EPSRC Engineering and Physical Sciences Research Council

ORCHID

Budget-Limited Adaptive Crowdsourcing

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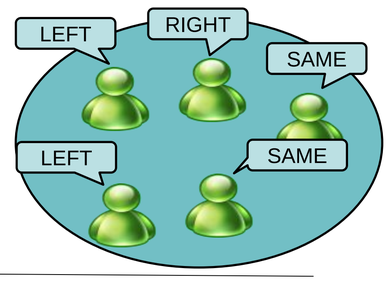
1. Adaptive Crowdsourcing

Crowdsourcing systems:

Use mass of human intelligence to solve hard AI problems

amazon mechanical turk™ Artificial Artificial Intelligence



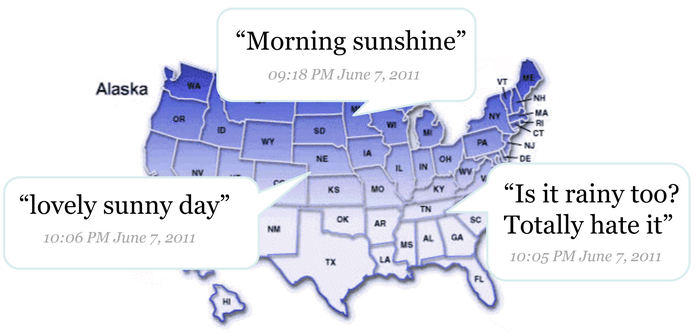
Single response is *unreliable* → *redundant task allocation*

How many responses/task are *sufficient* *when budget is limited* ?

Adaptive manner: *online* task allocation → cost savings

2. Real World Applications

Tweet Sentiment Analysis



CrowdFlower

CrowdFlower dataset:
- 98,935 Tweets
- 569,7860 Judgments
- 1,960 Workers

Text Sentiment Analysis

Dataset:
- 5000 Text snippets
- 27.746 Judgments
- 204 Workers

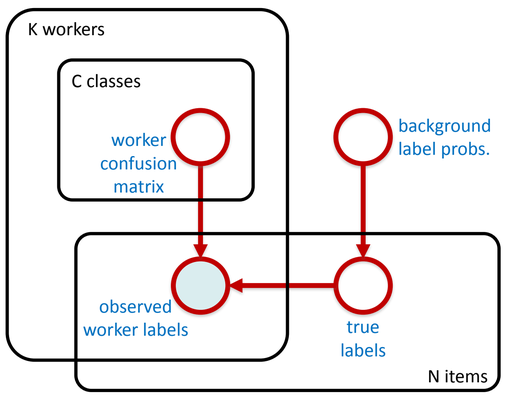
Music Genre Classification

Dataset:
- 10 Music files
- 2.945 Judgments
- 44 Workers

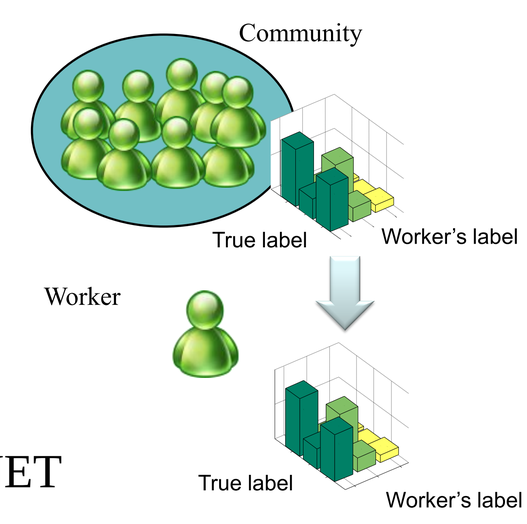
3. Intelligent Task-Worker Selection

Probabilistic model of worker’s reliabilities and aggregated labels:

Bayesian Classifier Combination (BCC)
[Simpsons et al., 2013]



Community-Based BCC
[Venanzi et al., 2014]



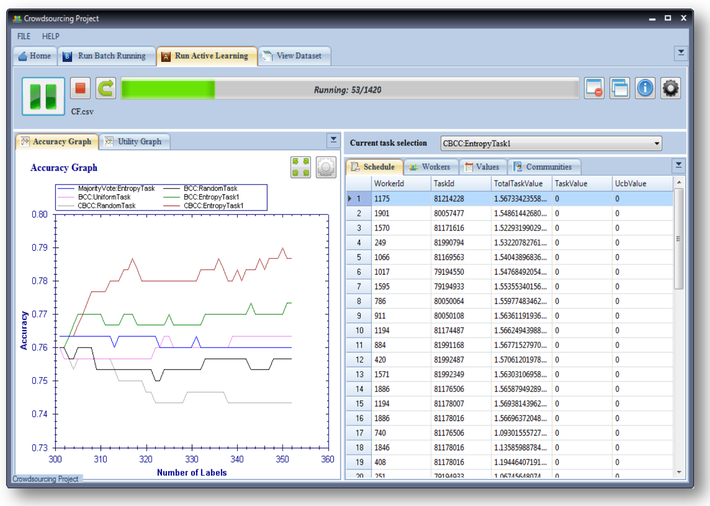
Scalable inference using Infer.NET

Model-Based Active Learning for Label Selection:
- Entropy-based utility to select tasks
- Forward planning frameworks (MDP, Expected information gain) to select workers and tasks

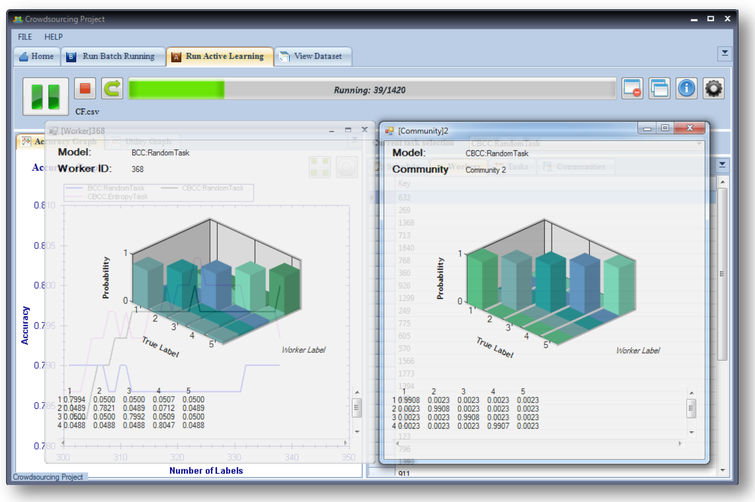
infer.net

4. Software Framework

Supports many state-of-the-art crowdsourcing models:
- Majority voting
- Dawid & Skene
- BCC
- CBCC



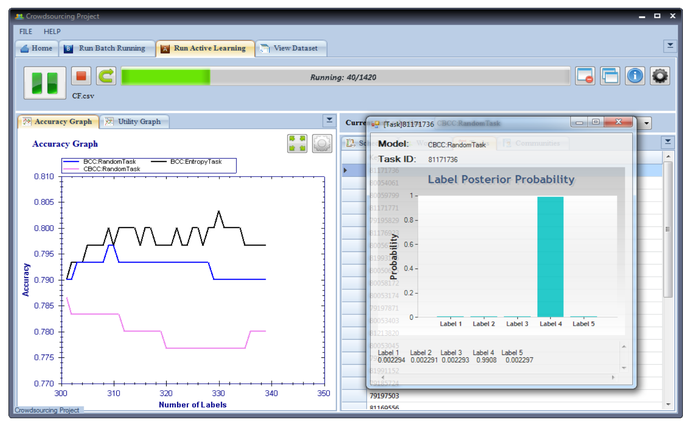
Active Learning Experiment Interface



Updated inference results
- Confusion matrices
- Communities
- Task’s label predictions

Worker and Community Confusion Matrices

Evaluate different active learning methods:
- Random sampling
- Entropy
- Expected gain



Label Posterior Probabilities of Each Task

Run Active Learning Experiment with Various Models:
- Adapt Models with Different Task Selection Strategies
- Dynamic accuracy and utility graphs
- Real-time data of schedules. tasks, workers and communities

5. Future Work

Task-worker selection with large uncertainty
- Utility estimation is noisy
- Current frameworks follow greedy approach
- Additional learning layer to be added
- Idea: multi-armed bandit + BCC

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