

```
1 "C:\Users\My PC\AppData\Local\Programs\Python\Python36-32\  
2 python.exe" D:/pfe/Projets/pfe/apprentissage_HAS.py  
3  
4  
5 -----Decision Tree-----  
6  
7  
8  
9 dataset/HAS/taken/HAS_del.csv  
10  
11  
12  
13 count      285  
14 unique     2  
15 top        False  
16 freq       248  
17 Name: is_code_smell, dtype: object  
18 [[74  1]  
19 [ 0 11]]  
20 the recall for this model is : 1.0  
21 TP 11  
22 TN 74  
23 FP 1  
24 FN 0  
25  
26 -----Classification Report-----  
27  
28  
29          precision    recall   f1-score   support  
30      False        1.00     0.99     0.99      75  
31      True        0.92     1.00     0.96      11  
32      micro avg     0.99     0.99     0.99      86  
33      macro avg     0.96     0.99     0.97      86  
34 weighted avg     0.99     0.99     0.99      86  
35  
36 Precision =  0.9166666666666666  
37 Rappel= 1.0  
38 F_Mesure= 0.9565217391304348  
39  
40 -----Using cross Validation-----  
41  
42 -----k= 1 -----
```

```
43
44 F_Mesure= 1.0
45
46 -----k= 2 -----
47
48 F_Mesure= 1.0
49
50 -----k= 3 -----
51
52 F_Mesure= 1.0
53
54 -----k= 4 -----
55
56 F_Mesure= 1.0
57
58 -----k= 5 -----
59
60 F_Mesure= 0.9333333333333333
61 F_Mesures moyenne = 0.9866666666666667
62
63
64
65 -----Decision Tree-----
66
67
68
69 dataset/HAS/taken/HAS_RandomUnderSampler.csv
70
71
72
73 count      74
74 unique     2
75 top        True
76 freq       37
77 Name: is_code_smell, dtype: object
78 [[ 9  0]
79 [ 0 14]]
80 the recall for this model is : 1.0
81 TP 14
82 TN 9
83 FP 0
84 FN 0
85
86 -----Classification Report
-----
```

	precision	recall	f1-score	support
87				
88				
89	False	1.00	1.00	1.00
90	True	1.00	1.00	1.00
91				
92	micro avg	1.00	1.00	1.00
93	macro avg	1.00	1.00	1.00
94	weighted avg	1.00	1.00	1.00
95				
96	Precision = 1.0			
97	Rappel= 1.0			
98	F_Mesure= 1.0			
99				
100	-----Using cross Validation			
101				
102	-----k= 1 -----			
103				
104	F_Mesure= 1.0			
105				
106	-----k= 2 -----			
107				
108	F_Mesure= 1.0			
109				
110	-----k= 3 -----			
111				
112	F_Mesure= 1.0			
113				
114	-----k= 4 -----			
115				
116	F_Mesure= 1.0			
117				
118	-----k= 5 -----			
119				
120	F_Mesure= 1.0			
121	F_Mesures moyenne = 1.0			
122				
123				
124				
125	-----Decision Tree-----			
126				
127				
128				
129	dataset/HAS/taken/HAS_AllKNN.csv			
130				

```
131
132
133 count      275
134 unique      2
135 top        False
136 freq       238
137 Name: is_code_smell, dtype: object
138 [[69  1]
139 [ 0 13]]
140 the recall for this model is : 1.0
141 TP 13
142 TN 69
143 FP 1
144 FN 0
145
146 -----Classification Report
-----
147          precision    recall   f1-score   support
148
149      False      1.00      0.99      0.99      70
150      True      0.93      1.00      0.96      13
151
152  micro avg      0.99      0.99      0.99      83
153  macro avg      0.96      0.99      0.98      83
154 weighted avg      0.99      0.99      0.99      83
155
156 Precision =  0.9285714285714286
157 Rappel=  1.0
158 F_Mesure= 0.962962962962963
159
160 -----Using cross Validation
-----
161
162 -----k= 1 -----
163
164 F_Mesure= 1.0
165
166 -----k= 2 -----
167
168 F_Mesure= 1.0
169
170 -----k= 3 -----
171
172 F_Mesure= 1.0
173
```

```
174 -----k= 4 -----
175
176 F_Mesure= 0.923076923076923
177
178 -----k= 5 -----
179
180 F_Mesure= 1.0
181 F_Mesures moyenne = 0.9846153846153847
182
183
184
185 -----Decision Tree-----
186
187
188
189 dataset/HAS/taken/HAS_InstanceHardnessThreshold.csv
190
191
192
193 count      271
194 unique     2
195 top        False
196 freq       234
197 Name: is_code_smell, dtype: object
198 [[71  0]
199 [ 0 11]]
200 the recall for this model is : 1.0
201 TP 11
202 TN 71
203 FP 0
204 FN 0
205
206 -----Classification Report
-----
207
208
209          precision    recall   f1-score   support
210
211
212
213
214
215
216 Precision = 1.0
217 Rappel= 1.0
```

```
218 F_Mesure= 1.0
219
220 -----Using cross Validation
-----
221
222 -----k= 1 -----
223
224 F_Mesure= 1.0
225
226 -----k= 2 -----
227
228 F_Mesure= 1.0
229
230 -----k= 3 -----
231
232 F_Mesure= 1.0
233
234 -----k= 4 -----
235
236 F_Mesure= 1.0
237
238 -----k= 5 -----
239
240 F_Mesure= 1.0
241 F_Mesures moyenne = 1.0
242
243
244
245 -----Decision Tree-----
246
247
248
249 dataset/HAS/taken/HAS_NearMiss.csv
250
251
252
253 count      74
254 unique     2
255 top        True
256 freq       37
257 Name: is_code_smell, dtype: object
258 [[11  0]
259 [ 0 12]]
260 the recall for this model is : 1.0
261 TP 12
```

```
262 TN 11
263 FP 0
264 FN 0
265
266 -----Classification Report
-----
267             precision    recall   f1-score   support
268
269     False        1.00      1.00      1.00       11
270     True         1.00      1.00      1.00       12
271
272     micro avg     1.00      1.00      1.00       23
273     macro avg     1.00      1.00      1.00       23
274 weighted avg     1.00      1.00      1.00       23
275
276 Precision = 1.0
277 Rappel= 1.0
278 F_Mesure= 1.0
279
280 -----Using cross Validation
-----
281
282 -----k= 1 -----
283
284 F_Mesure= 1.0
285
286 -----k= 2 -----
287
288 F_Mesure= 1.0
289
290 -----k= 3 -----
291
292 F_Mesure= 1.0
293
294 -----k= 4 -----
295
296 F_Mesure= 1.0
297
298 -----k= 5 -----
299
300 F_Mesure= 0.9090909090909091
301 F_Mesures moyenne = 0.9818181818181818
302
303
304
```

```
305 -----Decision Tree-----
306
307
308
309 dataset/HAS/taken/HAS_OneSidedSelection.csv
310
311
312
313 count      68
314 unique     2
315 top        True
316 freq       37
317 Name: is_code_smell, dtype: object
318 [[ 7  0]
319 [ 0 14]]
320 the recall for this model is : 1.0
321 TP 14
322 TN 7
323 FP 0
324 FN 0
325
326 -----Classification Report
-----
327          precision    recall   f1-score   support
328
329      False      1.00      1.00      1.00       7
330      True      1.00      1.00      1.00      14
331
332  micro avg     1.00      1.00      1.00      21
333  macro avg     1.00      1.00      1.00      21
334 weighted avg   1.00      1.00      1.00      21
335
336 Precision =  1.0
337 Rappel=  1.0
338 F_Mesure= 1.0
339
340 -----Using cross Validation
-----
341
342 -----k= 1 -----
343
344 F_Mesure= 1.0
345
346 -----k= 2 -----
347
```

```
348 F_Mesure= 1.0
349
350 -----k= 3 -----
351
352 F_Mesure= 1.0
353
354 -----k= 4 -----
355
356 F_Mesure= 1.0
357
358 -----k= 5 -----
359
360 F_Mesure= 0.8571428571428571
361 F_Mesures moyenne = 0.9714285714285713
362
363
364
365 -----Decision Tree-----
366
367
368
369 dataset/HAS/taken/HAS_RandomUnderSampler_default.csv
370
371
372
373 count      74
374 unique     2
375 top        True
376 freq       37
377 Name: is_code_smell, dtype: object
378 [[13  0]
379 [ 0 10]]
380 the recall for this model is : 1.0
381 TP 10
382 TN 13
383 FP 0
384 FN 0
385
386 -----Classification Report
-----
```

	precision	recall	f1-score	support	
389	False	1.00	1.00	1.00	13
390	True	1.00	1.00	1.00	10

391

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```
392     micro avg      1.00      1.00      1.00      23
393     macro avg      1.00      1.00      1.00      23
394 weighted avg      1.00      1.00      1.00      23
395
396 Precision = 1.0
397 Rappel= 1.0
398 F_Mesure= 1.0
399
400 -----Using cross Validation
-----
401
402 -----k= 1 -----
403
404 F_Mesure= 1.0
405
406 -----k= 2 -----
407
408 F_Mesure= 1.0
409
410 -----k= 3 -----
411
412 F_Mesure= 1.0
413
414 -----k= 4 -----
415
416 F_Mesure= 1.0
417
418 -----k= 5 -----
419
420 F_Mesure= 1.0
421 F_Mesures moyenne = 1.0
422
423
424
425 -----Decision Tree-----
426
427
428
429 dataset/HAS/taken/HAS_TomekLinks.csv
430
431
432
433 count      284
434 unique      2
435 top      False
```

```
436 freq          247
437 Name: is_code_smell, dtype: object
438 [[76  1]
439 [ 0  9]]
440 the recall for this model is : 1.0
441 TP 9
442 TN 76
443 FP 1
444 FN 0
445
446 -----Classification Report
-----
447              precision    recall   f1-score   support
448
449      False        1.00      0.99      0.99       77
450      True         0.90      1.00      0.95        9
451
452  micro avg       0.99      0.99      0.99       86
453  macro avg       0.95      0.99      0.97       86
454 weighted avg     0.99      0.99      0.99       86
455
456 Precision =  0.9
457 Rappel=  1.0
458 F_Mesure= 0.9473684210526316
459
460 -----Using cross Validation
-----
461
462 -----k= 1 -----
463
464 F_Mesure= 1.0
465
466 -----k= 2 -----
467
468 F_Mesure= 1.0
469
470 -----k= 3 -----
471
472 F_Mesure= 1.0
473
474 -----k= 4 -----
475
476 F_Mesure= 1.0
477
478 -----k= 5 -----
```

```
479
480 F_Mesure= 0.9333333333333333
481 F_Mesures moyenne = 0.9866666666666667
482
483
484
485 -----Decision Tree-----
486
487
488
489 dataset/HAS/taken/HAS_CondensedNearestNeighbour.csv
490
491
492
493 count      45
494 unique     2
495 top        True
496 freq       37
497 Name: is_code_smell, dtype: object
498 [[ 1  0]
499 [ 0 13]]
500 the recall for this model is : 1.0
501 TP 13
502 TN 1
503 FP 0
504 FN 0
505
506 -----Classification Report
-----
507          precision    recall   f1-score   support
508
509      False       1.00     1.00      1.00       1
510      True        1.00     1.00      1.00      13
511
512  micro avg     1.00     1.00      1.00      14
513  macro avg     1.00     1.00      1.00      14
514 weighted avg   1.00     1.00      1.00      14
515
516 Precision = 1.0
517 Rappel= 1.0
518 F_Mesure= 1.0
519
520 -----Using cross Validation
-----
```

```
522 -----k= 1 -----
523
524 F_Mesure= 1.0
525
526 -----k= 2 -----
527
528
529 -----k= 3 -----
530
531 F_Mesure= 1.0
532
533 -----k= 4 -----
534
535 F_Mesure= 1.0
536
537 -----k= 5 -----
538
539 F_Mesure= 1.0
540 F_Mesures moyenne = 1.0
541
542
543
544 -----Random Forest-----
545
546
547
548 dataset/HAS/taken/HAS_del.csv
549
550
551
552 count      285
553 unique     2
554 top        False
555 freq       248
556 Name: is_code_smell, dtype: object
557 [[75  0]
558 [ 0 11]]
559 the recall for this model is : 1.0
560 TP 11
561 TN 75
562 FP 0
563 FN 0
564
565 -----Classification Report
-----
```

	precision	recall	f1-score	support
566				
567				
568	False	1.00	1.00	1.00
569	True	1.00	1.00	1.00
570				
571	micro avg	1.00	1.00	1.00
572	macro avg	1.00	1.00	1.00
573	weighted avg	1.00	1.00	1.00
574				
575	Precision = 1.0			
576	Rappel= 1.0			
577	F_Mesure= 1.0			
578				
579	-----Using cross Validation			
580				
581	-----k= 1 -----			
582				
583	F_Mesure= 1.0			
584				
585	-----k= 2 -----			
586				
587	F_Mesure= 1.0			
588				
589	-----k= 3 -----			
590				
591	F_Mesure= 1.0			
592				
593	-----k= 4 -----			
594				
595	F_Mesure= 1.0			
596				
597	-----k= 5 -----			
598				
599	F_Mesure= 0.9333333333333333			
600	F_Mesures moyenne = 0.9866666666666667			
601				
602				
603				
604	-----Random Forest-----			
605				
606				
607				
608	dataset/HAS/taken/HAS_RandomUnderSampler.csv			
609				

```
610
611
612 count      74
613 unique     2
614 top        True
615 freq       37
616 Name: is_code_smell, dtype: object
617 [[ 9  0]
618 [ 0 14]]
619 the recall for this model is : 1.0
620 TP 14
621 TN 9
622 FP 0
623 FN 0
624
625 -----Classification Report
-----
626          precision    recall   f1-score   support
627
628      False      1.00      1.00      1.00       9
629      True       1.00      1.00      1.00      14
630
631  micro avg     1.00      1.00      1.00      23
632  macro avg     1.00      1.00      1.00      23
633 weighted avg   1.00      1.00      1.00      23
634
635 Precision =  1.0
636 Rappel=  1.0
637 F_Mesure= 1.0
638
639 -----Using cross Validation
-----
640
641 -----k= 1 -----
642
643 F_Mesure= 1.0
644
645 -----k= 2 -----
646
647 F_Mesure= 1.0
648
649 -----k= 3 -----
650
651 F_Mesure= 1.0
652
```

```
653 -----k= 4 -----
654
655 F_Mesure= 1.0
656
657 -----k= 5 -----
658
659 F_Mesure= 1.0
660 F_Measures moyenne = 1.0
661
662
663
664 -----Random Forest-----
665
666
667
668 dataset/HAS/taken/HAS_AllKNN.csv
669
670
671
672 count      275
673 unique     2
674 top        False
675 freq       238
676 Name: is_code_smell, dtype: object
677 [[69  1]
678 [ 0 13]]
679 the recall for this model is : 1.0
680 TP 13
681 TN 69
682 FP 1
683 FN 0
684
685 -----Classification Report
-----
686
687
688          precision    recall   f1-score   support
689
690
691          False        1.00      0.99      0.99       70
692          True         0.93      1.00      0.96       13
693
694
695          micro avg     0.99      0.99      0.99       83
696          macro avg     0.96      0.99      0.98       83
697          weighted avg   0.99      0.99      0.99       83
698
699
700
701 Precision =  0.9285714285714286
702 Rappel= 1.0
```

```
697 F_Mesure= 0.962962962962963
698
699 -----Using cross Validation
-----
700
701 -----k= 1 -----
702
703 F_Mesure= 1.0
704
705 -----k= 2 -----
706
707 F_Mesure= 1.0
708
709 -----k= 3 -----
710
711 F_Mesure= 1.0
712
713 -----k= 4 -----
714
715 F_Mesure= 0.923076923076923
716
717 -----k= 5 -----
718
719 F_Mesure= 1.0
720 F_Mesures moyenne = 0.9846153846153847
721
722
723
724 -----Random Forest-----
725
726
727
728 dataset/HAS/taken/HAS_InstanceHardnessThreshold.csv
729
730
731
732 count      271
733 unique     2
734 top        False
735 freq       234
736 Name: is_code_smell, dtype: object
737 [[74  0]
738 [ 0  8]]
739 the recall for this model is : 1.0
740 TP 8
```

```
741 TN 74
742 FP 0
743 FN 0
744
745 -----Classification Report
-----
746          precision    recall   f1-score   support
747
748      False       1.00      1.00      1.00       74
749      True        1.00      1.00      1.00        8
750
751      micro avg     1.00      1.00      1.00       82
752      macro avg     1.00      1.00      1.00       82
753 weighted avg     1.00      1.00      1.00       82
754
755 Precision = 1.0
756 Rappel= 1.0
757 F_Mesure= 1.0
758
759 -----Using cross Validation
-----
760
761 -----k= 1 -----
762
763 F_Mesure= 1.0
764
765 -----k= 2 -----
766
767 F_Mesure= 1.0
768
769 -----k= 3 -----
770
771 F_Mesure= 1.0
772
773 -----k= 4 -----
774
775 F_Mesure= 1.0
776
777 -----k= 5 -----
778
779 F_Mesure= 1.0
780 F_Mesures moyenne = 1.0
781
782
783
```

```
784 -----Random Forest-----
785
786
787
788 dataset/HAS/taken/HAS_NearMiss.csv
789
790
791
792 count      74
793 unique      2
794 top        True
795 freq       37
796 Name: is_code_smell, dtype: object
797 [[10  0]
798 [ 0 13]]
799 the recall for this model is : 1.0
800 TP 13
801 TN 10
802 FP 0
803 FN 0
804
805 -----Classification Report
-----
806          precision    recall   f1-score   support
807
808      False      1.00      1.00      1.00      10
809      True      1.00      1.00      1.00      13
810
811  micro avg      1.00      1.00      1.00      23
812  macro avg      1.00      1.00      1.00      23
813 weighted avg      1.00      1.00      1.00      23
814
815 Precision = 1.0
816 Rappel= 1.0
817 F_Mesure= 1.0
818
819 -----Using cross Validation
-----
820
821 -----k= 1 -----
822
823 F_Mesure= 1.0
824
825 -----k= 2 -----
826
```

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```
827 F_Mesure= 1.0
828
829 -----k= 3 -----
830
831 F_Mesure= 1.0
832
833 -----k= 4 -----
834
835 F_Mesure= 1.0
836
837 -----k= 5 -----
838
839 F_Mesure= 0.9090909090909091
840 F_Mesures moyenne = 0.9818181818181818
841
842
843
844 -----Random Forest-----
845
846
847
848 dataset/HAS/taken/HAS_OneSidedSelection.csv
849
850
851
852 count      68
853 unique     2
854 top        True
855 freq       37
856 Name: is_code_smell, dtype: object
857 [[ 8  0]
858 [ 0 13]]
859 the recall for this model is : 1.0
860 TP 13
861 TN 8
862 FP 0
863 FN 0
864
865 -----Classification Report
-----
866          precision    recall   f1-score   support
867
868      False       1.00      1.00      1.00         8
869      True       1.00      1.00      1.00        13
870
```

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```
871     micro avg      1.00      1.00      1.00      21
872     macro avg      1.00      1.00      1.00      21
873 weighted avg      1.00      1.00      1.00      21
874
875 Precision = 1.0
876 Rappel= 1.0
877 F_Mesure= 1.0
878
879 -----Using cross Validation
-----
880
881 -----k= 1 -----
882
883 F_Mesure= 1.0
884
885 -----k= 2 -----
886
887 F_Mesure= 1.0
888
889 -----k= 3 -----
890
891 F_Mesure= 1.0
892
893 -----k= 4 -----
894
895 F_Mesure= 1.0
896
897 -----k= 5 -----
898
899 F_Mesure= 0.8571428571428571
900 F_Mesures moyenne = 0.9714285714285713
901
902
903
904 -----Random Forest-----
905
906
907
908 dataset/HAS/taken/HAS_RandomUnderSampler_default.csv
909
910
911
912 count      74
913 unique     2
914 top        True
```

```
915 freq          37
916 Name: is_code_smell, dtype: object
917 [[10  0]
918 [ 0 13]]
919 the recall for this model is : 1.0
920 TP 13
921 TN 10
922 FP 0
923 FN 0
924
925 -----Classification Report
-----
926              precision    recall   f1-score   support
927
928      False       1.00     1.00      1.00      10
929      True        1.00     1.00      1.00      13
930
931  micro avg     1.00     1.00      1.00      23
932  macro avg     1.00     1.00      1.00      23
933 weighted avg   1.00     1.00      1.00      23
934
935 Precision =  1.0
936 Rappel=  1.0
937 F_Mesure= 1.0
938
939 -----Using cross Validation
-----
940
941 -----k= 1 -----
942
943 F_Mesure= 1.0
944
945 -----k= 2 -----
946
947 F_Mesure= 1.0
948
949 -----k= 3 -----
950
951 F_Mesure= 1.0
952
953 -----k= 4 -----
954
955 F_Mesure= 1.0
956
957 -----k= 5 -----
```

```
958
959 F_Mesure= 1.0
960 F_Mesures moyenne = 1.0
961
962
963
964 -----Random Forest-----
965
966
967
968 dataset/HAS/taken/HAS_TomekLinks.csv
969
970
971
972 count      284
973 unique      2
974 top        False
975 freq       247
976 Name: is_code_smell, dtype: object
977 [[78  0]
978 [ 0  8]]
979 the recall for this model is : 1.0
980 TP 8
981 TN 78
982 FP 0
983 FN 0
984
985 -----Classification Report
-----
986          precision    recall   f1-score   support
987
988      False      1.00      1.00      1.00      78
989      True      1.00      1.00      1.00       8
990
991  micro avg      1.00      1.00      1.00      86
992  macro avg      1.00      1.00      1.00      86
993 weighted avg      1.00      1.00      1.00      86
994
995 Precision = 1.0
996 Rappel= 1.0
997 F_Mesure= 1.0
998
999 -----Using cross Validation
-----
```

File - unknown

```
1001 -----k= 1 -----
1002
1003 F_Mesure= 1.0
1004
1005 -----k= 2 -----
1006
1007 F_Mesure= 1.0
1008
1009 -----k= 3 -----
1010
1011 F_Mesure= 1.0
1012
1013 -----k= 4 -----
1014
1015 F_Mesure= 1.0
1016
1017 -----k= 5 -----
1018
1019 F_Mesure= 0.933333333333333
1020 F_Mesures moyenne = 0.9866666666666667
1021
1022
1023
1024 -----Random Forest-----
1025
1026
1027
1028 dataset/HAS/taken/HAS_CondensedNearestNeighbour.csv
1029
1030
1031
1032 count      45
1033 unique     2
1034 top        True
1035 freq       37
1036 Name: is_code_smell, dtype: object
1037 [[ 2  0]
1038 [ 0 12]]
1039 the recall for this model is : 1.0
1040 TP 12
1041 TN 2
1042 FP 0
1043 FN 0
1044
1045 -----Classification Report
```

```
1045 -----
1046             precision    recall   f1-score   support
1047
1048     False        1.00      1.00      1.00       2
1049     True         1.00      1.00      1.00      12
1050
1051     micro avg     1.00      1.00      1.00      14
1052     macro avg     1.00      1.00      1.00      14
1053 weighted avg     1.00      1.00      1.00      14
1054
1055 Precision = 1.0
1056 Rappel= 1.0
1057 F_Mesure= 1.0
1058
1059 -----Using cross Validation
-----
1060
1061 -----k= 1 -----
1062
1063 F_Mesure= 1.0
1064
1065 -----k= 2 -----
1066
1067
1068 -----k= 3 -----
1069
1070 F_Mesure= 1.0
1071
1072 -----k= 4 -----
1073
1074 F_Mesure= 1.0
1075
1076 -----k= 5 -----
1077
1078 F_Mesure= 1.0
1079 F_Mesures moyenne = 1.0
1080
1081
1082
1083 -----Naive Bayes-----
1084
1085
1086
1087 dataset/HAS/taken/HAS_del.csv
1088
```

```
1089
1090
1091 count      285
1092 unique      2
1093 top        False
1094 freq       248
1095 Name: is_code_smell, dtype: object
1096 [[45 29]
1097 [ 0 12]]
1098 the recall for this model is : 1.0
1099 TP 12
1100 TN 45
1101 FP 29
1102 FN 0
1103
1104 -----Classification Report
-----
1105          precision    recall   f1-score   support
1106
1107      False      1.00     0.61      0.76      74
1108      True      0.29     1.00      0.45      12
1109
1110  micro avg      0.66     0.66      0.66      86
1111  macro avg      0.65     0.80      0.60      86
1112 weighted avg      0.90     0.66      0.71      86
1113
1114 Precision =  0.2926829268292683
1115 Rappel= 1.0
1116 F_Mesure= 0.45283018867924524
1117
1118 -----Using cross Validation
-----
1119
1120 -----k= 1 -----
1121
1122 F_Mesure= 0.7407407407407407
1123
1124 -----k= 2 -----
1125
1126 F_Mesure= 0.23076923076923078
1127
1128 -----k= 3 -----
1129
1130 F_Mesure= 0.5714285714285715
1131
```

```
1132 -----k= 4 -----
1133
1134 F_Mesure= 0.5777777777777777
1135
1136 -----k= 5 -----
1137
1138 F_Mesure= 0.7368421052631579
1139 F_Mesures moyenne = 0.5715116851958958
1140
1141
1142
1143 -----Naive Bayes-----
1144
1145
1146
1147 dataset/HAS/taken/HAS_RandomUnderSampler.csv
1148
1149
1150
1151 count      74
1152 unique     2
1153 top        True
1154 freq       37
1155 Name: is_code_smell, dtype: object
1156 [[ 6  2]
1157 [ 0 15]]
1158 the recall for this model is : 1.0
1159 TP 15
1160 TN 6
1161 FP 2
1162 FN 0
1163
1164 -----Classification Report
-----
1165          precision    recall   f1-score   support
1166
1167      False       1.00      0.75      0.86         8
1168      True        0.88      1.00      0.94        15
1169
1170  micro avg     0.91      0.91      0.91        23
1171  macro avg     0.94      0.88      0.90        23
1172 weighted avg   0.92      0.91      0.91        23
1173
1174 Precision =  0.8823529411764706
1175 Rappel= 1.0
```

```
1176 F_Mesure= 0.9375
1177
1178 -----Using cross Validation
-----
1179
1180 -----k= 1 -----
1181
1182 F_Mesure= 0.9411764705882353
1183
1184 -----k= 2 -----
1185
1186 F_Mesure= 0.9090909090909091
1187
1188 -----k= 3 -----
1189
1190 F_Mesure= 0.9473684210526316
1191
1192 -----k= 4 -----
1193
1194 F_Mesure= 0.625
1195
1196 -----k= 5 -----
1197
1198 F_Mesure= 0.7142857142857143
1199 F_Mesures moyenne = 0.827384303003498
1200
1201
1202
1203 -----Naive Bayes-----
1204
1205
1206
1207 dataset/HAS/taken/HAS_AllKNN.csv
1208
1209
1210
1211 count      275
1212 unique     2
1213 top        False
1214 freq       238
1215 Name: is_code_smell, dtype: object
1216 [[64  9]
1217 [ 0 10]]
1218 the recall for this model is : 1.0
1219 TP 10
```

```
1220 TN 64
1221 FP 9
1222 FN 0
1223
1224 -----Classification Report
-----
1225             precision    recall   f1-score   support
1226
1227     False        1.00      0.88      0.93       73
1228     True         0.53      1.00      0.69       10
1229
1230     micro avg     0.89      0.89      0.89       83
1231     macro avg     0.76      0.94      0.81       83
1232 weighted avg     0.94      0.89      0.90       83
1233
1234 Precision = 0.5263157894736842
1235 Rappel= 1.0
1236 F_Mesure= 0.6896551724137931
1237
1238 -----Using cross Validation
-----
1239
1240 -----k= 1 -----
1241
1242 F_Mesure= 0.6666666666666666
1243
1244 -----k= 2 -----
1245
1246 F_Mesure= 0.782608695652174
1247
1248 -----k= 3 -----
1249
1250 F_Mesure= 0.9
1251
1252 -----k= 4 -----
1253
1254 F_Mesure= 0.6666666666666666
1255
1256 -----k= 5 -----
1257
1258 F_Mesure= 0.7000000000000001
1259 F_Mesures moyenne = 0.7431884057971014
1260
1261
1262
```

```
1263 -----Naive Bayes-----
1264
1265
1266
1267 dataset/HAS/taken/HAS_InstanceHardnessThreshold.csv
1268
1269
1270
1271 count      271
1272 unique      2
1273 top        False
1274 freq       234
1275 Name: is_code_smell, dtype: object
1276 [[64 10]
1277 [ 0  8]]
1278 the recall for this model is : 1.0
1279 TP 8
1280 TN 64
1281 FP 10
1282 FN 0
1283
1284 -----Classification Report
-----
1285          precision    recall   f1-score   support
1286
1287      False      1.00     0.86     0.93      74
1288      True       0.44     1.00     0.62       8
1289
1290  micro avg     0.88     0.88     0.88      82
1291  macro avg     0.72     0.93     0.77      82
1292 weighted avg   0.95     0.88     0.90      82
1293
1294 Precision =  0.4444444444444444
1295 Rappel= 1.0
1296 F_Mesure= 0.6153846153846153
1297
1298 -----Using cross Validation
-----
1299
1300 -----k= 1 -----
1301
1302 F_Mesure= 0.8235294117647058
1303
1304 -----k= 2 -----
1305
```

```
1306 F_Mesure= 0.9
1307
1308 -----k= 3 -----
1309
1310 F_Mesure= 0.5714285714285715
1311
1312 -----k= 4 -----
1313
1314 F_Mesure= 0.625
1315
1316 -----k= 5 -----
1317
1318 F_Mesure= 0.8
1319 F_Mesures moyenne = 0.7439915966386556
1320
1321
1322
1323 -----Naive Bayes-----
1324
1325
1326
1327 dataset/HAS/taken/HAS_NearMiss.csv
1328
1329
1330
1331 count      74
1332 unique     2
1333 top        True
1334 freq       37
1335 Name: is_code_smell, dtype: object
1336 [[ 7  1]
1337 [ 0 15]]
1338 the recall for this model is : 1.0
1339 TP 15
1340 TN 7
1341 FP 1
1342 FN 0
1343
1344 -----Classification Report
-----
```

	precision	recall	f1-score	support
1345				
1346				
1347	False	1.00	0.88	0.93
1348	True	0.94	1.00	0.97
1349				

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```
1350    micro avg      0.96      0.96      0.96      23
1351    macro avg      0.97      0.94      0.95      23
1352    weighted avg   0.96      0.96      0.96      23
1353
1354 Precision = 0.9375
1355 Rappel= 1.0
1356 F_Mesure= 0.967741935483871
1357
1358 -----Using cross Validation
-----
1359
1360 -----k= 1 -----
1361
1362 F_Mesure= 0.8
1363
1364 -----k= 2 -----
1365
1366 F_Mesure= 0.8695652173913044
1367
1368 -----k= 3 -----
1369
1370 F_Mesure= 0.9473684210526316
1371
1372 -----k= 4 -----
1373
1374 F_Mesure= 0.625
1375
1376 -----k= 5 -----
1377
1378 F_Mesure= 0.7692307692307693
1379 F_Mesures moyenne = 0.8022328815349411
1380
1381
1382
1383 -----Naive Bayes-----
1384
1385
1386
1387 dataset/HAS/taken/HAS_OneSidedSelection.csv
1388
1389
1390
1391 count      68
1392 unique     2
1393 top        True
```

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```
1394 freq      37
1395 Name: is_code_smell, dtype: object
1396 [[ 5  3]
1397 [ 0 13]]
1398 the recall for this model is : 1.0
1399 TP 13
1400 TN 5
1401 FP 3
1402 FN 0
1403
1404 -----Classification Report
-----
1405          precision    recall   f1-score   support
1406
1407    False        1.00     0.62      0.77       8
1408    True        0.81     1.00      0.90      13
1409
1410  micro avg     0.86     0.86      0.86      21
1411  macro avg     0.91     0.81      0.83      21
1412 weighted avg   0.88     0.86      0.85      21
1413
1414 Precision =  0.8125
1415 Rappel=  1.0
1416 F_Mesure= 0.896551724137931
1417
1418 -----Using cross Validation
-----
1419
1420 -----k= 1 -----
1421
1422 F_Mesure= 1.0
1423
1424 -----k= 2 -----
1425
1426 F_Mesure= 0.9090909090909091
1427
1428 -----k= 3 -----
1429
1430 F_Mesure= 0.9411764705882353
1431
1432 -----k= 4 -----
1433
1434 F_Mesure= 0.625
1435
1436 -----k= 5 -----
```

```
1437
1438 F_Mesure= 0.5454545454545454
1439 F_Mesures moyenne = 0.8041443850267381
1440
1441
1442
1443 -----Naive Bayes-----
1444
1445
1446
1447 dataset/HAS/taken/HAS_RandomUnderSampler_default.csv
1448
1449
1450
1451 count      74
1452 unique     2
1453 top        True
1454 freq       37
1455 Name: is_code_smell, dtype: object
1456 [[ 5  4]
1457 [ 0 14]]
1458 the recall for this model is : 1.0
1459 TP 14
1460 TN 5
1461 FP 4
1462 FN 0
1463
1464 -----Classification Report
-----
1465          precision    recall   f1-score   support
1466
1467      False      1.00      0.56      0.71       9
1468      True       0.78      1.00      0.88      14
1469
1470  micro avg     0.83      0.83      0.83      23
1471  macro avg     0.89      0.78      0.79      23
1472 weighted avg   0.86      0.83      0.81      23
1473
1474 Precision = 0.7777777777777778
1475 Rappel= 1.0
1476 F_Mesure= 0.8750000000000001
1477
1478 -----Using cross Validation
-----
1479
```

```
1480 -----k= 1 -----
1481
1482 F_Mesure= 1.0
1483
1484 -----k= 2 -----
1485
1486 F_Mesure= 0.8695652173913044
1487
1488 -----k= 3 -----
1489
1490 F_Mesure= 1.0
1491
1492 -----k= 4 -----
1493
1494 F_Mesure= 0.625
1495
1496 -----k= 5 -----
1497
1498 F_Mesure= 0.7142857142857143
1499 F_Mesures moyenne = 0.8417701863354038
1500
1501
1502
1503 -----Naive Bayes-----
1504
1505
1506
1507 dataset/HAS/taken/HAS_TomekLinks.csv
1508
1509
1510
1511 count      284
1512 unique      2
1513 top        False
1514 freq       247
1515 Name: is_code_smell, dtype: object
1516 [[45 28]
1517 [ 0 13]]
1518 the recall for this model is : 1.0
1519 TP 13
1520 TN 45
1521 FP 28
1522 FN 0
1523
1524 -----Classification Report
```

```
1524 -----
1525             precision    recall   f1-score   support
1526
1527     False        1.00      0.62      0.76      73
1528     True         0.32      1.00      0.48      13
1529
1530     micro avg     0.67      0.67      0.67      86
1531     macro avg     0.66      0.81      0.62      86
1532 weighted avg     0.90      0.67      0.72      86
1533
1534 Precision =  0.3170731707317073
1535 Rappel= 1.0
1536 F_Mesure= 0.48148148148148145
1537
1538 -----Using cross Validation
-----
1539
1540 -----k= 1 -----
1541
1542 F_Mesure= 0.4666666666666667
1543
1544 -----k= 2 -----
1545
1546 F_Mesure= 0.4444444444444445
1547
1548 -----k= 3 -----
1549
1550 F_Mesure= 0.7777777777777778
1551
1552 -----k= 4 -----
1553
1554 F_Mesure= 0.5263157894736842
1555
1556 -----k= 5 -----
1557
1558 F_Mesure= 0.7000000000000001
1559 F_Mesures moyenne = 0.5830409356725147
1560
1561
1562
1563 -----Naive Bayes-----
1564
1565
1566
1567 dataset/HAS/taken/HAS_CondensedNearestNeighbour.csv
```

```
1568
1569
1570
1571 count      45
1572 unique     2
1573 top        True
1574 freq       37
1575 Name: is_code_smell, dtype: object
1576 [[ 4  0]
1577 [ 0 10]]
1578 the recall for this model is : 1.0
1579 TP 10
1580 TN 4
1581 FP 0
1582 FN 0
1583
1584 -----Classification Report
-----
1585             precision    recall   f1-score   support
1586
1587      False       1.00     1.00      1.00       4
1588      True        1.00     1.00      1.00      10
1589
1590  micro avg     1.00     1.00      1.00      14
1591  macro avg     1.00     1.00      1.00      14
1592 weighted avg  1.00     1.00      1.00      14
1593
1594 Precision =  1.0
1595 Rappel= 1.0
1596 F_Mesure= 1.0
1597
1598 -----Using cross Validation
-----
1599
1600 -----k= 1 -----
1601
1602 F_Mesure= 0.9333333333333333
1603
1604 -----k= 2 -----
1605
1606
1607 -----k= 3 -----
1608
1609 F_Mesure= 1.0
1610
```

```
1611 -----k= 4 -----
1612
1613 F_Mesure= 1.0
1614
1615 -----k= 5 -----
1616
1617 F_Mesure= 0.9333333333333333
1618 F_Mesures moyenne = 0.9666666666666668
1619
1620
1621
1622 -----SVM-----
1623
1624
1625
1626 dataset/HAS/taken/HAS_del.csv
1627
1628
1629
1630 count 285
1631 unique 2
1632 top False
1633 freq 248
1634 Name: is_code_smell, dtype: object
1635 [[74 2]
1636 [ 2 8]]
1637 the recall for this model is : 0.8
1638 TP 8
1639 TN 74
1640 FP 2
1641 FN 2
1642
1643 -----Classification Report
-----
1644 precision recall f1-score support
1645
1646 False 0.97 0.97 0.97 76
1647 True 0.80 0.80 0.80 10
1648
1649 micro avg 0.95 0.95 0.95 86
1650 macro avg 0.89 0.89 0.89 86
1651 weighted avg 0.95 0.95 0.95 86
1652
1653 Precision = 0.8
1654 Rappel= 0.8
```

```
1655 F_Mesure= 0.8000000000000002
1656
1657 -----Using cross Validation
-----
1658
1659 -----k= 1 -----
1660
1661 F_Mesure= 0.9523809523809523
1662
1663 -----k= 2 -----
1664
1665 F_Mesure= 0.8571428571428571
1666
1667 -----k= 3 -----
1668
1669 F_Mesure= 0.7272727272727273
1670
1671 -----k= 4 -----
1672
1673 F_Mesure= 0.8181818181818181
1674
1675 -----k= 5 -----
1676
1677 F_Mesure= 0.9333333333333333
1678 F_Mesures moyenne = 0.8576623376623378
1679
1680
1681
1682 -----SVM-----
1683
1684
1685
1686 dataset/HAS/taken/HAS_RandomUnderSampler.csv
1687
1688
1689
1690 count      74
1691 unique     2
1692 top        True
1693 freq       37
1694 Name: is_code_smell, dtype: object
1695 [[10  0]
1696 [ 0 13]]
1697 the recall for this model is : 1.0
1698 TP 13
```

```
1699 TN 10
1700 FP 0
1701 FN 0
1702
1703 -----Classification Report
-----
1704             precision    recall   f1-score   support
1705
1706     False        1.00      1.00      1.00       10
1707     True         1.00      1.00      1.00       13
1708
1709     micro avg     1.00      1.00      1.00       23
1710     macro avg     1.00      1.00      1.00       23
1711 weighted avg     1.00      1.00      1.00       23
1712
1713 Precision = 1.0
1714 Rappel= 1.0
1715 F_Mesure= 1.0
1716
1717 -----Using cross Validation
-----
1718
1719 -----k= 1 -----
1720
1721 F_Mesure= 1.0
1722
1723 -----k= 2 -----
1724
1725 F_Mesure= 1.0
1726
1727 -----k= 3 -----
1728
1729 F_Mesure= 1.0
1730
1731 -----k= 4 -----
1732
1733 F_Mesure= 1.0
1734
1735 -----k= 5 -----
1736
1737 F_Mesure= 1.0
1738 F_Mesures moyenne = 1.0
1739
1740
1741
```

```
1742 -----SVM-----
1743
1744
1745
1746 dataset/HAS/taken/HAS_AllKNN.csv
1747
1748
1749
1750 count      275
1751 unique      2
1752 top        False
1753 freq       238
1754 Name: is_code_smell, dtype: object
1755 [[70  1]
1756 [ 0 12]]
1757 the recall for this model is : 1.0
1758 TP 12
1759 TN 70
1760 FP 1
1761 FN 0
1762
1763 -----Classification Report
-----
1764          precision    recall   f1-score   support
1765
1766      False      1.00      0.99      0.99      71
1767      True       0.92      1.00      0.96      12
1768
1769  micro avg     0.99      0.99      0.99      83
1770  macro avg     0.96      0.99      0.98      83
1771 weighted avg   0.99      0.99      0.99      83
1772
1773 Precision =  0.9230769230769231
1774 Rappel= 1.0
1775 F_Mesure= 0.9600000000000001
1776
1777 -----Using cross Validation
-----
1778
1779 -----k= 1 -----
1780
1781 F_Mesure= 0.833333333333334
1782
1783 -----k= 2 -----
1784
```

```
1785 F_Mesure= 0.9411764705882353
1786
1787 -----k= 3 -----
1788
1789 F_Mesure= 0.9411764705882353
1790
1791 -----k= 4 -----
1792
1793 F_Mesure= 0.923076923076923
1794
1795 -----k= 5 -----
1796
1797 F_Mesure= 1.0
1798 F_Mesures moyenne = 0.9277526395173453
1799
1800
1801
1802 -----SVM-----
1803
1804
1805
1806 dataset/HAS/taken/HAS_InstanceIdHardnessThreshold.csv
1807
1808
1809
1810 count      271
1811 unique     2
1812 top        False
1813 freq       234
1814 Name: is_code_smell, dtype: object
1815 [[72  0]
1816 [ 0 10]]
1817 the recall for this model is : 1.0
1818 TP 10
1819 TN 72
1820 FP 0
1821 FN 0
1822
1823 -----Classification Report
-----
```

	precision	recall	f1-score	support
1824				
1825				
1826	False	1.00	1.00	72
1827	True	1.00	1.00	10
1828				

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```
1829    micro avg      1.00      1.00      1.00      82
1830    macro avg      1.00      1.00      1.00      82
1831    weighted avg   1.00      1.00      1.00      82
1832
1833 Precision = 1.0
1834 Rappel= 1.0
1835 F_Mesure= 1.0
1836
1837 -----Using cross Validation
-----
1838
1839 -----k= 1 -----
1840
1841 F_Mesure= 0.7692307692307692
1842
1843 -----k= 2 -----
1844
1845 F_Mesure= 1.0
1846
1847 -----k= 3 -----
1848
1849 F_Mesure= 1.0
1850
1851 -----k= 4 -----
1852
1853 F_Mesure= 1.0
1854
1855 -----k= 5 -----
1856
1857 F_Mesure= 0.9565217391304348
1858 F_Mesures moyenne = 0.9451505016722408
1859
1860
1861
1862 -----SVM-----
1863
1864
1865
1866 dataset/HAS/taken/HAS_NearMiss.csv
1867
1868
1869
1870 count      74
1871 unique     2
1872 top        True
```

```
1873 freq      37
1874 Name: is_code_smell, dtype: object
1875 [[ 6  5]
1876 [ 1 11]]
1877 the recall for this model is : 0.9166666666666666
1878 TP 11
1879 TN 6
1880 FP 5
1881 FN 1
1882
1883 -----Classification Report
-----
1884          precision    recall   f1-score   support
1885
1886      False       0.86      0.55      0.67      11
1887      True        0.69      0.92      0.79      12
1888
1889  micro avg     0.74      0.74      0.74      23
1890  macro avg     0.77      0.73      0.73      23
1891 weighted avg   0.77      0.74      0.73      23
1892
1893 Precision = 0.6875
1894 Rappel= 0.9166666666666666
1895 F_Mesure= 0.7857142857142857
1896
1897 -----Using cross Validation
-----
1898
1899 -----k= 1 -----
1900
1901 F_Mesure= 0.875
1902
1903 -----k= 2 -----
1904
1905 F_Mesure= 0.888888888888889
1906
1907 -----k= 3 -----
1908
1909 F_Mesure= 0.8421052631578948
1910
1911 -----k= 4 -----
1912
1913 F_Mesure= 0.7499999999999999
1914
1915 -----k= 5 -----
```

```
1916
1917 F_Mesure= 0.6666666666666666
1918 F_Mesures moyenne = 0.80453216374269
1919
1920
1921
1922 -----SVM-----
1923
1924
1925
1926 dataset/HAS/taken/HAS_OneSidedSelection.csv
1927
1928
1929
1930 count      68
1931 unique     2
1932 top        True
1933 freq       37
1934 Name: is_code_smell, dtype: object
1935 [[8 2]
1936 [3 8]]
1937 the recall for this model is : 0.7272727272727273
1938 TP 8
1939 TN 8
1940 FP 2
1941 FN 3
1942
1943 -----Classification Report
-----
1944          precision    recall   f1-score   support
1945
1946      False      0.73      0.80      0.76      10
1947      True       0.80      0.73      0.76      11
1948
1949  micro avg     0.76      0.76      0.76      21
1950  macro avg     0.76      0.76      0.76      21
1951 weighted avg   0.77      0.76      0.76      21
1952
1953 Precision = 0.8
1954 Rappel= 0.7272727272727273
1955 F_Mesure= 0.761904761904762
1956
1957 -----Using cross Validation
-----
1958
```

File - unknown

```
1959 -----k= 1 -----
1960
1961 F_Mesure= 0.9090909090909091
1962
1963 -----k= 2 -----
1964
1965 F_Mesure= 0.8421052631578948
1966
1967 -----k= 3 -----
1968
1969 F_Mesure= 1.0
1970
1971 -----k= 4 -----
1972
1973 F_Mesure= 0.6666666666666666
1974
1975 -----k= 5 -----
1976
1977 F_Mesure= 0.8
1978 F_Mesures moyenne = 0.8435725677830941
1979
1980
1981
1982 -----SVM-----
1983
1984
1985
1986 dataset/HAS/taken/HAS_RandomUnderSampler_default.csv
1987
1988
1989
1990 count      74
1991 unique     2
1992 top        True
1993 freq       37
1994 Name: is_code_smell, dtype: object
1995 [[15  0]
1996 [ 0  8]]
1997 the recall for this model is : 1.0
1998 TP 8
1999 TN 15
2000 FP 0
2001 FN 0
2002
2003 -----Classification Report
```

File - unknown

```
2003 -----
2004             precision      recall   f1-score   support
2005
2006     False       1.00       1.00       1.00       15
2007     True        1.00       1.00       1.00        8
2008
2009     micro avg    1.00       1.00       1.00      23
2010     macro avg    1.00       1.00       1.00      23
2011 weighted avg   1.00       1.00       1.00      23
2012
2013 Precision =  1.0
2014 Rappel= 1.0
2015 F_Mesure= 1.0
2016
2017 -----Using cross Validation
-----
2018
2019 -----k= 1 -----
2020
2021 F_Mesure= 1.0
2022
2023 -----k= 2 -----
2024
2025 F_Mesure= 1.0
2026
2027 -----k= 3 -----
2028
2029 F_Mesure= 1.0
2030
2031 -----k= 4 -----
2032
2033 F_Mesure= 1.0
2034
2035 -----k= 5 -----
2036
2037 F_Mesure= 1.0
2038 F_Mesures moyenne = 1.0
2039
2040
2041
2042 -----SVM-----
2043
2044
2045
2046 dataset/HAS/taken/HAS_TomekLinks.csv
```

```
2047
2048
2049
2050 count      284
2051 unique      2
2052 top        False
2053 freq       247
2054 Name: is_code_smell, dtype: object
2055 [[70  0]
2056 [ 6 10]]
2057 the recall for this model is : 0.625
2058 TP 10
2059 TN 70
2060 FP 0
2061 FN 6
2062
2063 -----Classification Report
-----
2064             precision    recall   f1-score   support
2065
2066      False       0.92      1.00      0.96      70
2067      True        1.00      0.62      0.77      16
2068
2069      micro avg     0.93      0.93      0.93      86
2070      macro avg     0.96      0.81      0.86      86
2071 weighted avg     0.94      0.93      0.92      86
2072
2073 Precision = 1.0
2074 Rappel= 0.625
2075 F_Mesure= 0.7692307692307693
2076
2077 -----Using cross Validation
-----
2078
2079 -----k= 1 -----
2080
2081 F_Mesure= 0.8571428571428571
2082
2083 -----k= 2 -----
2084
2085 F_Mesure= 0.9090909090909091
2086
2087 -----k= 3 -----
2088
2089 F_Mesure= 0.8750000000000001
```

```
2090
2091 -----k= 4 -----
2092
2093 F_Mesure= 0.7777777777777777
2094
2095 -----k= 5 -----
2096
2097 F_Mesure= 0.8750000000000001
2098 F_Mesures moyenne = 0.8588023088023089
2099
2100
2101
2102 -----SVM-----
2103
2104
2105
2106 dataset/HAS/taken/HAS_CondensedNearestNeighbour.csv
2107
2108
2109
2110 count      45
2111 unique     2
2112 top        True
2113 freq       37
2114 Name: is_code_smell, dtype: object
2115 [[ 0  4]
2116 [ 0 10]]
2117 the recall for this model is : 1.0
2118 TP 10
2119 TN 0
2120 FP 4
2121 FN 0
2122
2123 -----Classification Report
-----
2124 C:\Users\My PC\AppData\Local\Programs\Python\Python36-32
    \lib\site-packages\sklearn\metrics\classification.py:
1143: UndefinedMetricWarning: Precision and F-score are
    ill-defined and being set to 0.0 in labels with no
    predicted samples.
2125 'precision', 'predicted', average, warn_for)
2126             precision    recall   f1-score   support
2127
2128     False      0.00      0.00      0.00         4
2129     True       0.71      1.00      0.83        10
```

```
2130
2131     micro avg      0.71      0.71      0.71      14
2132     macro avg      0.36      0.50      0.42      14
2133 weighted avg      0.51      0.71      0.60      14
2134
2135 Precision = 0.7142857142857143
2136 Rappel= 1.0
2137 F_Mesure= 0.8333333333333333
2138
2139 -----Using cross Validation
-----
2140
2141 -----k= 1 -----
2142
2143 F_Mesure= 0.8750000000000001
2144
2145 -----k= 2 -----
2146
2147
2148 -----k= 3 -----
2149
2150 F_Mesure= 0.9411764705882353
2151
2152 -----k= 4 -----
2153
2154 F_Mesure= 0.8
2155
2156 -----k= 5 -----
2157
2158 F_Mesure= 0.8750000000000001
2159 F_Mesures moyenne = 0.8727941176470588
2160
2161 Process finished with exit code 0
2162
```