

# Accounting for Confirmation Bias in Crowdsourced Label Aggregation

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# *Cognitive Biases in Crowdsourcing*

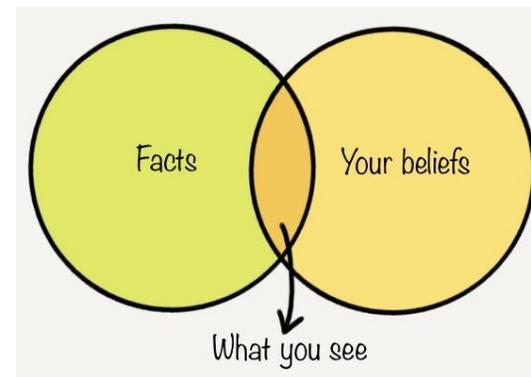
**Crowd workers are prone to a wide range of biases!**

In-batch annotation bias

Sequential bias

In-group bias

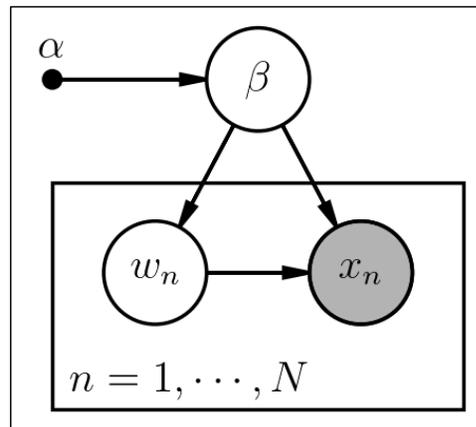
**Confirmation bias**



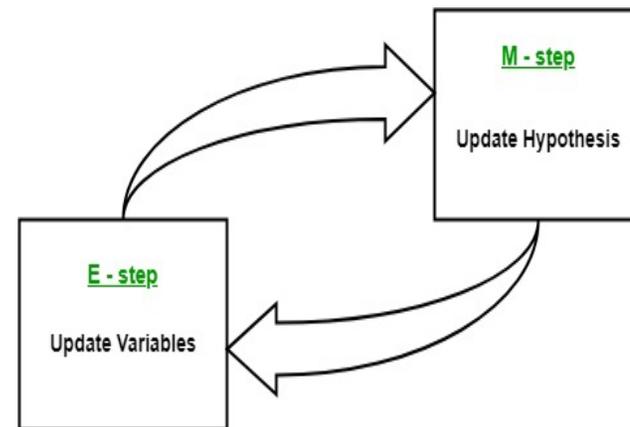
**Label aggregation algorithms are developed, but they seldom take worker biases into account...**

## Our Approach: Bias-Aware Label Aggregation

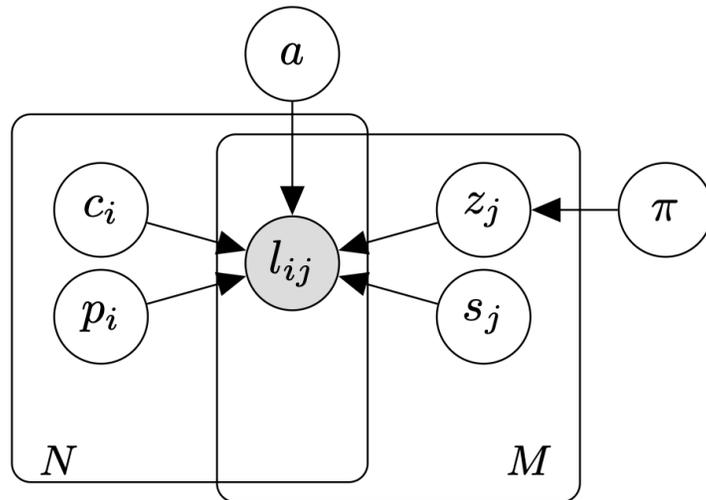
Model explicitly how worker's confirmation bias sneaks into annotations.



Design an algorithm based on the proposed model to reduce bias in the aggregated labels.



# Probabilistic Model of Label Generation



$$P(l_{ij} = 0 | c_i, p_i, s_j, z_j, a) = \frac{1}{e^{a[(1-p_i)(s_j-c_i)^2 + p_i z_j]}}$$

$\mathbf{c}_i \in [0, 1]$  : the values of annotator  $i$

$\mathbf{s}_j \in [0, 1]$  : the values of information contained in task  $j$

$\mathbf{z}_j \in \{0, 1\}$  : ground truth label of the task  $j$

$\mathbf{\pi} = P(\mathbf{z}_j = 0)$  : the prior probability for a task to have the preferable label

$\mathbf{p}_i \in [0, 1]$  : extent to which annotator  $i$  is subject to confirmation bias

$\mathbf{a} \in [0, +\infty)$  : annotators' base rate of providing the preferable label

# Evaluate Our Approach with Real-World Data

Label a statement as either  
"Opinion" or "Factual"

**Task 5 out of 13**

Read the following statement carefully and decide whether it is an opinion or a factual statement.

*"Guns easily freed USA from British Forces."*

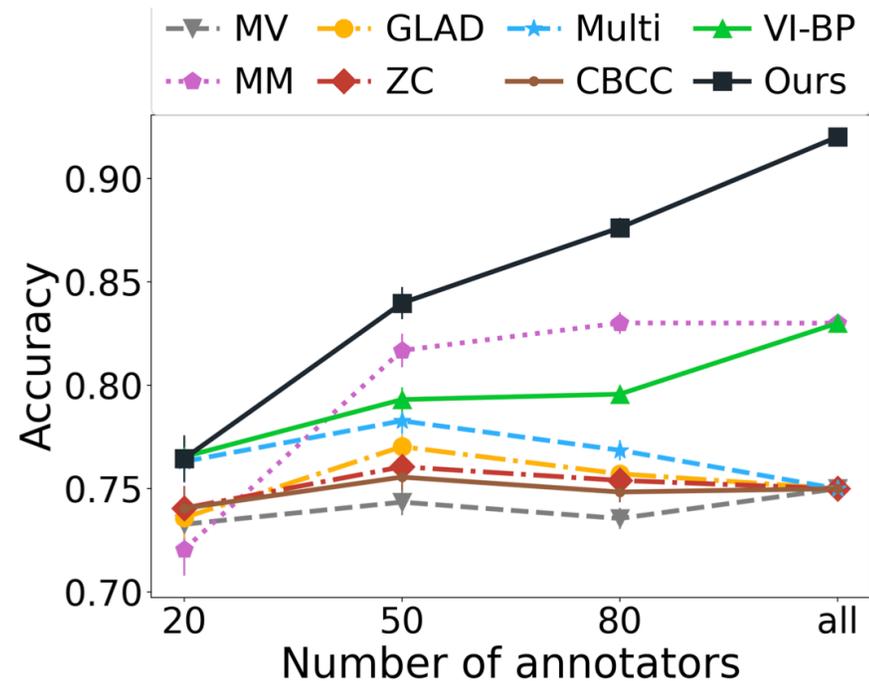
Opinion

Factual

I don't know

Next

110 workers × 12 statements  
= 1320 labels



**Our algorithm almost always achieves the highest accuracy!**



**Scan the code to check out our paper!**

