Machine Learning Project Essay

This essay will discuss the algorithms and the two datasets that were used in the project. The first being the Adult dataset (Kohavi and Becker, 2018). The second being the Ionosphere dataset (Sigillito, 2018). Both of the datasets are used to train and test machine learning algorithms that are used for binary classification as both of these datasets are about sorting data into two categories. The Adult dataset has <=50K or >50K and the Ionosphere dataset has g(ood) or b(ad). The machine learning model that was used was a voting ensemble made up of three different algorithms. The first algorithm is Naïve Bayes, the second is Sequential Minimal Optimization and the final one is Multilayer Perceptron.

The reason that these algorithms were chosen, was that after research and talking to lecturers about binary classification algorithms and the ones available on WEKA these three were the top recommended ones. As well as this each of the algorithms have different strengths and weaknesses as well as having different levels of complexity. Naïve Bayes is the simplest of the three algorithms however it is good at classification with a small amount of training data which was especially good for the ionosphere dataset as it doesn't have that much data, however due to its relative simplicity the Naïve Bayes is not as accurate as the algorithms. The second algorithm, Sequential Minimal Optimization is the most complex out of the three algorithms and as a result is the most accurate of the three algorithms, however it has a severe disadvantage which is that it takes a lot longer to process the data given to it, sometimes taking as long as 15 minutes to run on a test set. Finally, there is Multilayer Perceptron. Multilayer Perceptron is the second most complex of the algorithms and its main advantage is that it is very good at working with complex and random datasets in order to get the correct result this was especially good for both of the datasets chosen as they're both complex datasets as each has 10+ instances. Now these three algorithms were put into a voting ensemble. They were combined as each of them had different advantages which worked well with the chosen datasets. As a result, when they were combined together and trained on the datasets they did very well together as can be seen in Appendix 4, for the adult dataset the ensemble managed to get a respectable 84.4595% accuracy on the Adult dataset and a very respectable 88.889% accuracy on the lonosphere dataset.

The best way to discuss the model architecture is to split it up into the 3 different algorithms that make up the model, discuss them individually and then talk about the voting ensemble model as a whole. The algorithms themselves were each trained about 15 times, after they were trained each algorithm went through experiments each of which was designed to change one parameter and leave the other ones alone. Once each algorithm had each of its individual parameters changed, each setting of each parameter which did the best job was put in and tested. One problem presented doing this technique was that even though some of the parameters when changed in isolation had a positive effect when they were combined it caused problems, this can be best seen with the Multilayer Perceptron in Appendix 3. Overall this technique was successful at improving the algorithms individually as well as when they were part of the ensemble.

For the Naïve Bayes algorithm there were not that many parameters that were changeable. As can be seen in Appendix 1 the ones that were changeable were put into an excel spreadsheet and changed incrementally. The parameters that were the ones that made a difference to the F measure average and the correctly identified instances were the kernel estimator and the supervised discretisation. However, the supervised discretisation made a negative impact on both the F

measure and the correctly identified instances. So ultimately the only parameter that was changed from the default Naïve Bayes was making the kernel estimator true.

For the Sequential Minimal Optimization algorithm, it was the opposite of the Naïve Bayes as it had so many different parameters that could be changed and had sub algorithms that had parameters that could also be altered. The only problem was that the Sequential Minimal Optimization algorithm took 15+ minutes to run on my machine and as a result none of the sub-algorithms were changed. So the only tested parameter that changed the F measure and the correctly identified instances was the C value as can be seen in Appendix 2.

For the Multilayer Perceptron there were a lot of different parameters that could be changed and the good thing was it took a fraction of the time of the Sequential Minimal Optimization algorithm which meant all of the different parameters could be experimented with. So the parameters which had an effect on the F measure and the correctly identified instances are: hidden layers; learning rates; momentum; nominal to binary filter; normalise attributes and the seed. However the learning rates, momentum, nominal to binary filter and normalise attributes parameters all had negative impacts on the F measure and the correctly identified instances. The hidden layers and the seed were the only parameters which had a positive impact on the F measure and the correctly identified instances, as can be seen in Appendix 3.

For the voting ensemble algorithm there was only two things that could reasonably be changed and that was the combination rule and the seed. However, both of them only caused a negative impact on the F measure and the correctly identified instances so they were left to their defaults.

The data preparation will be broken down per each dataset. The first one to be discussed is the Adult dataset. The first thing that was done was to download the dataset, which was in the .data format which WEKA would not use, and even WEKA's built in converter wouldn't convert the dataset to the .arff format, so the dataset was copied into excel and all of the attributes and their different values were added to the top of the file and the data was identified as having missing values. It was then saved into the .csv format and then converted into a .arff file. Now that the dataset was in a WEKA readable file it underwent pre-processing. Using an algorithm, the missing data was replaced using the mean and modes from each attribute. The data was then normalised to aid with binary classification. Now that the dataset had underwent pre-processing the final step was to split the dataset into a training, test and validation subsections. This was done using the Resample function built into WEKA. The dataset was split into 80%/10%/10% with 80% being used for the training, and 10% going to both the test and validation subsections respectively, as well as splitting the dataset like this it was also important to make sure that none of the data was duplicated in the datasets as this would lead to false readings, so one of the options of the Resample method allows for it to be specified that none of the data is duplicated among the subsections. The second dataset to be discussed is the Ionosphere dataset. WEKA already had the Ionosphere dataset within it's example datasets. As a result it was already in the .arff format which meant there was no need to do anything to the file format. As well as this the ionosphere dataset doesn't have any missing data which means that during pre-processing it wasn't required to fill in the missing data like it was in the Adult dataset. However just like the Adult dataset an algorithm, the data was then normalised to aid with binary classification. Now that the dataset had finished pre-processing the final step was to split the dataset into a training, test and validation subsections. This was done using the Resample function built into WEKA just as it was with the Adult dataset. The dataset was split into 80%/10%/10% with 80% being used for the training, and 10% going to both the test and validation subsections respectively, as well as splitting the dataset like this it was also important to make sure that none of the data was duplicated in the datasets as this would lead to false readings, so one of the options of

the Resample method allows for it to be specified that none of the data is duplicated among the subsections. With the datasets now ready for use by algorithms the three that were chosen were Naïve Bayes, Sequential Minimal Optimization and Multilayer Perceptron. Each one of these algorithms had the training sets ran at least 15 times on it. After this each algorithm was then ran through a series of optimization experiments as was discussed above. Due to the fact that both datasets were binary classification tasks the need for the parameters or the algorithms themselves to be changed for each dataset was not there as the same parameters and algorithms work best for binary classification tasks, this is part of the reason why all of the experiments were done with the Adult dataset, the other part of the reason is so that there was an accurate comparison between the algorithms as they were running under the same amount of training and were running the same training and test sets.

In conclusion the voting ensemble with Naïve Bayes, Sequential Minimal Optimization and Multilayer Perceptron was a good machine learning model to use for both of these datasets as they are binary classification datasets, and those algorithms are designed for use on binary classification problems. The experimental procedure was also the best way to do this as standardising the algorithms to 15 training runs followed by them being run on the test datasets for the experiments allowed for them to be easily compared to one another.

References

Kohavi, R. and Becker, B. (2018). UCI Machine Learning Repository: Adult Data Set. [online] Archive.ics.uci.edu. Available at: http://archive.ics.uci.edu/ml/datasets/adult [Accessed 29 Apr. 2018].

Sigillito, V. (2018). UCI Machine Learning Repository: Ionosphere Data Set. [online] Archive.ics.uci.edu. Available at: https://archive.ics.uci.edu/ml/datasets/ionosphere [Accessed 1 May 2018].

Algorithm	Batch Size	Number of Decimal Places	Kernal Estimator (True/False)	Supervised Discretisation (True/False)	F Measure average	Correctly Identified Instances (%)	
laïveBayes	10	1	FALSE	FALSE	0.826	83.4203	
aïveBayes		1	FALSE	FALSE	0.826	83.4203	
laïveBaves	30	1	FALSE	FALSE	0.826	83.4203	
laïveBayes	40	1	FALSE	FALSE	0.826	83.4203	
laïveBayes	50	1	FALSE	FALSE	0.826	83.4203	
laïveBayes	60	1	FALSE	FALSE	0.826	83.4203	
laïveBayes	70	1	FALSE	FALSE	0.826	83.4203	
laïveBayes	80	1	FALSE	FALSE	0.826	83.4203	
laïveBayes	90	1	FALSE	FALSE	0.826	83.4203	
laïveBayes		1	FALSE	FALSE	0.826	83.4203	
NaïveBa	ayes Nur	nber of Decimal P	aces Experiments				
Algorithm	Batch Size	Number of Decimal Places	Kernal Estimator (True/False)	Supervised Discretisation (True/False)	F Measure average	Correctly Identified Instances (%	
laïveBayes	100	1	FALSE	FALSE	0.826	83.4203	
laïveBayes	100	2	FALSE	FALSE	0.826	83.4203	
laïveBayes	100	3	FALSE	FALSE	0.826	83.4203	
laïveBayes	100	4	FALSE	FALSE	0.826	83.4203	
laïveBayes	100	5	FALSE	FALSE	0.826	83.4203	
laïveBayes	100	6	FALSE	FALSE	0.826	83.4203	
laïveBayes	100	7	FALSE	FALSE	0.826	83.4203	
laïveBayes	100	8	FALSE	FALSE	0.826	83.4203	
laïveBayes	100	9	FALSE	FALSE	0.826	83.4203	
laïveBayes	100	10	FALSE	FALSE	0.826	83.4203	
NaïveBa	ayes Ker	nal Estimator Exp	eriments				
Algorithm	Datch Size	Number of Decimal Diseas	Vornal Estimator/Truo/Ealco	Supervised Discretisation (True/False)	F Measure average	Correctly Identified Instances (%	
_	100		FALSE	FALSE	0.826	83.4203	
NaïveBayes NaïveBayes	100	2 2	TRUE	FALSE	0.856	86.0608	
			ation Experiments	Tribote	5.550	80.0000	
Algorithm	Batch Size	Number of Decimal Places	Kernal Estimator (True/False)	Supervised Discretisation (True/False)	F Measure average	Correctly Identified Instances (%	
NaïveBayes		1	FALSE	TRUE	0.846	84.0958	
NaïveBa	aves Nur	mber of Decimal P	aces with Kernal Es	imator = TRUE, Experimer	nts		
Algorithm	Batch Size			Supervised Discretisation (True/False)	F Measure average	Correctly Identified Instances (%	
laïveBayes	100	2	TRUE	FALSE	ALSE 0.845 85.04		
laïveBayes	100	3	TRUE	FALSE	0.845	85.043	
laïveBayes	100	4	TRUE	FALSE	0.845	85.043	
laïveBayes	100	5	TRUE	FALSE	0.845	85.043	
laïveBayes	100	6	TRUE	FALSE	0.845	85.043	
laïveBayes	100	7	TRUE	FALSE	0.845	85.043	
laïveBayes	100	8	TRUE	FALSE	0.845	85.043	
NaïveBayes	100	9	TRUE	FALSE	0.845	85.043	
	eBayes 100 10 TRUE		FALSE	0.845	85.043		

SMO Batch Si	ze Experi	ments							
Algorithm	Batch Size	C	Calibrator	Filer Type	Kernel	Number of Decimal Places	Seed	F Measure average	Correctly Identified Instances (%)
SMO	10	1	weks.classifiers.functions.Logistic -R 1.0E-8 -M -1 -num-decimal-places 4	None	weka.classifiers.functions.supportVector.PolyKernel-E 1.0 -C 250007	1	1	0.843	85.0097
SMO	20	1	weka.classifiers.functions.Logistic -R 1.0E-8 -M -1 -num-decimal-places 4	None	weka.classifiers.functions.supportVector.PolyKernel-E1.0-C250007	1	1	0.843	85.0097
SMO	30	1	weks classifiers functions Logistic -R 1.0E-8 -M -1 -num-decimal-places 4	None	weka.classifiers.functions.supportVector.PolyKernel-E 1.0 -C 250007	1	1	0.843	85.0097
SMO	40	1	weka.classifiers.functions.Logistic -R 1.0E-8 -M -1 -num-decimal-places 4	None	weka.classifiers.functions.supportVector.PolyKernel-E 1.0 -C 250007	1	1	0.843	85.0097
SMO	50	1	weka.classifiers.functions.Logistic -R 1.0E-8 -M -1 -num-decimal-places 4	None	weka.classifiers.functions.supportVector.PolyKernel-E 1.0 -C 250007	1	1	0.843	85.0097
SMO	60	1	weks.classifiers.functions.Logistic -R 1.0E-8 -M -1 -num-decimal-places 4	None	weks.classifiers.functions.supportVector.PolyKernel-E1.0-C250007	1	1	0.843	85.0097
SMO	70	1	weka.classifiers.functions.Logistic -R 1.0E-8 -M -1 -num-decimal-places 4	None	weka.classifiers.functions.supportVector.PolyKernel-E1.0-C250007	1	1	0.843	85.0097
SMO	80	1	weka.classifiers.functions.Logistic -R 1.0E-8 -M -1 -num-decimal-places 4	None	weka.classifiers.functions.supportVector.PolyKernel-E 1.0 -C 250007	1	1	0.843	85.0097
SMO	90	1	weks.classifiers.functions.Logistic -R 1.0E-8 -M -1 -num-decimal-places 4	None	weks.classifiers.functions.supportVector.PolyKernel-E 1.0 -C 250007	1	1	0.843	85.0097
SMO	100	1	weka.classifiers.functions.Logistic -R 1.0E-8 -M -1 -num-decimal-places 4	None	weka.classifiers.functions.supportVector.PolyKernel-E 1.0-C 250007	1	1	0.843	85.0097
SMO C Experi	ments								
Algorithm	Batch Size	С	Calibrator	Filer Type	Kernel	Number of Decimal Places	Seed	F Measure average	Correctly Identified Instances (%)
SMO	100	1	weka.classifiers.functions.Logistic -R 1.0E-8 -M -1 -num-decimal-places 4	None	weka.classifiers.functions.supportVector.PolyKernel-E 1.0 -C 250007	1	1	0.843	85.0097
SMO	100	1.5	weks.classifiers.functions.Logistic -R 1.0E-8 -M -1 -num-decimal-places 4	None	weks.classifiers.functions.supportVector.PolyKernel-E 1.0 -C 250007	1	1	0.843	85.0097
SMO	100	2	weks.classifiers.functions.Logistic -R 1.0E-8 -M -1 -num-decimal-places 4	None	weka.classifiers.functions.supportVector.PolyKernel-E1.0-C250007	1	1	0.843	85.0404
SMO	100	2.5	weka.classifiers.functions.Logistic -R 1.0E-8 -M -1 -num-decimal-places 4	None	weka_classifiers.functions.supportVector.PolyKernel-E 1.0 -C 250007	1	1	0.843	85.0373
SMO	100	0.5	waka.classifiers.functions.Logistic -R 1.0E-8 -M -1 -num-decimal-places 4	None	wake classifiers functions support/vector PolyKernel -E 1.0 -C 250007	1	1	0.842	84.9513

MultilayerPerce	ptron B	atch Size Ex	periments								
Algorithm	Batch Size	Hidden Layers	Learning Rate	Momentum	Nominal To Binary Filter (True/False)	Normalise Attributes (True/False)	Normalise Numeric Class (True/False)	Number of Decimal Places	Seed	F Measure average	Correctly Identified Instances (%)
MultilayerPerceptron MultilayerPerceptron	10 20	1 1	0.1	0.1	TRUE TRUE	TRUE TRUE	TRUE TRUE	1	0	0.83	83.973 83.973
MultilayerPerceptron	30	1	0.1	0.1	TRUE	TRUE	TRUE	1	0	0.83	83.973
MultilayerPerceptron MultilayerPerceptron	40 50	1	0.1	0.1	TRUE TRUE	TRUE TRUE	TRUE TRUE	1 1	0	0.83	83.973 83.973
MultilayerPerceptron	60	1	0.1	0.1	TRUE	TRUE	TRUE	1	0	0.83	83.973
MultilayerPerceptron MultilayerPerceptron	70 80	1 1	0.1	0.1 0.1	TRUE TRUE	TRUE TRUE	TRUE TRUE	1	0	0.83 0.83	83.973 83.973
MultilayerPerceptron MultilayerPerceptron	90 100	1	0.1	0.1	TRUE TRUE	TRUE TRUE	TRUE TRUE	1	0	0.83 0.83	83.973 83.973
MultilayerPerce		dden I avers			TRUE	INDE	TRUE		U	0.05	05.575
Algorithm	Batch Size	Hidden Layers	Learning Rate		Nominal To Rinary Filter (True /False)	Normalice Attributes (True /Falce)	Normalise Numeric Class (True/False)	Number of Decimal Places	Seed	F Measure average	Correctly Identified Instances [%]
MultilayerPerceptron	100	1	0.1	0.1	TRUE	TRUE	TRUE	1	0	0.83	83.973
MultilayerPerceptron MultilayerPerceptron	100	3	0.1	0.1	TRUE TRUE	TRUE TRUE	TRUE TRUE	1	0	0.826 0.825	83.7888 83.5431
MultilayerPerceptron	100	4	0.1	0.1	TRUE	TRUE	TRUE	1	0	0.832	83.973
MultilayerPerceptron MultilayerPerceptron	100	6	0.1	0.1	TRUE TRUE	TRUE TRUE	TRUE TRUE	1	0	0.827 0.832	83.666 84.1572
MultilayerPerceptron MultilayerPerceptron		7 8	0.1	0.1	TRUE	TRUE	TRUE TRUE	1	0	0.828	83.8809
MultilayerPerceptron		9	0.1	0.1	TRUE TRUE	TRUE TRUE	TRUE	1	0	0.835 0.832	84.2186 83.973
MultilayerPerceptron MultilayerPerceptron	100	10 12	0.1	0.1	TRUE TRUE	TRUE TRUE	TRUE TRUE	1	0	0.839 0.832	84.4642 84.0037
MultilayerPerceptron	100	14	0.1	0.1	TRUE	TRUE	TRUE	1	0	0.829	83.8809
MultilayerPerce	eptron Le	earning Rate	es Experim	ents							
Algorithm	Batch Size	Hidden Layers	Learning Rate	Momentum	Nominal To Binary Filter (True/False)	Normalise Attributes (True/False)	Normalise Numeric Class (True/False)	Number of Decimal Places	Seed	F Measure average	Correctly Identified Instances (%
MultilayerPerceptron MultilayerPerceptron	100 100	1	0.1	0.1	TRUE TRUE	TRUE TRUE	TRUE TRUE	1	0	0.83 0.82	83.973 83.2054
MultilayerPerceptron	100	1	0.3	0.1	TRUE	TRUE	TRUE	1	0	0.823	83.1747
MultilayerPerceptron	100	1	0.4	0.1	TRUE TRUE	TRUE TRUE	TRUE TRUE	1	0	0 0.822	75.7753 82.8984
MultilayerPerceptron MultilayerPerceptron	100	1	0.5	0.1	TRUE	TRUE	TRUE	1	0	0.81	82.5913
MultilayerPerceptron	100	1	0.7	0.1	TRUE TRUE	TRUE	TRUE	1 1	0	0 0.806	75.7753
MultilayerPerceptron MultilayerPerceptron	100 100	1	0.8	0.1	TRUE	TRUE TRUE	TRUE TRUE	1	0	0.81	82.3764 82.4378
MultilayerPerceptron	100	1	1	0.1	TRUE	TRUE	TRUE	1	0	0.81	82.008
MultilayerPerce	eptron M	omentum Ex	operiments	:							
Algorithm		Hidden Layers			Nominal To Binary Filter (True/False)	Normalise Attributes (True/False)	Normalise Numeric Class (True/False)	Number of Decimal Places	Seed	F Measure average	Correctly Identified Instances (%)
MultilayerPerceptron		1	0.1	0.1	TRUE	TRUE	TRUE	1	0	0.83	83.973
MultilayerPerceptron MultilayerPerceptron	100	1	0.1	0.2	TRUE TRUE	TRUE TRUE	TRUE TRUE	1	0	0.827 0.827	83.6967 83.6045
MultilayerPerceptron	100	1	0.1	0.4	TRUE	TRUE	TRUE	1	0	0.828	83.666
MultilayerPerceptron MultilayerPerceptron	100	1	0.1	0.5	TRUE TRUE	TRUE TRUE	TRUE TRUE	1	0	0.824 0.823	83.4817 83.3896
MultilayerPerceptron	100	1	0.1	0.7	TRUE	TRUE	TRUE	- 1	0	0.822	83.1133
MultilayerPerceptron	100			0.0		TOUR		- :			00.0303
MultilayerPerceptron		1	0.1 0.1	0.8	TRUE TRUE	TRUE TRUE	TRUE TRUE	1 1	0	0.798 0.82	82.0387 82.5913
MultilayerPerceptron	100	1 1	0.1	0.9	TRUE TRUE		TRUE	1 1 1	0	0.798	
MultilayerPerceptron MultilayerPerce	ptron N		0.1 0.1 inary Filter	0.9 1 Experimer	TRUE TRUE	TRUE TRUE	TRUE TRUE TRUE	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0 0	0.798 0.82 0	82.5913 75.7753
MultilayerPerceptron MultilayerPerce Algorithm MultilayerPerceptron	Batch Size	1 1 2 2 3 3 4 4 5 6 7 7 8 7 8 7 8 7 8 7 8 7 8 7 8 7 8 7 8	0.1 0.1 inary Filter Learning Rate 0.1	0.9 1 Experimer Momentum 0.1	TRUE TRUE TRUE Nominal To Binary Filter (True/False) TRUE	TRUE TRUE Normalise Attributes (True/False) TRUE	TRUE TRUE TRUE TRUE Normalise Numeric Class [True/False] TRUE	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0 0 0 Seed 0	0.798 0.82 0 F Measure average 0.83	82.5913 75.7753 Correctly Identified Instances (%) 83.973
MultilayerPerceptron MultilayerPerce Algorithm MultilayerPerceptron MultilayerPerceptron	Batch Size	Hidden Layers 1 1	0.1 0.1 inary Filter Learning Rate 0.1 0.1	0.9 1 Experimer Momentum 0.1 0.1	TRUE TRUE 1ts Nominal To Binary Filter (True/False)	TRUE TRUE Normalise Attributes (True/False)	TRUE TRUE TRUE TRUE Normalise Numeric Class [True/False]	1 1 1 1 Number of Decimal Places	0 0 0	0.798 0.82 0	82.5913 75.7753 Correctly Identified Instances (%)
MultilayerPerceptron MultilayerPerce Algorithm MultilayerPerceptron MultilayerPerceptron	Batch Size	Hidden Layers 1 1	0.1 0.1 inary Filter Learning Rate 0.1 0.1	0.9 1 Experimer Momentum 0.1 0.1	TRUE TRUE TRUE Nominal To Binary Filter (True/False) TRUE	TRUE TRUE Normalise Attributes (True/False) TRUE	TRUE TRUE TRUE TRUE Normalise Numeric Class [True/False] TRUE	1 1 1 1 Number of Decimal Places 1	0 0 0 Seed 0	0.798 0.82 0 F Measure average 0.83	82.5913 75.7753 Correctly Identified Instances (%) 83.973
MultilayerPercet Algorithm MultilayerPercet Algorithm MultilayerPerceptron MultilayerPercet Algorithm	Batch Size 100 100 eptron N Batch Size 100 100 Batch Size	Hidden Layers 1 1 2 crmalise Attr	0.1 0.1 inary Filter Learning Rate 0.1 0.1 ributes Exp	0.9 1 Experimer Momentum 0.1 0.1 Deriments	TRUE TRUE TRUE Nominal To Binary Filter (True/False) TRUE FALSE Nominal To Binary Filter (True/False)	TRUE TRUE Normalise Attributes [True/False] TRUE TRUE Normalise Attributes [True/False]	TRUE TRUE TRUE TRUE TRUE TRUE Normalise Numeric Class [True/False] TRUE TRUE TRUE	1	0 0 0 0 Seed 0	0.798 0.82 0 FMeasure average 0.83 0.831 FMeasure average	82.5913 75.7753 Correctly Identified Instances [%] 83.973 83.666 Correctly Identified Instances [%]
MultilayerPercet MultilayerPercet Algorithm MultilayerPerceptron MultilayerPerceptron MultilayerPerce Algorithm	Batch Size 100 100 Batch Size 100 100 Batch Size 100 100	Hidden Layers 1 1 2 crmalise Attr	0.1 0.1 inary Filter Learning Rate 0.1 0.1	0.9 1 Experimen Momentum 0.1 0.1 0.1	TRUE TRUE TRUE Nominal To Binary Filter (True/False) TRUE FALSE	TRUE TRUE Normalise Attributes (True/False) TRUE TRUE	TRUE TRUE TRUE Normalise Numeric Class (True/False) TRUE TRUE	1	0 0 0 0 Seed 0	0.798 0.82 0 0 FMeasure average 0.83 0.831	82.5913 75.7753 Correctly Identified Instances (%) 83.973 83.666
MultilayerPerceptron MultilayerPerce Algorithm MultilayerPerceptron MultilayerPerceptron MultilayerPerceptron MultilayerPerceptron MultilayerPerceptron	Batch Size 100 Batch Size 100 100 Batch Size 100 100	Hidden Layers 1 1 2 prmalise Attr Hidden Layers 1 1	0.1 0.1 inary Filter Learning Rate 0.1 0.1 ributes Exp Learning Rate 0.1 0.1	Momentum 0.1 Deriments Momentum 0.1 Momentum 0.1 Ool	TRUE TRUE TRUE Nominal To Binary Filter (True/False) TRUE FALSE Nominal To Binary Filter (True/False) TRUE TRUE TRUE TRUE	TRUE TRUE Normalise Attributes (True/False) TRUE TRUE TRUE Normalise Attributes (True/False) TRUE	TRUE TRUE TRUE TRUE TRUE TRUE Normalise Numeric Class [True/False] TRUE TRUE TRUE TRUE TRUE Normalise Numeric Class [True/False] TRUE	1	0 0 0 0 Seed 0 0	0.798 0.82 0 0 FMeasure average 0.83 0.831 FMeasure average 0.83	82.5913 75.7753 Correctly identified instances (%) 83.973 83.666 Correctly identified Instances (%) 83.973
MultilayerPerceptron MultilayerPerceptron Algorithm MultilayerPerceptron MultilayerPerceptron MultilayerPerceptron MultilayerPerceptron MultilayerPerceptron MultilayerPerceptron MultilayerPerceptron	Batch Size 100 Batch Size 100 100 Batch Size 100 100	Hidden Layers 1 1 1 Drmalise Attr Hidden Layers 1 1 1 Drmalise Nur	0.1 0.1 inary Filter Learning Rate 0.1 0.1 ributes Exp Learning Rate 0.1 0.1 meric Class	0.9 1 Experimer Momentum 0.1 0.1 0.1 Deriments Momentum 0.1 0.1 s Experime	TRUE TRUE TRUE Nominal To Binary Filter (True/False) TRUE FALSE Nominal To Binary Filter (True/False) TRUE TRUE TRUE TRUE	TRUE TRUE Normalise Attributes (True/False) TRUE TRUE TRUE TRUE Normalise Attributes (True/False) TRUE FALSE	TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	1 1 Number of Decimal Places 1 1	Seed 0 0 0 Seed 0 0 0 Seed	0.798 0.82 0 FMeasure average 0.83 0.831 FMeasure average 0.33 0.831	83.5913 75.7753 Correctly identified instances [N] 83.973 83.666 Correctly identified instances [N] 83.973 75.7753 Correctly identified instances [N] Correctly identified instances [N]
MultilayerPerceptron MultilayerPerce Algorithm MultilayerPerceptron MultilayerPerceptron MultilayerPerceptron MultilayerPerceptron MultilayerPerceptron MultilayerPerceptron MultilayerPerceptron MultilayerPerceptron Algorithm MultilayerPerceptron	Batch Size 100 Batch Size 100 100 Batch Size 100 100 Batch Size 100 100	Hidden Layers 1 1 1 Drmalise Attr Hidden Layers 1 1 1 Drmalise Nur	0.1 0.1 inary Filter Learning Rate 0.1 0.1 ributes Exp Learning Rate 0.1 0.1 meric Clas:	Momentum 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1	TRUE TRUE TRUE TRUE Nominal To Binary Filter (True/False) TRUE FALSE Nominal To Binary Filter (True/False) TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	TRUE TRUE TRUE Normalise Attributes (True/False) TRUE TRUE TRUE FALSE Normalise Attributes (True/False) TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	1 1 Number of Decimal Places 1 1	0 0 0 0 Seed 0 0 0	0.798 0.82 0 FMeasure average 0.83 0.831 FMeasure average 0.83 0 FMeasure average 0.83 0	82.5913 75.7753 Correctly Identified Instances [N] 83.973 83.066 Correctly Identified Instances [N] 79 83.773 75.7753 Correctly Identified Instances [N] 83.973
MultilayerPerceptron MultilayerPerce Augustem MultilayerPerceptron	Batch Size 100 Batch Size 100 100 Batch Size 100 100 Batch Size 100 100 Batch Size 100 100	Hidden Layers 1 1 1 Dormalise Attr Hidden Layers 1 1 Dormalise Nun Hidden Layers 1 1 This is a second to the	0.1 0.1 inary Filter Learning Rate 0.1 0.1 0.1 in the service of t	0.9 1 Experimer Momentum 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1	TRUE TRUE TRUE TRUE ITS Nominal To Binary Filter (True/False) TRUE FALSE FALSE TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRU	TRUE TRUE Normalise Attributes (True/False) TRUE TRUE TRUE TRUE Normalise Attributes (True/False) TRUE FALSE	TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	1 1 Number of Decimal Places 1 1	Seed 0 0 0 Seed 0 0 0 Seed	0.798 0.82 0 0 F Measure average 0.83 0.831 F Measure average 0.83 0 0 F Measure average	83.5913 75.7753 Correctly identified instances [N] 83.973 83.666 Correctly identified instances [N] 83.973 75.7753 Correctly identified instances [N] Correctly identified instances [N]
MultilayerPerceptron	Batch Size Potron N Batch Size 100 100 200 100 100 Batch Size 100 100 100 potron N Batch Size 100 100 potron N	Hidden Layers 1 1 2 2 2 3 3 3 3 3 3 4 4 4 4 4 4 4 4 4 4 4	0.1 0.1 10 0.1	0.9 1 Experimer Momentum 0.1 0.1 0.1 0.1 SExperiments Momentum 0.1 0.1 0.1 0.1 sexperiments Momentum 0.1 0.1 0.1 sexperiments	TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	TRUE TRUE Normalise Attributes (True/False) TRUE TRUE TRUE FALSE Normalise Attributes (True/False) FALSE Normalise Attributes (True/False) TRUE TRUE TRUE	TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	1 1 Number of Decimal Places 1 1 Number of Decimal Places 1 1 1 1	0 0 0 0 Seed 0 0 0 0 Seed 0	0.798 0.82 0 0 FMeasure average 0.83 0.831 FMeasure average 0.83 0.831	82.5913 75.7753 Correctly Identified Instances [N] 83.973 83.966 Correctly Identified Instances [N] 83.973 75.7753 Correctly Identified Instances [N] 83.973 83.973 83.973
MultilayerPerceptron MultilayerPerce Algorithm MultilayerPerceptron	Batch Size Both Size 100 100 Batch Size 100 100 Batch Size 100 100 Batch Size 100 100 Batch Size 100 100	Hidden Layers 1 1 1 Dormalise Attr Hidden Layers 1 1 Dormalise Nun Hidden Layers 1 1 This is a second to the	0.1 0.1 1 consider the service of th	0.9 1 Experimer Momentum 0.1 0.1 0.1 0.1 SExperime Momentum 0.1 0.1 0.1 Experiments Momentum 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1	TRUE TRUE TRUE TRUE ITS Nominal To Binary Filter (True/False) TRUE FALSE Nominal To Binary Filter (True/False) TRUE TRUE TRUE TRUE TRUE TRUE Nominal To Binary Filter (True/False) TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	TRUE TRUE TRUE Normalise Attributes (True/False) TRUE TRUE TRUE Normalise Attributes (True/False) TRUE FALSE Normalise Attributes (True/False) TRUE TRUE TRUE TRUE TRUE Normalise Attributes (True/False) TRUE	TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	1 1 Number of Decimal Places 1 1 Number of Decimal Places 1 1 1 1	0 0 0 0 Seed 0 0 0 0 Seed 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.798 0.92 0 0 FMeasure average 0.83 0.831 FMeasure average 0.33 0.33 0.35 FMeasure average 0.35 0.35 0.35	83.5913 75.7753 83.973 83.973 83.973 83.973 83.973 83.973 83.973 83.973 83.973 83.973 83.973 83.973
MultilayerPerceptron MultilayerPerce Algorithm MultilayerPerceptron	Batch Size 100 100 Batch Size	Hidden Layers 1 1 2 2 2 3 3 3 3 3 3 4 4 4 4 4 4 4 4 4 4 4	0.1 0.1 1 carning Rate 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1	0.9 Experimer Momentum 0.1 0.1 0.1 SEXPERIME Momentum 0.1 0.1 0.1 Momentum 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1	TRUE TRUE TRUE Nominal To Binary Filter (True/Fahe) TRUE FALSE Nominal To Binary Filter (True/Fahe) TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	TRUE TRUE TRUE IRUE IRUE IRUE IRUE IRUE IRUE FALSE IRUE FALSE Normalise Attributes (True/False) IRUE FALSE IRUE FALSE IRUE IRUE IRUE IRUE IRUE IRUE IRUE IRU	TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	1 1 Number of Decimal Places 1 1 Number of Decimal Places 1 1 1 1	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.798 0.82 0 0 FMeasure average 0.83 0.851 FMeasure average 0.83 0 FMeasure average 0.83 0.83 0.83	82.5913 75.7753 Correctly Identified Instances [N] 83.973 83.666 Correctly Identified Instances [N] 83.973 75.7753 Correctly Identified Instances [N] 83.973 83.973 63.973 63.973 63.973 83.973
MultilayerPerceptron MultilayerPerce Algorithm MultilayerPerceptron	Batch Size Both Size 100 100 Batch Size 100 100 Batch Size 100 100 Batch Size 100 100 Batch Size 100 100	Hidden Layers 1 1 2 2 2 3 3 3 3 3 3 4 4 4 4 4 4 4 4 4 4 4	0.1 0.1 10.1 10.1 10.1 10.1 10.1 10.1 1	0.9 1 1 1 1 1 1 1 1 1	TRUE TRUE TRUE Nominal To Binary Filter (True/False) TRUE FAUSE Nominal To Binary Filter (True/False) TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	1 1 Number of Decimal Places 1 1 Number of Decimal Places 1 1 1 1	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.798 0.82 0 0 FMeasure average 0.83 0.831 FMeasure average 0.83 0 FMeasure average 0.83 0.83 0.83 0.83	82.5913 75.7753 83.973 83.973 83.973 83.973 83.973 83.973 83.973 83.973 83.973 83.973 83.973 83.973 83.973 83.973 83.973
MultilayerPerceptron	100	Hidden Layers 1 1 2 2 2 3 3 3 3 3 3 4 4 4 4 4 4 4 4 4 4 4	0.1 0.1 10 0.1	0.9 Experimer Momentum 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1	TRUE TRUE TRUE Nominal To Binary Filter (True/False) FALSE Nominal To Binary Filter (True/False) TRUE FALSE Nominal To Binary Filter (True/False) TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	1 1 1 Number of Dacimal Places 1 1 Number of Dacimal Places 1 1 Number of Dacimal Places 2 3 4 5	0 0 0 0 Seed 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.798 0.82 0 0 FMeasure average 0.83 0.83 0 FMeasure average 0.83 0 FMeasure average 0.83 0.83 0.83 0.83	83.5913 75.7753 83.973 83.973 83.973 83.973 83.973 83.973 83.973 83.973 83.973 83.973 83.973 83.973 83.973 83.973 83.973 83.973 83.973 83.973 83.973
MultilayerPerceptron MultilayerPerce Algorithm MultilayerPerceptron	100	Hidden Layers 1 1 2 2 2 3 3 3 3 3 3 4 4 4 4 4 4 4 4 4 4 4	0.1 0.1 inary Filter Learning Rate 0.1 0.1 0.1 inary Filter 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1	0.9 1 Experimer Momentum 0.1 0	TRUE TRUE TRUE TRUE ITS Nominal To Binary Filter (True/False) FALSE FALSE Nominal To Binary Filter (True/False) TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	Humber of Dacimal Places 1 1 Number of Dacimal Places 1 1 Number of Dacimal Places 2 2 3 4 5 6 7	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.798 0.82 0 0 FMeasure average 0.83 0.83 0 FMeasure average 0.33 0.33 0.33 0.33 0.33 0.33	83.5913 75.7753 83.973
MultilayerPerceptron	Batch Size	Hidden Layers 1 1 2 2 2 3 3 3 3 3 3 4 4 4 4 4 4 4 4 4 4 4	0.1 o.1 o.1 inary Filter Learning Rate 1.0 o.1 o.1 ibutes Exp Learning Rate 0.1 o.1 o.1 o.1 o.1 o.1 o.1 o.1 o.1 o.1 o	0.9 1 Experimer Momentum 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1	TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	TRUE TRUE TRUE Normalise Attributes (True/False) TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	1 1 1 Number of Dacimal Places 1 1 Number of Dacimal Places 1 1 Number of Dacimal Places 2 3 4 5	0	0.798 0.82 0 0 FMeasure average 0.83 0.831 FMeasure average 0.83 0 0 FMeasure average 0.83 0 0.83 0.83 0.83	82.5913 75.7753 83.973 83.973 83.966 Correctly identified instances [N] 83.973 83.973 75.7753 Correctly identified instances [N] 83.973 83.973 83.973 83.973 83.973 83.973 83.973 83.973 83.973 83.973 83.973 83.973 83.973
MultilayerPerceptron MultilayerPerce Algorithm MultilayerPerceptron	Batch Size 100	Hidden Layers 1 1 2 2 2 3 3 3 3 3 3 4 4 4 4 4 4 4 4 4 4 4	0.1 0.1 inary Filter Learning Rate 0.1 0.1 0.1 inary Filter 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1	0.9 1 Experimer Momentum 0.1 0	TRUE TRUE TRUE TRUE ITS Nominal To Binary Filter (True/False) FALSE FALSE Nominal To Binary Filter (True/False) TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	Humber of Dacimal Places 1 1 Number of Dacimal Places 1 1 Number of Dacimal Places 2 2 3 4 5 6 7	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.798 0.82 0 0 FMeasure average 0.83 0.83 0 FMeasure average 0.33 0.33 0.33 0.33 0.33 0.33	83.5913 75.7753 83.973
MultilayerPerceptron	Batch Size	Hidden Layers This is a second of the secon	0.1 0.1 inary Filter Learning Rate 0.1 0.1 0.1 10 10 11 10 10 10 10 10 10 10 10 10 10	0.9 1 1 1 1 1 1 1 1 1	TRUE TRUE TRUE TRUE Nominal To Binary Filter (True/False) TRUE FASSE Nominal To Binary Filter (True/False) TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	TRUE TRUE TRUE Normalise Attributes (True/False) TRUE TRUE TRUE FALSE Normalise Attributes (True/False) TRUE FALSE Normalise Attributes (True/False) TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	1 1 1 Number of Dacimal Places 1 1 1 Number of Dacimal Places 1 1 1 Number of Dacimal Places 1 2 3 4 5 6 7 8 9	0	0.798 0.82 0.82 0.83 F Measure average 0.83 0.83 0.83 0.83 F Measure average 0.83 0.83 0.83 0.83 0.83 0.83 0.83	82.5913 75.7753 83.973
MultilayerPerceptron	100 100	Hidden Layers This second sec	0:1 0:1 inary Filter Learning Rate 0:1 0:1 0:1 0:1 0:1 0:1 0:1 0:1 0:1 0:1	0.9 1 1 1 1 1 1 1 1 1	TRUE TRUE TRUE TRUE TRUE Nominal To Binary Filter (True/False) TRUE FRASE Nominal To Binary Filter (True/False) TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	TRUE TRUE TRUE Normalise Attributes (True/False) TRUE TRUE TRUE FALSE Normalise Attributes (True/False) TRUE FALSE Normalise Attributes (True/False) TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	1 1 1 Number of Decimal Places 1 1 1 Number of Decimal Places 1 1 1 1 1 1 1 2 3 3 4 4 4 5 6 7 8 9 9 10	O	0.798 0.82 0 0 FMeasure average 0.83 0.83 0 FMeasure average 0.83 0 FMeasure average 0.83 0.83 0.83 0.83 0.83 0.83 0.83 0.83	82.5913 75.7753 83.575 83.975 83.975 83.975 83.975 83.973 75.7753 Correctly identified instances [%] 83.973 75.7753 Correctly identified instances [%] 83.973
MultilayerPerceptron	100 100	Hidden Layers This second sec	0.1 0.1 inary Filter tearning Rate 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1	0.9 1 1 1 1 1 1 1 1 1	TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	1 1 1 Number of Decimal Places 1 1 1 Number of Decimal Places 1 1 1 1 1 1 1 2 3 3 4 4 4 5 6 7 8 9 9 10	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.798 0.82 0 0 FMeasure average 0.83 0.831 0.831 0.83 0.83 0.83 0.83 0.83 0.83 0.83 0.83	83.5913 75.7753 83.666 Correctly identified instances [%] 83.973 83.666 Correctly identified instances [%] 75.7753 Correctly identified instances [%] 83.973
MultilayerPerceptron	100 100	Hidden Layers This second sec	0.1 0.1 inary Filter Learning Rate 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1	0.9 1 1 1 1 1 1 1 1 1	TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	1 1 1 Number of Dacimal Places 1 1 Number of Dacimal Places 1 1 Number of Dacimal Places 1 1 1 1 2 3 3 4 4 5 5 6 7 8 9 10 10 Number of Dacimal Places	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.798 0.92 0 0 F Measure average 0.03 0.83 0.83 0.83 0.83 0.83 0.83 0.83	82.5913 75.7753 83.675 83.977 83.666 Correctly identified instances [N] 83.977 83.676 Correctly identified instances [N] 83.977 75.7753 Correctly identified instances [N] 83.977
MultilayerPerceptron	100 Batch Size Batch Size 100 100 100 100 100 100 100 1	Hidden Layers This second sec	0.1 0.1	0.9 1 1 1 1 1 1 1 1 1	TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	Number of Ducimal Places 1 Number of Ducimal Places 1 1 Number of Ducimal Places 2 2 3 4 5 6 7 10 Number of Ducimal Places 10 Number of Ducimal Places 1 1 1 1 1 1	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.798 0.82 0.82 0.83 0.831 FMeasure average 0.83 0.83 0.83 0.83 0.83 0.83 0.83 0.83	82.5913 75.7753 83.973 83.973 83.966 Correctly identified instances [N] 83.972 83.973
MultilayerPerceptron	100 100	Hidden Layers This is a series of the serie	0.1 0.1 inary Filter Learning Rate 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1	0.9 1 1 1 1 1 1 1 1 1	TRUE TRUE TRUE TRUE TRUE TRUE TRUE FALSE FALSE Rominal To Binary Filter (True/False) TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	1 1 1 1 Number of Decimal Places 1 1 1 1 Number of Decimal Places 1 1 1 1 1 Number of Decimal Places 1 1 1 1 1 1 Number of Decimal Places 1 1 1 1 1 1 1 1 1 1 1 1	Seed	0.798 0.92 0 0 FMeasure average 0.83 0.831 FMeasure average 0.83 0.831 FMeasure average 0.83 0.83 0.83 0.83 0.83 0.83 0.83 0.83	83.5913 75.7753 83.666 83.573 83.666 Correctly identified instances [%] 83.973
MultilayerPerceptron Multilaye	100 Batch Size 100 100 100 100 Batch Size 100 100 100 100 100 100 100 100 100 10	Hidden Layers This second sec	0.1 0.1	0.9 1 1 1 1 1 1 1 1 1	TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	1 1 1 Number of Decimal Places 1 1 Number of Decimal Places 1 1 Number of Decimal Places 1 1 1 1 1 1 1 1 1 1 1 Number of Decimal Places 1 1 1 1 1 1 1 Number of Decimal Places 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Seed O O O O O O O O O	0.798 0.82 0.82 0.82 0.83 F Measure average 0.83 0.83 0.83 0.83 0.83 0.83 0.83 0.83	83.5913 75.7753 83.575 83.666 Correctly identified instances [N] 83.575 83.575 83.577 83.5775 83.577 83.5775 83.577 83.5775 83.5773
MultilayerPerceptron	100 Batch Size 100 100 100 100 100 100 100 100 100 10	Hidden Layers This in the second of the sec	0.1 0.1 1.1	0.9 1 1 1 1 1 1 1 1 1	TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	1 1 1 Number of Decimal Places 1 1 Number of Decimal Places 1 1 Number of Decimal Places 1 1 1 1 1 1 1 1 Number of Decimal Places 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Seed O O O O O O O O O	0.798 0.82 0.82 0.83 F Measure average 0.83 0.83 0.83 0.83 0.83 0.83 0.83 0.83	83.9913 75.7753 83.973
MultilayerPerceptron Multilaye	100 100	Hidden Layers This is a series of the serie	0.1 0.1 0.1 1.1	0.9 1 1 1 1 1 1 1 1 1	TRUE TRUE TRUE TRUE TRUE TRUE TRUE FALSE Nominal To Binary Filter (True/False) TRUE FALSE Nominal To Binary Filter (True/False) TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.798 0.92 0.02 0 0 FMeasure average 0.03 0.83 0.83 0.83 0.83 0.83 0.83 0.83	83.5913 75.7753 83.666 Correctly identified instances [%] 83.973 83.666 Correctly identified instances [%] 83.973 75.7753 Correctly identified instances [%] 83.973
MultilayerPerceptron Multilaye	100 Batch Size 100 100 100 100 100 100 100 1	Hidden Layers This is a series of De layer of De layers	0.1 0.1 1.1	0.9 1 1 1 1 1 1 1 1 1	TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	1 1 1 Number of Decimal Places 1 1 Number of Decimal Places 1 1 Number of Decimal Places 1 1 1 1 1 1 1 1 Number of Decimal Places 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Seed O O O O O O O O O	0.798 0.82 0.82 0.83 F Measure average 0.83 0.83 0.83 0.83 0.83 0.83 0.83 0.83	82.5913 75.7753 83.973
MultilayerPerceptron	100 100	Hidden Layers This seed Experim Hidden Layers Layers Hidden Layers Layer	0.1 0.1 1.1	0.9 1 1 1 1 1 1 1 1 1	TRUE TRUE TRUE TRUE TRUE TRUE TRUE FALSE Nominal To Binary Filter (True/False) TRUE FALSE Nominal To Binary Filter (True/False) TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	1 1 1 Number of Dacimal Places 1 1 Number of Dacimal Places 1 1 Number of Dacimal Places 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.798 0.92 0 0 F Measure average 0.83 0.83 0.83 0.83 F Measure average 0.83 0.83 0.83 0.83 0.83 0.83 0.83 0.83	82.5913 75.7753 83.676 Correctly identified instances [N] 83.977 83.666 Correctly identified instances [N] 83.977
MultilayerPerceptron	100 100	Hidden Layers This seed Experim Hidden Layers	0.1 0.1 1.1	0.9 1 1 1 1 1 1 1 1 1	TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	1 1 1 Number of Dacimal Places 1 1 Number of Dacimal Places 1 1 Number of Dacimal Places 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.798 0.82 0.82 0.83 0.83 0.83 0.83 FMeasure average 0.83 0.83 0.83 0.83 0.83 0.83 0.83 0.83	82.5913 75.7753 83.973
MultilayerPerceptron Multilaye	100 100	Hidden Layers This is a series of the serie	0.1 0.1	0.9 1 1 1 1 1 1 1 1 1	TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	TRUE TRUE TRUE TRUE TRUE TRUE TRUE TRUE	1 1 1 Number of Dacimal Places 1 1 Number of Dacimal Places 1 1 Number of Dacimal Places 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.798 0.92 0 0 FMeasure average 0.83 0.831 FMeasure average 0.83 0.831 FMeasure average 0.83 0.83 0.83 0.83 0.83 0.83 0.83 0.83	82.5913 75.7753 83.973

Voting Ense	emble C	optimisation Experiments	Voting Ensemble Opting	nisation Experimen	ts				
					_				
Algorithm	Batch Size	Classifiers	Combination Rule	Number of Decimal Places	Seed	Pre-built Classifiers	F Measure average	Correctly Identified Instances (%)	
Voting Ensemble	100	Optimised NaiveBayes, SMO and MLP	Average of Probabilities	2	1	NONE	0.906	85.2925	
Voting Ensemble	100	Optimised NaiveBayes, SMO and MLP	Product of Probabilities	2	1	NONE	0.836	84.398	
Voting Ensemble	100	Optimised NaiveBayes, SMO and MLP	Majority Voting	2	1	NONE	0.845	84.9509	
Voting Ensemble	100	Optimised NaiveBayes, SMO and MLP	Minimum Probability	2	1	NONE	0.836	84.398	
Voting Ensemble	100	Optimised NaiveBayes, SMO and MLP	Maximum Probability	2	1	NONE	0.836	84.3673	
Voting Ensemble	100	Optimised NaiveBayes, SMO and MLP	Average of Probabilities	2	1	NONE	0.906	85.2925	
Voting Ensemble	100	Optimised NaiveBayes, SMO and MLP	Average of Probabilities	2	2	NONE	0.837	84.4595	
Voting Ensemble	100	Optimised NaiveBayes, SMO and MLP	Average of Probabilities	2	5	NONE	0.837	84.4595	
Voting Ensemble	100	Optimised NaiveBayes, SMO and MLP	Average of Probabilities	2	10	NONE	0.837	84.4595	
Voting Ense	emble T	est Experiments							
Algorithm	Batch Size	Classifiers	Combination Rule	Number of Decimal Places	Seed	Pre-built Classifiers	Dataset	F Measure average	Correctly Identified Insta
Voting Ensemble	100	Optimised NaiveBayes, SMO and MLP	Average of Probabilities	2	1	NONE	Adult	0.837	84.4595
Voting Ensemble	100	Optimised NaiveBayes, SMO and MLP	Average of Probabilities	2	1	NONE	Ionosphere	0.888	88.8889