

Early Classification of Time Series: Cost-based Multi-class Algorithms: Supplementary material

1st Given Name Surname
dept. name of organization (of Aff.)
name of organization (of Aff.)
City, Country
email address or ORCID

2nd Given Name Surname
dept. name of organization (of Aff.)
name of organization (of Aff.)
City, Country
email address or ORCID

3rd Given Name Surname
dept. name of organization (of Aff.)
name of organization (of Aff.)
City, Country
email address or ORCID

4th Given Name Surname
dept. name of organization (of Aff.)
name of organization (of Aff.)
City, Country
email address or ORCID

5th Given Name Surname
dept. name of organization (of Aff.)
name of organization (of Aff.)
City, Country
email address or ORCID

6th Given Name Surname
dept. name of organization (of Aff.)
name of organization (of Aff.)
City, Country
email address or ORCID

I. MULTI-CLASS DATASETS

Below are presented the full results obtained for the 33 datasets from [1] with more than 2 classes.

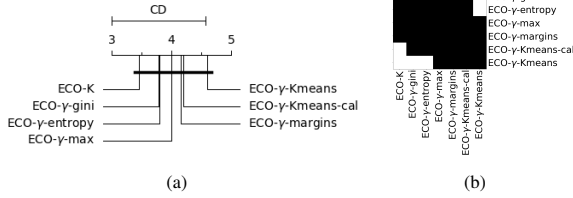


Fig. 1: Comparison of ECONOMY approaches for $\alpha = 0.001$ using (a) Nemenyi and (b) Wilcoxon signed-rank tests

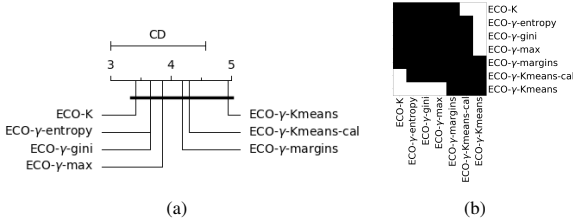


Fig. 2: Comparison of ECONOMY approaches for $\alpha = 0.01$ using (a) Nemenyi and (b) Wilcoxon signed-rank tests

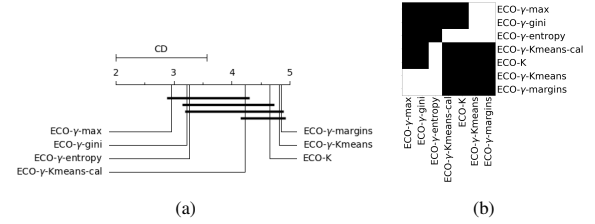


Fig. 3: Comparison of ECONOMY approaches for $\alpha = 0.1$ using (a) Nemenyi and (b) Wilcoxon signed-rank tests

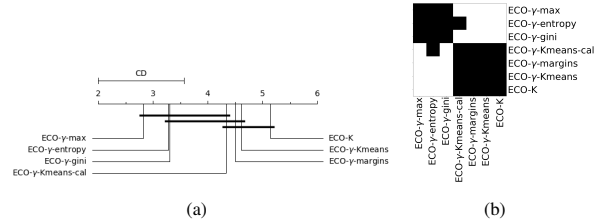
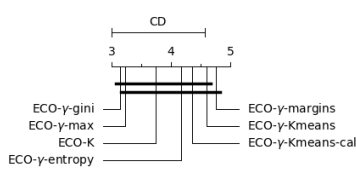
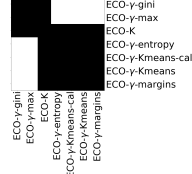


Fig. 4: Comparison of ECONOMY approaches for $\alpha = 0.2$ using (a) Nemenyi and (b) Wilcoxon signed-rank tests

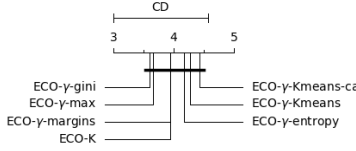


(a)

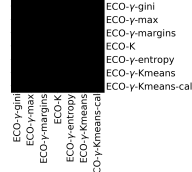


(b)

Fig. 5: Comparison of ECONOMY approaches for $\alpha = 0.3$ using (a) Nemenyi and (b) Wilcoxon signed-rank tests

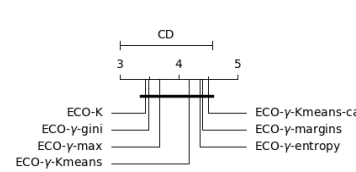


(a)

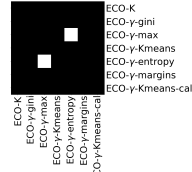


(b)

Fig. 6: Comparison of ECONOMY approaches for $\alpha = 0.4$ using (a) Nemenyi and (b) Wilcoxon signed-rank tests

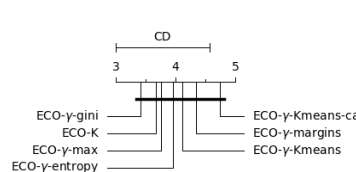


(a)

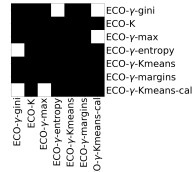


(b)

Fig. 7: Comparison of ECONOMY approaches for $\alpha = 0.5$ using (a) Nemenyi and (b) Wilcoxon signed-rank tests

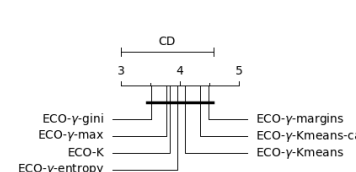


(a)

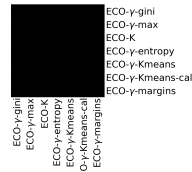


(b)

Fig. 8: Comparison of ECONOMY approaches for $\alpha = 0.6$ using (a) Nemenyi and (b) Wilcoxon signed-rank tests

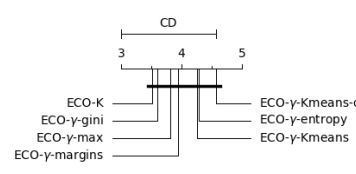


(a)

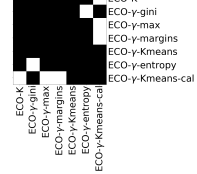


(b)

Fig. 9: Comparison of ECONOMY approaches for $\alpha = 0.7$ using (a) Nemenyi and (b) Wilcoxon signed-rank tests

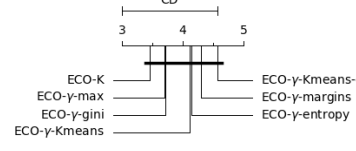


(a)

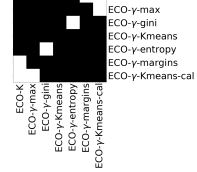


(b)

Fig. 10: Comparison of ECONOMY approaches for $\alpha = 0.8$ using (a) Nemenyi and (b) Wilcoxon signed-rank tests

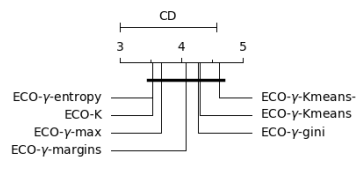


(a)

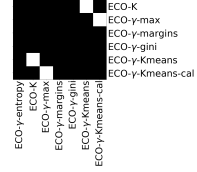


(b)

Fig. 11: Comparison of ECONOMY approaches for $\alpha = 0.9$ using (a) Nemenyi and (b) Wilcoxon signed-rank tests



(a)



(b)

Fig. 12: Comparison of ECONOMY approaches for $\alpha = 1$ using (a) Nemenyi and (b) Wilcoxon signed-rank tests

II. FULL BENCHMARK, INCLUDING BINARY CLASSIFICATION

This section presents the same experiments as before, but carried out on the 45 datasets used in [1], including 12 binary classification datasets.

Algorithm	wins	defeats	ties	balance
ECO- γ -gini	22	0	50	+22
ECO- γ -max	15	0	57	+15
ECO- γ -entropy	12	3	57	+9
ECO-K	8	6	58	+2
ECO- γ -margins	2	9	61	-7
ECO- γ -Kmeans-cal	2	18	52	-16
ECO- γ -Kmeans	0	25	47	-25

TABLE I: ECONOMY approaches comparison using Wilcoxon signed-rank test: significant wins / defeats of each approach (against all the other) counted for all α , based on the *AvgCost* criterion.

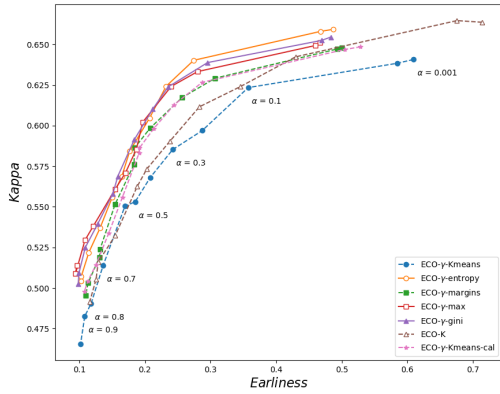


Fig. 13: Average Earliness vs. Average Kappa score obtain over the 45 datasets by varying the slope of the time cost, such as $\alpha \in [10^{-3}, 1]$.

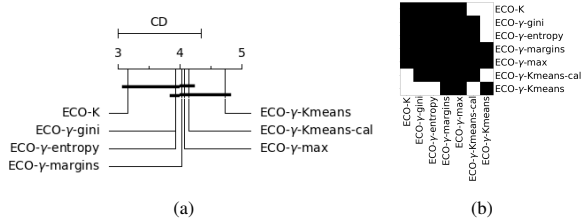


Fig. 14: Comparison of ECONOMY approaches for $\alpha = 0.001$ using (a) Nemenyi and (b) Wilcoxon signed-rank tests

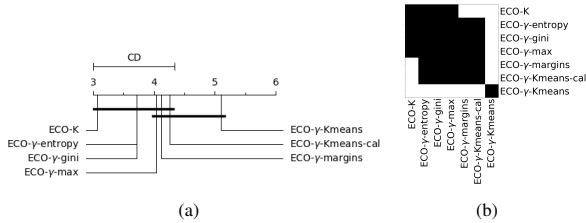


Fig. 15: Comparison of ECONOMY approaches for $\alpha = 0.01$ using (a) Nemenyi and (b) Wilcoxon signed-rank tests

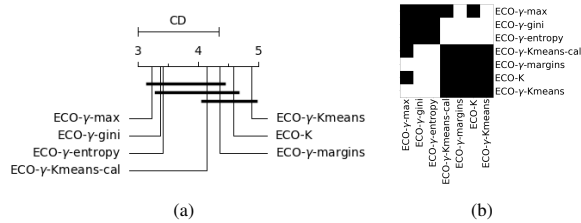


Fig. 16: Comparison of ECONOMY approaches for $\alpha = 0.1$ using (a) Nemenyi and (b) Wilcoxon signed-rank tests

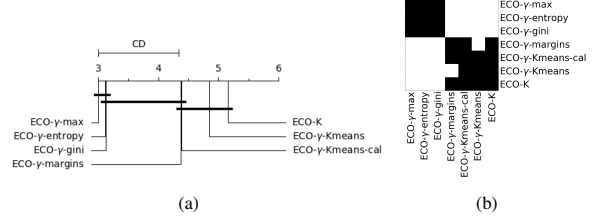


Fig. 17: Comparison of ECONOMY approaches for $\alpha = 0.2$ using (a) Nemenyi and (b) Wilcoxon signed-rank tests

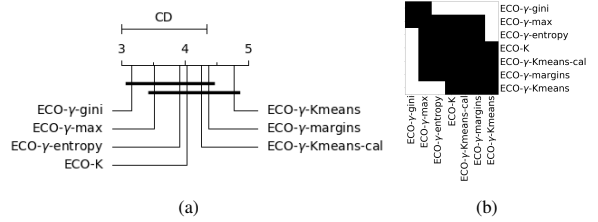


Fig. 18: Comparison of ECONOMY approaches for $\alpha = 0.3$ using (a) Nemenyi and (b) Wilcoxon signed-rank tests

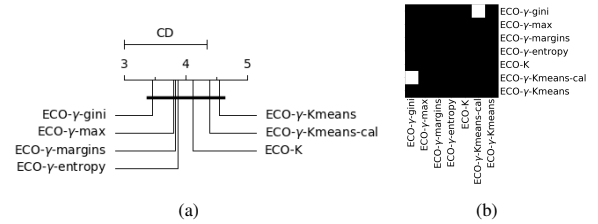


Fig. 19: Comparison of ECONOMY approaches for $\alpha = 0.4$ using (a) Nemenyi and (b) Wilcoxon signed-rank tests

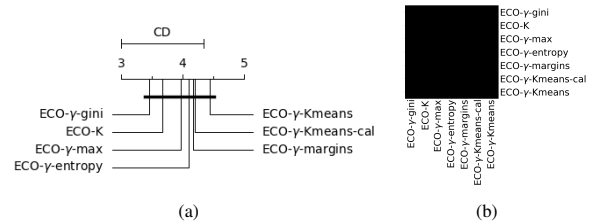


Fig. 20: Comparison of ECONOMY approaches for $\alpha = 0.5$ using (a) Nemenyi and (b) Wilcoxon signed-rank tests

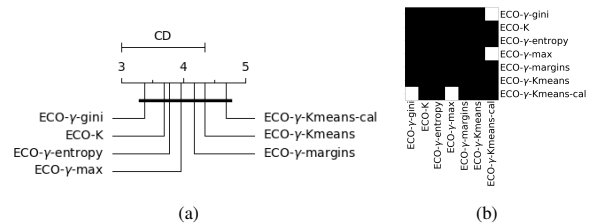


Fig. 21: Comparison of ECONOMY approaches for $\alpha = 0.6$ using (a) Nemenyi and (b) Wilcoxon signed-rank tests

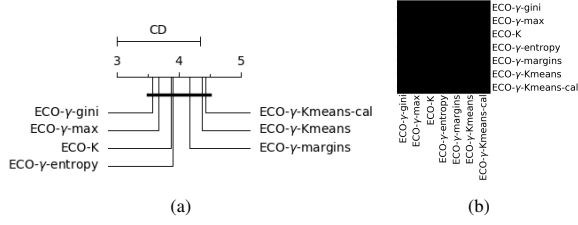


Fig. 22: Comparison of ECONOMY approaches for $\alpha = 0.7$ using (a) Nemenyi and (b) Wilcoxon signed-rank tests

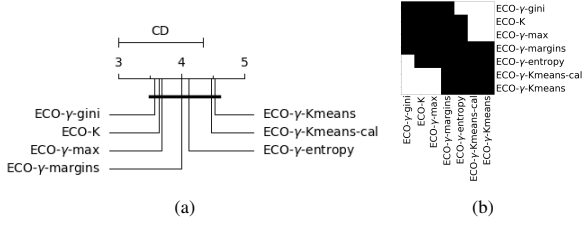


Fig. 23: Comparison of ECONOMY approaches for $\alpha = 0.8$ using (a) Nemenyi and (b) Wilcoxon signed-rank tests

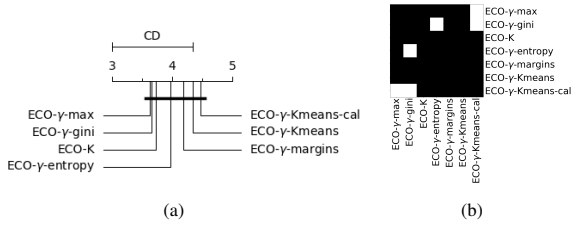


Fig. 24: Comparison of ECONOMY approaches for $\alpha = 0.9$ using (a) Nemenyi and (b) Wilcoxon signed-rank tests

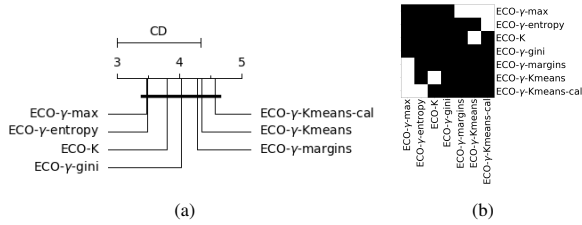


Fig. 25: Comparison of ECONOMY approaches for $\alpha = 1$ using (a) Nemenyi and (b) Wilcoxon signed-rank tests

REFERENCES

- [1] U. Mori, A. Mendiburu, S. Dasgupta, and J. A. Lozano, “Early classification of time series by simultaneously optimizing the accuracy and earliness,” *IEEE transactions on neural networks and learning systems*, vol. 29, no. 10, pp. 4569–4578, 2017.