

Algorithm 2: Algorithm for an automatic predicting student at-risk with ML application

Algorithm for predicting student at-risk.

1. Construct **dimensional vector V** using Algorithm 1
2. Verify **dimensional vector V** using Algorithm 1
3. Convert categorical variable of **dimensional vector V**
4. $V_k["final_total"] \leftarrow \text{if } (1:\text{Pass} ; 0:\text{Fail})$
5. Visual inspection of **dimensional vector V** to select attributes
6. Apply 5 ML classification algorithms
7. classifier [] = { "J48 ", "Random Forest", "decision stump", "OneR", "NBTree" }
8. Compare performance metrics PM_{1-5}
9. $k=10$
10. $i=1$
11. **for** each classifier:cl **do**
12. $PM[i] \leftarrow (1/k) \times (\text{sum of performance metric of cl for k randomly subset of V})$
13. $PME[i] \leftarrow (1/k) \times (\text{sum of performance metric of boosting method with base classifier cl for k randomly subset of V})$
14. $i++$
15. **endfor**
16. **for** j: 1..5 **do**
17. **if** $PM[j] > PM[j+1]$ **then**
18. $\text{selectedclassifier1} \leftarrow j$
19. **elseif** $PM[j] < PM[j+1]$ **then**
20. $\text{selectedclassifier1} \leftarrow j+1$
21. **endif**
22. **if** $PME[j] > PME[j+1]$ **then**
23. $\text{selectedclassifier2} \leftarrow j$
24. **elseif** $PME[j] < PME[j+1]$ **then**
25. $\text{selectedclassifier2} \leftarrow j+1$
26. **endif**
27. **endfor**
28. **if** $PM[\text{selectedclassifier1}] > PM[\text{selectedclassifier2}]$ **then**
29. $\text{selectedclassifier} \leftarrow \text{classifier} [\text{selectedclassifier1}]$
30. **elseif** $PM[\text{selectedclassifier1}] < PM[\text{selectedclassifier2}]$ **then**
31. $\text{selectedclassifier} \leftarrow \text{classifier} [\text{selectedclassifier2}]$
32. **endif**
33. $\text{studentatrisk}[] \leftarrow \text{predicting students' performance with } \textit{selectedclassifier}$
34. **for** each $\text{studentatrisk}[]$ **do**
35. offer interventions and support
36. **Endfor**