**Table 1.6.** Summary of the research of multi-class classification methods

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| **Author(s)** | **Methods** | **Approx. accuracy/accuraccy score** | **Comments** |
| Mehenaoui et al. (2022) | • Logistic Regression (LR) ; • Linear Discriminant Analysis (LDA); • K-Nearest Neighbors (KNN); • Classification and Regression Trees (CART); • Gaussian Naive Bayes (NB) ; • Support Vector Machines (SVM). | 0.4-0.96; |  |
| Maaliw et al. (2017) | • Neural network using back propagation network (BP); • Bayesian network (BN); • PART; | • 0.85; • 0.83; • 0.89; |  |
| Gomede et al. (2020) | • Multi Layer Perceptron (MLP); | • 0.75-0.80; |  |
| Yunia et al. (2020) | • Decision tree (DT); • Bayesian network(BN); • K-Nearest Neighbors (KNN); | • 0.96-0.98; • 0.96-0.97; • 0.86-0.97; |  |
| Gambo et al. (2021) | • artificial neural network (ANN); | • 0.78-0.94; |  |
| Bernard et al. (2017) | • Artificial neural network (ANN); • Genetic algorithm (GA); • Ant colony system (ACS); • Particle swarm optimization (PSO); | • 0.807; • 0.790; • 0.788; • 0.791; |  |
| Zhang et al. (2020) | • Deep belief network (DBNLS); • Neural network using back propagation network (BP); | • 0.79-0.89; • 0.65-0.83; | When compared to the traditional classification methods, DBNLS achieves good accuracy and performance. |
| Ikawati et al. (2021) | • Decision tree (DT); • Gradient boosted tree (GBT); • Ensamble tree (Ensemble Tree Bagging) | • 0.843; • 0.898; • 0.900; |  |
| Bernardet al. (2015) | • LSID-ANN; • DeLeS; • NB Tree; • Bayesian network(BN); | • 0.80; • 0.75; • 0.55-0.70; • 0.80; |  |
| Kolekar et al. (2017) | • Gravitational Search based Back Propagation Neural Network (GSBPNN); • Back Propagation Neural Network (BPNN) ; | • 0.87-0.95; • 0.75-0.78; | GSBPNN algorithm predicts learning styles of the learner in real-time. It is a modification of basic Back Propagation Neural Network (BPNN) algorithm and it cal-culates the weights using Gravitation Search Algorithm (GSA). |
| Krishnamoorthy et al. (2020) | • Logistic Regression; • Gausian Naïve Bayes; • K-Nearest Neighbors (KNN); • Support Vector Machines (SVM); • Decision tree (DT); • Random Forest (RF); • Gradient Boost (GB); • XG Boost (XGB); • Light GBM (LGB); • Extra trees Classifier (ETC); • Voting Classifier; • Back Propagation Neural Network (BPNN) ; | • 0.63; • 0.55; • 0.64; • 0.65; • 0.60; • 0.70; • 0.69; • 0.69; • 0.69; • 0.69; • 0.7; • 0.62 ; |  |
| Rasheed et al. (2021) | • Support Vector Machine (SVM); • Decision tree(DT); • Logistic Regression; • Random forest (RF); • K-nearest neighbors (K-NN); • Linear Discriminant Analysis (LDA); • Bayesian network (BN); | • 0.76; • 0.46; • 0.73; • 0.73; • 0.68; • 0.69; • 0.71; |  |
| Altamimi et al. (2022) | • Support Vector Machine (SVM); • Multi-Layers Perceptron Neural Network (NN);  • Random Forest (RF); • Decision Tree (DT); • K-Nearest Neighbors; | • 0.31-0.49; • 0.28-0.42; • 0.27-0.54; • 0.25-0.45; • 0.28-0.45; | VARK model was used. |
| Feldman et al. (2014) | • Decision tree(DT); • Fuzzy Decision tree (FDT); • Bayesian network (BN); • Fuzzy neural network (FNN); • Case based reasoning (CBR); • Genetic algoritms (GA); • NN abd self-organized maps (NNM); | • 0.77-0.94; • 0.86-0.88**;** • 0.66-0.82; • 0.94; • -; • 0.80-0.84; • 0.16(2 dimensions; 0.66(3 dimensions); |  |
| Obeng et al. (2023) | • Bayesian network (BN); • J48; • OneR; • Sequential minimal optimization (SMO); (SMO); | • 0.67; • 0.76; • 0.79; • 0.69; | VAR model used. |
| Nazempour et al. (2023) | • Light Gradient Boosting Machine; • Random Forest Classifier; • Extra Trees Classifier; • Gradient Boosting Classifier; • Ada Boost Classifier; • K Neighbors Classifier; • Logistic Regression; • Linear Discriminant Analysis; • Quadratic Discriminant Analysis; • Naive Bayes; • Decision Tree Classifier; • SVM- Linear Kernel; • Ridge Classifier; | • 0.83; • 0.83; • 0.83; • 0.82; • 0.80; • 0.79; • 0.77; • 0.77; • 0.68; • 0.69; • 0.75; • 0.76; • 0.77; | The anonymised Open University Learning Analytics Dataset (OULAD) :  https://alyse.kmi.open.ac.uk/open\_dataset. Finds the learning style features that maximize the probability of satisfactory grades in each quarter. It is a binary classification problem in which the classes are satisfactory or not satisfactory (S/NS) assessment grades that students achieved. |
| Fidelia et al. (2022) | • Logistic Regression (LR) ; • Recurrent neural network (RNN); • Bayesian network (BN); • Random forest (RF); • K-nearest neighbors (K-NN); • SVM; • Decision tree(DT); | 0.83-0.98 |  |
| Hmedna et al. (2020) | • Decision tree(DT); | 0.98 |  |
| Rashid et al. (2023) | - | - | Attributes by learning style dimension provided. |
| Ngatirin et al. (2021) | • Bayesian network (BN); • Decision tree (DT); • Neural network (FNN); • Fuzzy logic; | • 0.30-0.93; • 0.51-0.91; • 0.16-0.98; • 0.45-0.96; | Literature review with experiments. |
| Hasibuan et al. (2022) | • Bayesian network, j48, naive Bayes; • Artificial Neural Network, Genetic Algorithm (GA), Ant Colony System (ACS), Particle Swarm Optimization (PSO); • Gravitational Search based Back Propagation Neural Network (GSBPNN); • Reinforcement Learning techniques based on cognitive skills; • clustering method; • Fuzzy C Means clustering method; • Detection of learning styles by using; |  | Literature review for 2015-2021. |
| Saadia et al. (2023) | • Decision tree (DT); • Bayesian network(BN); • Support Vector Machines (SVM); • Decision tree(DT); • K-Means; • Logistic Regression (LR) ; |  | No experimentation - literature review. |

Note. The accuracy scores of the authors' predictions is presented with the values form an interval in cases when several databases were experimented with or when different accuracy scores were obtained according to different learning style dimensions - in such cases, the range between the minimum and maximum values achieved is provided.