Deep Learning Classification For Liver Disease

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Abstract

Liver disease is one of the top ten diseases with the highest mortality rate in Indonesia, with the increasing rate of one percent per year. Type of liver disease most attacking Indonesian people is Hepatitis. According to Basic Health Research (Riskesdas) 2013, Hepatitis had a prevalence number of 1.2 percent that was double than the prevalence in 2007. There are some methods to diagnose the liver disease such as enzymes pattern analysis, excretion, metabolism, electrophoresis and serologic test. This research focused on diagnosing the liver disease based on enzymes pattern using Deep Learning approach. We used Indian Liver Patient Dataset (ILPD) from UCI Machine Learning Repository with a total of 583 data (416 positives and 167 negatives) to build the classification model, with the training and testing rate of 0.7 and 0.3, respectively. We conducted a preprocessing step for the training data using Synthetic Minority Over-sampling Technique (SMOTE) with the percentage rate of 0.5 to balance the positive and negative class. Experiment results reveal that the created model can classify liver disease with the accuracy, sensitivity, and specificity rate of 0.89882, 0.84, and 0.9225 percent, recpectively.

Dataset

Dataset were used is Indian Liver Patient Dataset (ILPD) from UCI Machine Learning Repository with a total of 583 data (416 positives and 167 negatives).

| NO	VARIABLE	INFORMATION
1	AGE	Age
2	JK	Gender
3	TB	Total Bilirubin
4	DB	Direct Bilirubin
5	ALP	Alkaline Phospatase
6	SGPT	Alamine Aminotransferasae
7	SGOT	Aspartate Aminotransferase
8	TP	Total Protein
9	ALB	Albumin
10	AG	Albumin/Globulin Ratio
11	CLASS	Status, Positif or Negative

Table 1. List of Enzymes

Conclusion

Application for liver disease classification using deep learning is working successfully. The best model of deep learning to use with the number of accuracy, sensitivity, and specificity rate of 0.89882, 0.84, and 0.9225 percent.

Further Works

For future research, application can be designed to classify specific types of liver disease such as Hepatitis, Liver Cancer, and many more by adding more appropriate data.

Data Processing
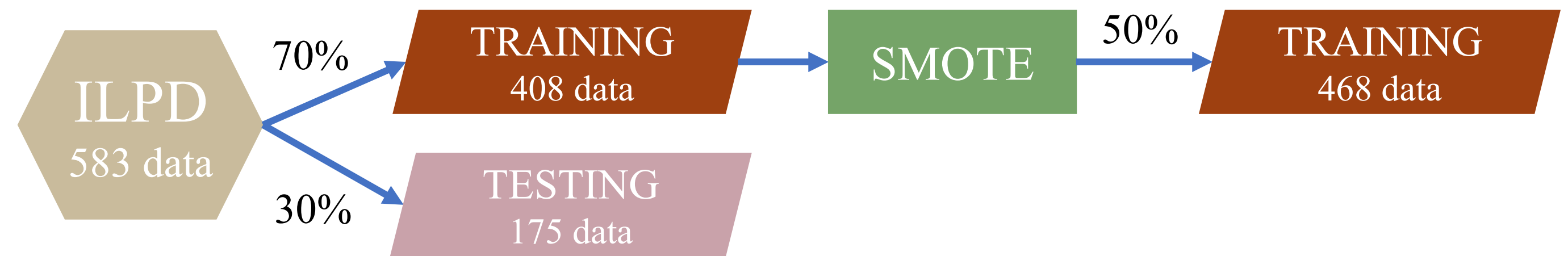
Experiment

Experiment were conducted to find the best model of deep learning to use in application. **3** of 5 attribute in deep learning be modified in this experiment
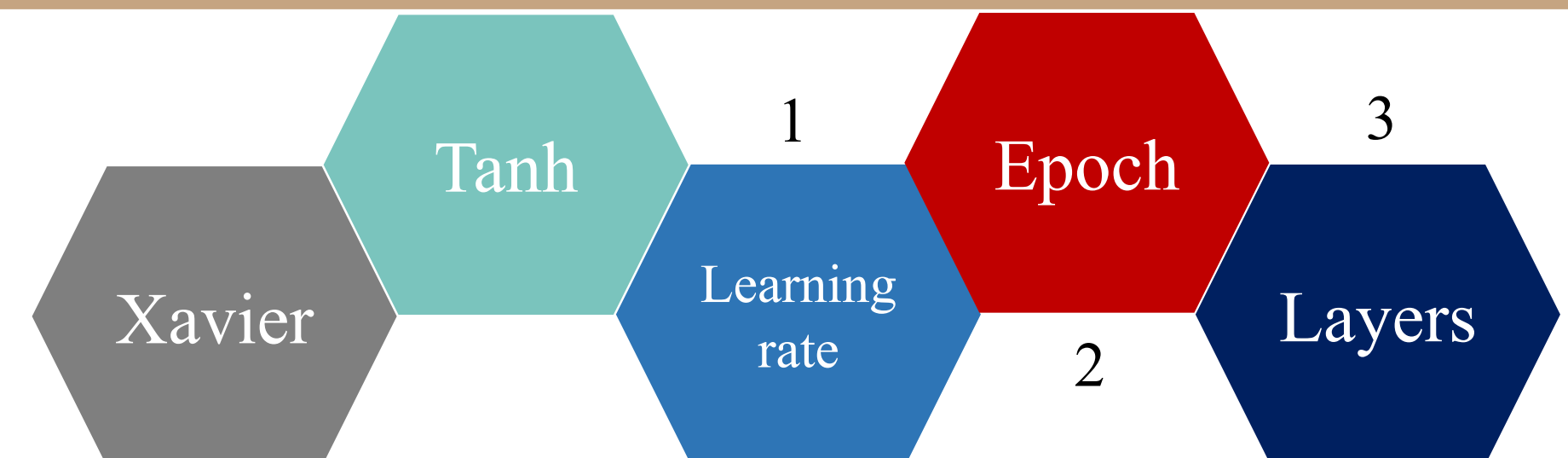
Result

Learning rate	Epoch	Layer	Training	Accuracy	Precission	Recall	F Measure
1e-1	5	3	Average	74.592	55.692	57.198	56.406
		4	Average	77.928	64.546	53.598	58.054
		5	Average	77.468	62.878	56.398	57.24
	10	3	Average	78.73	63.416	62	62.542
		4	Average	82.638	71.994	68.798	69.494
		5	Average	84.706	72.534	77.2	74.398
	15	3	Average	81.49	66.538	71.6	68.948
		4	Average	86.778	78.904	74.4	76.128
		5	Average	89.882	82.176	84	82.592

Table 2. Experiment with learning rate 0.1

Learning rate	Epoch	Layer	Training	Accuracy	Precission	Recall	F Measure
1e-2	5	3	Average	71.948	51.618	48.8	49.87
		4	Average	72.754	52.478	51.998	52.166
		5	Average	71.718	50.58	58.8	54.236
	10	3	Average	72.408	51.66	60.4	55.604
		4	Average	72.526	51.992	57.998	54.684
		5	Average	72.408	51.828	59.194	55.148
	15	3	Average	72.868	52.646	55.598	54.014
		4	Average	73.328	53.374	58	55.502
		5	Average	74.706	55.838	59.596	57.536

Table 3. Experiment with learning rate 0.01

Learning rate	Epoch	Layer	Training	Accuracy	Precission	Recall	F Measure
1e-3	5	3	Average	65.396	40.188	34.4	36.686
		4	Average	68.844	45.238	41.2	43.098
		5	Average	65.052	28.874	22	24.608
	10	3	Average	64.364	41.18	42	40.184
		4	Average	68.04	44.844	39.2	41.292
		5	Average	72.408	43.418	32.4	36.108
	15	3	Average	72.522	52.906	42	46.502
		4	Average	72.982	58.776	32	38.228
		5	Average	73.442	54.51	47.2	50.41

Table 4. Experiment with learning rate 0.001

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