CO395 Machine Learning
CBC #4
t-test

Group 1

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Results of the t-test

Clean dataset

	DT vs. ANN	DT vs. CBR	ANN vs. CBR
Emotion 1	3.0498	8.9429	3.9477
Emotion 2	4.2663	3.9580	1.0657
Emotion 3	1.0668	6.0045	2.2500
Emotion 4	4.6751	6.2453	-1.2377
Emotion 5	3.8522	6.9003	5.5578
Emotion 6	2.9902	3.5254	0.5006

Table 1: t-values for every emotion and algorithm on the *clean* dataset

	DT vs. ANN	DT vs. CBR	ANN vs. CBR
Emotion 1	different	different	different
Emotion 2	different	different	similar
Emotion 3	similar	different	similar
Emotion 4	different	different	similar
Emotion 5	different	different	different
Emotion 6	different	different	similar

Table 2: t-values for every emotion and algorithm on the *clean* dataset

Noisy dataset

	DT vs. ANN	DT vs. CBR	ANN vs. CBR
Emotion 1	7.7947	8.4406	1.0476
Emotion 2	6.2755	7.9588	2.2119
Emotion 3	2.0966	1.9214	0.2191
Emotion 4	2.5572	5.3489	0.5100
Emotion 5	1.0530	1.8700	1.3814
Emotion 6	3.9404	3.0950	-0.7212

Table 3: t-values for every emotion and algorithm on the *noisy* dataset

	DT vs. ANN	DT vs. CBR	ANN vs. CBR
Emotion 1	different	different	similar
Emotion 2	different	different	similar
Emotion 3	similar	similar	similar
Emotion 4	similar	different	similar
Emotion 5	similar	similar	similar
Emotion 6	different	different	similar

Table 4: Interpretation of the t-values for every algorithm for the *noisy* dataset

Questions

Performance of the algorithms

Adjustment of the significance level

Since we have 3 algorithms and we want to compare each with every other, we need $\frac{3\times 2}{2} = 3$ multiple comparisons. Our initially chose significance level was $\alpha = 0.05$ which, after applying the Bonferroni correction, is equal to $\alpha = \frac{0.05}{3} \approx 0.02$. The t-value for 9 degrees of freedom and $\alpha = 0.02$, which we used to determine whether the samples are statistically different, is $t = 2.821$.

Type of the t-test

In each fold for each algorithm the test set consisted of the same examples. For this reasion, we used the paired t-test because the samples which we are comparing are clearly not independent.

Classification error vs. F_1 measure

Trade-off between number of folds and examples

Additional emotions

If we wanted to add new emotions to the dataset, the Case Based Reasoning algorithm would require the fewest changes. We would simply add the new emotions to the existing Case Base which would be the only required change.

The Decision Trees and Neural Networks however would require a complete re-training. We would need to partition the new set of emotions together with the old ones into training and validation set and then run the training algorithm. This is obviously a more laborious task than for the CBR.