

Artificial Intelligence III: Artificial Intelligence and Deep Learning

Ch05 – Ensemble

Tutorial

1. Given three base classifiers in an ensemble and 5 testing samples as below:

Testing Sample	f_1			f_2			f_3			True Output
	ω_1	ω_2	ω_3	ω_1	ω_2	ω_3	ω_1	ω_2	ω_3	
x_1	0.7	0.2	0.3	0.5	0.2	0.6	0.7	0.4	0.1	ω_1
x_2	0.4	0.6	0.1	0.2	0.2	0.9	0.1	0.4	0.2	ω_3
x_3	0.2	0.2	0.5	0.5	0.2	0.4	0.7	0.5	0.5	ω_1
x_4	0.5	0.3	0.6	0.4	0.5	0.1	0.1	0.1	0.4	ω_3
x_5	0.2	0.9	0.8	0.0	0.1	0.2	0.2	0.6	0.7	ω_2

- a) What is the testing accuracy of each base classifier?
- b) If MAJORITY vote is used as the fusion method, which class does the samples ($x_i, i = 1..5$) belongs to? What is the testing accuracy of this ensemble?
- c) If MAX is used as the fusion method, which class does the samples ($x_i, i = 1..5$) belongs to? What is the testing accuracy of this ensemble?
- d) Assume that the training accuracy of classifier 1, 2 and 3 are 95%, 85% and 95%. By using WEIGHTED AVERAGE as the fusion method, which class does the samples ($x_i, i = 1..5$) belongs to? The weight should be determined by using this formula:

$$w_i = \frac{err_i}{\sum_{j=1}^L err_j}, \text{ where } err_i \text{ is the training accuracy of classifier } i$$

What is the testing accuracy of this ensemble?

- e) Calculate the diversity for the ensemble by using the following measurements:
 - i) Disagreement Measure
 - ii) Double Fault Measure
 - iii) Correlation coefficient
- f) Do you think adding more base classifiers can increase the performance of the ensemble?