Online Multi-Class classification on graphs remains as a challenging research due to three reasons.

1. Most online techniques focus on binary classification problems via addressing multi-class problems by using One-vs-All schema. Such a setting may be ineffective since it generalizes multiple binary classifiers and each classifier is updated independently of the others.

2. Online learning assumes that the labels of all vertices are provided already. It is impractical as labelling every sample is expensive and time-consuming in many real-world applications.

3. Data usually arrives in a sequential order in social networks and the network scale can be very large, which brings a critical challenge to develop an efficient and scalable algorithms for graph classification.

To minimize the labelling cost, we propose a new query technique based on both the "margin" and "uncertainty" criteria, to only query the labels of the most informative instances. In addition, to take full advantage of correctly predicted labels that are discarded in conservative algorithms, we introduce an aggressive version of selective sampling. It hybrids the conservative update with the aggressive sampling scheme, which updates the model even if no error occurs.

We evaluated the performance of baselines and our algorithms with two measurements: cumulative error rate and number of queried labels. The figures below show the performance with respect to online learning rounds, various ratio of queried labels and a sensitive study of low-rank impact on performance.

We introduced an aggressive selective sampling algorithm, namely MSG, to take full advantage of these wasted labels in existing conservative algorithms. The encouraging empirical results on several real-world datasets indicated that 1) the MSG is able to achieve comparable or better predictive performance by querying a significantly small amount of labelled data; 2) the aggressive selective sampling scheme can further reduce the query rate, achieving a convergence stage rapidly.

Bibliography