Improving Multiclass Classification in Crowdsourcing by Using Hierarchical Schemes

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Different workers may be good at distinguishing different items

Worker A
Siberian Husky

Worker B
Gray Wolf

Hierarchical Scheme Selection:
1. Generate many candidate hierarchical schemes.
2. For each scheme, simulate the worker allocation process, and estimate the expected accuracy.
3. Choose the scheme with the best accuracy.

In hierarchical classification, we can assign different workers to different sub-tasks

E.g.: Flat Classification of Canis Animals

E.g.: Hierarchical classification scheme

Worker Allocation Algorithm
Greedy algorithm focusing on variance of worker ability

Overview:
1. We publish a flat classification task as a qualification task.
2. We calculate accuracy of each worker for each subtask by using the ground truth.
3. We assign workers to subtasks by a greedy algorithm giving priority to workers whose accuracy largely changes depending on tasks.

Calculate standard scores of workers’ accuracy in each subtask. Sort workers by the variance of the standard scores in subtasks.

Result of Experiment 1 on AMT

Result of Experiment 2 on AMT

Summary
- Published 2 experiments on Amazon Mechanical Turk.
- Compare the accuracy of flat and hierarchical schemes with majority voting and EM-based weighted voting.
- Conclusion: Hierarchical schemes improve the accuracy if we choose an appropriate hierarchy by our algorithm.