression Logistique | 0.557 | 0.267 | 0.847 | 0.476 | 0.866 | 0.000 | 0.996 | 0.000 |
| SVM | 0.521 | 0.170 | 0.873 | 0.385 | 0.870 | 0.000 | 1.000 | 0.000 |
| ANN |  |  |  |  | 0.870 | 0.030 | 0.996 | 0.173 |

***Modèle d (WMC, Ca) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes | 0.500 | 0.182 | 0.818 | 0,386 | 0.657 | 0.941 | 0.076 | 0.267 |
| J48 | 0.598 | 0.667 | 0.530 | *0,595* | 0.677 | 0.807 | 0.409 | 0.575 |
| Random Forest | 0.591 | 0.545 | 0.636 | *0,589* | 0.711 | 0.822 | 0.485 | **0.631** |
| Régression Logistique | 0.591 | 0.394 | 0.788 | 0,557 | 0.667 | 0.985 | 0.015 | 0.122 |
| SVM | 0.470 | 0.470 | 0.470 | 0,470 | 0.672 | 1.000 | 0.000 | 0.000 |
| ANN | 0.522 | 0.520 | 0.528 | 0.555 | 0.692 | 0.919 | 0.227 | 0.457 |
| **ANT 14** | Naïve Bayes | 0.586 | 0.229 | 0.943 | 0,465 | 0.742 | 0.120 | 0.964 | 0.340 |
| J48 | 0.707 | 0.750 | 0.664 | **0,706** | 0.716 | 0.140 | 0.921 | 0.359 |
| Random Forest | 0.689 | 0.614 | 0.764 | *0,685* | 0.784 | 0.520 | 0.879 | **0.676** |
| Régression Logistique | 0.650 | 0.500 | 0.800 | 0,632 | 0.737 | 0.080 | 0.971 | 0.279 |
| SVM | 0.532 | 0.093 | 0.971 | 0,301 | 0.732 | 0.000 | 0.993 | 0.000 |
| ANN | 0.610 | 0.560 | 0.724 | 0.658 | 0.784 | 0.420 | 0.914 | 0.620 |
| **ANT 15** | Naïve Bayes | 0.532 | 0.118 | 0.947 | 0,334 | 0.552 | 0.123 | 0.963 | 0.344 |
| J48 | 0.610 | 0.583 | 0.636 | **0,609** | 0.702 | 0.642 | 0.759 | **0.698** |
| Random Forest | 0.586 | 0.503 | 0.668 | 0,580 | 0.675 | 0.687 | 0.663 | 0.675 |
| Régression Logistique | 0.604 | 0.390 | 0.818 | 0,565 | 0.617 | 0.385 | 0.840 | 0.569 |
| SVM | 0.508 | 0.027 | 0.989 | 0,163 | 0.525 | 0.039 | 0.989 | 0.196 |
| ANN | 0.548 | 0.534 | 0.584 | 0.600 | 0.678 | 0.564 | 0.786 | 0.666 |
| ANT 16 | Naïve Bayes | 0.542 | 0.130 | 0.954 | 0,352 | 0.815 | 0.000 | 0.977 | 0.000 |
| J48 | 0.570 | 0.339 | 0.801 | 0,521 | 0.823 | 0.033 | 0.980 | 0.180 |
| Random Forest | 0.700 | 0.625 | 0.775 | **0,696** | 0.815 | 0.344 | 0.909 | **0.559** |
| Régression Logistique | 0.586 | 0.384 | 0.788 | 0,550 | 0.829 | 0.016 | 0.990 | 0.126 |
| SVM | 0.503 | 0.020 | 0.987 | 0,140 | 0.834 | 0.000 | 1.000 | 0.000 |
| ANN |  |  |  |  | 0.826 | 0.000 | 0.990 | 0.000 |
| ANT 17 | Naïve Bayes | 0.518 | 0.068 | 0.967 | 0.256 | 0.866 | 0.079 | 0.984 | 0.279 |
| J48 | 0.658 | 0.720 | 0.596 | 0.655 | 0.870 | 0.000 | 1.000 | 0.000 |
| Random Forest | 0.763 | 0.684 | 0.841 | **0.758** | 0.880 | 0.426 | 0.948 | **0.635** |
| Régression Logistique | 0.592 | 0.332 | 0.852 | 0.532 | 0.872 | 0.040 | 0.997 | 0.200 |
| SVM | 0.508 | 0.024 | 0.993 | 0.154 | 0.869 | 0.000 | 0.999 | 0.000 |
| ANN |  |  |  |  | 0.867 | 0.020 | 0.994 | 0.141 |

***Modèle d (WMC, CBO) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACCB** | **TPRB** | **TNRB** | **g-meanB** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes | 0.568 | 0.273 | 0.864 | 0,486 | 0.652 | 0.933 | 0.076 | 0.266 |
| J48 | 0.689 | 0.636 | 0.742 | 0,687 | 0.756 | 0.889 | 0.485 | 0.657 |
| Random Forest | 0.598 | 0.545 | 0.652 | 0,596 | 0.786 | 0.896 | 0.561 | **0.709** |
| Régression Logistique | 0.674 | 0.530 | 0.818 | 0,658 | 0.741 | 0.948 | 0.318 | 0.549 |
| SVM | 0.523 | 0.091 | 0.955 | 0,295 | 0.672 | 1.000 | 0.000 | 0.000 |
| ANN | 0.635 | 0.651 | 0.600 | **0.735** | 0.781 | 0.919 | 0.500 | 0.678 |
| **ANT 14** | Naïve Bayes | 0.646 | 0.379 | 0.914 | 0,589 | 0.758 | 0.200 | 0.957 | 0.437 |
| J48 | 0.704 | 0.743 | 0.664 | 0,702 | 0.768 | 0.400 | 0.900 | 0.600 |
| Random Forest | 0.668 | 0.650 | 0.686 | *0,668* | 0.784 | 0.600 | 0.850 | **0.714** |
| Régression Logistique | 0.700 | 0.593 | 0.807 | 0,692 | 0.753 | 0.200 | 0.950 | 0.436 |
| SVM | 0.639 | 0.343 | 0.936 | 0,567 | 0.726 | 0.000 | 0.986 | 0.000 |
| ANN | 0.691 | 0.671 | 0.728 | **0.725** | 0.784 | 0.480 | 0.893 | 0.655 |
| **ANT 15** | Naïve Bayes | 0.575 | 0.225 | 0.925 | 0,456 | 0.604 | 0.223 | 0.968 | 0.465 |
| J48 | 0.671 | 0.588 | 0.754 | 0,666 | 0.724 | 0.715 | 0.733 | 0.724 |
| Random Forest | 0.658 | 0.626 | 0.690 | 0,657 | 0.724 | 0.726 | 0.722 | **0.724** |
| Régression Logistique | 0.703 | 0.588 | 0.818 | **0,694** | 0.730 | 0.615 | 0.840 | 0.719 |
| SVM | 0.551 | 0.139 | 0.963 | 0,366 | 0.587 | 0.190 | 0.968 | 0.429 |
| ANN | 0.658 | 0.623 | 0.730 | 0.693 | 0.727 | 0.665 | 0.786 | 0.723 |
| ANT 16 | Naïve Bayes | 0.549 | 0.179 | 0.919 | 0,406 | 0.815 | 0.016 | 0.974 | 0.125 |
| J48 | 0.630 | 0.495 | 0.765 | 0,615 | 0.834 | 0.997 | 0.016 | 0.126 |
| Random Forest | 0.655 | 0.603 | 0.707 | **0,653** | 0.837 | 0.475 | 0.909 | **0.657** |
| Régression Logistique | 0.625 | 0.482 | 0.769 | 0,609 | 0.829 | 0.016 | 0.990 | 0.126 |
| SVM | 0.518 | 0.075 | 0.961 | 0,268 | 0.834 | 0.000 | 1.000 | 0.000 |
| ANN |  |  |  |  | 0.818 | 0.000 | 0.980 | 0.000 |
| ANT 17 | Naïve Bayes | 0.582 | 0.204 | 0.960 | *0.443* | 0.869 | 0.079 | 0.987 | 0.279 |
| J48 | 0.672 | 0.821 | 0.523 | 0.655 | 0.865 | 0.168 | 0.969 | 0.403 |
| Random Forest | 0.722 | 0.680 | 0.764 | **0.721** | 0.883 | 0.535 | 0.935 | **0.707** |
| Régression Logistique | 0.681 | 0.547 | 0.816 | 0.668 | 0.875 | 0.079 | 0.994 | 0.280 |
| SVM | 0.564 | 0.160 | 0.967 | 0.393 | 0.869 | 0.000 | 0.999 | 0.000 |
| ANN |  |  |  |  | 0.865 | 0.089 | 0.981 | 0.295 |

***Modèle d (WMC, Ce) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACCB** | **TPRB** | **TNRB** | **g-meanB** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes | 0.689 | 0.470 | 0.909 | 0,654 | 0.697 | 0.630 | 0.833 | 0.724 |
| J48 | 0.705 | 0.758 | 0.652 | 0,703 | 0.766 | 0.830 | 0.636 | 0.727 |
| Random Forest | 0.621 | 0.636 | 0.606 | 0,621 | 0.826 | 0.919 | 0.636 | **0.765** |
| Régression Logistique | 0.697 | 0.636 | 0.758 | 0,694 | 0.781 | 0.837 | 0.667 | 0.747 |
| SVM | 0.621 | 0.318 | 0.924 | 0,542 | 0.672 | 1.000 | 0.000 | 0.000 |
| ANN | 0.657 | 0.633 | 0.705 | **0.712** | 0.771 | 0.896 | 0.515 | 0.679 |
| **ANT 14** | Naïve Bayes | 0.679 | 0.507 | 0.850 | 0,656 | 0.800 | 0.360 | 0.957 | 0.587 |
| J48 | 0.707 | 0.764 | 0.650 | **0,705** | 0.789 | 0.400 | 0.929 | 0.610 |
| Random Forest | 0.686 | 0.671 | 0.700 | *0,685* | 0.753 | 0.560 | 0.821 | **0.678** |
| Régression Logistique | 0.693 | 0.621 | 0.764 | 0,689 | 0.800 | 0.360 | 0.957 | 0.587 |
| SVM | 0.686 | 0.529 | 0.843 | 0,668 | 0.753 | 0.060 | 1.000 | 0.245 |
| ANN | 0.672 | 0.636 | 0.743 | 0.687 | 0.789 | 0.400 | 0.929 | 0.610 |
| **ANT 15** | Naïve Bayes | 0.684 | 0.465 | 0.904 | 0,648 | 0.705 | 0.497 | 0.904 | 0.670 |
| J48 | 0.733 | 0.631 | 0.834 | **0,725** | 0.773 | 0.726 | 0.818 | **0.771** |
| Random Forest | 0.663 | 0.583 | 0.743 | 0,658 | 0.770 | 0.737 | 0.802 |  |
| Régression Logistique | 0.725 | 0.615 | 0.834 | 0,716 | 0.760 | 0.642 | 0.872 | 0.748 |
| SVM | 0.676 | 0.449 | 0.904 | 0,637 | 0.730 | 0.547 | 0.904 | 0.703 |
| ANN | 0.693 | 0.656 | 0.763 | 0.710 | 0.770 | 0.732 | 0.**807** | 0.769 |
| ANT 16 | Naïve Bayes | 0.634 | 0.410 | 0.857 | 0,593 | 0.834 | 0.197 | 0.961 | 0.435 |
| J48 | 0.695 | 0.759 | 0.632 | **0,693** | 0.834 | 0.000 | 1.000 | 0.000 |
| Random Forest | 0.673 | 0.612 | 0.733 | 0,670 | 0.823 | 0.393 | 0.909 | **0.598** |
| Régression Logistique | 0.643 | 0.511 | 0.775 | 0,629 | 0.829 | 0.082 | 0.977 | 0.283 |
| SVM | 0.653 | 0.479 | 0.827 | 0,629 | 0.834 | 0.000 | 1.000 | 0.000 |
| ANN |  |  |  |  | 0.829 | 0.000 | 0.993 | 0.000 |
| ANT 17 | Naïve Bayes | 0.649 | 0.419 | 0.879 | *0.607* | 0.876 | 0.327 | 0.959 | 0.560 |
| J48 | 0.717 | 0.615 | 0.819 | 0.710 | 0.901 | 0.317 | 0.988 | 0.560 |
| Random Forest | 0.776 | 0.720 | 0.833 | **0.774** | 0.876 | 0.455 | 0.939 | **0.654** |
| Régression Logistique | 0.714 | 0.631 | 0.797 | 0.709 | 0.901 | 0.317 | 0.988 | 0.560 |
| SVM | 0.712 | 0.591 | 0.833 | 0.702 | 0.871 | 0.010 | 1.000 | 0.100 |
| ANN |  |  |  |  | 0.894 | 0.287 | 0.985 | 0.532 |

***Modèle d (WMC, FANIN) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACCB** | **TPRB** | **TNRB** | **g-meanB** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes | 0.545 | 0.712 | 0.379 | 0,519 | 0.637 | 0.911 | 0.076 | 0.263 |
| J48 | 0.644 | 0.758 | 0.530 | 0,634 | 0.736 | 0.881 | 0.439 | 0.622 |
| Random Forest | 0.583 | 0.485 | 0.682 | 0,575 | 0.741 | 0.852 | 0.515 | **0.662** |
| Régression Logistique | 0.576 | 0.333 | 0.818 | 0,522 | 0.672 | 0.985 | 0.030 | 0.172 |
| SVM | 0.500 | 0.152 | 0.848 | 0,359 | 0.672 | 1.000 | 0.000 | 0.000 |
| ANN | 0.523 | 0.519 | 0.535 | **0.581** | 0.731 | 0.926 | 0.333 | 0.555 |
| **ANT 14** | Naïve Bayes | 0.579 | 0.229 | 0.929 | 0,461 | 0.742 | 0.080 | 0.979 | 0.280 |
| J48 | 0.771 | 0.736 | 0.807 | **0,771** | 0.779 | 0.660 | 0.821 | **0.736** |
| Random Forest | 0.696 | 0.671 | 0.721 | *0,696* | 0.805 | 0.600 | 0.879 | 0.726 |
| Régression Logistique | 0.736 | 0.593 | 0.879 | 0,722 | 0.742 | 0.080 | 0.979 | 0.280 |
| SVM | 0.532 | 0.079 | 0.986 | 0,279 | 0.726 | 0.000 | 0.986 | 0.000 |
| ANN | 0.711 | 0.708 | 0.715 | 0.720 | 0.816 | 0.580 | 0.900 | 0.722 |
| **ANT 15** | Naïve Bayes | 0.553 | 0.160 | 0.947 | 0,389 | 0.566 | 0.140 | 0.973 | 0.369 |
| J48 | 0.698 | 0.722 | 0.674 | **0,698** | 0.727 | 0.765 | 0.690 | **0.727** |
| Random Forest | 0.650 | 0.588 | 0.711 | 0,647 | 0.721 | 0.737 | 0.706 | 0.721 |
| Régression Logistique | 0.607 | 0.348 | 0.866 | 0,549 | 0.615 | 0.313 | 0.904 | 0.532 |
| SVM | 0.503 | 0.021 | 0.984 | 0,144 | 0.519 | 0.034 | 0.984 | 0.183 |
| ANN | 0.593 | 0.600 | 0.575 | 0.656 | 0.694 | 0.642 | 0.743 | 0.691 |
| ANT 16 | Naïve Bayes | 0.562 | 0.547 | 0.577 | 0,562 | 0.826 | 0.000 | 0.990 | 0.000 |
| J48 | 0.598 | 0.349 | 0.847 | 0,544 | 0.834 | 0.016 | 0.997 | 0.126 |
| Random Forest | 0.695 | 0.616 | 0.775 | **0,691** | 0.815 | 0.426 | 0.893 | **0.617** |
| Régression Logistique | 0.588 | 0.322 | 0.853 | 0,524 | 0.826 | 0.000 | 0.990 | 0.000 |
| SVM | 0.505 | 0.023 | 0.987 | 0,151 | 0.834 | 0.000 | 1.000 | 0.000 |
| ANN |  |  |  |  | 0.832 | 0.033 | 0.990 | 0.181 |
| ANT 17 | Naïve Bayes | 0.583 | 0.335 | 0.831 | *0.528* | 0.863 | 0.069 | 0.982 | 0.260 |
| J48 | 0.655 | 0.656 | 0.653 | 0.654 | 0.870 | 0.000 | 1.000 | 0.000 |
| Random Forest | 0.758 | 0.689 | 0.827 | **0.755** | 0.880 | 0.406 | 0.951 | **0.621** |
| Régression Logistique | 0.605 | 0.393 | 0.818 | 0.567 | 0.871 | 0.040 | 0.996 | 0.200 |
| SVM | 0.502 | 0.025 | 0.979 | 0.156 | 0.870 | 0.000 | 1.000 | 0.000 |
| ANN |  |  |  |  | 0.869 | 0.000 | 0.999 | 0.000 |

***Combinaison de Tous les Modèles :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACCB** | **TPRB** | **TNRB** | **g-meanB** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes | 0.705 | 0.561 | 0.848 | 0,690 | 0.756 | 0.696 | 0.879 | 0.782 |
| J48 | 0.765 | 0.667 | 0.864 | 0,759 | 0.791 | 0.852 | 0.667 | 0.754 |
| Random Forest | 0.773 | 0.758 | 0.788 | 0,773 | 0.866 | 0.919 | 0.758 | **0.835** |
| Régression Logistique | 0.773 | 0.727 | 0.818 | 0,771 | 0.806 | 0.852 | 0.712 | 0.779 |
| SVM | 0.758 | 0.606 | 0.909 | 0,742 | 0.826 | 0.830 | 0.818 | 0.824 |
| ANN | 0.765 | 0.722 | 0.835 | **0.782** | 0.821 | 0.874 | 0.712 | 0.789 |
| **ANT 14** | Naïve Bayes | 0.671 | 0.493 | 0.850 | 0,647 | 0.784 | 0.480 | 0.893 | 0.655 |
| J48 | 0.793 | 0.800 | 0.786 | 0,793 | 0.789 | 0.620 | 0.850 | 0.726 |
| Random Forest | 0.868 | 0.857 | 0.879 | **0,868** | 0.842 | 0.660 | 0.907 | **0.774** |
| Régression Logistique | 0.711 | 0.643 | 0.779 | 0,708 | 0.779 | 0.420 | 0.907 | 0.617 |
| SVM | 0.721 | 0.664 | 0.779 | 0,719 | 0.758 | 0.200 | 0.957 | 0.437 |
| ANN | 0.692 | 0.654 | 0.763 | 0.713 | 0.811 | 0.520 | 0.914 | 0.689 |
| **ANT 15** | Naïve Bayes | 0.663 | 0.439 | 0.888 | 0,624 | 0.675 | 0.413 | 0.925 | 0.618 |
| J48 | 0.751 | 0.727 | 0.775 | 0,751 | 0.787 | 0.743 | 0.829 | 0.785 |
| Random Forest | 0.802 | 0.781 | 0.824 | **0,802** | 0.820 | 0.810 | 0.829 | **0.819** |
| Régression Logistique | 0.711 | 0.620 | 0.802 | 0,705 | 0.781 | 0.693 | 0.866 | 0.775 |
| SVM | 0.674 | 0.471 | 0.877 | 0,643 | 0.735 | 0.587 | 0.877 | 0.717 |
| ANN | 0.696 | 0.660 | 0.763 | 0.712 | 0.773 | 0.704 | 0.840 | 0.769 |
| ANT 16 | Naïve Bayes | 0.640 | 0.423 | 0.857 | 0,602 | 0.791 | 0.328 | 0.883 | 0.538 |
| J48 | 0.785 | 0.847 | 0.723 | 0,783 | 0.834 | 0.443 | 0.912 | 0.636 |
| Random Forest | 0.871 | 0.902 | 0.840 | **0,870** | 0.861 | 0.443 | 0.945 | **0.647** |
| Régression Logistique | 0.656 | 0.547 | 0.765 | 0,647 | 0.823 | 0.213 | 0.945 | 0.449 |
| SVM | 0.676 | 0.531 | 0.821 | 0,66 | 0.834 | 0.000 | 1.000 | 0.000 |
| ANN |  |  |  |  | 0.840 | 0.262 | 0.954 | 0.500 |
| ANT 17 | Naïve Bayes |  |  |  |  | 0.869 | 0.376 | 0.942 | 0.595 |
| J48 |  |  |  |  | 0.897 | 0.307 | 0.985 | 0.550 |
| Random Forest |  |  |  |  | 0.918 | 0.475 | 0.984 | **0.684** |
| Régression Logistique |  |  |  |  | 0.894 | 0.356 | 0.975 | 0.589 |
| SVM |  |  |  |  | 0.888 | 0.188 | 0.993 | 0.432 |
| ANN |  |  |  |  | 0.899 | 0.297 | 0.990 | 0.542 |

***Combinaison Sans les Qi:***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACCB** | **TPRB** | **TNRB** | **g-meanB** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes | 0.727 | 0.591 | 0.864 | 0,715 | 0.761 | 0.704 | 0.879 | 0.787 |
| J48 | 0.720 | 0.712 | 0.727 | 0,719 | 0.811 | 0.874 | 0.682 | 0.772 |
| Random Forest | 0.720 | 0.727 | 0.712 | 0,719 | 0.861 | 0.933 | 0.712 | **0.815** |
| Régression Logistique | 0.765 | 0.697 | 0.833 | 0,762 | 0.811 | 0.844 | 0.742 | 0.791 |
| SVM | 0.750 | 0.606 | 0.894 | 0,736 | 0.811 | 0.800 | 0.833 | **0.816** |
| ANN | 0.760 | 0.718 | 0.828 | **0.778** | 0.821 | 0.881 | 0.697 | 0.784 |
| **ANT 14** | Naïve Bayes | 0.671 | 0.486 | 0.857 | 0,645 | 0.774 | 0.440 | 0.893 | 0.627 |
| J48 | 0.771 | 0.864 | 0.679 | 0,766 | 0.784 | 0.560 | 0.864 | 0.696 |
| Random Forest | 0.818 | 0.821 | 0.814 | **0,817** | 0.832 | 0.680 | 0.886 | **0.776** |
| Régression Logistique | 0.714 | 0.650 | 0.779 | 0,712 | 0.774 | 0.340 | 0.929 | 0.562 |
| SVM | 0.718 | 0.650 | 0.786 | 0,715 | 0.753 | 0.180 | 0.957 | 0.415 |
| ANN | 0.689 | 0.664 | 0.736 | 0.702 | 0.779 | 0.520 | 0.871 | 0.673 |
| **ANT 15** | Naïve Bayes | 0.668 | 0.460 | 0.877 | 0,635 | 0.686 | 0.464 | 0.898 | 0.646 |
| J48 | 0.725 | 0.636 | 0.813 | 0,719 | 0.806 | 0.726 | 0.882 | 0.800 |
| Random Forest | 0.746 | 0.749 | 0.743 | **0,746** | 0.801 | 0.816 | 0.786 | **0.801** |
| Régression Logistique | 0.725 | 0.610 | 0.840 | 0,716 | 0.760 | 0.687 | 0.829 | 0.755 |
| SVM | 0.679 | 0.481 | 0.877 | 0,649 | 0.746 | 0.609 | 0.877 | 0.731 |
| ANN | 0.693 | 0.657 | 0.761 | 0.710 | 0.776 | 0.737 | 0.813 | 0.774 |
| ANT 16 | Naïve Bayes | 0.647 | 0.446 | 0.847 | 0,615 | 0.807 | 0.377 | 0.893 | 0.580 |
| J48 | 0.779 | 0.866 | 0.691 | 0,774 | 0.823 | 0.098 | 0.967 | 0.308 |
| Random Forest | 0.816 | 0.821 | 0.811 | **0,816** | 0.856 | 0.443 | 0.938 | **0.645** |
| Régression Logistique | 0.664 | 0.56 | 0.769 | 0,656 | 0.829 | 0.131 | 0.967 | 0.356 |
| SVM | 0.679 | 0.537 | 0.821 | 0,664 | 0.834 | 0.000 | 1.000 | 0.000 |
| ANN |  |  |  |  | 0.834 | 0.197 | 0.961 | 0.435 |
| ANT 17 | Naïve Bayes |  |  |  |  | 0.870 | 0.455 | 0.932 | 0.651 |
| J48 |  |  |  |  | 0.902 | 0.287 | 0.994 | 0.534 |
| Random Forest |  |  |  |  | 0.911 | 0.505 | 0.972 | **0.701** |
| Régression Logistique |  |  |  |  | 0.896 | 0.356 | 0.976 | 0.589 |
| SVM |  |  |  |  | 0.890 | 0.208 | 0.993 | 0.454 |
| ANN |  |  |  |  | 0.898 | 0.287 | 0.990 | 0.533 |

Oversampling 35-65%:

Le tableau suivant décrit les différents systèmes Ant utilisés et met en évidence le nombre de classes, nombre de classes fautives ainsi que le ratio des classes fautives avant et après Oversampling.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***Système*** | ***#Classes*** | ***#Fautives*** | ***%Fautives*** | ***#ClassesB*** | ***#FautivesB*** | ***%FautivesB*** |
| Ant13 | 126 | 60 | 47.62% | - | - | - |
| Ant14 | 178 | 38 | 21.35% | 216 | 76 | 35.18% |
| Ant15 | 293 | 106 | 36.62% | - | - | - |
| Ant16 | 352 | 45 | 12.78% | 473 | 166 | 35.09% |
| Ant17 | 675 | 70 | 10.37% | 1039 | 364 | 35.05% |

***Modèle d (LOC, Ca) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACCB** | **TPRB** | **TNRB** | **g-meanB** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes | - | - | - | - | 0.796 | 0.741 | 0.909 | **0.821** |
| J48 | - | - | - | - | 0.811 | 0.852 | 0.727 | 0.787 |
| Random Forest | - | - | - | - | 0.836 | 0.919 | 0.667 | 0.783 |
| Régression Logistique | - | - | - | - | 0.821 | 0.837 | 0.788 | 0.812 |
| SVM | - | - | - | - | 0.687 | 1.000 | 0.045 | 0.212 |
| ANN | - | - | - | - | 0.826 | 0.881 | 0.712 | 0.792 |
| **ANT 14** | Naïve Bayes | 0.722 | 0.342 | 0.929 | 0.564 | 0.784 | 0.340 | 0.943 | 0.566 |
| J48 | 0.593 | 0.566 | 0.814 | **0.679** | 0.737 | 0.400 | 0.857 | 0.585 |
| Random Forest | 0.667 | 0.526 | 0.743 | *0.625* | 0.763 | 0.560 | 0.836 | **0.684** |
| Régression Logistique | 0.713 | 0.368 | 0.9 | 0.576 | 0.774 | 0.260 | 0.957 | 0.499 |
| SVM | 0.694 | 0.184 | 0.971 | 0.423 | 0.768 | 0.200 | 0.971 | 0.441 |
| ANN | 0.721 | 0.491 | 0.846 | 0.65 | 0.768 | 0.440 | 0.886 | 0.624 |
| **ANT 15** | Naïve Bayes | - | - | - | - | 0.697 | 0.464 | 0.920 | 0.653 |
| J48 | - | - | - | - | 0.768 | 0.765 | 0.770 | 0.767 |
| Random Forest | - | - | - | - | 0.768 | 0.799 | 0.738 | **0.768** |
| Régression Logistique | - | - | - | - | 0.740 | 0.615 | 0.861 | 0.728 |
| SVM | - | - | - | - | 0.683 | 0.436 | 0.920 | 0.633 |
| ANN | - | - | - | - | 0.765 | 0.754 | 0.775 | 0.764 |
| ANT 16 | Naïve Bayes | 0.704 | 0.289 | 0.928 | 0.518 | 0.823 | 0.131 | 0.961 | 0.355 |
| J48 | 0.61 | 0.608 | 0.792 | **0.694** | 0.834 | 0.000 | 1.000 | 0.000 |
| Random Forest | 0.666 | 0.554 | 0.726 | *0.634* | 0.821 | 0.557 | 0.873 | **0.697** |
| Régression Logistique | 0.704 | 0.307 | 0.919 | 0.531 | 0.834 | 0.115 | 0.977 | 0.335 |
| SVM | 0.662 | 0.102 | 0.964 | 0.314 | 0.834 | 0.000 | 1.000 | 0.000 |
| ANN | 0.724 | 0.455 | 0.869 | 0.63 | 0.823 | 0.049 | 0.977 | 0.219 |
| ANT 17 | Naïve Bayes | 0.731 | 0.36 | 0.93 | 0.579 | 0.887 | 0.366 | 0.964 | 0.594 |
| J48 | 0.629 | 0.599 | 0.836 | **0.707** | 0.896 | 0.248 | 0.993 | 0.496 |
| Random Forest | 0.702 | 0.563 | 0.776 | 0.661 | 0.852 | 0.465 | 0.910 | **0.650** |
| Régression Logistique | 0.744 | 0.42 | 0.919 | 0.621 | 0.889 | 0.248 | 0.985 | 0.494 |
| SVM | 0.729 | 0.343 | 0.936 | 0.567 | 0.876 | 0.089 | 0.994 | 0.297 |
| ANN | 0.757 | 0.592 | 0.847 | 0.714 | 0.889 | 0.347 | 0.970 | 0.580 |

***Modèle d (LOC, Cbo) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes | - | - | - | - | 0.791 | 0.807 | 0.758 | 0.782 |
| J48 | - | - | - | - | 0.811 | 0.852 | 0.727 | 0.787 |
| Random Forest | - | - | - | - | 0.841 | 0.919 | 0.682 | 0.792 |
| Régression Logistique | - | - | - | - | 0.821 | 0.837 | 0.788 | **0.812** |
| SVM | - | - | - | - | 0.687 | 1.000 | 0.045 | 0.212 |
| ANN | - | - | - | - | 0.826 | 0.881 | 0.712 | 0.792 |
| **ANT 14** | Naïve Bayes | 0.713 | 0.316 | 0.929 | 0.542 | 0.784 | 0.340 | 0.943 | 0.566 |
| J48 | 0.583 | 0.553 | 0.814 | 0.671 | 0.753 | 0.480 | 0.850 | 0.639 |
| Random Forest | 0.634 | 0.526 | 0.693 | *0.604* | 0.742 | 0.560 | 0.807 | **0.672** |
| Régression Logistique | 0.708 | 0.355 | 0.9 | 0.565 | 0.774 | 0.260 | 0.957 | 0.499 |
| SVM | 0.699 | 0.197 | 0.971 | 0.438 | 0.768 | 0.200 | 0.971 | 0.441 |
| ANN | 0.719 | 0.481 | 0.849 | **0.643** | 0.768 | 0.440 | 0.886 | 0.624 |
| **ANT 15** | Naïve Bayes | - | - | - | - | 0.697 | 0.464 | 0.920 | 0.653 |
| J48 | - | - | - | - | 0.768 | 0.765 | 0.770 | **0.767** |
| Random Forest | - | - | - | - | 0.765 | 0.804 | 0.727 | 0.765 |
| Régression Logistique | - | - | - | - | 0.740 | 0.615 | 0.861 | 0.728 |
| SVM | - | - | - | - | 0.686 | 0.441 | 0.920 | 0.637 |
| ANN | - | - | - | - | 0.765 | 0.754 | 0.775 | 0.764 |
| ANT 16 | Naïve Bayes | 0.698 | 0.271 | 0.928 | 0.502 | 0.823 | 0.131 | 0.961 | 0.355 |
| J48 | 0.579 | 0.56 | 0.798 | **0.669** | 0.834 | 0.000 | 1.000 | 0.000 |
| Random Forest | 0.653 | 0.524 | 0.723 | *0.616* | 0.823 | 0.557 | 0.876 | **0.699** |
| Régression Logistique | 0.704 | 0.307 | 0.919 | 0.531 | 0.834 | 0.115 | 0.977 | 0.335 |
| SVM | 0.655 | 0.078 | 0.967 | 0.275 | 0.834 | 0.000 | 1.000 | 0.000 |
| ANN | 0.721 | 0.45 | 0.867 | 0.626 | 0.823 | 0.049 | 0.977 | 0.219 |
| ANT 17 | Naïve Bayes | 0.731 | 0.36 | 0.93 | *0.579* | 0.887 | 0.366 | 0.964 | 0.594 |
| J48 | 0.608 | 0.569 | 0.837 | 0.69 | 0.896 | 0.248 | 0.993 | 0.496 |
| Random Forest | 0.674 | 0.536 | 0.748 | 0.633 | 0.856 | 0.535 | 0.904 | **0.695** |
| Régression Logistique | 0.744 | 0.42 | 0.919 | 0.621 | 0.889 | 0.248 | 0.985 | 0.494 |
| SVM | 0.725 | 0.332 | 0.936 | 0.558 | 0.875 | 0.089 | 0.993 | 0.297 |
| ANN | 0.76 | 0.604 | 0.845 | **0.721** | 0.889 | 0.347 | 0.970 | 0.580 |

***Modèle d (LOC, Ce) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACCB** | **TPRB** | **TNRB** | **g-meanB** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes | - | - | - | - | 0.796 | 0.741 | 0.909 | **0.821** |
| J48 | - | - | - | - | 0.811 | 0.852 | 0.727 | 0.787 |
| Random Forest | - | - | - | - | 0.826 | 0.919 | 0.636 | 0.765 |
| Régression Logistique | - | - | - | - | 0.821 | 0.837 | 0.788 | 0.812 |
| SVM | - | - | - | - | 0.692 | 1.000 | 0.061 | 0.247 |
| ANN | - | - | - | - | 0.826 | 0.881 | 0.712 | 0.792 |
| **ANT 14** | Naïve Bayes | 0.713 | 0.329 | 0.921 | 0.551 | 0.784 | 0.340 | 0.943 | 0.566 |
| J48 | 0.612 | 0.592 | 0.814 | **0.694** | 0.753 | 0.480 | 0.850 | 0.639 |
| Random Forest | 0.718 | 0.605 | 0.779 | *0.686* | 0.753 | 0.580 | 0.814 | **0.687** |
| Régression Logistique | 0.713 | 0.368 | 0.9 | 0.576 | 0.779 | 0.260 | 0.964 | 0.501 |
| SVM | 0.699 | 0.197 | 0.971 | 0.438 | 0.763 | 0.180 | 0.971 | 0.418 |
| ANN | 0.719 | 0.487 | 0.846 | 0.643 | 0.768 | 0.440 | 0.886 | 0.624 |
| **ANT 15** | Naïve Bayes | - | - | - | - | 0.697 | 0.469 | 0.914 | 0.655 |
| J48 | - | - | - | - | 0.770 | 0.771 | 0.770 | **0.770** |
| Random Forest | - | - | - | - | 0.757 | 0.799 | 0.717 | 0.757 |
| Régression Logistique | - | - | - | - | 0.740 | 0.615 | 0.861 | 0.728 |
| SVM | - | - | - | - | 0.678 | 0.419 | 0.925 | 0.623 |
| ANN | - | - | - | - | 0.765 | 0.754 | 0.775 | 0.764 |
| ANT 16 | Naïve Bayes | 0.706 | 0.295 | 0.928 | 0.523 | 0.826 | 0.131 | 0.964 | 0.355 |
| J48 | 0.611 | 0.639 | 0.756 | **0.695** | 0.834 | 0.000 | 1.000 | 0.000 |
| Random Forest | 0.664 | 0.524 | 0.739 | *0.623* | 0.829 | 0.541 | 0.886 | **0.692** |
| Régression Logistique | 0.704 | 0.307 | 0.919 | 0.531 | 0.832 | 0.098 | 0.977 | 0.309 |
| SVM | 0.662 | 0.078 | 0.977 | 0.277 | 0.834 | 0.000 | 1.000 | 0.000 |
| ANN | 0.726 | 0.459 | 0.869 | 0.635 | 0.826 | 0.049 | 0.980 | 0.219 |
| ANT 17 | Naïve Bayes | 0.731 | 0.36 | 0.93 | 0.579 | 0.888 | 0.356 | 0.967 | 0.587 |
| J48 | 0.608 | 0.569 | 0.837 | 0.69 | 0.896 | 0.248 | 0.993 | 0.496 |
| Random Forest | 0.674 | 0.536 | 0.748 | 0.633 | 0.856 | 0.505 | 0.908 | **0.677** |
| Régression Logistique | 0.744 | 0.42 | 0.919 | 0.621 | 0.890 | 0.248 | 0.987 | 0.495 |
| SVM | 0.725 | 0.332 | 0.936 | 0.558 | 0.875 | 0.069 | 0.996 | 0.262 |
| ANN | 0.76 | 0.604 | 0.845 | **0.721** | 0.889 | 0.347 | 0.970 | 0.580 |

***Modèle d (LOC, FANIN) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACCB** | **TPRB** | **TNRB** | **g-meanB** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes | - | - | - | - | 0.796 | 0.741 | 0.909 | **0.821** |
| J48 | - | - | - | - | 0.811 | 0.852 | 0.727 | 0.787 |
| Random Forest | - | - | - | - | 0.841 | 0.919 | 0.682 | 0.792 |
| Régression Logistique | - | - | - | - | 0.821 | 0.837 | 0.788 | 0.812 |
| SVM | - | - | - | - | 0.692 | 0.993 | 0.076 | 0.275 |
| ANN | - | - | - | - | 0.826 | 0.881 | 0.712 | 0.792 |
| **ANT 14** | Naïve Bayes | 0.718 | 0.329 | 0.929 | 0.553 | 0.784 | 0.340 | 0.943 | 0.566 |
| J48 | 0.589 | 0.566 | 0.807 | 0.676 | 0.753 | 0.480 | 0.850 | 0.639 |
| Random Forest | 0.634 | 0.513 | 0.7 | *0.599* | 0.753 | 0.560 | 0.821 | **0.678** |
| Régression Logistique | 0.708 | 0.355 | 0.9 | 0.565 | 0.774 | 0.260 | 0.957 | 0.499 |
| SVM | 0.699 | 0.197 | 0.971 | 0.438 | 0.774 | 0.220 | 0.971 | 0.462 |
| ANN | 0.715 | 0.472 | 0.847 | **0.635** | 0.768 | 0.440 | 0.886 | 0.624 |
| **ANT 15** | Naïve Bayes | - | - | - | - | 0.694 | 0.464 | 0.914 | 0.651 |
| J48 | - | - | - | - | 0.768 | 0.765 | 0.770 | **0.767** |
| Random Forest | - | - | - | - | 0.762 | 0.810 | 0.717 | 0.762 |
| Régression Logistique | - | - | - | - | 0.740 | 0.615 | 0.861 | 0.728 |
| SVM | - | - | - | - | 0.686 | 0.441 | 0.920 | 0.637 |
| ANN | - | - | - | - | 0.765 | 0.754 | 0.775 | 0.764 |
| ANT 16 | Naïve Bayes | 0.7 | 0.277 | 0.928 | 0.507 | 0.823 | 0.131 | 0.961 | 0.355 |
| J48 | 0.631 | 0.669 | 0.756 | **0.711** | 0.834 | 0.000 | 1.000 | 0.000 |
| Random Forest | 0.672 | 0.566 | 0.73 | *0.643* | 0.829 | 0.557 | 0.883 | **0.701** |
| Régression Logistique | 0.704 | 0.307 | 0.919 | 0.531 | 0.834 | 0.115 | 0.977 | 0.335 |
| SVM | 0.664 | 0.108 | 0.964 | 0.323 | 0.834 | 0.000 | 1.000 | 0.000 |
| ANN | 0.719 | 0.447 | 0.866 | 0.624 | 0.823 | 0.049 | 0.977 | 0.219 |
| ANT 17 | Naïve Bayes | 0.727 | 0.349 | 0.93 | 0.57 | 0.887 | 0.366 | 0.964 | 0.594 |
| J48 | 0.673 | 0.673 | 0.824 | **0.745** | 0.896 | 0.248 | 0.993 | 0.496 |
| Random Forest | 0.71 | 0.585 | 0.778 | 0.675 | 0.862 | 0.545 | 0.910 | **0.704** |
| Régression Logistique | 0.746 | 0.426 | 0.919 | 0.625 | 0.890 | 0.248 | 0.987 | 0.495 |
| SVM | 0.723 | 0.319 | 0.941 | 0.548 | 0.875 | 0.079 | 0.994 | 0.280 |
| ANN | 0.761 | 0.598 | 0.849 | 0.721 | 0.889 | 0.347 | 0.970 | 0.580 |

***Modèle d (Qi, CBO) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACCB** | **TPRB** | **TNRB** | **g-meanB** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes | - | - | - | - | 0.642 | 0.933 | 0.045 | 0.205 |
| J48 | - | - | - | - | 0.801 | 0.919 | 0.561 | **0.718** |
| Random Forest | - | - | - | - | 0.776 | 0.874 | 0.576 | 0.710 |
| Régression Logistique | - | - | - | - | 0.682 | 0.993 | 0.045 | 0.211 |
| SVM | - | - | - | - | 0.672 | 1.000 | 0.000 | 0.000 |
| ANN | - | - | - | - | 0.761 | 0.911 | 0.455 | 0.644 |
| **ANT 14** | Naïve Bayes | 0.644 | 0.039 | 0.971 | 0.196 | 0.732 | 0.060 | 0.971 | 0.241 |
| J48 | 0.647 | 0.737 | 0.707 | 0.722 | 0.747 | 0.420 | 0.864 | 0.602 |
| Random Forest | 0.704 | 0.461 | 0.836 | **0.62** | 0.774 | 0.560 | 0.850 | **0.690** |
| Régression Logistique | 0.657 | 0.092 | 0.964 | 0.298 | 0.732 | 0.060 | 0.971 | 0.241 |
| SVM | 0.644 | 0.013 | 0.986 | 0.114 | 0.732 | 0.000 | 0.993 | 0.000 |
| ANN | 0.718 | 0.445 | 0.866 | 0.677 | 0.800 | 0.500 | 0.907 | 0.673 |
| **ANT 15** | Naïve Bayes | - | - | - | - | 0.552 | 0.128 | 0.957 | 0.350 |
| J48 | - | - | - | - | 0.735 | 0.654 | 0.813 | 0.729 |
| Random Forest | - | - | - | - | 0.732 | 0.665 | 0.797 | 0.728 |
| Régression Logistique | - | - | - | - | 0.697 | 0.525 | 0.861 | 0.672 |
| SVM | - | - | - | - | 0.530 | 0.050 | 0.989 | 0.222 |
| ANN | - | - | - | - | 0.746 | 0.687 | 0.802 | **0.742** |
| ANT 16 | Naïve Bayes | 0.641 | 0.012 | 0.98 | 0.109 | 0.821 | 0.000 | 0.984 | 0.000 |
| J48 | 0.503 | 0.434 | 0.844 | 0.605 | 0.834 | 0.000 | 1.000 | 0.000 |
| Random Forest | 0.803 | 0.59 | 0.919 | **0.736** | 0.851 | 0.443 | 0.932 | **0.643** |
| Régression Logistique | 0.645 | 0.012 | 0.987 | 0.109 | 0.829 | 0.016 | 0.990 | 0.126 |
| SVM | 0.649 | 0 | 1 | 0 | 0.834 | 0.000 | 1.000 | 0.000 |
| ANN | 0.645 | 0.04 | 0.972 | 0.364 | 0.834 | 0.000 | 1.000 | 0.000 |
| ANT 17 | Naïve Bayes | 0.658 | 0.058 | 0.982 | *0.238* | 0.870 | 0.079 | 0.988 | 0.279 |
| J48 | 0.57 | 0.511 | 0.847 | 0.658 | 0.870 | 0.000 | 1.000 | 0.000 |
| Random Forest | 0.865 | 0.717 | 0.945 | **0.823** | 0.885 | 0.376 | 0.961 | **0.601** |
| Régression Logistique | 0.674 | 0.135 | 0.964 | 0.36 | 0.872 | 0.050 | 0.996 | 0.223 |
| SVM | 0.65 | 0.003 | 0.999 | 0.052 | 0.869 | 0.000 | 0.999 | 0.000 |
| ANN | 0.696 | 0.296 | 0.912 | 0.593 | 0.860 | 0.050 | 0.981 | 0.221 |

***Modèle d (Qi, FANIN) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACCB** | **TPRB** | **TNRB** | **g-meanB** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes | - | - | - | - | 0.612 | 0.881 | 0.061 | 0.232 |
| J48 | - | - | - | - | 0.756 | 0.919 | 0.424 | 0.624 |
| Random Forest | - | - | - | - | 0.806 | 0.867 | 0.682 | **0.769** |
| Régression Logistique | - | - | - | - | 0.672 | 1.000 | 0.000 | 0.000 |
| SVM | - | - | - | - | 0.672 | 1.000 | 0.000 | 0.000 |
| ANN | - | - | - | - | 0.672 | 1.000 | 0.000 | 0.000 |
| **ANT 14** | Naïve Bayes | 0.657 | 0.053 | 0.986 | 0.228 | 0.726 | 0.020 | 0.979 | 0.140 |
| J48 | 0.657 | 0.618 | 0.857 | 0.728 | 0.826 | 0.640 | 0.893 | **0.756** |
| Random Forest | 0.819 | 0.684 | 0.893 | **0.782** | 0.795 | 0.580 | 0.871 | 0.711 |
| Régression Logistique | 0.667 | 0.079 | 0.986 | 0.279 | 0.732 | 0.040 | 0.979 | 0.198 |
| SVM | 0.644 | 0.013 | 0.986 | 0.114 | 0.732 | 0.000 | 0.993 | 0.000 |
| ANN | 0.686 | 0.259 | 0.917 | 0.674 | 0.768 | 0.380 | 0.907 | 0.587 |
| **ANT 15** | Naïve Bayes | - | - | - | - | 0.555 | 0.134 | 0.957 | 0.358 |
| J48 | - | - | - | - | 0.683 | 0.765 | 0.604 | 0.680 |
| Random Forest | - | - | - | - | 0.732 | 0.715 | 0.749 | **0.732** |
| Régression Logistique | - | - | - | - | 0.571 | 0.179 | 0.947 | 0.412 |
| SVM | - | - | - | - | 0.522 | 0.034 | 0.989 | 0.183 |
| ANN | - | - | - | - | 0.626 | 0.419 | 0.824 | 0.588 |
| ANT 16 | Naïve Bayes | 0.641 | 0 | 0.987 | 0 | 0.826 | 0.000 | 0.990 | 0.000 |
| J48 | 0.377 | 0.277 | 0.896 | 0.498 | 0.829 | 0.000 | 0.993 | 0.000 |
| Random Forest | 0.805 | 0.584 | 0.925 | **0.735** | 0.845 | 0.377 | 0.938 | **0.595** |
| Régression Logistique | 0.647 | 0.012 | 0.99 | 0.109 | 0.829 | 0.000 | 0.993 | 0.000 |
| SVM | 0.649 | 0 | 1 | 0 | 0.834 | 0.000 | 1.000 | 0.000 |
| ANN | 0.649 | 0.009 | 0.995 | 0.131 | 0.823 | 0.000 | 0.987 | 0.000 |
| ANT 17 | Naïve Bayes | 0.648 | 0.003 | 0.996 | *0.052* | 0.870 | 0.069 | 0.990 | 0.261 |
| J48 | 0.493 | 0.327 | 1 | 0.572 | 0.870 | 0.000 | 1.000 | 0.000 |
| Random Forest | 0.835 | 0.648 | 0.936 | **0.779** | 0.865 | 0.168 | 0.969 | **0.403** |
| Régression Logistique | 0.645 | 0 | 0.993 | 0 | 0.866 | 0.000 | 0.996 | 0.000 |
| SVM | 0.65 | 0 | 1 | 0 | 0.870 | 0.000 | 1.000 | 0.000 |
| ANN | 0.647 | 0.001 | 0.995 | 0.074 | 0.870 | 0.030 | 0.996 | 0.173 |

***Modèle d (WMC, Ca) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes | - | - | - | - | 0.657 | 0.941 | 0.076 | 0.267 |
| J48 | - | - | - | - | 0.677 | 0.807 | 0.409 | 0.575 |
| Random Forest | - | - | - | - | 0.711 | 0.822 | 0.485 | **0.631** |
| Régression Logistique | - | - | - | - | 0.667 | 0.985 | 0.015 | 0.122 |
| SVM | - | - | - | - | 0.672 | 1.000 | 0.000 | 0.000 |
| ANN | - | - | - | - | 0.692 | 0.919 | 0.227 | 0.457 |
| **ANT 14** | Naïve Bayes | 0.657 | 0.105 | 0.957 | 0.317 | 0.742 | 0.120 | 0.964 | 0.340 |
| J48 | 0.575 | 0.605 | 0.729 | **0.664** | 0.716 | 0.140 | 0.921 | 0.359 |
| Random Forest | 0.694 | 0.513 | 0.793 | *0.638* | 0.784 | 0.520 | 0.879 | **0.676** |
| Régression Logistique | 0.667 | 0.132 | 0.957 | 0.355 | 0.737 | 0.080 | 0.971 | 0.279 |
| SVM | 0.644 | 0.013 | 0.986 | 0.114 | 0.732 | 0.000 | 0.993 | 0.000 |
| ANN | 0.694 | 0.37 | 0.87 | 0.631 | 0.784 | 0.420 | 0.914 | 0.620 |
| **ANT 15** | Naïve Bayes | - | - | - | - | 0.552 | 0.123 | 0.963 | 0.344 |
| J48 | - | - | - | - | 0.702 | 0.642 | 0.759 | **0.698** |
| Random Forest | - | - | - | - | 0.675 | 0.687 | 0.663 | 0.675 |
| Régression Logistique | - | - | - | - | 0.617 | 0.385 | 0.840 | 0.569 |
| SVM | - | - | - | - | 0.525 | 0.039 | 0.989 | 0.196 |
| ANN | - | - | - | - | 0.678 | 0.564 | 0.786 | 0.666 |
| ANT 16 | Naïve Bayes | 0.649 | 0.054 | 0.971 | 0.229 | 0.815 | 0.000 | 0.977 | 0.000 |
| J48 | 0.274 | 0.187 | 0.906 | 0.411 | 0.823 | 0.033 | 0.980 | 0.180 |
| Random Forest | 0.685 | 0.44 | 0.818 | **0.6** | 0.815 | 0.344 | 0.909 | **0.559** |
| Régression Logistique | 0.649 | 0.024 | 0.987 | 0.154 | 0.829 | 0.016 | 0.990 | 0.126 |
| SVM | 0.649 | 0 | 1 | 0 | 0.834 | 0.000 | 1.000 | 0.000 |
| ANN | 0.645 | 0.025 | 0.98 | 0.252 | 0.826 | 0.000 | 0.990 | 0.000 |
| ANT 17 | Naïve Bayes | 0.654 | 0.049 | 0.981 | 0.22 | 0.866 | 0.079 | 0.984 | 0.279 |
| J48 | 0.463 | 0.448 | 0.738 | 0.575 | 0.870 | 0.000 | 1.000 | 0.000 |
| Random Forest | 0.736 | 0.505 | 0.861 | **0.66** | 0.880 | 0.426 | 0.948 | **0.635** |
| Régression Logistique | 0.649 | 0.025 | 0.985 | 0.156 | 0.872 | 0.040 | 0.997 | 0.200 |
| SVM | 0.649 | 0 | 0.999 | 0 | 0.869 | 0.000 | 0.999 | 0.000 |
| ANN | 0.653 | 0.054 | 0.977 | 0.372 | 0.867 | 0.020 | 0.994 | 0.141 |

***Modèle d (WMC, CBO) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACCB** | **TPRB** | **TNRB** | **g-meanB** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes | - | - | - | - | 0.652 | 0.933 | 0.076 | 0.266 |
| J48 | - | - | - | - | 0.756 | 0.889 | 0.485 | 0.657 |
| Random Forest | - | - | - | - | 0.786 | 0.896 | 0.561 | **0.709** |
| Régression Logistique | - | - | - | - | 0.741 | 0.948 | 0.318 | 0.549 |
| SVM | - | - | - | - | 0.672 | 1.000 | 0.000 | 0.000 |
| ANN | - | - | - | - | 0.781 | 0.919 | 0.500 | 0.678 |
| **ANT 14** | Naïve Bayes | 0.694 | 0.224 | 0.95 | 0.461 | 0.758 | 0.200 | 0.957 | 0.437 |
| J48 | 0.614 | 0.671 | 0.721 | 0.696 | 0.768 | 0.400 | 0.900 | 0.600 |
| Random Forest | 0.685 | 0.487 | 0.793 | *0.621* | 0.784 | 0.600 | 0.850 | **0.714** |
| Régression Logistique | 0.731 | 0.342 | 0.943 | 0.568 | 0.753 | 0.200 | 0.950 | 0.436 |
| SVM | 0.644 | 0.013 | 0.986 | 0.114 | 0.726 | 0.000 | 0.986 | 0.000 |
| ANN | 0.737 | 0.516 | 0.856 | **0.669** | 0.784 | 0.480 | 0.893 | 0.655 |
| **ANT 15** | Naïve Bayes | - | - | - | - | 0.604 | 0.223 | 0.968 | 0.465 |
| J48 | - | - | - | - | 0.724 | 0.715 | 0.733 | 0.724 |
| Random Forest | - | - | - | - | 0.724 | 0.726 | 0.722 | **0.724** |
| Régression Logistique | - | - | - | - | 0.730 | 0.615 | 0.840 | 0.719 |
| SVM | - | - | - | - | 0.587 | 0.190 | 0.968 | 0.429 |
| ANN | - | - | - | - | 0.727 | 0.665 | 0.786 | 0.723 |
| ANT 16 | Naïve Bayes | 0.651 | 0.084 | 0.958 | 0.284 | 0.815 | 0.016 | 0.974 | 0.125 |
| J48 | 0.521 | 0.452 | 0.847 | 0.619 | 0.834 | 0.997 | 0.016 | 0.126 |
| Random Forest | 0.723 | 0.56 | 0.811 | **0.674** | 0.837 | 0.475 | 0.909 | **0.657** |
| Régression Logistique | 0.653 | 0.084 | 0.961 | 0.285 | 0.829 | 0.016 | 0.990 | 0.126 |
| SVM | 0.645 | 0 | 0.993 | 0 | 0.834 | 0.000 | 1.000 | 0.000 |
| ANN | 0.679 | 0.24 | 0.916 | 0.492 | 0.818 | 0.000 | 0.980 | 0.000 |
| ANT 17 | Naïve Bayes | 0.679 | 0.124 | 0.978 | *0.348* | 0.869 | 0.079 | 0.987 | 0.279 |
| J48 | 0.564 | 0.522 | 0.822 | 0.655 | 0.865 | 0.168 | 0.969 | 0.403 |
| Random Forest | 0.705 | 0.519 | 0.804 | **0.646** | 0.883 | 0.535 | 0.935 | **0.707** |
| Régression Logistique | 0.692 | 0.209 | 0.953 | 0.446 | 0.875 | 0.079 | 0.994 | 0.280 |
| SVM | 0.653 | 0.016 | 0.996 | 0.128 | 0.869 | 0.000 | 0.999 | 0.000 |
| ANN | 0.715 | 0.468 | 0.849 | 0.637 | 0.865 | 0.089 | 0.981 | 0.295 |

***Modèle d (WMC, Ce) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACCB** | **TPRB** | **TNRB** | **g-meanB** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes | - | - | - | - | 0.697 | 0.630 | 0.833 | 0.724 |
| J48 | - | - | - | - | 0.766 | 0.830 | 0.636 | 0.727 |
| Random Forest | - | - | - | - | 0.826 | 0.919 | 0.636 | **0.765** |
| Régression Logistique | - | - | - | - | 0.781 | 0.837 | 0.667 | 0.747 |
| SVM | - | - | - | - | 0.672 | 1.000 | 0.000 | 0.000 |
| ANN | - | - | - | - | 0.771 | 0.896 | 0.515 | 0.679 |
| **ANT 14** | Naïve Bayes | 0.722 | 0.342 | 0.929 | 0.564 | 0.800 | 0.360 | 0.957 | 0.587 |
| J48 | 0.469 | 0.395 | 0.843 | **0.577** | 0.789 | 0.400 | 0.929 | 0.610 |
| Random Forest | 0.653 | 0.408 | 0.786 | *0.566* | 0.753 | 0.560 | 0.821 | **0.678** |
| Régression Logistique | 0.718 | 0.421 | 0.879 | 0.608 | 0.800 | 0.360 | 0.957 | 0.587 |
| SVM | 0.676 | 0.092 | 0.993 | 0.302 | 0.753 | 0.060 | 1.000 | 0.245 |
| ANN | 0.729 | 0.499 | 0.854 | 0.655 | 0.789 | 0.400 | 0.929 | 0.610 |
| **ANT 15** | Naïve Bayes | - | - | - | - | 0.705 | 0.497 | 0.904 | 0.670 |
| J48 | - | - | - | - | 0.773 | 0.726 | 0.818 | **0.771** |
| Random Forest | - | - | - | - | 0.770 | 0.737 | 0.802 | 0.769 |
| Régression Logistique | - | - | - | - | 0.760 | 0.642 | 0.872 | 0.748 |
| SVM | - | - | - | - | 0.730 | 0.547 | 0.904 | 0.703 |
| ANN | - | - | - | - | 0.770 | 0.732 | 0.**807** | 0.769 |
| ANT 16 | Naïve Bayes | 0.681 | 0.259 | 0.909 | 0.485 | 0.834 | 0.197 | 0.961 | 0.435 |
| J48 | 0.561 | 0.512 | 0.831 | **0.652** | 0.834 | 0.000 | 1.000 | 0.000 |
| Random Forest | 0.729 | 0.536 | 0.834 | 0.669 | 0.823 | 0.393 | 0.909 | **0.598** |
| Régression Logistique | 0.679 | 0.259 | 0.906 | 0.484 | 0.829 | 0.082 | 0.977 | 0.283 |
| SVM | 0.653 | 0.042 | 0.984 | 0.204 | 0.834 | 0.000 | 1.000 | 0.000 |
| ANN | 0.692 | 0.364 | 0.87 | 0.582 | 0.829 | 0.000 | 0.993 | 0.000 |
| ANT 17 | Naïve Bayes | 0.714 | 0.335 | 0.919 | *0.555* | 0.876 | 0.327 | 0.959 | 0.560 |
| J48 | 0.6 | 0.558 | 0.837 | 0.683 | 0.901 | 0.317 | 0.988 | 0.560 |
| Random Forest | 0.772 | 0.602 | 0.864 | **0.721** | 0.876 | 0.455 | 0.939 | **0.654** |
| Régression Logistique | 0.719 | 0.39 | 0.896 | 0.591 | 0.901 | 0.317 | 0.988 | 0.560 |
| SVM | 0.708 | 0.261 | 0.95 | 0.498 | 0.871 | 0.010 | 1.000 | 0.100 |
| ANN | 0.73 | 0.471 | 0.869 | 0.671 | 0.894 | 0.287 | 0.985 | 0.532 |

***Modèle d (WMC, FANIN) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACCB** | **TPRB** | **TNRB** | **g-meanB** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes | - | - | - | - | 0.637 | 0.911 | 0.076 | 0.263 |
| J48 | - | - | - | - | 0.736 | 0.881 | 0.439 | 0.622 |
| Random Forest | - | - | - | - | 0.741 | 0.852 | 0.515 | **0.662** |
| Régression Logistique | - | - | - | - | 0.672 | 0.985 | 0.030 | 0.172 |
| SVM | - | - | - | - | 0.672 | 1.000 | 0.000 | 0.000 |
| ANN | - | - | - | - | 0.731 | 0.926 | 0.333 | 0.555 |
| **ANT 14** | Naïve Bayes | 0.662 | 0.079 | 0.979 | 0.278 | 0.742 | 0.080 | 0.979 | 0.280 |
| J48 | 0.654 | 0.684 | 0.779 | **0.73** | 0.779 | 0.660 | 0.821 | **0.736** |
| Random Forest | 0.69 | 0.553 | 0.764 | *0.65* | 0.805 | 0.600 | 0.879 | 0.726 |
| Régression Logistique | 0.662 | 0.092 | 0.971 | 0.299 | 0.742 | 0.080 | 0.979 | 0.280 |
| SVM | 0.662 | 0.066 | 0.986 | 0.255 | 0.726 | 0.000 | 0.986 | 0.000 |
| ANN | 0.763 | 0.596 | 0.854 | 0.722 | 0.816 | 0.580 | 0.900 | 0.722 |
| **ANT 15** | Naïve Bayes | - | - | - | - | 0.566 | 0.140 | 0.973 | 0.369 |
| J48 | - | - | - | - | 0.727 | 0.765 | 0.690 | **0.727** |
| Random Forest | - | - | - | - | 0.721 | 0.737 | 0.706 | 0.721 |
| Régression Logistique | - | - | - | - | 0.615 | 0.313 | 0.904 | 0.532 |
| SVM | - | - | - | - | 0.519 | 0.034 | 0.984 | 0.183 |
| ANN | - | - | - | - | 0.694 | 0.642 | 0.743 | 0.691 |
| ANT 16 | Naïve Bayes | 0.645 | 0.012 | 0.987 | 0.109 | 0.826 | 0.000 | 0.990 | 0.000 |
| J48 | 0.402 | 0.313 | 0.866 | 0.521 | 0.834 | 0.016 | 0.997 | 0.126 |
| Random Forest | 0.679 | 0.452 | 0.801 | **0.602** | 0.815 | 0.426 | 0.893 | **0.617** |
| Régression Logistique | 0.647 | 0.018 | 0.987 | 0.134 | 0.826 | 0.000 | 0.990 | 0.000 |
| SVM | 0.647 | 0 | 0.997 | 0 | 0.834 | 0.000 | 1.000 | 0.000 |
| ANN | 0.66 | 0.069 | 0.98 | 0.401 | 0.832 | 0.033 | 0.990 | 0.181 |
| ANT 17 | Naïve Bayes | 0.646 | 0 | 0.994 | *0* | 0.863 | 0.069 | 0.982 | 0.260 |
| J48 | 0.441 | 0.376 | 0.821 | 0.556 | 0.870 | 0.000 | 1.000 | 0.000 |
| Random Forest | 0.729 | 0.536 | 0.833 | **0.668** | 0.880 | 0.406 | 0.951 | **0.621** |
| Régression Logistique | 0.644 | 0.016 | 0.982 | 0.127 | 0.871 | 0.040 | 0.996 | 0.200 |
| SVM | 0.648 | 0 | 0.997 | 0 | 0.870 | 0.000 | 1.000 | 0.000 |
| ANN | 0.661 | 0.13 | 0.948 | 0.479 | 0.869 | 0.000 | 0.999 | 0.000 |

1. Existence de Faute de Sévérité élevé:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***Système*** | ***#Classes*** | ***#Fautives*** | ***%Fautives*** | ***#ClassesD*** | ***#FautivesD*** | ***%FautivesD*** |
| Ant13 |  |  |  |  |  |  |
| Ant14 |  |  |  |  |  |  |
| Ant15 | 293 | 55 | 18.77% | 298 | 60 | 20.13% |
| Ant16 |  |  |  |  |  |  |
| Ant17 |  |  |  |  |  |  |

***Modèle d (LOC, Ca) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 14** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 15** | Naïve Bayes | 0.795 | 0.073 | 0.962 | 0.265 | 0.779 | 0.067 | 0.958 | 0.253 |
| J48 | 0.033 | 0.018 | 0.983 | 0.134 | 0.358 | 0.317 | 0.887 | 0.53 |
| Random Forest | 0.758 | 0.400 | 0.84 | **0.580** | 0.765 | 0.467 | 0.84 | **0.626** |
| Régression Logistique | 0.799 | 0.036 | 0.975 | 0.188 | 0.789 | 0.067 | 0.971 | 0.254 |
| SVM | 0.812 | 0.000 | 1.000 | 0.000 | 0.799 | 0.0 | 1.0 | 0.0 |
| ANN | 0.795 | 0.039 | 0.969 | 0.201 | 0.78 | 0.044 | 0.965 | 0.249 |
| ANT 16 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| ANT 17 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |

***Modèle d (LOC, Cbo) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 14** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 15** | Naïve Bayes | 0.795 | 0.073 | 0.962 | 0.265 | 0.779 | 0.067 | 0.958 | 0.253 |
| J48 | 0.033 | 0.018 | 0.983 | 0.134 | 0.358 | 0.317 | 0.887 | 0.53 |
| Random Forest | 0.744 | 0.345 | 0.836 | **0.537** | 0.748 | 0.433 | 0.828 | **0.599** |
| Régression Logistique | 0.799 | 0.036 | 0.975 | 0.188 | 0.789 | 0.067 | 0.971 | 0.254 |
| SVM | 0.812 | 0.0 | 1.0 | 0.0 | 0.799 | 0.0 | 1.0 | 0.0 |
| ANN | 0.795 | 0.039 | 0.969 | 0.201 | 0.77 | 0.066 | 0.948 | 0.251 |
| ANT 16 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| ANT 17 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |

***Modèle d (LOC, Ce) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 14** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 15** | Naïve Bayes | 0.792 | 0.055 | 0.962 | 0.229 | 0.782 | 0.067 | 0.962 | 0.253 |
| J48 | 0.033 | 0.018 | 0.983 | 0.134 | 0.358 | 0.317 | 0.887 | 0.53 |
| Random Forest | 0.761 | 0.382 | 0.849 | 0.569 | 0.748 | 0.467 | 0.819 | **0.618** |
| Régression Logistique | 0.799 | 0.036 | 0.975 | 0.188 | 0.792 | 0.067 | 0.975 | 0.255 |
| SVM | 0.812 | 0.0 | 1.0 | 0.0 | 0.799 | 0.0 | 1.0 | 0.0 |
| ANN | 0.795 | 0.04 | 0.969 | 0.21 | 0.781 | 0.047 | 0.966 | 0.258 |
| ANT 16 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| ANT 17 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |

***Modèle d (LOC, FANIN) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 14** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 15** | Naïve Bayes | 0.795 | 0.073 | 0.962 | 0.265 | 0.779 | 0.067 | 0.958 | 0.253 |
| J48 | 0.033 | 0.018 | 0.983 | 0.134 | 0.358 | 0.317 | 0.887 | 0.53 |
| Random Forest | 0.751 | 0.382 | 0.836 | **0.565** | 0.752 | 0.483 | 0.819 | **0.629** |
| Régression Logistique | 0.799 | 0.036 | 0.975 | 0.188 | 0.789 | 0.067 | 0.971 | 0.254 |
| SVM | 0.812 | 0.0 | 1.0 | 0.0 | 0.799 | 0.0 | 1.0 | 0.0 |
| ANN | 0.794 | 0.036 | 0.97 | 0.194 | 0.77 | 0.065 | 0.947 | 0.254 |
| ANT 16 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| ANT 17 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |

***Modèle d (Qi, CBO) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 14** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 15** | Naïve Bayes | 0.799 | 0.0 | 0.983 | 0.0 | 0.782 | 0.0 | 0.979 | 0.0 |
| J48 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 |
| Random Forest | 0.792 | 0.255 | 0.916 | 0.483 | 0.792 | 0.367 | 0.899 | **0.574** |
| Régression Logistique | 0.809 | 0.0 | 0.996 | 0.0 | 0.795 | 0.0 | 0.996 | 0.0 |
| SVM | 0.812 | 0.0 | 1.0 | 0.0 | 0.799 | 0.0 | 1.0 | 0.0 |
| ANN | 0.811 | 0.0 | 0.998 | 0.0 | 0.796 | 0.0 | 0.997 | 0.0 |
| ANT 16 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| ANT 17 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |

***Modèle d (Qi, FANIN) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 14** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 15** | Naïve Bayes | 0.809 | 0.0 | 0.996 | 0.0 | 0.792 | 0.0 | 0.992 | 0.0 |
| J48 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 |
| Random Forest | 0.765 | 0.164 | 0.903 | 0.384 | 0.775 | 0.267 | 0.903 | 0.491 |
| Régression Logistique | 0.809 | 0.0 | 0.996 | 0.0 | 0.795 | 0.0 | 0.996 | 0.0 |
| SVM | 0.812 | 0.0 | 1.0 | 0.0 | 0.799 | 0.0 | 1.0 | 0.0 |
| ANN | 0.812 | 0.0 | 1.0 | 0.0 | 0.798 | 0.0 | 0.999 | 0.0 |
| ANT 16 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| ANT 17 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |

***Modèle d (WMC, Ca) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 14** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 15** | Naïve Bayes | 0.799 | 0.0 | 0.983 | 0.0 | 0.779 | 0.0 | 0.975 | 0.0 |
| J48 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 |
| Random Forest | 0.73 | 0.073 | 0.882 | 0.253 | 0.715 | 0.15 | 0.857 | 0.359 |
| Régression Logistique | 0.812 | 0.0 | 1.0 | 0.0 | 0.795 | 0.0 | 0.996 | 0.0 |
| SVM | 0.812 | 0.0 | 1.0 | 0.0 | 0.799 | 0.0 | 1.0 | 0.0 |
| ANN | 0.812 | 0.0 | 1.0 | 0.0 | 0.798 | 0.0 | 0.999 | 0.0 |
| ANT 16 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| ANT 17 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |

***Modèle d (WMC, CBO) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 14** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 15** | Naïve Bayes | 0.792 | 0.018 | 0.971 | 0.133 | 0.775 | 0.017 | 0.966 | 0.127 |
| J48 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 |
| Random Forest | 0.765 | 0.273 | 0.878 | 0.489 | 0.779 | 0.333 | 0.891 | 0.545 |
| Régression Logistique | 0.809 | 0.018 | 0.992 | 0.134 | 0.792 | 0.017 | 0.987 | 0.128 |
| SVM | 0.812 | 0.0 | 1.0 | 0.0 | 0.799 | 0.0 | 1.0 | 0.0 |
| ANN | 0.811 | 0.0 | 0.998 | 0.0 | 0.792 | 0.0 | 0.992 | 0.0 |
| ANT 16 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| ANT 17 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |

***Modèle d (WMC, Ce) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 14** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 15** | Naïve Bayes | 0.816 | 0.164 | 0.966 | 0.398 | 0.792 | 0.15 | 0.954 | 0.378 |
| J48 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.992 | 0.0 |
| Random Forest | 0.734 | 0.164 | 0.866 | 0.376 | 0.745 | 0.25 | 0.87 | 0.466 |
| Régression Logistique | 0.812 | 0.055 | 0.987 | 0.232 | 0.795 | 0.067 | 0.979 | 0.255 |
| SVM | 0.812 | 0.0 | 1.0 | 0.0 | 0.799 | 0.0 | 1.0 | 0.0 |
| ANN | 0.807 | 0.025 | 0.988 | 0.172 | 0.778 | 0.044 | 0.963 | 0.222 |
| ANT 16 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| ANT 17 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |

***Modèle d (WMC, FANIN) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 14** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 15** | Naïve Bayes | 0.802 | 0.0 | 0.987 | 0.0 | 0.785 | 0.0 | 0.983 | 0.0 |
| J48 | 0.0 | 0.0 | 0.996 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 |
| Random Forest | 0.751 | 0.164 | 0.887 | 0.381 | 0.748 | 0.25 | 0.874 | 0.467 |
| Régression Logistique | 0.809 | 0.0 | 0.996 | 0.0 | 0.792 | 0.0 | 0.992 | 0.0 |
| SVM | 0.812 | 0.0 | 1.0 | 0.0 | 0.799 | 0.0 | 1.0 | 0.0 |
| ANN | 0.811 | 0.0 | 0.998 | 0.0 | 0.795 | 0.0 | 0.996 | 0.0 |
| ANT 16 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| ANT 17 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |

***Modèle d (RFC, Ca) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 14** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 15** | Naïve Bayes | 0.805 | 0.182 | 0.95 | 0.416 | 0.772 | 0.1 | 0.941 | 0.307 |
| J48 | 0.088 | 0.055 | 0.958 | 0.229 | 0.358 | 0.317 | 0.887 | 0.53 |
| Random Forest | 0.795 | 0.4 | 0.887 | **0.596** | 0.758 | 0.467 | 0.832 | **0.623** |
| Régression Logistique | 0.792 | 0.036 | 0.966 | 0.187 | 0.782 | 0.067 | 0.962 | 0.253 |
| SVM | 0.812 | 0.0 | 1.0 | 0.0 | 0.799 | 0.0 | 1.0 | 0.0 |
| ANN | 0.788 | 0.016 | 0.967 | 0.133 | 0.773 | 0.038 | 0.959 | 0.234 |
| ANT 16 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| ANT 17 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |

***Modèle d (LOC, RFC) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 14** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 15** | Naïve Bayes | 0.792 | 0.091 | 0.954 | 0.294 | 0.772 | 0.1 | 0.941 | 0.307 |
| J48 | 0.033 | 0.018 | 0.983 | 0.134 | 0.358 | 0.317 | 0.887 | 0.53 |
| Random Forest | 0.761 | 0.382 | 0.849 | 0.569 | 0.758 | 0.467 | 0.832 | **0.623** |
| Régression Logistique | 0.795 | 0.055 | 0.966 | 0.23 | 0.782 | 0.067 | 0.962 | 0.253 |
| SVM | 0.812 | 0.0 | 1.0 | 0.0 | 0.799 | 0.0 | 1.0 | 0.0 |
| ANN | 0.803 | 0.015 | 0.985 | 0.13 | 0.773 | 0.038 | 0.959 | 0.234 |
| ANT 16 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| ANT 17 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |

1. Existence de Faute de Sévérité  Moyenne:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***Système*** | ***#Classes*** | ***#Fautives*** | ***%Fautives*** | ***#ClassesD*** | ***#FautivesD*** | ***%FautivesD*** |
| Ant13 |  |  |  |  |  |  |
| Ant14 |  |  |  |  |  |  |
| Ant15 | 293 | 58 | 19.79% | 316 | 81 | 25.63% |
| Ant16 |  |  |  |  |  |  |
| Ant17 |  |  |  |  |  |  |

***Modèle d (LOC, Ca) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 14** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 15** | Naïve Bayes | 0.802 | 0.155 | 0.962 | 0.386 | 0.772 | 0.235 | 0.957 | 0.474 |
| J48 | 0.0 | 0.0 | 1.0 | 0.0 | 0.593 | 0.667 | 0.8 | **0.730** |
| Random Forest | 0.771 | 0.362 | 0.872 | **0.562** | 0.797 | 0.593 | 0.868 | 0.717 |
| Régression Logistique | 0.809 | 0.138 | 0.974 | 0.367 | 0.778 | 0.259 | 0.957 | 0.498 |
| SVM | 0.802 | 0.0 | 1.0 | 0.0 | 0.766 | 0.136 | 0.983 | 0.365 |
| ANN | 0.797 | 0.261 | 0.929 | 0.546 | 0.775 | 0.382 | 0.911 | 0.702 |
| ANT 16 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| ANT 17 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |

***Modèle d (LOC, Cbo) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 14** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 15** | Naïve Bayes | 0.802 | 0.155 | 0.962 | 0.386 | 0.772 | 0.235 | 0.957 | 0.474 |
| J48 | 0.0 | 0.0 | 1.0 | 0.0 | 0.593 | 0.667 | 0.8 | **0.730** |
| Random Forest | 0.761 | 0.379 | 0.855 | **0.570** | 0.788 | 0.605 | 0.851 | 0.718 |
| Régression Logistique | 0.809 | 0.138 | 0.974 | 0.367 | 0.775 | 0.259 | 0.953 | 0.497 |
| SVM | 0.802 | 0.0 | 1.0 | 0.0 | 0.766 | 0.123 | 0.987 | 0.349 |
| ANN | 0.797 | 0.261 | 0.929 | 0.546 | 0.775 | 0.381 | 0.911 | 0.701 |
| ANT 16 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| ANT 17 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |

***Modèle d (LOC, Ce) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 14** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 15** | Naïve Bayes | 0.802 | 0.155 | 0.962 | 0.386 | 0.772 | 0.235 | 0.957 | 0.474 |
| J48 | 0.0 | 0.0 | 1.0 | 0.0 | 0.649 | 0.753 | 0.804 | **0.778** |
| Random Forest | 0.747 | 0.345 | 0.847 | 0.54 | 0.778 | 0.568 | 0.851 | 0.695 |
| Régression Logistique | 0.805 | 0.121 | 0.974 | 0.343 | 0.775 | 0.247 | 0.957 | 0.486 |
| SVM | 0.802 | 0.0 | 1.0 | 0.0 | 0.759 | 0.111 | 0.983 | 0.330 |
| ANN | 0.796 | 0.25 | 0.93 | 0.547 | 0.775 | 0.378 | 0.911 | 0.698 |
| ANT 16 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| ANT 17 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |

***Modèle d (LOC, FANIN) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 14** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 15** | Naïve Bayes | 0.802 | 0.155 | 0.962 | 0.386 | 0.772 | 0.235 | 0.957 | 0.474 |
| J48 | 0.0 | 0.0 | 1.0 | 0.0 | 0.593 | 0.667 | 0.8 | **0.730** |
| Random Forest | 0.758 | 0.362 | 0.855 | **0.556** | 0.791 | 0.605 | 0.855 | 0.719 |
| Régression Logistique | 0.809 | 0.138 | 0.974 | 0.367 | 0.775 | 0.259 | 0.953 | 0.497 |
| SVM | 0.802 | 0.0 | 1.0 | 0.0 | 0.766 | 0.136 | 0.983 | 0.365 |
| ANN | 0.798 | 0.268 | 0.929 | 0.546 | 0.776 | 0.385 | 0.911 | 0.704 |
| ANT 16 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| ANT 17 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |

***Modèle d (Qi, CBO) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 14** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 15** | Naïve Bayes | 0.0 | 0.0 | 1.0 | 0.0 | 0.744 | 0.062 | 0.979 | 0.246 |
| J48 | 0.754 | 0.293 | 0.868 | **0.504** | 0.554 | 0.63 | 0.779 | 0.7 |
| Random Forest | 0.802 | 0.034 | 0.991 | 0.185 | 0.801 | 0.593 | 0.872 | **0.719** |
| Régression Logistique | 0.802 | 0.0 | 1.0 | 0.0 | 0.744 | 0.062 | 0.979 | 0.246 |
| SVM | 0.794 | 0.046 | 0.979 | 0.316 | 0.737 | 0.0 | 0.991 | 0.0 |
| ANN | 0.0 | 0.0 | 1.0 | 0.0 | 0.75 | 0.272 | 0.914 | 0.548 |
| ANT 16 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| ANT 17 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |

***Modèle d (Qi, FANIN) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 14** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 15** | Naïve Bayes | 0.795 | 0.017 | 0.987 | 0.13 | 0.741 | 0.037 | 0.983 | 0.191 |
| J48 | 0.031 | 0.017 | 0.974 | 0.13 | 0.124 | 0.074 | 0.957 | 0.266 |
| Random Forest | 0.775 | 0.293 | 0.894 | **0.512** | 0.782 | 0.457 | 0.894 | **0.639** |
| Régression Logistique | 0.799 | 0.0 | 0.996 | 0.0 | 0.747 | 0.037 | 0.991 | 0.192 |
| SVM | 0.802 | 0.0 | 1.0 | 0.0 | 0.741 | 0.0 | 0.996 | 0.0 |
| ANN | 0.799 | 0.0 | 0.996 | 0.0 | 0.739 | 0.019 | 0.988 | 0.191 |
| ANT 16 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| ANT 17 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |

***Modèle d (WMC, Ca) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 14** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 15** | Naïve Bayes | 0.0 | 0.0 | 1.0 | 0.0 | 0.75 | 0.099 | 0.974 | 0.31 |
| J48 | 0.741 | 0.241 | 0.864 | 0.457 | 0.17 | 0.111 | 0.932 | 0.322 |
| Random Forest | 0.799 | 0.034 | 0.987 | 0.185 | 0.747 | 0.457 | 0.847 | **0.622** |
| Régression Logistique | 0.802 | 0.0 | 1.0 | 0.0 | 0.734 | 0.037 | 0.974 | 0.19 |
| SVM | 0.794 | 0.041 | 0.98 | 0.252 | 0.741 | 0.0 | 0.996 | 0.0 |
| ANN | 0.0 | 0.0 | 1.0 | 0.0 | 0.749 | 0.22 | 0.932 | 0.465 |
| ANT 16 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| ANT 17 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |

***Modèle d (WMC, CBO) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 14** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 15** | Naïve Bayes | 0.031 | 0.017 | 0.979 | 0.13 | 0.763 | 0.173 | 0.966 | 0.409 |
| J48 | 0.72 | 0.241 | 0.838 | 0.45 | 0.503 | 0.531 | 0.8 | 0.652 |
| Random Forest | 0.799 | 0.086 | 0.974 | 0.29 | 0.772 | 0.593 | 0.834 | **0.703** |
| Régression Logistique | 0.802 | 0.0 | 1.0 | 0.0 | 0.769 | 0.198 | 0.966 | 0.437 |
| SVM | 0.81 | 0.2 | 0.961 | 0.479 | 0.75 | 0.037 | 0.996 | 0.192 |
| ANN | 0.031 | 0.017 | 0.979 | 0.13 | 0.777 | 0.435 | 0.895 | 0.646 |
| ANT 16 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| ANT 17 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |

***Modèle d (WMC, Ce) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 14** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 15** | Naïve Bayes | 0.816 | 0.276 | 0.949 | 0.512 | 0.791 | 0.333 | 0.949 | 0.562 |
| J48 | 0.0 | 0.0 | 1.0 | 0.0 | 0.48 | 0.444 | 0.86 | 0.618 |
| Random Forest | 0.758 | 0.31 | 0.868 | 0.519 | 0.794 | 0.667 | 0.838 | **0.748** |
| Régression Logistique | 0.819 | 0.259 | 0.957 | 0.498 | 0.797 | 0.383 | 0.94 | 0.6 |
| SVM | 0.802 | 0.0 | 1.0 | 0.0 | 0.766 | 0.123 | 0.987 | 0.349 |
| ANN | 0.82 | 0.352 | 0.936 | 0.595 | 0.802 | 0.576 | 0.879 | 0.722 |
| ANT 16 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| ANT 17 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |

***Modèle d (WMC, FANIN) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 14** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 15** | Naïve Bayes | 0.792 | 0.034 | 0.979 | 0.184 | 0.741 | 0.037 | 0.983 | 0.191 |
| J48 | 0.031 | 0.017 | 0.979 | 0.13 | 0.252 | 0.185 | 0.902 | 0.409 |
| Random Forest | 0.751 | 0.259 | 0.872 | 0.475 | 0.782 | 0.58 | 0.851 | **0.703** |
| Régression Logistique | 0.802 | 0.034 | 0.991 | 0.185 | 0.741 | 0.037 | 0.983 | 0.191 |
| SVM | 0.802 | 0.0 | 1.0 | 0.0 | 0.737 | 0.0 | 0.991 | 0.0 |
| ANN | 0.796 | 0.029 | 0.985 | 0.316 | 0.748 | 0.182 | 0.943 | 0.512 |
| ANT 16 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| ANT 17 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |

***Modèle d (RFC, Ca) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 14** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 15** | Naïve Bayes | 0.823 | 0.345 | 0.94 | 0.569 | 0.813 | 0.444 | 0.94 | 0.647 |
| J48 | 0.211 | 0.138 | 0.957 | 0.363 | 0.605 | 0.642 | 0.834 | 0.732 |
| Random Forest | 0.765 | 0.362 | 0.864 | 0.559 | 0.81 | 0.63 | 0.872 | **0.741** |
| Régression Logistique | 0.829 | 0.345 | 0.949 | 0.572 | 0.81 | 0.494 | 0.919 | 0.674 |
| SVM | 0.805 | 0.017 | 1.0 | 0.131 | 0.756 | 0.086 | 0.987 | 0.292 |
| ANN | 0.827 | 0.404 | 0.932 | 0.621 | 0.811 | 0.586 | 0.889 | 0.722 |
| ANT 16 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| ANT 17 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |

***Modèle d (LOC, RFC) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 14** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 15** | Naïve Bayes | 0.802 | 0.224 | 0.945 | 0.46 | 0.788 | 0.346 | 0.94 | 0.57 |
| J48 | 0.0 | 0.0 | 1.0 | 0.0 | 0.639 | 0.753 | 0.791 | **0.772** |
| Random Forest | 0.765 | 0.328 | 0.872 | 0.535 | 0.791 | 0.568 | 0.868 | 0.702 |
| Régression Logistique | 0.802 | 0.155 | 0.962 | 0.386 | 0.782 | 0.333 | 0.936 | 0.559 |
| SVM | 0.802 | 0.0 | 1.0 | 0.0 | 0.772 | 0.222 | 0.962 | 0.462 |
| ANN | 0.794 | 0.288 | 0.919 | 0.542 | 0.795 | 0.6 | 0.862 | 0.728 |
| ANT 16 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| ANT 17 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |

1. Existence de Faute de Sévérité Faible :

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***Système*** | ***#Classes*** | ***#Fautives*** | ***%Fautives*** | ***#ClassesD*** | ***#FautivesD*** | ***%FautivesD*** |
| Ant13 |  |  |  |  |  |  |
| Ant14 |  |  |  |  |  |  |
| Ant15 | 293 | 18 | 6.14% | 295 | 20 | 6.78% |
| Ant16 |  |  |  |  |  |  |
| Ant17 |  |  |  |  |  |  |

***Modèle d (LOC, Ca) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 14** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 15** | Naïve Bayes | 0.918 | 0.0 | 0.978 | 0.0 | 0.925 | 0.15 | 0.982 | 0.384 |
| J48 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 |
| Random Forest | 0.884 | 0.0 | 0.942 | 0.0 | 0.881 | 0.2 | 0.931 | 0.431 |
| Régression Logistique | 0.935 | 0.0 | 0.996 | 0.0 | 0.929 | 0.0 | 0.996 | 0.0 |
| SVM | 0.939 | 0.0 | 1.0 | 0.0 | 0.932 | 0.0 | 1.0 | 0.0 |
| ANN | 0.937 | 0.0 | 0.998 | 0.0 | 0.93 | 0.0 | 0.998 | 0.0 |
| ANT 16 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| ANT 17 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |

***Modèle d (LOC, Cbo) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 14** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 15** | Naïve Bayes | 0.918 | 0.0 | 0.978 | 0.0 | 0.925 | 0.15 | 0.982 | 0.384 |
| J48 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 |
| Random Forest | 0.887 | 0.0 | 0.945 | 0.0 | 0.885 | 0.2 | 0.935 | 0.432 |
| Régression Logistique | 0.935 | 0.0 | 0.996 | 0.0 | 0.929 | 0.0 | 0.996 | 0.0 |
| SVM | 0.939 | 0.0 | 1.0 | 0.0 | 0.932 | 0.0 | 1.0 | 0.0 |
| ANN | 0.937 | 0.0 | 0.998 | 0.0 | 0.93 | 0.0 | 0.998 | 0.0 |
| ANT 16 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| ANT 17 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |

***Modèle d (LOC, Ce) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 14** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 15** | Naïve Bayes | 0.918 | 0.0 | 0.978 | 0.0 | 0.925 | 0.15 | 0.982 | 0.384 |
| J48 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 |
| Random Forest | 0.884 | 0.0 | 0.942 | 0.0 | 0.892 | 0.2 | 0.942 | 0.434 |
| Régression Logistique | 0.935 | 0.0 | 0.996 | 0.0 | 0.929 | 0.0 | 0.996 | 0.0 |
| SVM | 0.939 | 0.0 | 1.0 | 0.0 | 0.932 | 0.0 | 1.0 | 0.0 |
| ANN | 0.937 | 0.0 | 0.998 | 0.0 | 0.93 | 0.0 | 0.998 | 0.0 |
| ANT 16 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| ANT 17 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |

***Modèle d (LOC, FANIN) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 14** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 15** | Naïve Bayes | 0.918 | 0.0 | 0.978 | 0.0 | 0.925 | 0.15 | 0.982 | 0.384 |
| J48 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 |
| Random Forest | 0.877 | 0.0 | 0.935 | 0.0 | 0.885 | 0.2 | 0.935 | 0.432 |
| Régression Logistique | 0.935 | 0.0 | 0.996 | 0.0 | 0.929 | 0.0 | 0.996 | 0.0 |
| SVM | 0.939 | 0.0 | 1.0 | 0.0 | 0.932 | 0.0 | 1.0 | 0.0 |
| ANN | 0.937 | 0.0 | 0.998 | 0.0 | 0.93 | 0.0 | 0.998 | 0.0 |
| ANT 16 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| ANT 17 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |

***Modèle d (Qi, CBO) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 14** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 15** | Naïve Bayes | 0.928 | 0.056 | 0.985 | 0.234 | 0.932 | 0.15 | 0.989 | 0.385 |
| J48 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 |
| Random Forest | 0.911 | 0.111 | 0.964 | 0.327 | 0.912 | 0.15 | 0.967 | 0.381 |
| Régression Logistique | 0.935 | 0.0 | 0.996 | 0.0 | 0.929 | 0.0 | 0.996 | 0.0 |
| SVM | 0.939 | 0.0 | 1.0 | 0.0 | 0.932 | 0.0 | 1.0 | 0.0 |
| ANN | 0.937 | 0.0 | 0.998 | 0.0 | 0.93 | 0.0 | 0.997 | 0.0 |
| ANT 16 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| ANT 17 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |

***Modèle d (Qi, FANIN) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 14** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 15** | Naïve Bayes | 0.925 | 0.0 | 0.985 | 0.0 | 0.925 | 0.1 | 0.985 | 0.314 |
| J48 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 |
| Random Forest | 0.911 | 0.0 | 0.971 | 0.0 | 0.908 | 0.1 | 0.967 | 0.311 |
| Régression Logistique | 0.935 | 0.0 | 0.996 | 0.0 | 0.929 | 0.0 | 0.996 | 0.0 |
| SVM | 0.939 | 0.0 | 1.0 | 0.0 | 0.932 | 0.0 | 1.0 | 0.0 |
| ANN | 0.939 | 0.0 | 1.0 | 0.0 | 0.931 | 0.0 | 0.998 | 0.0 |
| ANT 16 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| ANT 17 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |

***Modèle d (WMC, Ca) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 14** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 15** | Naïve Bayes | 0.935 | 0.111 | 0.989 | 0.332 | 0.932 | 0.15 | 0.989 | 0.385 |
| J48 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 |
| Random Forest | 0.904 | 0.0 | 0.964 | 0.0 | 0.908 | 0.2 | 0.96 | 0.438 |
| Régression Logistique | 0.935 | 0.0 | 0.996 | 0.0 | 0.932 | 0.1 | 0.993 | 0.315 |
| SVM | 0.939 | 0.0 | 1.0 | 0.0 | 0.932 | 0.0 | 1.0 | 0.0 |
| ANN | 0.937 | 0.0 | 0.998 | 0.0 | 0.932 | 0.021 | 0.998 | 0.206 |
| ANT 16 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| ANT 17 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |

***Modèle d (WMC, CBO) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 14** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 15** | Naïve Bayes | 0.928 | 0.056 | 0.985 | 0.234 | 0.925 | 0.15 | 0.982 | 0.384 |
| J48 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 |
| Random Forest | 0.928 | 0.222 | 0.975 | 0.465 | 0.932 | 0.4 | 0.971 | **0.623** |
| Régression Logistique | 0.935 | 0.0 | 0.996 | 0.0 | 0.936 | 0.1 | 0.996 | 0.316 |
| SVM | 0.939 | 0.0 | 1.0 | 0.0 | 0.932 | 0.0 | 1.0 | 0.0 |
| ANN | 0.937 | 0.0 | 0.998 | 0.0 | 0.933 | 0.041 | 0.998 | 0.297 |
| ANT 16 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| ANT 17 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |

***Modèle d (WMC, Ce) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 14** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 15** | Naïve Bayes | 0.925 | 0.056 | 0.982 | 0.234 | 0.922 | 0.15 | 0.978 | 0.383 |
| J48 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 |
| Random Forest | 0.891 | 0.056 | 0.945 | 0.229 | 0.898 | 0.2 | 0.949 | 0.436 |
| Régression Logistique | 0.939 | 0.056 | 0.996 | 0.235 | 0.929 | 0.0 | 0.996 | 0.0 |
| SVM | 0.939 | 0.0 | 1.0 | 0.0 | 0.932 | 0.0 | 1.0 | 0.0 |
| ANN | 0.939 | 0.0 | 1.0 | 0.0 | 0.93 | 0.0 | 0.998 | 0.0 |
| ANT 16 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| ANT 17 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |

***Modèle d (WMC, FANIN) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 14** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 15** | Naïve Bayes | 0.925 | 0.0 | 0.985 | 0.0 | 0.925 | 0.1 | 0.985 | 0.314 |
| J48 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 |
| Random Forest | 0.908 | 0.0 | 0.967 | 0.0 | 0.895 | 0.1 | 0.953 | 0.309 |
| Régression Logistique | 0.935 | 0.0 | 0.996 | 0.0 | 0.925 | 0.0 | 0.993 | 0.0 |
| SVM | 0.939 | 0.0 | 1.0 | 0.0 | 0.932 | 0.0 | 1.0 | 0.0 |
| ANN | 0.938 | 0.0 | 1.0 | 0.0 | 0.929 | 0.0 | 0.996 | 0.0 |
| ANT 16 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| ANT 17 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |

***Modèle d (RFC, Ca) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 14** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 15** | Naïve Bayes | 0.922 | 0.111 | 0.975 | 0.329 | 0.915 | 0.15 | 0.971 | 0.382 |
| J48 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 |
| Random Forest | 0.877 | 0.056 | 0.931 | 0.227 | 0.885 | 0.2 | 0.935 | 0.432 |
| Régression Logistique | 0.942 | 0.056 | 1.0 | 0.236 | 0.939 | 0.1 | 1.0 | 0.316 |
| SVM | 0.939 | 0.0 | 1.0 | 0.0 | 0.932 | 0.0 | 1.0 | 0.0 |
| ANN | 0.939 | 0.004 | 1.0 | 0.091 | 0.936 | 0.05 | 1.0 | 0.316 |
| ANT 16 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| ANT 17 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |

***Modèle d (LOC, RFC) :***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **ACC** | **TPR** | **TNR** | **g-mean** | **ACCD** | **TPRD** | **TNRD** | **g-meanD** |
| **ANT 13** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 14** | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 15** | Naïve Bayes | 0.918 | 0.111 | 0.971 | 0.328 | 0.925 | 0.2 | 0.978 | 0.442 |
| J48 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 |
| Random Forest | 0.884 | 0.0 | 0.942 | 0.0 | 0.892 | 0.2 | 0.942 | 0.434 |
| Régression Logistique | 0.935 | 0.0 | 0.996 | 0.0 | 0.929 | 0.0 | 0.996 | 0.0 |
| SVM | 0.939 | 0.0 | 1.0 | 0.0 | 0.932 | 0.0 | 1.0 | 0.0 |
| ANN | 0.937 | 0.0 | 0.998 | 0.0 | 0.931 | 0.0 | 0.998 | 0.0 |
| ANT 16 | Naïve Bayes | 0.918 | 0.111 | 0.971 | 0.328 | 0.925 | 0.2 | 0.978 | 0.442 |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| ANT 17 | Naïve Bayes |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| Random Forest |  |  |  |  |  |  |  |  |
| Régression Logistique |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |

1. Sévérité des Fautes :

L’idée est de crées une nouvelle classe qui décrit la sévérité des fautes tel quesi cette classe vaut :

* 0 alors la classe ne contient pas de faute.
* 1 contient des fautes de sévérité faible.
* 2 contient des fautes de sévérité moyenne.
* 3 contient des fautes de sévérité élevé.

En prenant en compte les classes de sévérité les plus élevés : faible, moyenne, et élevé. Exemple

Si une classe contient 3 fautes de sévérité faible, une de sévérité élevée elle sera considérée de sévérité 3.

***Modèle d (LOC, Ca) :***

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **TPR** | **TNR** | **G-mean** | **F** | **AUC** | **TPRD** | **TNRD** | **G-meanD** | **FD** | **AUCD** |
| **ANT 13** | NB |  |  |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |  |  |
| **ANT 14** | NB |  |  |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |  |  |
| **ANT 15** | NB | 0.655 | 0.422 | 0.18 | 0.557 | 0.721 | 0.585 | 0.588 | 0.232 | 0.49 | 0.764 |
| J48 | 0.648 | 0.45 | 0.208 | 0.569 | 0.626 | 0.686 | 0.781 | 0.391 | 0.676 | 0.767 |
| RF | 0.587 | 0.599 | 0.264 | 0.580 | 0.673 | 0.757 | 0.855 | **0.646** | **0.758** | **0.850** |
| RLog | 0.655 | 0.416 | 0.187 | 0.559 | **0.753** | 0.639 | 0.671 | 0.268 | 0.56 | 0.793 |
| SVM | 0.659 | 0.341 | 0.178 | 0.523 | 0.5 | 0.563 | 0.551 | 0.21 | 0.456 | 0.556 |
| ANN | 0.679 | 0.543 | 0.251 | **0.614** | **0.745** | 0.636 | 0.738 | 0.277 | 0.568 | 0.784 |
| ANT 16 | NB |  |  |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |  |  |
| ANT 17 | NB |  |  |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |  |  |

***Modèle d (LOC, Cbo) :***

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **TPR** | **TNR** | **G-mean** | **F** | **AUC** | **TPRD** | **TNRD** | **G-meanD** | **FD** | **AUCD** |
| **ANT 13** | NB |  |  |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |  |  |
| **ANT 14** | NB |  |  |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |  |  |
| **ANT 15** | NB | 0.655 | 0.422 | 0.18 | 0.557 | 0.72 | 0.579 | 0.581 | 0.228 | 0.483 | 0.764 |
| J48 | 0.648 | 0.45 | 0.208 | 0.569 | 0.626 | 0.686 | 0.781 | 0.391 | 0.676 | 0.768 |
| RF | 0.573 | 0.608 | 0.268 | 0.572 | 0.671 | 0.746 | 0.851 | **0.642** | **0.747** | **0.845** |
| RLog | 0.655 | 0.416 | 0.187 | 0.559 | 0.753 | 0.639 | 0.671 | 0.268 | 0.56 | 0.793 |
| SVM | 0.659 | 0.341 | 0.178 | 0.523 | 0.5 | 0.56 | 0.548 | 0.207 | 0.452 | 0.553 |
| ANN | 0.679 | 0.543 | 0.251 | **0.614** | **0.745** | 0.636 | 0.738 | 0.277 | 0.568 | 0.784 |
| ANT 16 | NB |  |  |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |  |  |
| ANT 17 | NB |  |  |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |  |  |

***Modèle d (LOC, Ce) :***

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **TPR** | **TNR** | **G-mean** | **F** | **AUC** | **TPRD** | **TNRD** | **G-meanD** | **FD** | **AUCD** |
| **ANT 13** | NB |  |  |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |  |  |
| **ANT 14** | NB |  |  |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |  |  |
| **ANT 15** | NB | 0.655 | 0.422 | 0.18 | 0.557 | 0.718 | 0.574 | 0.575 | 0.224 | 0.476 | 0.768 |
| J48 | 0.645 | 0.449 | 0.207 | 0.567 | 0.625 | 0.694 | 0.783 | 0.393 | 0.683 | 0.771 |
| RF | 0.577 | 0.604 | 0.265 | 0.574 | 0.669 | 0.743 | 0.851 | **0.640** | **0.745** | **0.843** |
| RLog | 0.655 | 0.416 | 0.187 | 0.559 | **0.753** | 0.639 | 0.671 | 0.268 | 0.56 | 0.793 |
| SVM | 0.659 | 0.341 | 0.178 | 0.523 | 0.5 | 0.56 | 0.548 | 0.207 | 0.452 | 0.554 |
| ANN | 0.68 | 0.541 | 0.251 | **0.613** | **0.745** | 0.636 | 0.738 | 0.277 | 0.568 | 0.784 |
| ANT 16 | NB |  |  |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |  |  |
| ANT 17 | NB |  |  |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |  |  |

***Modèle d (LOC, FANIN) :***

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **TPR** | **TNR** | **G-mean** | **F** | **AUC** | **TPRD** | **TNRD** | **G-meanD** | **FD** | **AUCD** |
| **ANT 13** | NB |  |  |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |  |  |
| **ANT 14** | NB |  |  |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |  |  |
| **ANT 15** | NB | 0.655 | 0.422 | 0.18 | 0.557 | 0.72 | 0.587 | 0.591 | 0.234 | 0.494 | 0.766 |
| J48 | 0.659 | 0.487 | 0.224 | 0.587 | 0.646 | 0.686 | 0.781 | 0.391 | 0.676 | 0.768 |
| RF | 0.587 | 0.623 | 0.275 | 0.585 | 0.67 | 0.751 | 0.861 | **0.645** | **0.753** | **0.848** |
| RLog | 0.655 | 0.416 | 0.187 | 0.559 | **0.753** | 0.639 | 0.671 | 0.268 | 0.56 | 0.793 |
| SVM | 0.659 | 0.341 | 0.178 | 0.523 | 0.5 | 0.56 | 0.548 | 0.207 | 0.452 | 0.554 |
| ANN | 0.678 | 0.544 | 0.251 | **0.613** | **0.746** | 0.636 | 0.739 | 0.277 | 0.569 | 0.785 |
| ANT 16 | NB |  |  |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |  |  |
| ANT 17 | NB |  |  |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |  |  |

***Modèle d (Qi, CBO) :***

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **TPR** | **TNR** | **G-mean** | **F** | **AUC** | **TPRD** | **TNRD** | **G-meanD** | **FD** | **AUCD** |
| **ANT 13** | NB |  |  |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |  |  |
| **ANT 14** | NB |  |  |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |  |  |
| **ANT 15** | NB | 0.648 | 0.365 | 0.177 | 0.523 | 0.607 | 0.53 | 0.494 | 0.149 | 0.39 | 0.649 |
| J48 | 0.659 | 0.341 | 0.178 | 0.523 | 0.485 | 0.617 | 0.74 | 0.269 | 0.579 | 0.662 |
| RF | 0.648 | 0.564 | 0.260 | **0.616** | 0.586 | 0.71 | 0.791 | **0.409** | **0.701** | **0.791** |
| RLog | 0.648 | 0.357 | 0.177 | 0.521 | **0.679** | 0.546 | 0.535 | 0.195 | 0.433 | 0.72 |
| SVM | 0.659 | 0.341 | 0.178 | 0.523 | 0.5 | 0.536 | 0.488 | 0.15 | 0.391 | 0.512 |
| ANN | 0.642 | 0.37 | 0.142 | 0.526 | 0.656 | 0.576 | 0.641 | 0.256 | 0.504 | 0.717 |
| ANT 16 | NB |  |  |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |  |  |
| ANT 17 | NB |  |  |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |  |  |

***Modèle d (Qi, FANIN) :***

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **TPR** | **TNR** | **G-mean** | **F** | **AUC** | **TPRD** | **TNRD** | **G-meanD** | **FD** | **AUCD** |
| **ANT 13** | NB |  |  |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |  |  |
| **ANT 14** | NB |  |  |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |  |  |
| **ANT 15** | NB | 0.648 | 0.374 | 0.152 | 0.537 | 0.535 | 0.525 | 0.491 | 0.149 | 0.387 | 0.574 |
| J48 | 0.652 | 0.34 | 0.177 | 0.52 | 0.474 | 0.555 | 0.681 | 0.232 | 0.516 | 0.64 |
| RF | 0.631 | 0.542 | 0.235 | **0.593** | **0.609** | **0.653** | 0.761 | **0.376** | **0.645** | **0.782** |
| RLog | 0.655 | 0.341 | 0.178 | 0.522 | 0.588 | 0.53 | 0.486 | 0.149 | 0.388 | 0.655 |
| SVM | 0.659 | 0.341 | 0.178 | 0.523 | 0.5 | 0.525 | 0.472 | 0.178 | 0.363 | 0.498 |
| ANN | 0.657 | 0.341 | 0.178 | 0.522 | 0.517 | 0.53 | 0.493 | 0.184 | 0.392 | 0.575 |
| ANT 16 | NB |  |  |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |  |  |
| ANT 17 | NB |  |  |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |  |  |

***Modèle d (WMC, Ca) :***

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **TPR** | **TNR** | **G-mean** | **F** | **AUC** | **TPRD** | **TNRD** | **G-meanD** | **FD** | **AUCD** |
| **ANT 13** | NB |  |  |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |  |  |
| **ANT 14** | NB |  |  |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |  |  |
| **ANT 15** | NB | 0.655 | 0.481 | 0.139 | 0.578 | 0.692 | 0.536 | 0.504 | 0.1 | 0.405 | 0.61 |
| J48 | 0.635 | 0.458 | 0.197 | 0.556 | 0.589 | 0.609 | 0.724 | 0.322 | 0.589 | 0.648 |
| RF | 0.58 | 0.569 | 0.204 | 0.557 | 0.604 | 0.661 | 0.768 | **0.408** | **0.658** | **0.757** |
| RLog | 0.666 | 0.471 | 0.209 | 0.581 | 0.729 | 0.525 | 0.51 | 0.161 | 0.397 | 0.682 |
| SVM | 0.655 | 0.341 | 0.178 | 0.522 | 0.498 | 0.538 | 0.489 | 0.15 | 0.392 | 0.514 |
| ANN | 0.661 | 0.522 | **0.234** | **0.592** | **0.730** | 0.533 | 0.567 | 0.226 | 0.458 | 0.676 |
| ANT 16 | NB |  |  |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |  |  |
| ANT 17 | NB |  |  |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |  |  |

***Modèle d (WMC, CBO) :***

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **TPR** | **TNR** | **G-mean** | **F** | **AUC** | **TPRD** | **TNRD** | **G-meanD** | **FD** | **AUCD** |
| **ANT 13** | NB |  |  |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |  |  |
| **ANT 14** | NB |  |  |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |  |  |
| **ANT 15** | NB | 0.652 | 0.393 | 0.163 | 0.545 | 0.65 | 0.552 | 0.546 | 0.163 | 0.444 | 0.708 |
| J48 | 0.659 | 0.347 | 0.178 | 0.524 | 0.526 | 0.678 | 0.8 | 0.387 | 0.671 | 0.751 |
| RF | 0.59 | 0.567 | **0.252** | **0.575** | 0.57 | 0.713 | 0.811 | **0.433** | **0.713** | **0.789** |
| RLog | 0.648 | 0.38 | 0.137 | 0.534 | **0.701** | 0.568 | 0.592 | 0.227 | 0.476 | 0.747 |
| SVM | 0.659 | 0.341 | 0.178 | 0.523 | 0.5 | 0.538 | 0.489 | 0.15 | 0.392 | 0.513 |
| ANN | 0.647 | 0.429 | 0.186 | 0.554 | 0.697 | 0.617 | 0.709 | 0.269 | 0.555 | 0.748 |
| ANT 16 | NB |  |  |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |  |  |
| ANT 17 | NB |  |  |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |  |  |

***Modèle d (WMC, Ce) :***

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **TPR** | **TNR** | **G-mean** | **F** | **AUC** | **TPRD** | **TNRD** | **G-meanD** | **FD** | **AUCD** |
| **ANT 13** | NB |  |  |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |  |  |
| **ANT 14** | NB |  |  |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |  |  |
| **ANT 15** | NB | 0.655 | 0.481 | 0.139 | 0.578 | 0.692 | 0.593 | 0.641 | 0.246 | 0.513 | 0.765 |
| J48 | 0.635 | 0.458 | 0.197 | 0.556 | 0.589 | 0.648 | 0.781 | 0.323 | 0.626 | 0.733 |
| RF | 0.58 | 0.569 | 0.204 | 0.557 | 0.604 | 0.74 | 0.829 | **0.521** | **0.738** | **0.790** |
| RLog | 0.666 | 0.471 | 0.209 | 0.581 | 0.729 | 0.623 | 0.687 | 0.265 | 0.548 | 0.775 |
| SVM | 0.655 | 0.341 | 0.178 | 0.522 | 0.498 | 0.596 | 0.608 | 0.241 | 0.506 | 0.606 |
| ANN | 0.661 | 0.522 | **0.234** | **0.592** | **0.730** | 0.645 | 0.736 | 0.28 | 0.575 | 0.768 |
| ANT 16 | NB |  |  |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |  |  |
| ANT 17 | NB |  |  |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |  |  |

***Modèle d (WMC, FANIN) :***

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **TPR** | **TNR** | **G-mean** | **F** | **AUC** | **TPRD** | **TNRD** | **G-meanD** | **FD** | **AUCD** |
| **ANT 13** | NB |  |  |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |  |  |
| **ANT 14** | NB |  |  |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |  |  |
| **ANT 15** | NB | 0.645 | 0.356 | 0.177 | 0.52 | 0.571 | 0.527 | 0.489 | 0.149 | 0.387 | 0.602 |
| J48 | 0.652 | 0.392 | 0.18 | 0.551 | 0.634 | 0.623 | 0.758 | 0.303 | 0.596 | 0.704 |
| RF | 0.597 | 0.583 | **0.224** | **0.577** | 0.576 | 0.675 | 0.8 | **0.408** | **0.675** | **0.791** |
| RLog | 0.652 | 0.352 | 0.177 | 0.522 | **0.673** | 0.533 | 0.503 | 0.162 | 0.399 | 0.726 |
| SVM | 0.659 | 0.341 | 0.178 | 0.523 | 0.5 | 0.53 | 0.478 | 0.119 | 0.375 | 0.504 |
| ANN | 0.649 | 0.351 | 0.124 | 0.522 | 0.604 | 0.561 | 0.588 | 0.246 | 0.48 | 0.697 |
| ANT 16 | NB |  |  |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |  |  |
| ANT 17 | NB |  |  |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |  |  |

***Modèle d (RFC, Ca) :***

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **TPR** | **TNR** | **G-mean** | **F** | **AUC** | **TPRD** | **TNRD** | **G-meanD** | **FD** | **AUCD** |
| **ANT 13** | NB |  |  |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |  |  |
| **ANT 14** | NB |  |  |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |  |  |
| **ANT 15** | NB | 0.679 | 0.552 | 0.188 | 0.619 | 0.750 | 0.59 | 0.695 | 0.243 | 0.539 | 0.786 |
| J48 | 0.669 | 0.62 | 0.2 | 0.628 | 0.696 | 0.713 | 0.795 | 0.4 | 0.701 | 0.786 |
| RF | 0.662 | 0.718 | **0.322** | **0.661** | **0.740** | 0.776 | 0.873 | **0.461** | **0.776** | **0.865** |
| RLog | 0.689 | 0.552 | 0.242 | 0.620 | 0.770 | 0.667 | 0.732 | 0.279 | 0.59 | 0.799 |
| SVM | 0.662 | 0.348 | 0.116 | 0.531 | 0.505 | 0.631 | 0.643 | 0.257 | 0.545 | 0.648 |
| ANN | 0.696 | 0.587 | 0.255 | 0.632 | 0.768 | 0.666 | 0.749 | 0.281 | 0.594 | 0.799 |
| ANT 16 | NB |  |  |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |  |  |
| ANT 17 | NB |  |  |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |  |  |

***Modèle d (LOC, RFC) :***

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **TPR** | **TNR** | **G-mean** | **F** | **AUC** | **TPRD** | **TNRD** | **G-meanD** | **FD** | **AUCD** |
| **ANT 13** | NB |  |  |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |  |  |
| **ANT 14** | NB |  |  |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |  |  |
| **ANT 15** | NB | 0.666 | 0.453 | 0.209 | 0.58 | 0.738 | 0.59 | 0.695 | 0.243 | 0.539 | 0.786 |
| J48 | 0.648 | 0.456 | 0.212 | 0.572 | 0.619 | 0.713 | 0.795 | 0.4 | 0.701 | 0.786 |
| RF | 0.594 | 0.601 | 0.268 | 0.586 | 0.667 | 0.776 | 0.873 | **0.461** | **0.776** | **0.865** |
| RLog | 0.659 | 0.434 | 0.199 | 0.568 | **0.755** | 0.667 | 0.732 | 0.279 | 0.59 | 0.799 |
| SVM | 0.659 | 0.341 | 0.178 | 0.523 | 0.5 | 0.631 | 0.643 | 0.257 | 0.545 | 0.648 |
| ANN | 0.672 | 0.545 | **0.248** | **0.608** | **0.750** | 0.666 | 0.749 | 0.281 | 0.594 | 0.799 |
| ANT 16 | NB |  |  |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |  |  |
| ANT 17 | NB |  |  |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |  |  |

Restriction Modèles

A partir de maintenant on retient que les modèles :

D(WMC, CBO) ; D(LOC, Ce) ; D(LOC, RFC) ; D(RFC, Ca) ; D(Qi, FANIN) et D(LOC, FANIN)

1. Existence de Faute de Sévérité Normale :

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***Système*** | ***#Classes*** | ***#Fautives*** | ***%Fautives*** | ***#ClassesD*** | ***#FautivesD*** | ***%FautivesD*** |
| Ant13 | 126 | 55 | 43.64% | 285 | 214 | 75.09% |
| Ant14 | 178 | 29 | 16.29% | 186 | 37 | 19.89% |
| Ant15 | 293 | 64 | 21.84% | 330 | 101 | 30.61% |
| Ant16 | 352 | 32 | 9.09% | 362 | 42 | 11.60% |
| Ant17 | 745 | 56 | 7.51% | 765 | 76 | 9.93% |

***Modèle d (LOC, Ce) :***

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **TPR** | **TNR** | **G-mean** | **F** | **AUC** | **TPRD** | **TNRD** | **G-meanD** | **FD** | **AUCD** |
| **ANT 13** | NB | 0.770 | 0.723 | **0.724** | 0.759 | 0.811 | 0.796 | 0.801 | **0.799** | 0.807 | 0.871 |
| J48 | 0.786 | 0.801 | **0.791** | **0.786** | **0.724** | 0.87 | 0.759 | **0.807** | **0.869** | **0.785** |
| RF | 0.659 | 0.650 | 0.653 | 0.659 | 0.786 | 0.898 | 0.712 | **0.784** | 0.89 | 0.913 |
| RLog | 0.778 | 0.746 | **0.751** | 0.773 | 0.854 | 0.874 | 0.770 | **0.815** | **0.872** | **0.892** |
| SVM | 0.714 | 0.639 | 0.609 | 0.682 | 0.677 | 0.751 | 0.249 | 0.432 | 0.644 | 0.5 |
| ANN | 0.760 | 0.738 | **0.777** | 0.758 | 0.843 | 0.853 | 0.735 | **0.787** | 0.852 | 0.883 |
| **ANT 14** | NB | 0.831 | 0.301 | 0.407 | 0.798 | 0.657 | 0.817 | 0.386 | 0.483 | 0.785 | 0.715 |
| J48 | 0.837 | 0.163 | 0.369 | 0.763 | 0.481 | 0.796 | 0.218 | 0.163 | 0.719 | 0.481 |
| RF | 0.685 | 0.244 | 0.331 | 0.697 | 0.529 | 0.758 | 0.554 | **0.634** | **0.766** | **0.694** |
| RLog | 0.826 | 0.189 | 0.184 | 0.767 | 0.682 | 0.806 | 0.342 | 0.426 | 0.767 | 0.734 |
| SVM | 0.837 | 0.163 | 0.369 | 0.763 | 0.5 | 0.801 | 0.199 | 0.399 | 0.713 | 0.500 |
| ANN | 0.821 | 0.160 | 0.047 | 0.755 | 0.678 | 0.814 | 0.382 | 0.483 | 0.782 | 0.719 |
| **ANT 15** | NB | 0.785 | 0.321 | 0.368 | 0.733 | 0.754 | 0.739 | 0.464 | 0.487 | 0.693 | 0.816 |
| J48 | 0.782 | 0.218 | 0.413 | 0.686 | 0.479 | 0.785 | 0.761 | **0.772** | **0.789** | **0.746** |
| RF | 0.71 | 0.401 | 0.483 | 0.704 | 0.667 | 0.779 | 0.725 | **0.749** | 0.781 | 0.830 |
| RLog | 0.782 | 0.286 | 0.302 | 0.718 | 0.769 | 0.758 | 0.528 | 0.570 | 0.728 | 0.830 |
| SVM | 0.778 | 0.217 | 0.411 | 0.684 | 0.498 | 0.727 | 0.42 | 0.416 | 0.664 | 0.574 |
| ANN | 0.784 | 0.423 | **0.535** | **0.760** | **0.782** | 0.78 | 0.689 | **0.729** | 0.779 | 0.822 |
| ANT 16 | NB | 0.895 | 0.202 | 0.349 | 0.874 | 0.75 | 0.876 | 0.239 | 0.373 | 0.849 | 0.817 |
| J48 | 0.909 | 0.091 | 0.288 | 0.866 | 0.475 | 0.884 | 0.116 | 0.102 | 0.830 | 0.481 |
| RF | 0.855 | 0.254 | 0.416 | 0.854 | 0.727 | 0.870 | 0.569 | **0.693** | **0.874** | **0.826** |
| RLog | 0.901 | 0.118 | 0.176 | 0.866 | 0.778 | 0.870 | 0.156 | 0.216 | 0.831 | 0.824 |
| SVM | 0.909 | 0.091 | 0.288 | 0.866 | 0.500 | 0.884 | 0.116 | 0.102 | 0.830 | 0.500 |
| ANN | 0.909 | 0.091 | 0.288 | 0.866 | 0.681 | 0.881 | 0.124 | 0.119 | 0.830 | 0.750 |
| ANT 17 | NB | 0.917 | 0.288 | 0.475 | 0.906 | 0.785 | 0.906 | 0.393 | 0.565 | 0.895 | 0.804 |
| J48 | 0.922 | 0.124 | 0.231 | 0.894 | 0.691 | 0.914 | 0.276 | 0.443 | 0.89 | 0.726 |
| RF | 0.877 | 0.268 | 0.446 | 0.878 | 0.644 | 0.889 | 0.578 | **0.707** | **0.893** | **0.795** |
| RLog | 0.930 | 0.223 | 0.399 | 0.910 | 0.824 | 0.918 | 0.324 | 0.498 | 0.898 | 0.842 |
| SVM | 0.925 | 0.075 | 0.263 | 0.889 | 0.500 | 0.901 | 0.111 | 0.115 | 0.856 | 0.506 |
| ANN | 0.928 | 0.189 | 0.366 | 0.905 | 0.808 | 0.916 | 0.330 | 0.510 | 0.897 | 0.828 |

***Modèle d (LOC, FANIN) :***

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **TPR** | **TNR** | **G-mean** | **F** | **AUC** | **TPRD** | **TNRD** | **G-meanD** | **FD** | **AUCD** |
| **ANT 13** | NB | 0.770 | 0.723 | **0.724** | 0.759 | 0.811 | 0.804 | 0.803 | **0.803** | 0.813 | 0.873 |
| J48 | 0.786 | 0.801 | **0.791** | **0.786** | **0.724** | 0.881 | 0.782 | **0.825** | **0.88** | **0.794** |
| RF | 0.690 | 0.682 | 0.686 | 0.691 | 0.795 | 0.912 | 0.754 | **0.818** | 0.907 | 0.923 |
| RLog | 0.778 | 0.746 | **0.751** | 0.773 | 0.854 | 0.874 | 0.77 | **0.815** | 0.872 | 0.892 |
| SVM | 0.714 | 0.639 | 0.609 | 0.682 | 0.677 | 0.751 | 0.249 | 0.432 | 0.644 | 0.500 |
| ANN | 0.760 | 0.739 | **0.777** | 0.758 | 0.843 | 0.853 | 0.735 | **0.787** | 0.852 | 0.882 |
| **ANT 14** | NB | 0.831 | 0.301 | 0.407 | 0.798 | 0.654 | 0.812 | 0.384 | 0.481 | 0.781 | 0.714 |
| J48 | 0.837 | 0.163 | 0.369 | 0.763 | 0.481 | 0.796 | 0.218 | 0.163 | 0.719 | 0.481 |
| RF | 0.697 | 0.247 | 0.333 | 0.704 | 0.530 | 0.769 | 0.577 | **0.654** | **0.776** | **0.680** |
| RLog | 0.826 | 0.189 | 0.184 | 0.767 | 0.682 | 0.812 | 0.364 | 0.456 | 0.776 | 0.733 |
| SVM | 0.837 | 0.163 | 0.369 | 0.763 | 0.500 | 0.801 | 0.199 | 0.159 | 0.713 | 0.500 |
| ANN | 0.821 | 0.160 | 0.047 | 0.755 | 0.679 | 0.817 | 0.386 | 0.483 | 0.784 | 0.722 |
| **ANT 15** | NB | 0.785 | 0.321 | 0.368 | 0.733 | 0.755 | 0.742 | 0.471 | 0.496 | 0.697 | 0.813 |
| J48 | 0.782 | 0.218 | 0.413 | 0.686 | 0.479 | 0.785 | 0.761 | **0.772** | 0.789 | 0.746 |
| RF | 0.713 | 0.413 | 0.496 | 0.708 | 0.680 | 0.803 | 0.758 | **0.778** | **0.805** | **0.834** |
| RLog | 0.782 | 0.297 | 0.326 | 0.722 | 0.771 | 0.758 | 0.533 | 0.577 | 0.730 | 0.830 |
| SVM | 0.778 | 0.217 | 0.411 | 0.684 | 0.498 | 0.733 | 0.434 | 0.438 | 0.675 | 0.584 |
| ANN | 0.783 | 0.432 | **0.544** | **0.76** | **0.784** | 0.780 | 0.691 | **0.729** | 0.779 | 0.822 |
| ANT 16 | NB | 0.895 | 0.202 | 0.349 | 0.874 | 0.750 | 0.873 | 0.239 | 0.372 | 0.847 | 0.818 |
| J48 | 0.909 | 0.091 | 0.083 | 0.866 | 0.475 | 0.884 | 0.116 | 0.320 | 0.830 | 0.481 |
| RF | 0.855 | 0.311 | 0.478 | 0.858 | 0.733 | 0.870 | 0.611 | **0.721** | **0.877** | **0.828** |
| RLog | 0.901 | 0.118 | 0.176 | 0.866 | 0.779 | 0.870 | 0.156 | 0.216 | 0.831 | 0.824 |
| SVM | 0.909 | 0.091 | 0.083 | 0.866 | 0.500 | 0.884 | 0.116 | 0.320 | 0.830 | 0.500 |
| ANN | 0.909 | 0.091 | 0.083 | 0.866 | 0.688 | 0.879 | 0.115 | 0.101 | 0.827 | 0.801 |
| ANT 17 | NB | 0.914 | 0.288 | 0.474 | 0.904 | 0.783 | 0.907 | 0.404 | 0.576 | 0.897 | 0.801 |
| J48 | 0.921 | 0.108 | 0.188 | 0.891 | 0.671 | 0.914 | 0.276 | 0.443 | 0.89 | 0.715 |
| RF | 0.875 | 0.284 | 0.464 | 0.879 | 0.631 | 0.892 | 0.578 | **0.708** | **0.895** | **0.784** |
| RLog | 0.930 | 0.223 | 0.399 | 0.910 | 0.824 | 0.918 | 0.324 | 0.498 | 0.898 | 0.842 |
| SVM | 0.925 | 0.075 | 0.263 | 0.889 | 0.500 | 0.901 | 0.111 | 0.115 | 0.856 | 0.506 |
| ANN | 0.927 | 0.185 | 0.363 | 0.904 | 0.808 | 0.911 | 0.25 | 0.498 | 0.885 | 0.761 |

***Modèle d (LOC, FANIN) : Blanced***

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **TPR** | **TNR** | **G-mean** | **AUC** | **TPRD** | **TNRD** | **G-meanD** | **FD** | **AUCD** |
| **ANT 13** | NB |  |  |  |  | 0.804 | 0.803 | **0.803** | 0.813 | 0.873 |
| J48 |  |  |  |  | 0.881 | 0.782 | **0.825** | **0.88** | **0.794** |
| RF |  |  |  |  | 0.912 | 0.754 | **0.818** | 0.907 | 0.923 |
| RLog |  |  |  |  | 0.874 | 0.77 | **0.815** | 0.872 | 0.892 |
| SVM |  |  |  |  | 0.751 | 0.249 | 0.432 | 0.644 | 0.500 |
| ANN |  |  |  |  | 0.853 | 0.735 | **0.787** | 0.852 | 0.882 |
| **ANT 14** | NB |  |  |  |  | 0.812 | 0.384 | 0.481 | 0.781 | 0.714 |
| J48 |  |  |  |  | 0.796 | 0.218 | 0.163 | 0.719 | 0.481 |
| RF |  |  |  |  | 0.769 | 0.577 | **0.654** | **0.776** | **0.680** |
| RLog |  |  |  |  | 0.812 | 0.364 | 0.456 | 0.776 | 0.733 |
| SVM |  |  |  |  | 0.801 | 0.199 | 0.159 | 0.713 | 0.500 |
| ANN |  |  |  |  | 0.817 | 0.386 | 0.483 | 0.784 | 0.722 |
| **ANT 15** | NB | 0.258 | 0.934 | 0.491 | 0.778 | 0.742 | 0.471 | 0.496 | 0.697 | 0.813 |
| J48 | 0.766 | 0.747 | 0.756 | 0.706 | 0.785 | 0.761 | **0.772** | 0.789 | 0.746 |
| RF | 0.586 | 0.769 | 0.671 | 0.751 | 0.803 | 0.758 | **0.778** | **0.805** | **0.834** |
| RLog | 0.367 | 0.904 | 0.576 | 0.790 | 0.758 | 0.533 | 0.577 | 0.730 | 0.830 |
| SVM | 0.125 | 0.969 | 0.348 | 0.547 | 0.733 | 0.434 | 0.438 | 0.675 | 0.584 |
| ANN | 0.592 | 0.82 | 0.704 | 0.779 | 0.780 | 0.691 | **0.729** | 0.779 | 0.822 |
| ANT 16 | NB |  |  |  |  | 0.873 | 0.239 | 0.372 | 0.847 | 0.818 |
| J48 |  |  |  |  | 0.884 | 0.116 | 0.320 | 0.830 | 0.481 |
| RF |  |  |  |  | 0.870 | 0.611 | **0.721** | **0.877** | **0.828** |
| RLog |  |  |  |  | 0.870 | 0.156 | 0.216 | 0.831 | 0.824 |
| SVM |  |  |  |  | 0.884 | 0.116 | 0.320 | 0.830 | 0.500 |
| ANN |  |  |  |  | 0.879 | 0.115 | 0.101 | 0.827 | 0.801 |
| ANT 17 | NB |  |  |  |  | 0.907 | 0.404 | 0.576 | 0.897 | 0.801 |
| J48 |  |  |  |  | 0.914 | 0.276 | 0.443 | 0.89 | 0.715 |
| RF |  |  |  |  | 0.892 | 0.578 | **0.708** | **0.895** | **0.784** |
| RLog |  |  |  |  | 0.918 | 0.324 | 0.498 | 0.898 | 0.842 |
| SVM |  |  |  |  | 0.901 | 0.111 | 0.115 | 0.856 | 0.506 |
| ANN |  |  |  |  | 0.911 | 0.25 | 0.498 | 0.885 | 0.761 |

***Modèle d (Qi, FANIN) :***

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **TPR** | **TNR** | **G-mean** | **F** | **AUC** | **TPRD** | **TNRD** | **G-meanD** | **FD** | **AUCD** |
| **ANT 13** | NB | 0.727 | 0.183 | 0.365 | 0.376 | 0.489 | 0.958 | 0.014 | 0.116 | 0.636 | 0.497 |
| J48 | 0.873 | 0.394 | 0.587 | 0.585 | 0.543 | 0.930 | 0.408 | **0.616** | 0.782 | 0.654 |
| RF | 0.600 | 0.704 | **0.650** | **0.658** | **0.665** | 0.953 | 0.563 | **0.733** | **0.847** | **0.856** |
| RLog | 0.018 | 0.972 | 0.133 | 0.416 | 0.396 | 1.000 | 0.000 | 0.000 | 0.644 | 0.458 |
| SVM | 0.000 | 1.000 | 0.000 | 0.406 | 0.500 | 1.000 | 0.000 | 0.000 | 0.644 | 0.500 |
| ANN | 0.005 | 0.986 | 0.099 | 0.407 | 0.457 | 1.000 | 0.000 | 0.000 | 0.644 | 0.482 |
| **ANT 14** | NB | 0.034 | 0.98 | 0.184 | 0.767 | 0.521 | 0.108 | 0.987 | 0.327 | 0.753 | 0.672 |
| J48 | 0.000 | 1.000 | 0.000 | 0.763 | 0.481 | 0.297 | 0.913 | 0.521 | 0.772 | 0.639 |
| RF | 0.207 | 0.919 | 0.436 | 0.784 | 0.628 | 0.486 | 0.906 | **0.664** | **0.818** | **0.742** |
| RLog | 0.000 | 0.987 | 0.000 | 0.757 | 0.694 | 0.054 | 0.987 | 0.231 | 0.731 | 0.76 |
| SVM | 0.000 | 1.000 | 0.000 | 0.763 | 0.500 | 0.000 | 1.000 | 0.000 | 0.713 | 0.500 |
| ANN | 0.000 | 0.990 | 0.000 | 0.759 | 0.580 | 0.053 | 0.989 | 0.361 | 0.732 | 0.651 |
| **ANT 15** | NB | 0.775 | 0.239 | 0.175 | 0.694 | 0.598 | 0.742 | 0.471 | 0.496 | 0.697 | 0.813 |
| J48 | 0.782 | 0.218 | 0.413 | 0.686 | 0.479 | 0.785 | 0.761 | **0.772** | 0.789 | 0.746 |
| RF | 0.737 | 0.386 | 0.467 | 0.72 | 0.543 | 0.803 | 0.758 | **0.778** | **0.805** | **0.834** |
| RLog | 0.778 | 0.229 | 0.124 | 0.69 | 0.682 | 0.758 | 0.533 | 0.577 | 0.73 | 0.83 |
| SVM | 0.782 | 0.218 | 0.413 | 0.686 | 0.500 | 0.733 | 0.434 | 0.438 | 0.675 | 0.584 |
| ANN | 0.778 | 0.227 | 0.124 | 0.689 | 0.575 | 0.78 | 0.691 | 0.729 | 0.779 | 0.822 |
| ANT 16 | NB | 0.000 | 0.991 | 0.000 | 0.862 | 0.488 | 0.000 | 0.991 | 0.000 | 0.825 | 0.485 |
| J48 | 0.000 | 1.000 | 0.000 | 0.866 | 0.475 | 0.000 | 1.000 | 0.000 | 0.830 | 0.486 |
| RF | 0.063 | 0.969 | 0.246 | 0.862 | 0.523 | 0.357 | 0.956 | 0.584 | 0.877 | 0.758 |
| RLog | 0.000 | 0.997 | 0.000 | 0.864 | 0.510 | 0.000 | 0.997 | 0.000 | 0.828 | 0.538 |
| SVM | 0.000 | 1.000 | 0.000 | 0.866 | 0.500 | 0.000 | 1.000 | 0.000 | 0.830 | 0.500 |
| ANN | 0.000 | 1.000 | 0.000 | 0.866 | 0.493 | 0.000 | 0.999 | 0.000 | 0.829 | 0.488 |
| ANT 17 | NB | 0.018 | 0.994 | 0.133 | 0.889 | 0.507 | 0.039 | 0.993 | 0.198 | 0.859 | 0.517 |
| J48 | 0.000 | 1.000 | 0.000 | 0.889 | 0.478 | 0.000 | 1.000 | 0.000 | 0.854 | 0.484 |
| RF | 0.018 | 0.978 | 0.132 | 0.881 | 0.568 | 0.118 | 0.983 | 0.341 | 0.869 | 0.672 |
| RLog | 0.000 | 0.999 | 0.000 | 0.888 | 0.583 | 0.000 | 0.999 | 0.000 | 0.853 | 0.571 |
| SVM | 0.000 | 1.000 | 0.000 | 0.889 | 0.500 | 0.000 | 1.000 | 0.000 | 0.854 | 0.500 |
| ANN | 0.000 | 1.000 | 0.000 | 0.889 | 0.507 | 0.000 | 0.999 | 0.000 | 0.853 | 0.510 |

***Modèle d (WMC, CBO) :***

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **TPR** | **TNR** | **G-mean** | **F** | **AUC** | **TPRD** | **TNRD** | **G-meanD** | **FD** | **AUCD** |
| **ANT 13** | NB | 0.236 | 0.901 | 0.462 | 0.559 | 0.679 | 1.000 | 0.000 | 0.000 | 0.644 | 0.744 |
| J48 | 0.691 | 0.690 | **0.691** | 0.692 | 0.656 | 0.944 | 0.437 | **0.642** | 0.801 | 0.701 |
| RF | 0.673 | 0.676 | **0.674** | 0.676 | 0.726 | 0.981 | 0.606 | **0.771** | **0.879** | **0.834** |
| RLog | 0.309 | 0.901 | 0.528 | 0.605 | 0.762 | 0.991 | 0.085 | 0.289 | 0.686 | 0.795 |
| SVM | 0.018 | 0.972 | 0.133 | 0.416 | 0.495 | 1.000 | 0.000 | 0.000 | 0.644 | 0.500 |
| ANN | 0.352 | 0.873 | 0.732 | **0.617** | **0.682** | 0.926 | 0.429 | **0.647** | 0.786 | 0.786 |
| **ANT 14** | NB | 0.000 | 0.960 | 0.000 | 0.746 | 0.588 | 0.054 | 0.960 | 0.228 | 0.718 | 0.72 |
| J48 | 0.000 | 1.000 | 0.000 | 0.763 | 0.481 | 0.000 | 1.000 | 0.000 | 0.713 | 0.468 |
| RF | 0.207 | 0.879 | 0.427 | 0.761 | 0.574 | 0.541 | 0.886 | **0.692** | **0.817** | **0.762** |
| RLog | 0.034 | 0.973 | 0.183 | 0.763 | 0.696 | 0.054 | 0.960 | 0.228 | 0.718 | 0.752 |
| SVM | 0.000 | 1.000 | 0.000 | 0.763 | 0.500 | 0.000 | 1.000 | 0.000 | 0.713 | 0.500 |
| ANN | 0.003 | 0.978 | 0.073 | 0.754 | 0.68 | 0.043 | 0.957 | 0.422 | 0.712 | 0.742 |
| **ANT 15** | NB | 0.785 | 0.309 | 0.348 | 0.729 | 0.71 | 0.73 | 0.427 | 0.427 | 0.67 | 0.732 |
| J48 | 0.758 | 0.336 | 0.398 | 0.721 | 0.564 | 0.764 | 0.763 | **0.763** | **0.771** | **0.719** |
| RF | 0.73 | 0.429 | 0.515 | 0.723 | 0.653 | 0.748 | 0.684 | **0.712** | 0.751 | 0.785 |
| RLog | 0.778 | 0.274 | 0.276 | 0.711 | 0.755 | 0.752 | 0.486 | 0.516 | 0.709 | 0.802 |
| SVM | 0.782 | 0.218 | 0.413 | 0.686 | 0.5 | 0.706 | 0.339 | 0.222 | 0.601 | 0.523 |
| ANN | 0.793 | 0.366 | 0.471 | 0.752 | 0.747 | 0.758 | 0.613 | **0.684** | 0.749 | 0.793 |
| ANT 16 | NB | 0.000 | 0.975 | 0.000 | 0.854 | 0.577 | 0.000 | 0.975 | 0.000 | 0.818 | 0.613 |
| J48 | 0.000 | 1.000 | 0.000 | 0.866 | 0.475 | 0.000 | 0.994 | 0.000 | 0.827 | 0.482 |
| RF | 0.156 | 0.941 | 0.383 | 0.861 | 0.660 | 0.500 | 0.925 | **0.680** | **0.878** | **0.764** |
| RLog | 0.031 | 0.994 | 0.176 | 0.869 | 0.715 | 0.024 | 0.991 | 0.154 | 0.832 | 0.754 |
| SVM | 0.000 | 1.000 | 0.000 | 0.866 | 0.500 | 0.000 | 1.000 | 0.000 | 0.830 | 0.500 |
| ANN | 0.000 | 0.999 | 0.000 | 0.865 | 0.595 | 0.000 | 0.997 | 0.000 | 0.828 | 0.645 |
| ANT 17 | NB | 0.036 | 0.990 | 0.188 | 0.890 | 0.650 | 0.053 | 0.985 | 0.228 | 0.858 | 0.666 |
| J48 | 0.000 | 1.000 | 0.000 | 0.889 | 0.478 | 0.000 | 1.000 | 0.000 | 0.854 | 0.484 |
| RF | 0.286 | 0.955 | 0.522 | 0.901 | 0.711 | 0.526 | 0.945 | **0.705** | **0.904** | **0.819** |
| RLog | 0.018 | 0.999 | 0.134 | 0.891 | 0.77 | 0.039 | 0.996 | 0.198 | 0.861 | 0.798 |
| SVM | 0.000 | 1.000 | 0.000 | 0.889 | 0.500 | 0.000 | 1.000 | 0.000 | 0.854 | 0.500 |
| ANN | 0.000 | 0.999 | 0.000 | 0.888 | 0.633 | 0.034 | 0.993 | 0.198 | 0.858 | 0.769 |

***Modèle d (RFC, Ca) :***

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **TPR** | **TNR** | **G-mean** | **F** | **AUC** | **TPRD** | **TNRD** | **G-meanD** | **FD** | **AUCD** |
| **ANT 13** | NB | 0.491 | 0.901 | **0.665** | 0.707 | 0.825 | 0.911 | 0.732 | **0.817** | 0.867 | 0.873 |
| J48 | 0.836 | 0.718 | **0.775** | **0.771** | **0.723** | 0.935 | 0.718 | **0.819** | **0.879** | **0.785** |
| RF | 0.618 | 0.732 | **0.673** | 0.682 | 0.770 | 0.963 | 0.69 | **0.815** | 0.891 | 0.887 |
| RLog | 0.618 | 0.845 | **0.723** | 0.742 | 0.837 | 0.935 | 0.676 | **0.795** | 0.867 | 0.878 |
| SVM | 0.218 | 0.958 | 0.457 | 0.571 | 0.588 | 1.000 | 0.000 | 0.000 | 0.644 | 0.500 |
| ANN | 0.711 | 0.776 | **0.771** | 0.748 | 0.821 | 0.937 | 0.655 | **0.787** | 0.862 | 0.869 |
| **ANT 14** | NB | 0.207 | 0.953 | 0.444 | 0.804 | 0.677 | 0.297 | 0.953 | 0.532 | 0.797 | 0.737 |
| J48 | 0.000 | 0.987 | 0.000 | 0.757 | 0.492 | 0.297 | 0.980 | 0.540 | 0.815 | 0.606 |
| RF | 0.172 | 0.879 | 0.389 | 0.753 | 0.606 | 0.405 | 0.852 | 0.588 | 0.763 | 0.687 |
| RLog | 0.069 | 0.993 | 0.262 | 0.785 | 0.703 | 0.270 | 0.966 | 0.511 | 0.797 | 0.751 |
| SVM | 0.000 | 1.000 | 0.000 | 0.763 | 0.500 | 0.000 | 1.000 | 0.000 | 0.713 | 0.500 |
| ANN | 0.032 | 0.993 | 0.180 | 0.772 | 0.702 | 0.251 | 0.962 | 0.534 | 0.789 | 0.744 |
| **ANT 15** | NB | 0.816 | 0.487 | 0.582 | 0.795 | 0.777 | 0.779 | 0.581 | 0.631 | 0.758 | 0.818 |
| J48 | 0.785 | 0.715 | **0.747** | **0.796** | **0.723** | 0.803 | 0.786 | 0.794 | 0.807 | 0.781 |
| RF | 0.751 | 0.48 | 0.567 | 0.746 | 0.727 | 0.818 | 0.776 | **0.795** | **0.82** | **0.853** |
| RLog | 0.819 | 0.488 | 0.584 | 0.798 | 0.813 | 0.8 | 0.652 | 0.700 | 0.79 | 0.854 |
| SVM | 0.785 | 0.231 | 0.125 | 0.694 | 0.508 | 0.752 | 0.47 | 0.491 | 0.702 | 0.611 |
| ANN | 0.811 | 0.541 | 0.643 | 0.8 | 0.808 | 0.666 | 0.749 | 0.281 | 0.594 | 0.799 |
| ANT 16 | NB | 0.188 | 0.969 | 0.426 | 0.882 | 0.683 | 0.214 | 0.969 | 0.456 | 0.861 | 0.768 |
| J48 | 0.000 | 1.000 | 0.000 | 0.866 | 0.475 | 0.000 | 1.000 | 0.000 | 0.830 | 0.481 |
| RF | 0.125 | 0.925 | 0.340 | 0.848 | 0.678 | 0.500 | 0.931 | **0.682** | **0.882** | **0.798** |
| RLog | 0.031 | 0.991 | 0.176 | 0.868 | 0.785 | 0.071 | 0.978 | 0.264 | 0.837 | 0.825 |
| SVM | 0.000 | 1.000 | 0.000 | 0.866 | 0.500 | 0.000 | 1.000 | 0.000 | 0.830 | 0.500 |
| ANN | 0.000 | 0.997 | 0.000 | 0.864 | 0.694 | 0.020 | 0.984 | 0.145 | 0.828 | 0.824 |
| ANT 17 | NB | 0.107 | 0.990 | 0.326 | 0.901 | 0.719 | 0.145 | 0.987 | 0.378 | 0.877 | 0.75 |
| J48 | 0.000 | 1.000 | 0.000 | 0.889 | 0.478 | 0.000 | 1.000 | 0.000 | 0.854 | 0.484 |
| RF | 0.232 | 0.954 | 0.470 | 0.894 | 0.726 | 0.539 | 0.951 | **0.716** | **0.91** | **0.823** |
| RLog | 0.036 | 0.994 | 0.188 | 0.892 | 0.811 | 0.079 | 0.990 | 0.280 | 0.866 | 0.826 |
| SVM | 0.000 | 1.000 | 0.000 | 0.889 | 0.500 | 0.000 | 1.000 | 0.000 | 0.854 | 0.500 |
| ANN | 0.018 | 0.997 | 0.174 | 0.890 | 0.763 | 0.115 | 0.988 | 0.342 | 0.872 | 0.819 |

***Modèle d (LOC, RFC) :***

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **TPR** | **TNR** | **G-mean** | **F** | **AUC** | **TPRD** | **TNRD** | **G-meanD** | **FD** | **AUCD** |
| **ANT 13** | NB | 0.582 | 0.901 | **0.724** | 0.754 | 0.832 | 0.850 | 0.803 | **0.826** | **0.844** | **0.889** |
| J48 | 0.855 | 0.732 | **0.791** | **0.786** | **0.724** | 0.930 | 0.704 | **0.809** | 0.872 | 0.790 |
| RF | 0.636 | 0.690 | **0.663** | 0.667 | 0.788 | 0.991 | 0.620 | **0.784** | 0.890 | 0.915 |
| RLog | 0.655 | 0.887 | **0.762** | 0.782 | 0.854 | 0.925 | 0.69 | **0.799** | 0.865 | 0.892 |
| SVM | 0.582 | 0.915 | **0.730** | 0.761 | 0.749 | 0.958 | 0.451 | **0.657** | 0.815 | 0.704 |
| ANN | 0.720 | 0.815 | **0.769** | 0.773 | 0.847 | 0.918 | 0.62 | **0.782** | 0.840 | 0.869 |
| **ANT 14** | NB | 0.172 | 0.953 | 0.405 | 0.794 | 0.662 | 0.243 | 0.953 | 0.481 | 0.781 | 0.720 |
| J48 | 0.000 | 1.000 | 0.000 | 0.763 | 0.481 | 0.027 | 0.987 | 0.163 | 0.719 | 0.481 |
| RF | 0.138 | 0.799 | 0.332 | 0.701 | 0.532 | 0.486 | 0.826 | **0.634** | **0.766** | **0.689** |
| RLog | 0.034 | 0.980 | 0.184 | 0.767 | 0.680 | 0.243 | 0.960 | 0.483 | 0.785 | 0.730 |
| SVM | 0.000 | 1.000 | 0.000 | 0.763 | 0.500 | 0.000 | 1.000 | 0.000 | 0.713 | 0.500 |
| ANN | 0.000 | 0.985 | 0.000 | 0.757 | 0.669 | 0.240 | 0.960 | 0.483 | 0.784 | 0.718 |
| **ANT 15** | NB | 0.778 | 0.353 | 0.421 | 0.738 | 0.758 | 0.758 | 0.539 | 0.584 | 0.731 | 0.819 |
| J48 | 0.782 | 0.218 | 0.413 | 0.686 | 0.479 | 0.785 | 0.761 | **0.772** | **0.789** | **0.746** |
| RF | 0.724 | 0.394 | 0.476 | 0.712 | 0.671 | 0.794 | 0.732 | **0.759** | **0.795** | **0.830** |
| RLog | 0.782 | 0.32 | 0.368 | 0.73 | 0.779 | 0.764 | 0.569 | 0.618 | 0.744 | 0.831 |
| SVM | 0.778 | 0.217 | 0.411 | 0.684 | 0.498 | 0.739 | 0.47 | 0.495 | 0.695 | 0.605 |
| ANN | 0.772 | 0.409 | **0.519** | **0.748** | **0.781** | 0.777 | 0.706 | 0.738 | 0.778 | 0.821 |
| ANT 16 | NB | 0.125 | 0.963 | 0.347 | 0.869 | 0.767 | 0.143 | 0.953 | 0.369 | 0.838 | 0.822 |
| J48 | 0.000 | 1.000 | 0.000 | 0.866 | 0.475 | 0.000 | 1.000 | 0.000 | 0.830 | 0.481 |
| RF | 0.188 | 0.922 | 0.416 | 0.854 | 0.726 | 0.524 | 0.919 | **0.694** | **0.877** | **0.825** |
| RLog | 0.031 | 0.984 | 0.175 | 0.865 | 0.786 | 0.095 | 0.978 | 0.305 | 0.842 | 0.825 |
| SVM | 0.000 | 1.000 | 0.000 | 0.866 | 0.500 | 0.000 | 1.000 | 0.000 | 0.830 | 0.500 |
| ANN | 0.000 | 1.000 | 0.000 | 0.866 | 0.742 | 0.000 | 1.000 | 0.000 | 0.829 | 0.817 |
| ANT 17 | NB | 0.304 | 0.962 | 0.540 | 0.907 | 0.802 | 0.408 | 0.961 | 0.626 | 0.9 | 0.816 |
| J48 | 0.054 | 0.993 | 0.231 | 0.894 | 0.691 | 0.197 | 0.993 | 0.443 | 0.890 | 0.726 |
| RF | 0.196 | 0.933 | 0.428 | 0.878 | 0.638 | 0.526 | 0.929 | **0.699** | **0.893** | **0.788** |
| RLog | 0.161 | 0.993 | 0.399 | 0.910 | 0.827 | 0.250 | 0.987 | 0.497 | 0.895 | 0.843 |
| SVM | 0.000 | 1.000 | 0.000 | 0.889 | 0.500 | 0.000 | 1.000 | 0.000 | 0.854 | 0.500 |
| ANN | 0.092 | 0.993 | 0.333 | 0.900 | 0.813 | 0.180 | 0.992 | 0.497 | 0.886 | 0.780 |

***Modèle d D(d(Loc,Ce),d(Rfc,Ca)):***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **TPR** | **TNR** | **G-mean** | **AUC** | **TPRD** | **TNRD** | **G-meanD** | **AUCD** |
| **ANT 13** | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 14** | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 15** | NB | 0.141 | 0.965 | 0.368 | 0.755 | 0.248 | 0.956 | 0.487 | 0.815 |
| J48 | 0.000 | 1.000 | 0.000 | 0.479 | 0.743 | 0.803 | 0.772 | 0.746 |
| RF | 0.313 | 0.856 | 0.517 | 0.680 | 0.723 | 0.838 | **0.778** | **0.824** |
| RLog | 0.094 | 0.974 | 0.302 | 0.770 | 0.347 | 0.939 | 0.57 | 0.831 |
| SVM | 0.000 | 0.996 | 0.000 | 0.498 | 0.178 | 0.969 | 0.416 | 0.574 |
| ANN | 0.286 | 0.922 | 0.541 | 0.783 | 0.619 | 0.852 | 0.728 | 0.823 |
| ANT 16 | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| ANT 17 | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |

***Modèle D(d(Loc,Wmc),d(Rfc,Ca)):***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **TPR** | **TNR** | **G-mean** | **AUC** | **TPRD** | **TNRD** | **G-meanD** | **AUCD** |
| **ANT 13** | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 14** | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 15** | NB | 0.141 | 0.965 | 0.368 | 0.755 | 0.248 | 0.956 | 0.487 | 0.814 |
| J48 | 0.000 | 1.000 | 0.000 | 0.479 | 0.743 | 0.803 | 0.772 | 0.746 |
| RF | 0.313 | 0.856 | 0.517 | 0.678 | 0.723 | 0.838 | **0.778** | **0.825** |
| RLog | 0.094 | 0.974 | 0.302 | 0.770 | 0.347 | 0.939 | 0.570 | 0.831 |
| SVM | 0.000 | 0.996 | 0.000 | 0.498 | 0.178 | 0.969 | 0.416 | 0.574 |
| ANN | 0.289 | 0.922 | 0.541 | 0.783 | 0.619 | 0.852 | 0.729 | 0.823 |
| ANT 16 | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| ANT 17 | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |

***Modèle D(d(Loc,Rfc),d(Loc,Ca),d(Rfc,Ca)):***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **TPR** | **TNR** | **G-mean** | **AUC** | **TPRD** | **TNRD** | **G-meanD** | **AUCD** |
| **ANT 13** | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 14** | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 15** | NB | 0.188 | 0.943 | 0.421 | 0.759 | 0.376 | 0.930 | 0.592 | 0.820 |
| J48 | 0.000 | 1.000 | 0.000 | 0.479 | 0.743 | 0.803 | 0.772 | 0.746 |
| RF | 0.266 | 0.847 | 0.474 | 0.667 | 0.683 | 0.843 | **0.759** | **0.828** |
| RLog | 0.141 | 0.961 | 0.368 | 0.779 | 0.416 | 0.917 | 0.618 | 0.831 |
| SVM | 0.000 | 0.996 | 0.000 | 0.498 | 0.257 | 0.956 | 0.496 | 0.607 |
| ANN | 0.261 | 0.914 | 0.510 | 0.782 | 0.649 | 0.834 | 0.738 | 0.821 |
| ANT 16 | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| ANT 17 | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |

***Modèle (Loc,d(Rfc,Ca)):***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **TPR** | **TNR** | **G-mean** | **AUC** | **TPRD** | **TNRD** | **G-meanD** | **AUCD** |
| **ANT 13** | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 14** | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 15** | NB | 0.141 | 0.965 | 0.368 | 0.754 | 0.248 | 0.956 | 0.487 | 0.814 |
| J48 | 0.000 | 1.000 | 0.000 | 0.479 | 0.743 | 0.803 | 0.772 | 0.746 |
| RF | 0.281 | 0.817 | 0.479 | 0.669 | 0.713 | 0.817 | **0.763** | **0.830** |
| RLog | 0.094 | 0.974 | 0.302 | 0.769 | 0.347 | 0.939 | 0.570 | 0.830 |
| SVM | 0.000 | 0.996 | 0.000 | 0.498 | 0.178 | 0.969 | 0.416 | 0.574 |
| ANN | 0.284 | 0.924 | 0.535 | 0.782 | 0.617 | 0.852 | 0.728 | 0.822 |
| ANT 16 | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| ANT 17 | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |

***Modèle (Rfc,d(Loc,Ca)):***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **TPR** | **TNR** | **G-mean** | **AUC** | **TPRD** | **TNRD** | **G-meanD** | **AUCD** |
| **ANT 13** | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 14** | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 15** | NB | 0.125 | 0.969 | 0.348 | 0.722 | 0.238 | 0.961 | 0.478 | 0.793 |
| J48 | 0.000 | 1.000 | 0.000 | 0.479 | 0.703 | 0.777 | 0.739 | 0.744 |
| RF | 0.313 | 0.821 | 0.507 | 0.656 | 0.713 | 0.817 | 0.763 | 0.805 |
| RLog | 0.094 | 0.974 | 0.302 | 0.748 | 0.267 | 0.956 | 0.506 | 0.811 |
| SVM | 0.000 | 0.996 | 0.000 | 0.498 | 0.178 | 0.969 | 0.416 | 0.574 |
| ANN | 0.254 | 0.935 | 0.547 | 0.763 | 0.603 | 0.858 | 0.731 | 0.810 |
| ANT 16 | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| ANT 17 | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |

1. Existence de Faute de Sévérité Elevée :

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***Système*** | ***#Classes*** | ***#Fautives*** | ***%Fautives*** | ***#ClassesD*** | ***#FautivesD*** | ***%FautivesD*** |
| Ant13 | 126 | 60 | 47.62% | 279 | 147 | 52.69% |
| Ant14 | 178 | 12 | 6.74% | 179 | 13 | 7.26% |
| Ant15 | 293 | 55 | 18.77% | 298 | 60 | 20.13% |
| Ant16 | 352 | 19 | 5.40% | 352 | 19 | 5.40% |
| Ant17 | 745 | 22 | 2.95% | 748 | 25 | 3.34% |

***Modèle d (LOC, Ce) :***

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **TPR** | **TNR** | **G-mean** | **F** | **AUC** | **TPRD** | **TNRD** | **G-meanD** | **FD** | **AUCD** |
| **ANT 13** | NB | 0.550 | 0.909 | **0.707** | 0.728 | 0.794 | 0.748 | 0.894 | **0.818** | 0.801 | 0.86 |
| J48 | 0.700 | 0.773 | **0.735** | 0.738 | 0.738 | 0.898 | 0.576 | **0.719** | 0.791 | 0.817 |
| RF | 0.650 | 0.606 | **0.628** | 0.627 | 0.729 | 0.905 | 0.636 | **0.759** | 0.817 | 0.869 |
| RLog | 0.683 | 0.818 | **0.748** | 0.753 | 0.837 | 0.850 | 0.788 | **0.819** | **0.833** | **0.892** |
| SVM | 0.383 | 0.955 | **0.605** | 0.652 | 0.669 | 1.000 | 0.000 | 0.000 | 0.564 | 0.500 |
| ANN | 0.687 | 0.828 | **0.768** | **0.76** | **0.825** | 0.867 | 0.707 | **0.789** | 0.818 | 0.884 |
| **ANT 14** | NB | 0.167 | 0.952 | 0.398 | 0.895 | 0.732 | 0.154 | 0.952 | 0.383 | 0.887 | 0.732 |
| J48 | 0.000 | 1.000 | 0.000 | 0.900 | 0.427 | 0.000 | 1.000 | 0.000 | 0.892 | 0.412 |
| RF | 0.083 | 0.952 | 0.282 | 0.886 | 0.574 | 0.308 | 0.934 | 0.536 | 0.892 | 0.652 |
| RLog | 0.083 | 0.994 | 0.288 | 0.909 | 0.744 | 0.077 | 0.994 | 0.277 | 0.902 | 0.752 |
| SVM | 0.000 | 1.000 | 0.000 | 0.900 | 0.500 | 0.000 | 1.000 | 0.000 | 0.892 | 0.500 |
| ANN | 0.000 | 1.000 | 0.000 | 0.900 | 0.684 | 0.000 | 1.000 | 0.000 | 0.892 | 0.678 |
| **ANT 15** | NB | 0.073 | 0.962 | 0.265 | 0.740 | 0.700 | 0.083 | 0.958 | 0.283 | 0.726 | 0.73 |
| J48 | 0.018 | 0.983 | 0.134 | 0.729 | 0.485 | 0.267 | 0.903 | 0.491 | 0.756 | 0.582 |
| RF | 0.382 | 0.836 | 0.565 | 0.755 | 0.691 | 0.500 | 0.824 | **0.642** | **0.766** | **0.734** |
| RLog | 0.036 | 0.975 | 0.188 | 0.733 | 0.721 | 0.067 | 0.975 | 0.255 | 0.728 | 0.740 |
| SVM | 0.000 | 1.000 | 0.000 | 0.728 | 0.500 | 0.000 | 1.000 | 0.000 | 0.709 | 0.500 |
| ANN | 0.036 | 0.970 | 0.194 | 0.730 | 0.714 | 0.088 | 0.953 | 0.294 | 0.725 | 0.730 |
| ANT 16 | NB | 0.000 | 0.982 | 0.000 | 0.911 | 0.588 | - | - | - | - | - |
| J48 | 0.000 | 1.000 | 0.000 | 0.920 | 0.473 | - | - | - | - | - |
| RF | 0.000 | 0.952 | 0.000 | 0.897 | 0.441 | - | - | - | - | - |
| RLog | 0.000 | 1.000 | 0.000 | 0.920 | 0.605 | - | - | - | - | - |
| SVM | 0.000 | 1.000 | 0.000 | 0.920 | 0.500 | - | - | - | - | - |
| ANN | 0.000 | 1.000 | 0.000 | 0.920 | 0.566 | - | - | - | - | - |
| ANT 17 | NB | 0.182 | 0.982 | 0.423 | 0.956 | 0.781 | 0.24 | 0.983 | 0.486 | 0.955 | 0.779 |
| J48 | 0.000 | 1.000 | 0.000 | 0.956 | 0.462 | 0.000 | 1.000 | 0.000 | 0.950 | 0.580 |
| RF | 0.091 | 0.979 | 0.298 | 0.950 | 0.618 | 0.320 | 0.972 | 0.558 | 0.952 | 0.648 |
| RLog | 0.000 | 0.999 | 0.000 | 0.955 | 0.798 | 0.000 | 0.997 | 0.000 | 0.949 | 0.819 |
| SVM | 0.000 | 1.000 | 0.000 | 0.956 | 0.500 | 0.000 | 1.000 | 0.000 | 0.950 | 0.500 |
| ANN | 0.000 | 1.000 | 0.000 | 0.956 | 0.694 | 0.000 | 1.000 | 0.000 | 0.950 | 0.693 |

***Modèle d (LOC, FANIN) :***

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **TPR** | **TNR** | **G-mean** | **F** | **AUC** | **TPRD** | **TNRD** | **G-meanD** | **FD** | **AUCD** |
| **ANT 13** | NB | 0.550 | 0.924 | **0.713** | 0.736 | 0.793 | 0.755 | 0.879 | **0.815** | 0.801 | 0.863 |
| J48 | 0.700 | 0.788 | **0.743** | 0.745 | 0.750 | 0.898 | 0.576 | **0.719** | 0.791 | 0.817 |
| RF | 0.683 | 0.682 | **0.683** | 0.683 | 0.753 | 0.912 | 0.697 | **0.797** | 0.843 | 0.875 |
| RLog | 0.683 | 0.818 | **0.748** | 0.753 | 0.837 | 0.850 | 0.788 | **0.819** | **0.833** | **0.891** |
| SVM | 0.400 | 0.955 | **0.618** | 0.663 | 0.677 | 1.000 | 0.000 | 0.000 | 0.564 | 0.500r |
| ANN | 0.687 | 0.828 | **0.768** | **0.760** | **0.824** | 0.867 | 0.706 | **0.790** | 0.817 | 0.884 |
| **ANT 14** | NB | 0.167 | 0.952 | 0.398 | 0.895 | 0.732 | 0.154 | 0.952 | 0.383 | 0.887 | 0.735 |
| J48 | 0.000 | 1.000 | 0.000 | 0.900 | 0.427 | 0.000 | 1.000 | 0.000 | 0.892 | 0.412 |
| RF | 0.083 | 0.952 | 0.282 | 0.886 | 0.574 | 0.231 | 0.940 | 0.466 | 0.888 | 0.645 |
| RLog | 0.083 | 0.994 | 0.288 | 0.909 | 0.744 | 0.077 | 0.994 | 0.277 | 0.902 | 0.752 |
| SVM | 0.000 | 1.000 | 0.000 | 0.900 | 0.5 | 0.000 | 1.000 | 0.000 | 0.892 | 0.500 |
| ANN | 0.000 | 1.000 | 0.000 | 0.900 | 0.684 | 0.000 | 1.000 | 0.000 | 0.892 | 0.682 |
| **ANT 15** | NB | 0.073 | 0.962 | 0.265 | 0.740 | 0.700 | 0.083 | 0.958 | 0.283 | 0.726 | 0.733 |
| J48 | 0.018 | 0.983 | 0.134 | 0.729 | 0.485 | 0.267 | 0.903 | 0.491 | 0.756 | 0.582 |
| RF | 0.382 | 0.836 | 0.565 | 0.755 | 0.691 | 0.500 | 0.824 | **0.642** | **0.766** | **0.721** |
| RLog | 0.036 | 0.975 | 0.188 | 0.733 | 0.721 | 0.067 | 0.975 | 0.255 | 0.728 | 0.740 |
| SVM | 0.000 | 1.000 | 0.000 | 0.728 | 0.500 | 0.000 | 1.000 | 0.000 | 0.709 | 0.500 |
| ANN | 0.036 | 0.97 | 0.194 | 0.73 | 0.714 | 0.088 | 0.953 | 0.290 | 0.725 | 0.731 |
| ANT 16 | NB | 0.000 | 0.982 | 0.000 | 0.911 | 0.588 | - | - | - | - | - |
| J48 | 0.000 | 1.000 | 0.000 | 0.920 | 0.473 | - | - | - | - | - |
| RF | 0.000 | 0.952 | 0.000 | 0.897 | 0.441 | - | - | - | - | - |
| RLog | 0.000 | 1.000 | 0.000 | 0.920 | 0.605 | - | - | - | - | - |
| SVM | 0.000 | 1.000 | 0.000 | 0.920 | 0.500 | - | - | - | - | - |
| ANN | 0.000 | 1.000 | 0.000 | 0.920 | 0.566 | - | - | - | - | - |
| ANT 17 | NB | 0.182 | 0.982 | 0.423 | 0.956 | 0.781 | 0.240 | 0.983 | 0.486 | 0.955 | 0.775 |
| J48 | 0.000 | 1.000 | 0.000 | 0.956 | 0.462 | 0.000 | 1.000 | 0.000 | 0.950 | 0.580 |
| RF | 0.091 | 0.979 | 0.298 | 0.950 | 0.618 | 0.320 | 0.979 | 0.560 | 0.956 | 0.671 |
| RLog | 0.000 | 0.999 | 0.000 | 0.955 | 0.798 | 0.000 | 0.997 | 0.000 | 0.949 | 0.818 |
| SVM | 0.000 | 1.000 | 0.000 | 0.956 | 0.500 | 0.000 | 1.000 | 0.000 | 0.950 | 0.500 |
| ANN | 0.000 | 1.000 | 0.000 | 0.956 | 0.694 | 0.000 | 1.000 | 0.000 | 0.950 | 0.697 |

***Modèle d (Qi, FANIN) :***

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **TPR** | **TNR** | **G-mean** | **F** | **AUC** | **TPRD** | **TNRD** | **G-meanD** | **FD** | **AUCD** |
| **ANT 13** | NB | 0.933 | 0.030 | 0.168 | 0.325 | 0.524 | 0.959 | 0.015 | 0.121 | 0.56 | 0.497 |
| J48 | 0.667 | 0.409 | 0.522 | 0.524 | 0.514 | 0.905 | 0.439 | **0.631** | 0.744 | 0.643 |
| RF | 0.583 | 0.758 | **0.665** | **0.672** | **0.681** | 0.857 | 0.621 | **0.730** | **0.782** | **0.809** |
| RLog | 0.017 | 0.955 | 0.126 | 0.366 | 0.363 | 1.000 | 0.000 | 0.000 | 0.564 | 0.495 |
| SVM | 0.000 | 1.000 | 0.000 | 0.360 | 0.500 | 1.000 | 0.000 | 0.000 | 0.564 | 0.500 |
| ANN | 0.095 | 0.893 | 0.302 | 0.419 | 0.459 | 1.000 | 0.000 | 0.000 | 0.564 | 0.487 |
| **ANT 14** | NB | 0.000 | 1.000 | 0.000 | 0.900 | 0.735 | 0.000 | 1.000 | 0.000 | 0.892 | 0.681 |
| J48 | 0.000 | 1.000 | 0.000 | 0.900 | 0.427 | 0.000 | 1.000 | 0.000 | 0.892 | 0.412 |
| RF | 0.167 | 0.952 | 0.398 | 0.895 | 0.646 | 0.154 | 0.952 | 0.383 | 0.887 | 0.632 |
| RLog | 0.000 | 1.000 | 0.000 | 0.900 | 0.549 | 0.000 | 1.000 | 0.000 | 0.892 | 0.435 |
| SVM | 0.000 | 1.000 | 0.000 | 0.900 | 0.5 | 0.000 | 1.000 | 0.000 | 0.892 | 0.500 |
| ANN | 0.000 | 1.000 | 0.000 | 0.900 | 0.445 | 0.000 | 1.000 | 0.000 | 0.892 | 0.418 |
| **ANT 15** | NB | 0.000 | 0.996 | 0.000 | 0.726 | 0.491 | 0.000 | 0.992 | 0.000 | 0.706 | 0.469 |
| J48 | 0.000 | 1.000 | 0.000 | 0.728 | 0.474 | 0.000 | 1.000 | 0.000 | 0.709 | 0.497 |
| RF | 0.164 | 0.903 | 0.384 | 0.739 | 0.621 | 0.283 | 0.887 | 0.501 | 0.751 | 0.616 |
| RLog | 0.000 | 0.996 | 0.000 | 0.726 | 0.508 | 0.000 | 0.996 | 0.000 | 0.708 | 0.522 |
| SVM | 0.000 | 1.000 | 0.000 | 0.728 | 0.500 | 0.000 | 1.000 | 0.000 | 0.709 | 0.500 |
| ANN | 0.000 | 1.000 | 0.000 | 0.728 | 0.488 | 0.000 | 0.999 | 0.000 | 0.709 | 0.48 |
| ANT 16 | NB | 0.000 | 1.000 | 0.000 | 0.920 | 0.374 | - | - | - | - | - |
| J48 | 0.000 | 1.000 | 0.000 | 0.920 | 0.473 | - | - | - | - | - |
| RF | 0.053 | 0.976 | 0.227 | 0.913 | 0.678 | - | - | - | - | - |
| RLog | 0.000 | 1.000 | 0.000 | 0.920 | 0.475 | - | - | - | - | - |
| SVM | 0.000 | 1.000 | 0.000 | 0.920 | 0.500 | - | - | - | - | - |
| ANN | 0.000 | 1.000 | 0.000 | 0.920 | 0.490 | - | - | - | - | - |
| ANT 17 | NB | 0.045 | 0.994 | 0.213 | 0.956 | 0.457 | 0.160 | 0.993 | 0.399 | 0.957 | 0.587 |
| J48 | 0.000 | 1.000 | 0.000 | 0.956 | 0.462 | 0.000 | 1.000 | 0.000 | 0.950 | 0.508 |
| RF | 0.000 | 0.993 | 0.000 | 0.953 | 0.339 | 0.160 | 0.993 | 0.399 | 0.957 | 0.437 |
| RLog | 0.000 | 0.999 | 0.000 | 0.955 | 0.584 | 0.000 | 0.997 | 0.000 | 0.949 | 0.633 |
| SVM | 0.000 | 1.000 | 0.000 | 0.956 | 0.500 | 0.000 | 1.000 | 0.000 | 0.950 | 0.500 |
| ANN | 0.000 | 1.000 | 0.000 | 0.956 | 0.519 | 0.000 | 0.999 | 0.000 | 0.950 | 0.540 |

***Modèle d (WMC, CBO) :***

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **TPR** | **TNR** | **G-mean** | **F** | **AUC** | **TPRD** | **TNRD** | **G-meanD** | **FD** | **AUCD** |
| **ANT 13** | NB | 0.250 | 0.909 | 0.477 | 0.544 | 0.667 | 0.993 | 0.045 | 0.212 | 0.593 | 0.750 |
| J48 | 0.617 | 0.727 | 0.670 | 0.673 | 0.626 | 0.891 | 0.530 | 0.687 | 0.771 | 0.743 |
| RF | 0.533 | 0.576 | 0.554 | 0.556 | 0.585 | 0.864 | 0.591 | 0.715 | 0.776 | 0.793 |
| RLog | 0.417 | 0.833 | 0.589 | 0.617 | 0.734 | 0.966 | 0.273 | 0.513 | 0.707 | 0.797 |
| SVM | 0.033 | 0.955 | 0.178 | 0.382 | 0.494 | 1.000 | 0.000 | 0.000 | 0.564 | 0.500 |
| ANN | 0.418 | 0.784 | 0.707 | 0.595 | 0.669 | 0.92 | 0.485 | 0.703 | 0.771 | 0.787 |
| **ANT 14** | NB | 0.000 | 0.988 | 0.000 | 0.894 | 0.754 | 0.000 | 0.994 | 0.000 | 0.89 | 0.751 |
| J48 | 0.000 | 1.000 | 0.000 | 0.900 | 0.427 | 0.000 | 1.000 | 0.000 | 0.892 | 0.412 |
| RF | 0.083 | 0.928 | 0.278 | 0.873 | 0.591 | 0.231 | 0.934 | 0.464 | 0.885 | 0.669 |
| RLog | 0.000 | 0.988 | 0.000 | 0.894 | 0.756 | 0.000 | 0.994 | 0.000 | 0.890 | 0.749 |
| SVM | 0.000 | 1.000 | 0.000 | 0.900 | 0.500 | 0.000 | 1.000 | 0.000 | 0.892 | 0.500 |
| ANN | 0.000 | 0.998 | 0.000 | 0.899 | 0.606 | 0.000 | 1.000 | 0.000 | 0.892 | 0.580 |
| **ANT 15** | NB | 0.018 | 0.971 | 0.133 | 0.724 | 0.559 | 0.017 | 0.975 | 0.127 | 0.707 | 0.598 |
| J48 | 0.000 | 1.000 | 0.000 | 0.728 | 0.474 | 0.000 | 1.000 | 0.000 | 0.709 | 0.497 |
| RF | 0.273 | 0.878 | 0.489 | 0.754 | 0.570 | 0.367 | 0.887 | 0.570 | 0.773 | 0.594 |
| RLog | 0.018 | 0.992 | 0.134 | 0.733 | 0.665 | 0.017 | 0.992 | 0.129 | 0.714 | 0.683 |
| SVM | 0.000 | 1.000 | 0.000 | 0.728 | 0.500 | 0.000 | 1.000 | 0.000 | 0.709 | 0.500 |
| ANN | 0.000 | 0.998 | 0.000 | 0.727 | 0.608 | 0.007 | 0.993 | 0.105 | 0.710 | 0.653 |
| ANT 16 | NB | 0.000 | 1.000 | 0.000 | 0.920 | 0.427 | - | - | - | - | - |
| J48 | 0.000 | 0.997 | 0.000 | 0.918 | 0.511 | - | - | - | - | - |
| RF | 0.158 | 0.964 | 0.390 | 0.916 | 0.496 | - | - | - | - | - |
| RLog | 0.000 | 1.000 | 0.000 | 0.920 | 0.550 | - | - | - | - | - |
| SVM | 0.000 | 1.000 | 0.000 | 0.920 | 0.500 | - | - | - | - | - |
| ANN | 0.000 | 1.000 | 0.000 | 0.920 | 0.543 | - | - | - | - | - |
| ANT 17 | NB | 0.136 | 0.989 | 0.367 | 0.958 | 0.570 | 0.160 | 0.992 | 0.398 | 0.956 | 0.626 |
| J48 | 0.000 | 1.000 | 0.000 | 0.956 | 0.462 | 0.000 | 0.999 | 0.000 | 0.949 | 0.466 |
| RF | 0.000 | 0.975 | 0.000 | 0.944 | 0.468 | 0.160 | 0.979 | 0.396 | 0.949 | 0.569 |
| RLog | 0.000 | 0.999 | 0.000 | 0.955 | 0.707 | 0.080 | 0.999 | 0.283 | 0.956 | 0.731 |
| SVM | 0.000 | 1.000 | 0.000 | 0.956 | 0.500 | 0.000 | 1.000 | 0.000 | 0.950 | 0.500 |
| ANN | 0.000 | 0.999 | 0.000 | 0.956 | 0.602 | 0.040 | 0.999 | 0.283 | 0.953 | 0.658 |

***Modèle d (RFC, Ca) :***

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **TPR** | **TNR** | **G-mean** | **F** | **AUC** | **TPRD** | **TNRD** | **G-meanD** | **FD** | **AUCD** |
| **ANT 13** | NB | 0.517 | 0.894 | **0.680** | 0.703 | 0.798 | 0.741 | 0.818 | **0.779** | 0.773 | 0.873 |
| J48 | 0.850 | 0.727 | **0.786** | **0.785** | **0.717** | 0.884 | 0.727 | **0.802** | 0.835 | 0.769 |
| RF | 0.650 | 0.697 | **0.673** | 0.674 | 0.769 | 0.912 | 0.697 | **0.797** | 0.843 | 0.876 |
| RLog | 0.667 | 0.818 | **0.739** | 0.744 | 0.817 | 0.912 | 0.727 | **0.814** | **0.853** | **0.882** |
| SVM | 0.400 | 0.924 | **0.608** | 0.649 | 0.662 | 1.000 | 0.000 | 0.000 | 0.564 | 0.500 |
| ANN | 0.573 | 0.809 | **0.770** | 0.691 | 0.762 | 0.904 | 0.656 | **0.781** | 0.824 | 0.872 |
| **ANT 14** | NB | 0.167 | 0.994 | 0.407 | 0.920 | 0.767 | 0.077 | 0.988 | 0.276 | 0.898 | 0.759 |
| J48 | 0.000 | 0.976 | 0.000 | 0.889 | 0.408 | 0.000 | 0.994 | 0.000 | 0.890 | 0.446 |
| RF | 0.333 | 0.958 | 0.565 | 0.914 | 0.726 | 0.462 | 0.952 | **0.663** | **0.918** | **0.830** |
| RLog | 0.000 | 0.994 | 0.000 | 0.897 | 0.791 | 0.000 | 0.994 | 0.000 | 0.890 | 0.775 |
| SVM | 0.000 | 1.000 | 0.000 | 0.900 | 0.500 | 0.000 | 1.000 | 0.000 | 0.892 | 0.500 |
| ANN | 0.000 | 0.997 | 0.000 | 0.898 | 0.645 | 0.000 | 0.997 | 0.000 | 0.891 | 0.609 |
| **ANT 15** | NB | 0.182 | 0.95 | 0.416 | 0.77 | 0.699 | 0.217 | 0.945 | 0.453 | 0.766 | 0.722 |
| J48 | 0.055 | 0.958 | 0.229 | 0.732 | 0.492 | 0.267 | 0.924 | 0.496 | 0.769 | 0.59 |
| RF | 0.400 | 0.887 | 0.596 | 0.791 | 0.695 | 0.467 | 0.887 | **0.643** | **0.799** | **0.736** |
| RLog | 0.036 | 0.966 | 0.187 | 0.729 | 0.724 | 0.133 | 0.962 | 0.358 | 0.747 | 0.74 |
| SVM | 0.000 | 1.000 | 0.000 | 0.728 | 0.500 | 0.000 | 1.000 | 0.000 | 0.709 | 0.500 |
| ANN | 0.016 | 0.967 | 0.133 | 0.721 | 0.707 | 0.146 | 0.959 | 0.454 | 0.75 | 0.688 |
| ANT 16 | NB | 0.000 | 0.991 | 0.000 | 0.916 | 0.587 | - | - | - | - | - |
| J48 | 0.000 | 1.000 | 0.000 | 0.920 | 0.473 | - | - | - | - | - |
| RF | 0.053 | 0.952 | 0.224 | 0.901 | 0.447 | - | - | - | - | - |
| RLog | 0.000 | 0.997 | 0.000 | 0.918 | 0.618 | - | - | - | - | - |
| SVM | 0.000 | 1.000 | 0.000 | 0.920 | 0.500 | - | - | - | - | - |
| ANN | 0.000 | 0.999 | 0.000 | 0.919 | 0.577 | - | - | - | - | - |
| ANT 17 | NB | 0.136 | 0.988 | 0.367 | 0.957 | 0.671 | 0.200 | 0.989 | 0.445 | 0.957 | 0.671 |
| J48 | 0.000 | 1.000 | 0.000 | 0.956 | 0.462 | 0.000 | 0.997 | 0.000 | 0.949 | 0.511 |
| RF | 0.136 | 0.976 | 0.365 | 0.951 | 0.646 | 0.200 | 0.975 | 0.442 | 0.948 | 0.731 |
| RLog | 0.045 | 0.999 | 0.213 | 0.958 | 0.785 | 0.080 | 0.999 | 0.283 | 0.956 | 0.794 |
| SVM | 0.000 | 1.000 | 0.000 | 0.956 | 0.500 | 0.000 | 1.000 | 0.000 | 0.95 | 0.500 |
| ANN | 0.000 | 0.999 | 0.000 | 0.956 | 0.680 | 0.041 | 0.999 | 0.346 | 0.953 | 0.693 |

***Modèle d (LOC, RFC) :***

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **TPR** | **TNR** | **G-mean** | **F** | **AUC** | **TPRD** | **TNRD** | **G-meanD** | **FD** | **AUCD** |
| **ANT 13** | NB | 0.583 | 0.909 | **0.728** | 0.746 | 0.822 | 0.81 | 0.818 | **0.814** | 0.817 | 0.882 |
| J48 | 0.700 | 0.788 | **0.743** | 0.745 | 0.750 | 0.898 | 0.576 | **0.719** | 0.791 | 0.817 |
| RF | 0.667 | 0.621 | **0.644** | 0.643 | 0.737 | 0.912 | 0.636 | **0.762** | 0.822 | 0.870 |
| RLog | 0.683 | 0.818 | **0.748** | 0.753 | 0.837 | 0.85 | 0.773 | **0.811** | 0.829 | 0.892 |
| SVM | 0.567 | 0.909 | **0.718** | 0.737 | 0.738 | 0.837 | 0.803 | **0.820** | **0.830** | **0.820** |
| ANN | 0.711 | 0.821 | **0.775** | **0.768** | **0.822** | 0.865 | 0.714 | **0.798** | 0.819 | 0.885 |
| **ANT 14** | NB | 0.083 | 0.952 | 0.282 | 0.886 | 0.742 | 0.077 | 0.952 | 0.271 | 0.879 | 0.739 |
| J48 | 0.000 | 1.000 | 0.000 | 0.900 | 0.427 | 0.000 | 1.000 | 0.000 | 0.892 | 0.412 |
| RF | 0.167 | 0.946 | 0.397 | 0.891 | 0.578 | 0.308 | 0.928 | 0.534 | 0.888 | 0.650 |
| RLog | 0.000 | 1.000 | 0.000 | 0.900 | 0.756 | 0.000 | 1.000 | 0.000 | 0.892 | 0.756 |
| SVM | 0.000 | 1.000 | 0.000 | 0.900 | 0.500 | 0.000 | 1.000 | 0.000 | 0.892 | 0.500 |
| ANN | 0.000 | 1.000 | 0.000 | 0.900 | 0.712 | 0.000 | 1.000 | 0.000 | 0.892 | 0.714 |
| **ANT 15** | NB | 0.091 | 0.954 | 0.294 | 0.743 | 0.708 | 0.100 | 0.954 | 0.309 | 0.730 | 0.733 |
| J48 | 0.018 | 0.983 | 0.134 | 0.729 | 0.485 | 0.267 | 0.903 | 0.491 | 0.756 | 0.582 |
| RF | 0.382 | 0.849 | 0.569 | 0.763 | 0.712 | 0.500 | 0.828 | **0.643** | **0.769** | **0.739** |
| RLog | 0.055 | 0.966 | 0.23 | 0.736 | 0.727 | 0.067 | 0.958 | 0.253 | 0.719 | 0.742 |
| SVM | 0.0 | 1.0 | 0.0 | 0.728 | 0.5 | 0.000 | 1.000 | 0.000 | 0.709 | 0.500 |
| ANN | 0.015 | 0.985 | 0.13 | 0.728 | 0.718 | 0.038 | 0.971 | 0.234 | 0.714 | 0.671 |
| ANT 16 | NB | 0.000 | 0.979 | 0.000 | 0.910 | 0.585 | - | - | - | - | - |
| J48 | 0.000 | 1.000 | 0.000 | 0.920 | 0.473 | - | - | - | - | - |
| RF | 0.000 | 0.964 | 0.000 | 0.902 | 0.450 | - | - | - | - | - |
| RLog | 0.000 | 1.000 | 0.000 | 0.920 | 0.607 | - | - | - | - | - |
| SVM | 0.000 | 1.000 | 0.000 | 0.920 | 0.500 | - | - | - | - | - |
| ANN | 0.000 | 1.000 | 0.000 | 0.920 | 0.569 | - | - | - | - | - |
| ANT 17 | NB | 0.182 | 0.981 | 0.422 | 0.955 | 0.796 | 0.240 | 0.979 | 0.485 | 0.953 | 0.788 |
| J48 | 0.000 | 1.000 | 0.000 | 0.956 | 0.462 | 0.000 | 1.000 | 0.000 | 0.950 | 0.580 |
| RF | 0.091 | 0.972 | 0.297 | 0.946 | 0.591 | 0.240 | 0.971 | 0.483 | 0.948 | 0.648 |
| RLog | 0.000 | 0.999 | 0.000 | 0.955 | 0.805 | 0.000 | 0.996 | 0.000 | 0.948 | 0.818 |
| SVM | 0.000 | 1.000 | 0.000 | 0.956 | 0.500 | 0.000 | 1.000 | 0.000 | 0.950 | 0.500 |
| ANN | 0.000 | 1.000 | 0.000 | 0.956 | 0.731 | 0.000 | 1.000 | 0.000 | 0.950 | 0.732 |

***Modèle d D(d(Loc,Ce),d(Rfc,Ca)):***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **TPR** | **TNR** | **G-mean** | **AUC** | **TPRD** | **TNRD** | **G-meanD** | **AUCD** |
| **ANT 13** | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 14** | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 15** | NB | 0.073 | 0.962 | 0.265 | 0.700 | 0.083 | 0.962 | 0.283 | 0.730 |
| J48 | 0.018 | 0.983 | 0.134 | 0.485 | 0.267 | 0.899 | 0.490 | 0.580 |
| RF | 0.400 | 0.819 | 0.572 | 0.687 | 0.517 | 0.836 | **0.657** | **0.732** |
| RLog | 0.036 | 0.975 | 0.188 | 0.718 | 0.067 | 0.975 | 0.255 | 0.739 |
| SVM | 0.000 | 1.000 | 0.000 | 0.500 | 0.000 | 1.000 | 0.000 | 0.500 |
| ANN | 0.040 | 0.968 | 0.198 | 0.710 | 0.085 | 0.952 | 0.296 | 0.731 |
| ANT 16 | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| ANT 17 | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |

***Modèle D(d(Loc,Wmc),d(Rfc,Ca)):***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **TPR** | **TNR** | **G-mean** | **AUC** | **TPRD** | **TNRD** | **G-meanD** | **AUCD** |
| **ANT 13** | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 14** | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 15** | NB | 0.073 | 0.962 | 0.265 | 0.698 | 0.083 | 0.962 | 0.283 | 0.733 |
| J48 | 0.018 | 0.983 | 0.134 | 0.485 | 0.267 | 0.899 | 0.490 | 0.580 |
| RF | 0.400 | 0.824 | 0.574 | 0.690 | 0.500 | 0.832 | **0.645** | **0.731** |
| RLog | 0.036 | 0.975 | 0.188 | 0.718 | 0.067 | 0.975 | 0.255 | 0.739 |
| SVM | 0.000 | 1.000 | 0.000 | 0.500 | 0.000 | 1.000 | 0.000 | 0.500 |
| ANN | 0.040 | 0.968 | 0.198 | 0.710 | 0.085 | 0.952 | 0.296 | 0.731 |
| ANT 16 | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| ANT 17 | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |

***Modèle D(d(Loc,Rfc),d(Loc,Ca),d(Rfc,Ca)):***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **TPR** | **TNR** | **G-mean** | **AUC** | **TPRD** | **TNRD** | **G-meanD** | **AUCD** |
| **ANT 13** | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 14** | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 15** | NB | 0.091 | 0.954 | 0.294 | 0.71 | 0.1 | 0.954 | 0.309 | 0.732 |
| J48 | 0.018 | 0.983 | 0.134 | 0.485 | 0.267 | 0.899 | 0.490 | 0.580 |
| RF | 0.382 | 0.849 | 0.569 | 0.714 | 0.500 | 0.832 | **0.645** | **0.738** |
| RLog | 0.055 | 0.966 | 0.230 | 0.727 | 0.067 | 0.958 | 0.253 | 0.742 |
| SVM | 0.000 | 1.000 | 0.000 | 0.500 | 0.000 | 1.000 | 0.000 | 0.500 |
| ANN | 0.040 | 0.968 | 0.198 | 0.710 | 0.085 | 0.952 | 0.296 | 0.731 |
| ANT 16 | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| ANT 17 | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |

***Modèle (Loc,d(Rfc,Ca)):***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **TPR** | **TNR** | **G-mean** | **AUC** | **TPRD** | **TNRD** | **G-meanD** | **AUCD** |
| **ANT 13** | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 14** | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 15** | NB | 0.036 | 0.962 | 0.187 | 0.697 | 0.067 | 0.958 | 0.253 | 0.731 |
| J48 | 0.018 | 0.983 | 0.134 | 0.485 | 0.267 | 0.903 | 0.491 | 0.582 |
| RF | 0.382 | 0.853 | 0.571 | 0.706 | 0.483 | 0.832 | **0.634** | **0.737** |
| RLog | 0.036 | 0.975 | 0.188 | 0.719 | 0.067 | 0.975 | 0.255 | 0.741 |
| SVM | 0.000 | 1.000 | 0.000 | 0.500 | 0.000 | 1.000 | 0.000 | 0.500 |
| ANN | 0.040 | 0.968 | 0.198 | 0.710 | 0.085 | 0.952 | 0.296 | 0.731 |
| ANT 16 | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| ANT 17 | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |

***Modèle (Rfc,d(Loc,Ca)):***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **TPR** | **TNR** | **G-mean** | **AUC** | **TPRD** | **TNRD** | **G-meanD** | **AUCD** |
| **ANT 13** | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 14** | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 15** | NB | 0.036 | 0.962 | 0.187 | 0.672 | 0.067 | 0.962 | 0.253 | 0.698 |
| J48 | 0.018 | 0.983 | 0.134 | 0.485 | 0.267 | 0.899 | 0.490 | 0.580 |
| RF | 0.345 | 0.849 | 0.541 | 0.676 | 0.433 | 0.857 | **0.609** | **0.754** |
| RLog | 0.036 | 0.975 | 0.188 | 0.700 | 0.067 | 0.979 | 0.255 | 0.717 |
| SVM | 0.000 | 1.000 | 0.000 | 0.500 | 0.000 | 1.000 | 0.000 | 0.500 |
| ANN | 0.040 | 0.968 | 0.198 | 0.710 | 0.085 | 0.952 | 0.296 | 0.731 |
| ANT 16 | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| ANT 17 | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |

Prédiction du Niveau de Sévérité

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***Système*** | ***#Classes*** | ***#Fautives*** | ***%Fautives*** | ***#ClassesD*** | ***#FautivesD*** | ***%FautivesD*** |
| Ant13 | 126 | 60 | 47.62% | 279 | 147 | 52.69% |
| Ant14 | 178 | 38 | 21.35% | 185 | 45 | 24.32% |
| Ant15 | 293 | 100 | 34.13% | 321 | 128 | 39.87% |
| Ant16 | 352 | 45 | 12.78% | 358 | 51 | 14.24% |
| Ant17 | 745 | 70 | 9.40% | 765 | 90 | 11.76% |

***Modèle d (LOC, Ce) :***

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **TPR** | **TNR** | **G-mean** | **F** | **AUC** | **TPRD** | **TNRD** | **G-meanD** | **FD** | **AUCD** |
| **ANT 13** | NB | 0.746 | 0.730 | **0.718** | 0.737 | 0.789 | 0.798 | 0.859 | **0.825** | **0.805** | **0.86** |
| J48 | 0.73 | 0.726 | **0.727** | 0.729 | 0.729 | 0.779 | 0.726 | **0.749** | 0.781 | 0.797 |
| RF | 0.667 | 0.667 | 0.667 | 0.667 | 0.769 | 0.836 | 0.734 | **0.774** | 0.831 | 0.875 |
| RLog | 0.762 | 0.756 | **0.757** | 0.761 | 0.835 | 0.822 | 0.795 | **0.807** | 0.824 | 0.892 |
| SVM | 0.675 | 0.647 | 0.592 | 0.642 | 0.661 | 0.69 | 0.31 | 0.462 | 0.564 | 0.5 |
| ANN | 0.743 | 0.734 | **0.766** | **0.740** | **0.807** | 0.829 | 0.789 | **0.812** | **0.831** | **0.882** |
| **ANT 14** | NB | 0.775 | 0.371 | 0.294 | 0.716 | 0.723 | 0.768 | 0.419 | 0.367 | 0.709 | 0.746 |
| J48 | 0.787 | 0.213 | 0.316 | 0.693 | 0.471 | 0.751 | 0.273 | 0.236 | 0.66 | 0.575 |
| RF | 0.657 | 0.433 | 0.398 | 0.664 | 0.654 | 0.714 | 0.603 | **0.597** | **0.719** | **0.741** |
| RLog | 0.792 | 0.333 | 0.334 | 0.738 | 0.737 | 0.773 | 0.403 | 0.382 | 0.715 | 0.759 |
| SVM | 0.787 | 0.213 | 0.316 | 0.693 | 0.5 | 0.757 | 0.243 | 0.316 | 0.652 | 0.5 |
| ANN | 0.787 | 0.306 | 0.343 | 0.722 | 0.734 | 0.773 | 0.403 | 0.382 | 0.714 | 0.758 |
| **ANT 15** | NB | 0.652 | 0.398 | 0.0 | 0.549 | 0.713 | 0.607 | 0.474 | 0.357 | 0.5 | 0.766 |
| J48 | 0.655 | 0.427 | 0.0 | 0.568 | 0.635 | 0.614 | 0.671 | 0.491 | 0.598 | 0.706 |
| RF | 0.577 | 0.6 | 0.381 | 0.576 | 0.668 | 0.648 | 0.74 | **0.670** | **0.652** | **0.744** |
| RLog | 0.652 | 0.398 | 0.0 | 0.552 | 0.756 | 0.626 | 0.517 | 0.488 | 0.533 | 0.78 |
| SVM | 0.659 | 0.341 | 0.0 | 0.523 | 0.5 | 0.601 | 0.41 | 0.121 | 0.459 | 0.505 |
| ANN | 0.678 | 0.547 | 0.0 | 0.613 | 0.759 | 0.632 | 0.656 | **0.673** | **0.57** | **0.767** |
| ANT 16 | NB | 0.858 | 0.223 | 0.294 | 0.817 | 0.678 | 0.844 | 0.224 | 0.28 | 0.797 | 0.703 |
| J48 | 0.872 | 0.128 | 0.316 | 0.813 | 0.468 | 0.858 | 0.142 | 0.316 | 0.792 | 0.486 |
| RF | 0.787 | 0.256 | 0.342 | 0.782 | 0.599 | 0.793 | 0.420 | 0.435 | 0.795 | 0.684 |
| RLog | 0.872 | 0.147 | 0.249 | 0.818 | 0.704 | 0.846 | 0.158 | 0.235 | 0.791 | 0.723 |
| SVM | 0.872 | 0.128 | 0.316 | 0.813 | 0.5 | 0.858 | 0.142 | 0.316 | 0.792 | 0.5 |
| ANN | 0.871 | 0.128 | 0.316 | 0.812 | 0.656 | 0.857 | 0.148 | 0.316 | 0.793 | 0.691 |
| ANT 17 | NB | 0.894 | 0.273 | 0.368 | 0.872 | 0.792 | 0.88 | 0.35 | 0.399 | 0.855 | 0.782 |
| J48 | 0.906 | 0.12 | 0.254 | 0.866 | 0.591 | 0.894 | 0.264 | 0.341 | 0.861 | 0.75 |
| RF | 0.835 | 0.296 | 0.331 | 0.839 | 0.682 | 0.854 | 0.543 | **0.620** | 0.859 | 0.775 |
| RLog | 0.909 | 0.21 | 0.334 | 0.877 | 0.818 | 0.893 | 0.303 | 0.375 | 0.86 | 0.833 |
| SVM | 0.906 | 0.094 | 0.316 | 0.861 | 0.5 | 0.882 | 0.118 | 0.316 | 0.827 | 0.5 |
| ANN | 0.907 | 0.125 | 0.316 | 0.867 | 0.805 | 0.891 | 0.292 | 0.369 | 0.857 | 0.83 |

***Modèle d (LOC, FANIN) :***

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **TPR** | **TNR** | **G-mean** | **F** | **AUC** | **TPRD** | **TNRD** | **G-meanD** | **FD** | **AUCD** |
| **ANT 13** | NB | 0.746 | 0.728 | 0.713 | 0.736 | 0.795 | 0.798 | 0.859 | 0.825 | 0.805 | 0.859 |
| J48 | 0.73 | 0.726 | 0.727 | 0.729 | 0.729 | 0.779 | 0.726 | 0.749 | 0.781 | 0.797 |
| RF | 0.706 | 0.706 | 0.706 | 0.706 | 0.776 | 0.854 | 0.768 | 0.803 | 0.851 | 0.886 |
| RLog | 0.762 | 0.756 | 0.757 | 0.761 | 0.834 | 0.822 | 0.795 | 0.807 | 0.824 | 0.892 |
| SVM | 0.675 | 0.647 | 0.592 | 0.642 | 0.661 | 0.69 | 0.31 | 0.0 | 0.564 | 0.5 |
| ANN | 0.745 | 0.736 | **0.766** | 0.742 | 0.808 | 0.828 | 0.789 | 0.812 | 0.83 | 0.882 |
| **ANT 14** | NB | 0.775 | 0.371 | 0.294 | 0.716 | 0.726 | 0.773 | 0.419 | 0.382 | 0.716 | 0.745 |
| J48 | 0.787 | 0.213 | 0.316 | 0.693 | 0.471 | 0.751 | 0.273 | 0.236 | 0.66 | 0.575 |
| RF | 0.663 | 0.414 | 0.399 | 0.666 | 0.659 | 0.724 | 0.589 | **0.578** | 0.726 | 0.728 |
| RLog | 0.792 | 0.333 | 0.334 | 0.738 | 0.737 | 0.773 | 0.403 | 0.382 | 0.715 | 0.759 |
| SVM | 0.787 | 0.213 | 0.316 | 0.693 | 0.5 | 0.757 | 0.243 | 0.316 | 0.652 | 0.5 |
| ANN | 0.787 | 0.301 | 0.343 | 0.722 | 0.734 | 0.773 | 0.403 | 0.382 | 0.714 | 0.758 |
| **ANT 15** | NB | 0.652 | 0.398 | 0.0 | 0.549 | 0.713 | 0.607 | 0.474 | 0.357 | 0.5 | 0.768 |
| J48 | 0.659 | 0.457 | 0.0 | 0.577 | 0.66 | 0.611 | 0.694 | 0.529 | 0.603 | 0.708 |
| RF | 0.601 | 0.629 | 0.388 | 0.599 | 0.679 | 0.657 | 0.754 | **0.683** | **0.662** | **0.754** |
| RLog | 0.652 | 0.398 | 0.0 | 0.552 | 0.756 | 0.626 | 0.517 | 0.488 | 0.533 | 0.779 |
| SVM | 0.659 | 0.341 | 0.0 | 0.523 | 0.5 | 0.601 | 0.41 | 0.121 | 0.459 | 0.505 |
| ANN | 0.677 | 0.55 | 0.0 | 0.614 | 0.759 | 0.633 | 0.659 | **0.702** | **0.571** | **0.767** |
| ANT 16 | NB | 0.858 | 0.223 | 0.294 | 0.817 | 0.675 | 0.844 | 0.224 | 0.28 | 0.797 | 0.704 |
| J48 | 0.872 | 0.128 | 0.316 | 0.813 | 0.468 | 0.858 | 0.142 | 0.316 | 0.792 | 0.486 |
| RF | 0.784 | 0.294 | 0.342 | 0.782 | 0.603 | 0.788 | 0.469 | 0.434 | 0.793 | 0.69 |
| RLog | 0.869 | 0.147 | 0.249 | 0.816 | 0.704 | 0.846 | 0.158 | 0.235 | 0.791 | 0.724 |
| SVM | 0.872 | 0.128 | 0.316 | 0.813 | 0.5 | 0.858 | 0.142 | 0.316 | 0.792 | 0.5 |
| ANN | 0.871 | 0.128 | 0.316 | 0.812 | 0.66 | 0.857 | 0.148 | 0.316 | 0.793 | 0.7 |
| ANT 17 | NB | 0.893 | 0.273 | 0.367 | 0.871 | 0.786 | 0.878 | 0.35 | 0.399 | 0.854 | 0.783 |
| J48 | 0.906 | 0.12 | 0.254 | 0.866 | 0.585 | 0.894 | 0.264 | 0.341 | 0.861 | 0.749 |
| RF | 0.846 | 0.322 | 0.354 | 0.847 | 0.689 | 0.863 | 0.582 | **0.630** | 0.867 | 0.771 |
| RLog | 0.909 | 0.21 | 0.334 | 0.877 | 0.817 | 0.892 | 0.302 | 0.375 | 0.859 | 0.833 |
| SVM | 0.906 | 0.094 | 0.316 | 0.861 | 0.5 | 0.882 | 0.118 | 0.316 | 0.827 | 0.5 |
| ANN | 0.907 | 0.125 | 0.316 | 0.867 | 0.811 | 0.891 | 0.29 | 0.368 | 0.857 | 0.829 |

***Modèle d (Qi, FANIN) :***

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **TPR** | **TNR** | **G-mean** | **F** | **AUC** | **TPRD** | **TNRD** | **G-meanD** | **FD** | **AUCD** |
| **ANT 13** | NB | 0.452 | 0.487 | 0.297 | 0.37 | 0.493 | 0.681 | 0.322 | 0.172 | 0.575 | 0.512 |
| J48 | 0.603 | 0.617 | 0.594 | 0.596 | 0.584 | 0.77 | 0.579 | 0.626 | 0.75 | 0.657 |
| RF | 0.675 | 0.666 | 0.665 | 0.672 | 0.633 | 0.812 | 0.74 | **0.771** | **0.811** | **0.846** |
| RLog | 0.508 | 0.462 | 0.484 | 0.353 | 0.412 | 0.69 | 0.31 | 0.462 | 0.564 | 0.514 |
| SVM | 0.524 | 0.476 | 0.499 | 0.36 | 0.5 | 0.69 | 0.31 | 0.462 | 0.564 | 0.5 |
| ANN | 0.515 | 0.474 | 0.286 | 0.4 | 0.466 | 0.69 | 0.31 | 0.462 | 0.564 | 0.504 |
| **ANT 14** | NB | 0.787 | 0.253 | 0.295 | 0.711 | 0.66 | 0.762 | 0.307 | 0.333 | 0.688 | 0.689 |
| J48 | 0.758 | 0.249 | 0.246 | 0.689 | 0.521 | 0.789 | 0.705 | 0.492 | 0.769 | 0.699 |
| RF | 0.742 | 0.506 | 0.363 | 0.721 | 0.662 | 0.773 | 0.66 | 0.505 | 0.765 | 0.708 |
| RLog | 0.775 | 0.212 | 0.315 | 0.687 | 0.755 | 0.762 | 0.291 | 0.31 | 0.681 | 0.747 |
| SVM | 0.787 | 0.213 | 0.316 | 0.693 | 0.5 | 0.751 | 0.242 | 0.316 | 0.649 | 0.497 |
| ANN | 0.784 | 0.223 | 0.248 | 0.696 | 0.613 | 0.749 | 0.277 | 0.331 | 0.667 | 0.72 |
| **ANT 15** | NB | 0.655 | 0.387 | 0.0 | 0.547 | 0.508 | 0.579 | 0.428 | 0.236 | 0.462 | 0.557 |
| J48 | 0.659 | 0.341 | 0.0 | 0.523 | 0.473 | 0.604 | 0.411 | 0.121 | 0.465 | 0.506 |
| RF | 0.631 | 0.553 | 0.39 | 0.599 | 0.606 | 0.632 | 0.618 | **0.565** | **0.608** | **0.68** |
| RLog | 0.655 | 0.341 | 0.0 | 0.522 | 0.573 | 0.598 | 0.398 | 0.0 | 0.45 | 0.619 |
| SVM | 0.659 | 0.341 | 0.0 | 0.523 | 0.5 | 0.601 | 0.399 | 0.0 | 0.452 | 0.5 |
| ANN | 0.657 | 0.341 | 0.0 | 0.522 | 0.514 | 0.599 | 0.401 | 0.209 | 0.454 | 0.528 |
| ANT 16 | NB | 0.861 | 0.127 | 0.315 | 0.807 | 0.463 | 0.849 | 0.158 | 0.315 | 0.789 | 0.511 |
| J48 | 0.872 | 0.128 | 0.316 | 0.813 | 0.468 | 0.858 | 0.142 | 0.316 | 0.792 | 0.486 |
| RF | 0.827 | 0.163 | 0.312 | 0.792 | 0.489 | 0.83 | 0.273 | 0.365 | 0.801 | 0.575 |
| RLog | 0.866 | 0.127 | 0.316 | 0.81 | 0.543 | 0.855 | 0.142 | 0.316 | 0.79 | 0.553 |
| SVM | 0.872 | 0.128 | 0.316 | 0.813 | 0.5 | 0.858 | 0.142 | 0.316 | 0.792 | 0.5 |
| ANN | 0.871 | 0.128 | 0.316 | 0.812 | 0.49 | 0.856 | 0.142 | 0.316 | 0.791 | 0.514 |
| ANT 17 | NB | 0.901 | 0.094 | 0.316 | 0.859 | 0.45 | 0.881 | 0.157 | 0.355 | 0.834 | 0.496 |
| J48 | 0.906 | 0.094 | 0.316 | 0.861 | 0.496 | 0.882 | 0.118 | 0.316 | 0.827 | 0.484 |
| RF | 0.89 | 0.106 | 0.213 | 0.855 | 0.519 | 0.873 | 0.233 | 0.372 | 0.845 | 0.654 |
| RLog | 0.905 | 0.094 | 0.316 | 0.861 | 0.512 | 0.88 | 0.118 | 0.316 | 0.826 | 0.529 |
| SVM | 0.906 | 0.094 | 0.316 | 0.861 | 0.5 | 0.882 | 0.118 | 0.316 | 0.827 | 0.5 |
| ANN | 0.906 | 0.094 | 0.316 | 0.861 | 0.502 | 0.882 | 0.118 | 0.316 | 0.827 | 0.534 |

***Modèle d (WMC, CBO) :***

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **TPR** | **TNR** | **G-mean** | **F** | **AUC** | **TPRD** | **TNRD** | **G-meanD** | **FD** | **AUCD** |
| **ANT 13** | NB | 0.563 | 0.532 | 0.436 | 0.508 | 0.627 | 0.7 | 0.339 | 0.212 | 0.593 | 0.766 |
| J48 | 0.69 | 0.685 | 0.686 | 0.689 | 0.666 | 0.779 | 0.634 | 0.68 | 0.769 | 0.708 |
| RF | 0.595 | 0.593 | 0.593 | 0.595 | 0.634 | 0.812 | 0.732 | 0.765 | 0.811 | 0.823 |
| RLog | 0.651 | 0.633 | 0.612 | 0.637 | 0.744 | 0.756 | 0.515 | 0.55 | 0.72 | 0.796 |
| SVM | 0.532 | 0.488 | 0.22 | 0.402 | 0.51 | 0.69 | 0.31 | 0. 462 | 0.564 | 0.5 |
| ANN | 0.624 | 0.601 | **0.714** | 0.6 | 0.677 | 0.775 | 0.607 | 0.705 | 0.76 | 0.773 |
| **ANT 14** | NB | 0.775 | 0.271 | 0.294 | 0.706 | 0.714 | 0.751 | 0.336 | 0.309 | 0.678 | 0.761 |
| J48 | 0.787 | 0.233 | 0.249 | 0.702 | 0.493 | 0.73 | 0.379 | 0.329 | 0.674 | 0.59 |
| RF | 0.73 | 0.467 | 0.361 | 0.717 | 0.669 | 0.724 | 0.605 | **0.547** | **0.727** | **0.725** |
| RLog | 0.764 | 0.23 | 0.314 | 0.683 | 0.754 | 0.751 | 0.321 | 0.309 | 0.677 | 0.772 |
| SVM | 0.787 | 0.213 | 0.316 | 0.693 | 0.5 | 0.757 | 0.243 | 0.316 | 0.652 | 0.5 |
| ANN | 0.774 | 0.245 | 0.284 | 0.696 | 0.743 | 0.743 | 0.353 | 0.379 | 0.677 | 0.761 |
| **ANT 15** | NB | 0.648 | 0.392 | 0.0 | 0.54 | 0.66 | 0.595 | 0.471 | 0.266 | 0.483 | 0.702 |
| J48 | 0.659 | 0.341 | 0.0 | 0.523 | 0.473 | 0.617 | 0.686 | 0.662 | 0.577 | 0.686 |
| RF | 0.604 | 0.571 | 0.436 | 0.592 | 0.592 | 0.648 | 0.692 | **0.667** | **0.642** | **0.693** |
| RLog | 0.645 | 0.373 | 0.0 | 0.527 | 0.718 | 0.626 | 0.494 | 0.461 | 0.527 | 0.739 |
| SVM | 0.659 | 0.341 | 0.0 | 0.523 | 0.498 | 0.601 | 0.399 | 0.0 | 0.452 | 0.5 |
| ANN | 0.652 | 0.428 | 0.219 | 0.555 | 0.714 | 0.625 | 0.585 | 0.589 | 0.549 | 0.732 |
| ANT 16 | NB | 0.861 | 0.146 | 0.315 | 0.808 | 0.584 | 0.844 | 0.158 | 0.315 | 0.786 | 0.644 |
| J48 | 0.872 | 0.128 | 0.316 | 0.813 | 0.468 | 0.852 | 0.142 | 0.316 | 0.789 | 0.492 |
| RF | 0.81 | 0.258 | 0.348 | 0.798 | 0.601 | 0.832 | 0.456 | **0.501** | **0.827** | **0.664** |
| RLog | 0.866 | 0.147 | 0.316 | 0.811 | 0.611 | 0.849 | 0.158 | 0.315 | 0.789 | 0.678 |
| SVM | 0.872 | 0.128 | 0.316 | 0.813 | 0.5 | 0.858 | 0.142 | 0.316 | 0.792 | 0.5 |
| ANN | 0.871 | 0.128 | 0.316 | 0.812 | 0.577 | 0.856 | 0.142 | 0.316 | 0.791 | 0.622 |
| ANT 17 | NB | 0.899 | 0.094 | 0.316 | 0.858 | 0.651 | 0.878 | 0.157 | 0.355 | 0.832 | 0.756 |
| J48 | 0.906 | 0.094 | 0.316 | 0.861 | 0.496 | 0.884 | 0.127 | 0.198 | 0.83 | 0.492 |
| RF | 0.863 | 0.285 | 0.374 | 0.856 | 0.62 | 0.877 | 0.506 | 0.522 | 0.873 | 0.747 |
| RLog | 0.905 | 0.107 | 0.316 | 0.861 | 0.742 | 0.881 | 0.147 | 0.299 | 0.831 | 0.775 |
| SVM | 0.906 | 0.094 | 0.316 | 0.861 | 0.5 | 0.882 | 0.118 | 0.316 | 0.827 | 0.5 |
| ANN | 0.905 | 0.094 | 0.316 | 0.861 | 0.64 | 0.882 | 0.136 | 0.324 | 0.831 | 0.748 |

***Modèle d (RFC, Ca) :***

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **TPR** | **TNR** | **G-mean** | **F** | **AUC** | **TPRD** | **TNRD** | **G-meanD** | **FD** | **AUCD** |
| **ANT 13** | NB | 0.714 | 0.696 | 0.680 | 0.703 | 0.803 | 0.789 | 0.813 | **0.800** | **0.795** | **0.878** |
| J48 | 0.77 | 0.774 | **0.771** | **0.77o** | **0.710** | 0.831 | 0.774 | **0.799** | **0.831** | **0.796** |
| RF | 0.69 | 0.688 | 0.689 | 0.69 | 0.799 | 0.85 | 0.749 | **0.788** | **0.845** | **0.872** |
| RLog | 0.73 | 0.723 | **0.722** | **0.728** | **0.818** | 0.854 | 0.784 | **0.814** | **0.853** | **0.883** |
| SVM | 0.683 | 0.655 | 0.605 | 0.652 | 0.669 | 0.69 | 0.31 | 0. 462 | 0.564 | 0.5 |
| ANN | 0.741 | 0.736 | **0.757** | **0.74** | **0.803** | 0.84 | 0.772 | **0.807** | **0.839** | **0.876** |
| **ANT 14** | NB | 0.792 | 0.471 | 0.368 | 0.755 | 0.741 | 0.757 | 0.463 | 0.38 | 0.708 | 0.752 |
| J48 | 0.815 | 0.398 | 0.441 | 0.765 | 0.544 | 0.762 | 0.42 | 0.449 | 0.721 | 0.583 |
| RF | 0.713 | 0.441 | 0.504 | 0.709 | 0.603 | 0.724 | 0.557 | **0.600** | **0.723** | **0.694** |
| RLog | 0.803 | 0.395 | 0.313 | 0.745 | 0.75 | 0.768 | 0.465 | 0.381 | 0.715 | 0.771 |
| SVM | 0.787 | 0.213 | 0.316 | 0.693 | 0.5 | 0.757 | 0.243 | 0.316 | 0.652 | 0.5 |
| ANN | 0.796 | 0.315 | 0.264 | 0.72 | 0.701 | 0.778 | 0.384 | 0.384 | 0.707 | 0.71 |
| **ANT 15** | NB | 0.672 | 0.544 | 0.205 | 0.611 | 0.754 | 0.623 | 0.614 | 0.486 | 0.552 | 0.782 |
| J48 | 0.638 | 0.623 | 0.238 | 0.61 | 0.683 | 0.704 | 0.734 | 0.667 | 0.692 | 0.731 |
| RF | 0.645 | 0.686 | 0.431 | 0.638 | 0.721 | 0.713 | 0.779 | 0.718 | 0.709 | 0.787 |
| RLog | 0.689 | 0.54 | 0.0 | 0.619 | 0.778 | 0.654 | 0.633 | 0.623 | 0.578 | 0.794 |
| SVM | 0.662 | 0.348 | 0.0 | 0.531 | 0.505 | 0.62 | 0.442 | 0.341 | 0.5 | 0.531 |
| ANN | 0.7 | 0.607 | 0.0 | 0.638 | 0.77 | 0.677 | 0.692 | **0.739** | **0.608** | **0.788** |
| ANT 16 | NB | 0.855 | 0.241 | 0.325 | 0.818 | 0.626 | 0.844 | 0.274 | 0.332 | 0.804 | 0.71 |
| J48 | 0.872 | 0.128 | 0.316 | 0.813 | 0.468 | 0.858 | 0.142 | 0.316 | 0.792 | 0.486 |
| RF | 0.767 | 0.217 | 0.244 | 0.767 | 0.564 | 0.804 | 0.387 | 0.365 | 0.8 | 0.657 |
| RLog | 0.869 | 0.166 | 0.249 | 0.817 | 0.718 | 0.858 | 0.192 | 0.281 | 0.802 | 0.743 |
| SVM | 0.872 | 0.128 | 0.316 | 0.813 | 0.5 | 0.858 | 0.142 | 0.316 | 0.792 | 0.5 |
| ANN | 0.872 | 0.133 | 0.316 | 0.814 | 0.671 | 0.855 | 0.15 | 0.316 | 0.791 | 0.709 |
| ANT 17 | NB | 0.897 | 0.145 | 0.315 | 0.859 | 0.783 | 0.884 | 0.206 | 0.309 | 0.844 | 0.81 |
| J48 | 0.906 | 0.094 | 0.316 | 0.861 | 0.496 | 0.89 | 0.254 | 0.348 | 0.854 | 0.734 |
| RF | 0.862 | 0.285 | 0.334 | 0.855 | 0.693 | 0.882 | 0.525 | 0.578 | 0.878 | 0.830 |
| RLog | 0.901 | 0.119 | 0.316 | 0.86 | 0.798 | 0.876 | 0.166 | 0.298 | 0.83 | 0.819 |
| SVM | 0.906 | 0.094 | 0.316 | 0.861 | 0.5 | 0.882 | 0.118 | 0.316 | 0.827 | 0.5 |
| ANN | 0.904 | 0.103 | 0.316 | 0.861 | 0.725 | 0.879 | 0.172 | 0.316 | 0.834 | 0.804 |

***Modèle d D(d(Loc,Ce),d(Rfc,Ca)):***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **TPR** | **TNR** | **G-mean** | **AUC** | **TPRD** | **TNRD** | **G-meanD** | **AUCD** |
| **ANT 13** | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 14** | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 15** | NB | 0.000 | 0.964 | 0.000 | 0.756 | 0.176 | 0.964 | 0.412 | 0.757 |
| J48 | 0.000 | 0.943 | 0.000 | 0.634 | 0.412 | 0.834 | 0.586 | 0.701 |
| RF | 0.222 | 0.756 | 0.410 | 0.673 | 0.662 | 0.720 | **0.690** | **0.743** |
| RLog | 0.000 | 0.959 | 0.000 | 0.761 | 0.235 | 0.953 | 0.474 | 0.775 |
| SVM | 0.000 | 1.000 | 0.000 | 0.500 | 0.029 | 0.995 | 0.171 | 0.507 |
| ANN | 0.000 | 0.917 | 0.000 | 0.752 | 0.462 | 0.887 | 0.666 | 0.771 |
| ANT 16 | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| ANT 17 | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |

***Modèle D(d(Loc,Wmc),d(Rfc,Ca)):***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **TPR** | **TNR** | **G-mean** | **AUC** | **TPRD** | **TNRD** | **G-meanD** | **AUCD** |
| **ANT 13** | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 14** | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 15** | NB | 0.000 | 0.964 | 0.000 | 0.755 | 0.176 | 0.964 | 0.412 | 0.755 |
| J48 | 0.000 | 0.943 | 0.000 | 0.634 | 0.412 | 0.834 | 0.586 | 0.701 |
| RF | 0.222 | 0.756 | 0.410 | 0.672 | 0.662 | 0.731 | 0.695 | 0.747 |
| RLog | 0.000 | 0.959 | 0.000 | 0.761 | 0.235 | 0.953 | 0.474 | 0.775 |
| SVM | 0.000 | 1.000 | 0.000 | 0.500 | 0.029 | 0.995 | 0.171 | 0.507 |
| ANN | 0.000 | 0.916 | 0.000 | 0.752 | 0.462 | 0.886 | 0.664 | 0.771 |
| ANT 16 | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| ANT 17 | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |

***Modèle D(d(Loc,Rfc),d(Loc,Ca),d(Rfc,Ca)):***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **TPR** | **TNR** | **G-mean** | **AUC** | **TPRD** | **TNRD** | **G-meanD** | **AUCD** |
| **ANT 13** | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 14** | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 15** | NB | 0.000 | 0.953 | 0.000 | 0.755 | 0.235 | 0.938 | 0.470 | 0.762 |
| J48 | 0.000 | 0.948 | 0.000 | 0.609 | 0.412 | 0.834 | 0.586 | 0.699 |
| RF | 0.178 | 0.751 | 0.365 | 0.690 | 0.647 | 0.756 | **0.700** | **0.753** |
| RLog | 0.000 | 0.953 | 0.000 | 0.760 | 0.250 | 0.938 | 0.484 | 0.774 |
| SVM | 0.000 | 1.000 | 0.000 | 0.500 | 0.118 | 0.974 | 0.339 | 0.530 |
| ANN | 0.000 | 0.907 | 0.000 | 0.751 | 0.504 | 0.872 | 0.680 | 0.771 |
| ANT 16 | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| ANT 17 | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |

***Modèle (Loc,d(Rfc,Ca)):***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **TPR** | **TNR** | **G-mean** | **AUC** | **TPRD** | **TNRD** | **G-meanD** | **AUCD** |
| **ANT 13** | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 14** | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 15** | NB | 0.000 | 0.964 | 0.000 | 0.757 | 0.176 | 0.964 | 0.412 | 0.756 |
| J48 | 0.000 | 0.948 | 0.000 | 0.613 | 0.368 | 0.834 | 0.554 | 0.695 |
| RF | 0.178 | 0.715 | 0.357 | 0.685 | 0.647 | 0.720 | **0.683** | **0.745** |
| RLog | 0.000 | 0.959 | 0.000 | 0.762 | 0.235 | 0.953 | 0.474 | 0.774 |
| SVM | 0.000 | 1.000 | 0.000 | 0.500 | 0.029 | 0.995 | 0.171 | 0.507 |
| ANN | 0.000 | 0.916 | 0.000 | 0.753 | 0.463 | 0.886 | 0.666 | 0.771 |
| ANT 16 | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| ANT 17 | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |

***Modèle (Rfc,d(Loc,Ca)):***

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **TPR** | **TNR** | **G-mean** | **AUC** | **TPRD** | **TNRD** | **G-meanD** | **AUCD** |
| **ANT 13** | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 14** | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| **ANT 15** | NB | 0.000 | 0.964 | 0.000 | 0.723 | 0.162 | 0.964 | 0.395 | 0.725 |
| J48 | 0.000 | 0.948 | 0.000 | 0.616 | 0.412 | 0.798 | 0.573 | 0.706 |
| RF | 0.133 | 0.720 | 0.310 | 0.663 | 0.647 | 0.731 | **0.688** | **0.739** |
| RLog | 0.000 | 0.964 | 0.000 | 0.745 | 0.191 | 0.959 | 0.428 | 0.757 |
| SVM | 0.000 | 1.000 | 0.000 | 0.500 | 0.029 | 0.995 | 0.171 | 0.509 |
| ANN | 0.000 | 0.931 | 0.000 | 0.731 | 0.397 | 0.898 | 0.639 | 0.754 |
| ANT 16 | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |
| ANT 17 | NB |  |  |  |  |  |  |  |  |
| J48 |  |  |  |  |  |  |  |  |
| RF |  |  |  |  |  |  |  |  |
| RLog |  |  |  |  |  |  |  |  |
| SVM |  |  |  |  |  |  |  |  |
| ANN |  |  |  |  |  |  |  |  |

RISK Prédiction

***Modèle d (LOC, Ce) :***

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | | **Corrélation Coeff (r)** | **MAE** | **RMSE** | **RAE %** | **RSE %** |
| **ANT 13** | LR | 0.586 | 5.4216 | 7.7423 | 72.49 | 81.04 |
| Gaussian | 0.635 | 5.1649 | 7.3401 | 69.05 | 76.83 |
| RF | 0.443 | 6.0915 | 9.2793 | 81.44 | 97.12 |
| M5P | 0.577 | 5.4492 | 7.8263 | 72.85 | 81.91 |
| SmoReg | 0.605 | 4.841 | 7.8749 | 64.72 | 82.42 |
| ANN | 0.556 | 5.6601 | 8.0556 | 75.67 | 84.32 |
| **ANT 14** | LR | 0.391 | 1.271 | 2.003 | 82.5 | 91.573 |
| Gaussian | 0.075 | 1.422 | 2.177 | 92.295 | 99.554 |
| RF | 0.209 | 1.31 | 2.392 | 85.002 | 109.372 |
| M5P | 0.391 | 1.271 | 2.003 | 82.5 | 91.573 |
| SmoReg | 0.385 | 0.972 | 2.379 | 63.106 | 108.764 |
| ANN | 0.278 | 1.343 | 2.179 | 87.177 | 99.642 |
| **ANT 15** | LR | 0.361 | 2.652 | 3.71 | 86.435 | 93.629 |
| Gaussian | 0.031 | 3.003 | 3.958 | 97.872 | 99.878 |
| RF | 0.325 | 2.653 | 4.061 | 86.471 | 102.474 |
| M5P | 0.404 | 2.448 | 3.681 | 79.776 | 92.894 |
| SmoReg | 0.408 | 2.217 | 3.82 | 72.265 | 96.402 |
| ANN | 0.477 | 2.696 | 3.743 | 87.889 | 94.46 |
| ANT 16 | LR | 0.18 | 0.877 | 1.606 | 94.225 | 98.302 |
| Gaussian | -0.128 | 0.893 | 1.632 | 96.017 | 99.884 |
| RF | 0.062 | 0.883 | 1.94 | 94.942 | 118.722 |
| M5P | 0.262 | 0.842 | 1.57 | 90.533 | 96.122 |
| SmoReg | 0.033 | 0.534 | 1.71 | 57.39 | 104.667 |
| ANN | 0.083 | 0.948 | 1.719 | 101.886 | 105.23 |
| ANT 17 | LR | 0.428 | 0.656 | 1.403 | 82.6 | 90.375 |
| Gaussian | 0.124 | 0.734 | 1.55 | 92.425 | 99.842 |
| RF | 0.286 | 0.672 | 1.658 | 84.691 | 106.811 |
| M5P | 0.428 | 0.656 | 1.403 | 82.6 | 90.375 |
| SmoReg | 0.218 | 0.438 | 1.61 | 55.216 | 103.691 |
| ANN | 0.355 | 0.852 | 1.488 | 107.367 | 95.859 |

***Modèle d (LOC, FANIN) :***

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | | **Corrélation Coeff (r)** | **MAE** | **RMSE** | **RAE** | **RSE** |
| **ANT 13** | LR | 0.588 | 5.412 | 7.725 | 72.365 | 80.855 |
| Gaussian | 0.222 | 7.096 | 9.48 | 94.883 | 99.231 |
| RF | 0.442 | 6.029 | 9.28 | 80.61 | 97.132 |
| M5P | 0.579 | 5.44 | 7.809 | 72.738 | 81.735 |
| SmoReg | 0.602 | 4.954 | 7.83 | 66.241 | 81.96 |
| ANN | 0.556 | 5.662 | 8.056 | 75.707 | 84.329 |
| **ANT 14** | LR | 0.392 | 1.266 | 2.001 | 82.161 | 91.501 |
| Gaussian | 0.101 | 1.413 | 2.177 | 91.687 | 99.525 |
| RF | 0.18 | 1.341 | 2.426 | 87.073 | 110.93 |
| M5P | 0.392 | 1.266 | 2.001 | 82.161 | 91.501 |
| SmoReg | 0.323 | 0.972 | 2.378 | 63.109 | 108.73 |
| ANN | 0.279 | 1.343 | 2.179 | 87.195 | 99.622 |
| **ANT 15** | LR | 0.378 | 2.636 | 3.677 | 85.93 | 92.799 |
| Gaussian | 0.048 | 2.998 | 3.957 | 97.732 | 99.86 |
| RF | 0.345 | 2.594 | 4.017 | 84.555 | 101.364 |
| M5P | 0.413 | 2.442 | 3.655 | 79.599 | 92.228 |
| SmoReg | 0.416 | 2.217 | 3.8 | 72.272 | 95.897 |
| ANN | 0.467 | 2.739 | 3.786 | 89.272 | 95.534 |
| ANT 16 | LR | 0.19 | 0.874 | 1.602 | 93.913 | 98.036 |
| Gaussian | -0.123 | 0.891 | 1.632 | 95.71 | 99.881 |
| RF | 0.055 | 0.907 | 1.962 | 97.509 | 120.067 |
| M5P | 0.266 | 0.84 | 1.569 | 90.292 | 96.006 |
| SmoReg | 0.088 | 0.534 | 1.71 | 57.357 | 104.652 |
| ANN | 0.085 | 0.949 | 1.719 | 101.985 | 105.211 |
| ANT 17 | LR | 0.438 | 0.656 | 1.395 | 82.59 | 89.879 |
| Gaussian | 0.154 | 0.729 | 1.55 | 91.827 | 99.828 |
| RF | 0.3 | 0.657 | 1.638 | 82.763 | 105.49 |
| M5P | 0.431 | 0.656 | 1.401 | 82.643 | 90.263 |
| SmoReg | 0.453 | 0.438 | 1.61 | 55.184 | 103.687 |
| ANN | 0.356 | 0.852 | 1.488 | 107.365 | 95.85 |

***Modèle d (WMC, CBO) :***

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | | **Corrélation Coeff (r)** | **MAE** | **RMSE** | **RAE** | **RSE** |
| **ANT 13** | LR | 0.233 | 7.018 | 9.311 | 93.835 | 97.462 |
| Gaussian | -0.134 | 7.316 | 9.54 | 97.826 | 99.854 |
| RF | 0.342 | 7.441 | 10.527 | 99.487 | 110.186 |
| M5P | 0.3 | 6.825 | 9.109 | 91.252 | 95.348 |
| SmoReg | 0.201 | 6.691 | 10.678 | 89.466 | 111.77 |
| ANN | 0.336 | 7.291 | 9.295 | 97.482 | 97.288 |
| **ANT 14** | LR | 0.286 | 1.376 | 2.088 | 89.313 | 95.462 |
| Gaussian | -0.147 | 1.485 | 2.185 | 96.411 | 99.884 |
| RF | 0.265 | 1.272 | 2.279 | 82.565 | 104.211 |
| M5P | 0.361 | 1.25 | 2.032 | 81.125 | 92.908 |
| SmoReg | 0.276 | 0.973 | 2.377 | 63.15 | 108.685 |
| ANN | 0.178 | 1.324 | 2.291 | 85.907 | 104.762 |
| **ANT 15** | LR | 0.295 | 2.844 | 3.781 | 92.701 | 95.409 |
| Gaussian | -0.046 | 3.025 | 3.96 | 98.594 | 99.924 |
| RF | 0.358 | 2.777 | 4.007 | 90.505 | 101.123 |
| M5P | 0.38 | 2.606 | 3.662 | 84.948 | 92.403 |
| SmoReg | 0.201 | 2.405 | 4.339 | 78.377 | 109.491 |
| ANN | 0.296 | 3.159 | 4.093 | 102.959 | 103.282 |
| ANT 16 | LR | 0.109 | 0.91 | 1.619 | 97.825 | 99.066 |
| Gaussian | -0.181 | 0.913 | 1.634 | 98.164 | 99.98 |
| RF | 0.12 | 0.879 | 1.875 | 94.465 | 114.773 |
| M5P | 0.152 | 0.869 | 1.614 | 93.36 | 98.781 |
| SmoReg | 0.035 | 0.536 | 1.709 | 57.584 | 104.618 |
| ANN | -0.032 | 0.97 | 1.759 | 104.256 | 107.659 |
| ANT 17 | LR | 0.226 | 0.748 | 1.531 | 94.195 | 98.616 |
| Gaussian | -0.069 | 0.768 | 1.552 | 96.683 | 99.968 |
| RF | 0.11 | 0.759 | 1.861 | 95.61 | 119.866 |
| M5P | 0.168 | 0.751 | 1.569 | 94.578 | 101.065 |
| SmoReg | 0.073 | 0.442 | 1.609 | 55.634 | 103.653 |
| ANN | 0.093 | 0.882 | 1.727 | 111.066 | 111.218 |

***Modèle d (RFC, Ca) :***

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | | **Corrélation Coeff (r)** | **MAE** | **RMSE** | **RAE** | **RSE** |
| **ANT 13** | LR | 0.533 | 5.62 | 8.15 | 75.14 | 85.31 |
| Gaussian | 0.092 | 7.147 | 9.5 | 95.556 | 99.444 |
| RF | 0.586 | 5.312 | 7.926 | 71.026 | 82.965 |
| M5P | 0.53 | 5.705 | 8.189 | 76.285 | 85.721 |
| SmoReg | 0.565 | 5.249 | 8.006 | 70.186 | 83.801 |
| ANN | 0.548 | 6.027 | 8.029 | 80.582 | 84.045 |
| **ANT 14** | LR | 0.423 | 1.237 | 1.976 | 80.31 | 90.368 |
| Gaussian | -0.026 | 1.452 | 2.182 | 94.256 | 99.772 |
| RF | 0.286 | 1.363 | 2.343 | 88.501 | 107.137 |
| M5P | 0.4 | 1.253 | 2.046 | 81.35 | 93.568 |
| SmoReg | 0.387 | 0.973 | 2.378 | 63.145 | 108.708 |
| ANN | 0.311 | 1.379 | 2.182 | 89.501 | 99.782 |
| **ANT 15** | LR | 0.536 | 2.362 | 3.344 | 76.987 | 84.376 |
| Gaussian | 0.127 | 2.975 | 3.947 | 96.983 | 99.609 |
| RF | 0.465 | 2.322 | 3.754 | 75.687 | 94.746 |
| M5P | 0.538 | 2.329 | 3.335 | 75.9 | 84.163 |
| SmoReg | 0.533 | 2.14 | 3.545 | 69.761 | 89.466 |
| ANN | 0.509 | 2.61 | 3.522 | 85.079 | 88.873 |
| ANT 16 | LR | 0.253 | 0.854 | 1.576 | 91.833 | 96.444 |
| Gaussian | -0.089 | 0.89 | 1.632 | 95.662 | 99.865 |
| RF | 0.098 | 0.897 | 1.847 | 96.405 | 113.073 |
| M5P | 0.197 | 0.861 | 1.604 | 92.494 | 98.167 |
| SmoReg | 0.221 | 0.532 | 1.71 | 57.217 | 104.638 |
| ANN | 0.082 | 1.022 | 1.747 | 109.829 | 106.955 |
| ANT 17 | LR | 0.41 | 0.687 | 1.415 | 86.588 | 91.16 |
| Gaussian | -0.015 | 0.756 | 1.552 | 95.235 | 99.936 |
| RF | 0.218 | 0.676 | 1.694 | 85.09 | 109.101 |
| M5P | 0.344 | 0.696 | 1.459 | 87.625 | 93.988 |
| SmoReg | 0.221 | 0.438 | 1.61 | 55.214 | 103.714 |
| ANN | 0.146 | 0.994 | 1.73 | 125.235 | 111.453 |

***Modèle d (LOC, RFC) :***

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | | **Corrélation Coeff (r)** | **MAE** | **RMSE** | **RAE** | **RSE** |
| **ANT 13** | LR | 0.651 | 5.004 | 7.211 | 66.902 | 75.478 |
| Gaussian | 0.629 | 5.117 | 7.381 | 68.424 | 77.260 |
| RF | 0.439 | 6.091 | 9.282 | 81.437 | 97.162 |
| M5P | 0.651 | 5.004 | 7.211 | 66.902 | 75.478 |
| SmoReg | 0.659 | 4.769 | 7.358 | 63.763 | 77.022 |
| ANN | 0.557 | 5.659 | 8.059 | 75.669 | 84.354 |
| **ANT 14** | LR | 0.391 | 1.257 | 2.001 | 81.595 | 91.507 |
| Gaussian | 0.355 | 1.287 | 2.033 | 83.597 | 92.987 |
| RF | 0.203 | 1.335 | 2.419 | 86.661 | 110.591 |
| M5P | 0.391 | 1.257 | 2.001 | 81.595 | 91.507 |
| SmoReg | 0.351 | 0.972 | 2.378 | 63.118 | 108.742 |
| ANN | 0.264 | 1.371 | 2.196 | 88.996 | 100.391 |
| **ANT 15** | LR | 0.468 | 2.494 | 3.496 | 81.3 | 88.229 |
| Gaussian | 0.504 | 2.337 | 3.414 | 76.189 | 86.168 |
| RF | 0.347 | 2.587 | 4.007 | 84.311 | 101.126 |
| M5P | 0.431 | 2.461 | 3.594 | 80.201 | 90.703 |
| SmoReg | 0.472 | 2.096 | 3.607 | 68.333 | 91.047 |
| ANN | 0.482 | 2.644 | 3.571 | 86.194 | 90.104 |
| ANT 16 | LR | 0.232 | 0.858 | 1.584 | 92.253 | 96.965 |
| Gaussian | 0.243 | 0.845 | 1.580 | 90.890 | 96.733 |
| RF | 0.07 | 0.878 | 1.93 | 94.385 | 118.11 |
| M5P | 0.208 | 0.853 | 1.596 | 91.653 | 97.679 |
| SmoReg | 0.087 | 0.533 | 1.71 | 57.277 | 104.679 |
| ANN | 0.121 | 1.004 | 1.698 | 107.894 | 103.903 |
| ANT 17 | LR | 0.452 | 0.678 | 1.384 | 85.464 | 89.128 |
| Gaussian | 0.459 | 0.640 | 1.377 | 80.728 | 88.711 |
| RF | 0.280 | 0.681 | 1.669 | 85.763 | 107.51 |
| M5P | 0.452 | 0.678 | 1.384 | 85.464 | 89.128 |
| SmoReg | 0.341 | 0.440 | 1.501 | 55.435 | 96.686 |
| ANN | 0.343 | 0.87 | 1.499 | 109.589 | 96.517 |

Discussion