

DOCS: A Domain-Aware Crowdsourcing System Using Knowledge Bases

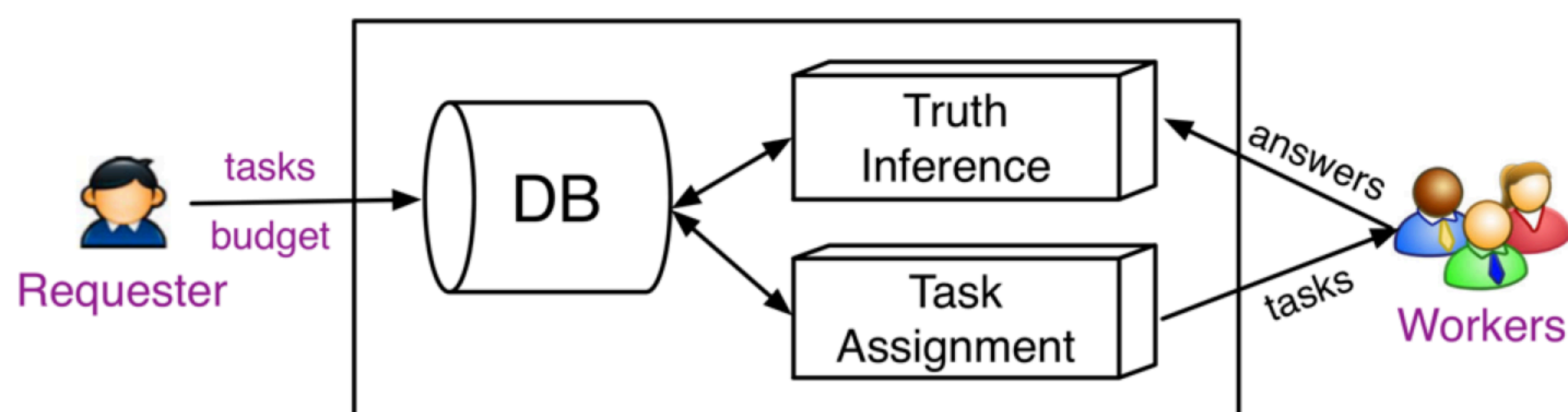


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Crowdsourcing Workflow

- Task Assignment:** When a worker comes to the platform, the worker will be assigned to a set of tasks;
- Truth Inference:** When a worker accomplishes tasks, the platform will collect answers from the worker.



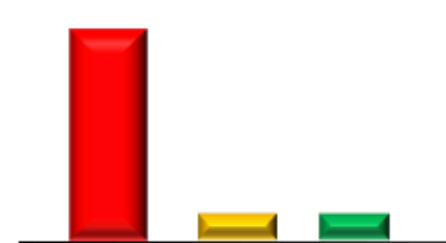
Existing Works Fail in QA Tasks

- Each task is related to different domains

■ Sports ■ Politics ■ Entertainment

Did Michael Jordan win more NBA championships than Kobe Bryant?

→ Sports

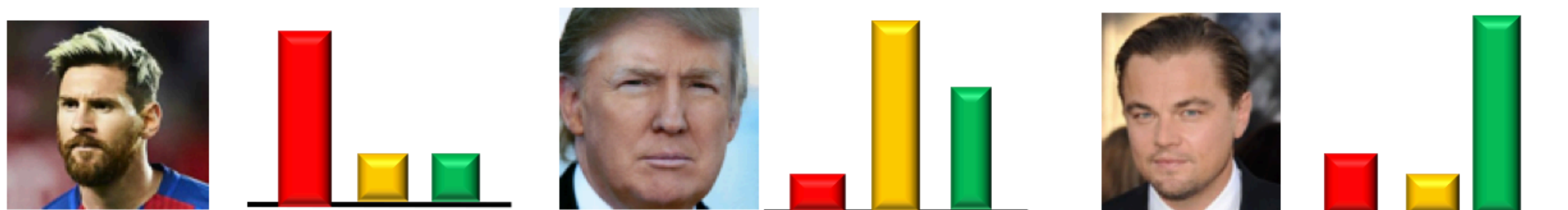


Is there a name for the song that FC Barcelona is known for?

→ Sports & Entertainment

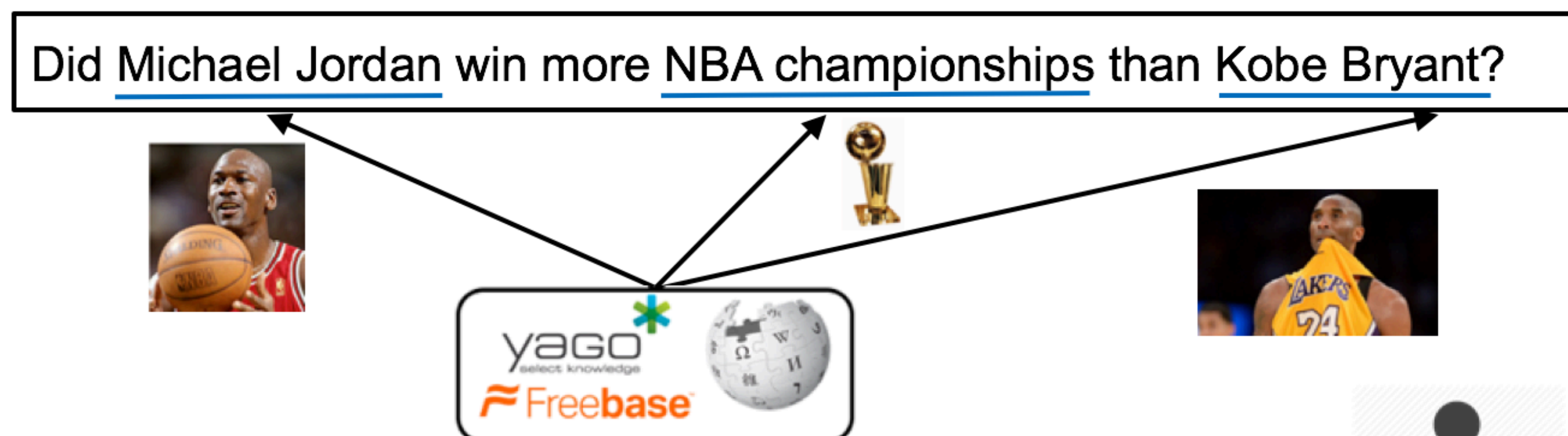


- Each worker has diverse qualities over domains



Build Domain Aware Task Model

- (1) **Entity linking** (map entity to knowledge bases)



- (2) Hierarchical domains in knowledge bases
- (3) Obtain the task model (a vector of distribution)

■ Sports ■ Politics ■ Entertainment

Did Michael Jordan win more NBA championships than Kobe Bryant?

→ Sports



Build Domain Aware Worker Model

- Use **qualification test** (like an "exam") amazon mechanical turk Artificial Intelligence
- Two rules for selecting **qualification test**
 - (1) Each selected task should **capture a certain domain**
 - (2) The domain distribution of selected tasks should **approximate the distribution of all tasks**

KL-divergence

$$\min_{\{n'_k\}} \sum_{k=1}^m \frac{n'_k}{n'} \cdot \ln \frac{n'_k \cdot n}{n' \cdot \sum_{i=1}^n r_k^{t_i}}$$

s.t. $\sum_{k=1}^m n'_k = n'$ and $n'_k \in \mathbb{N}$ for $1 \leq k \leq m$.

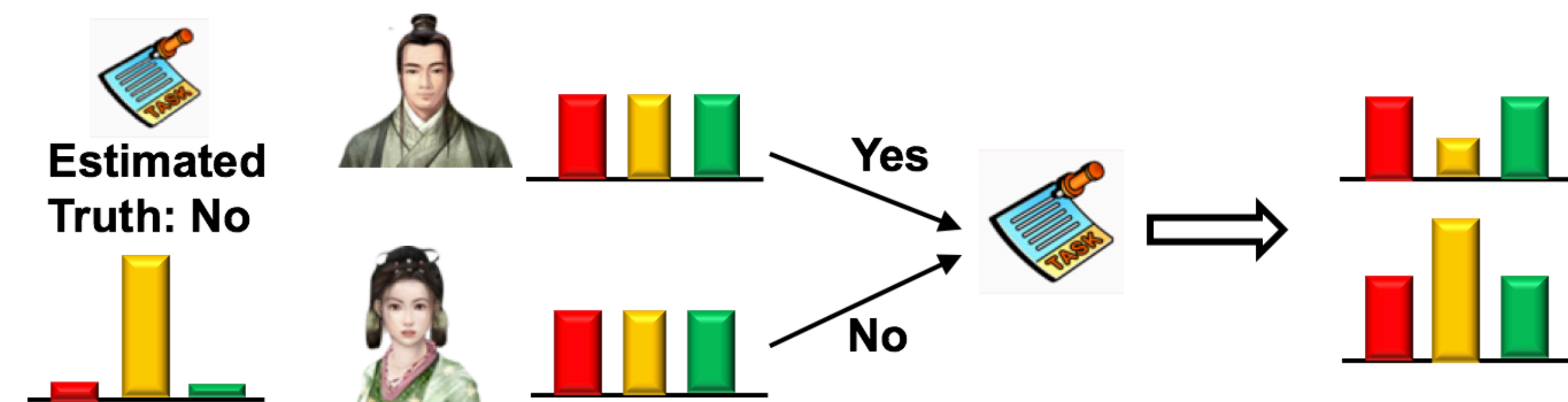
Truth Inference

- 1. **Quality for each worker** \Rightarrow **Truth for each task**

■ Sports ■ Politics ■ Entertainment



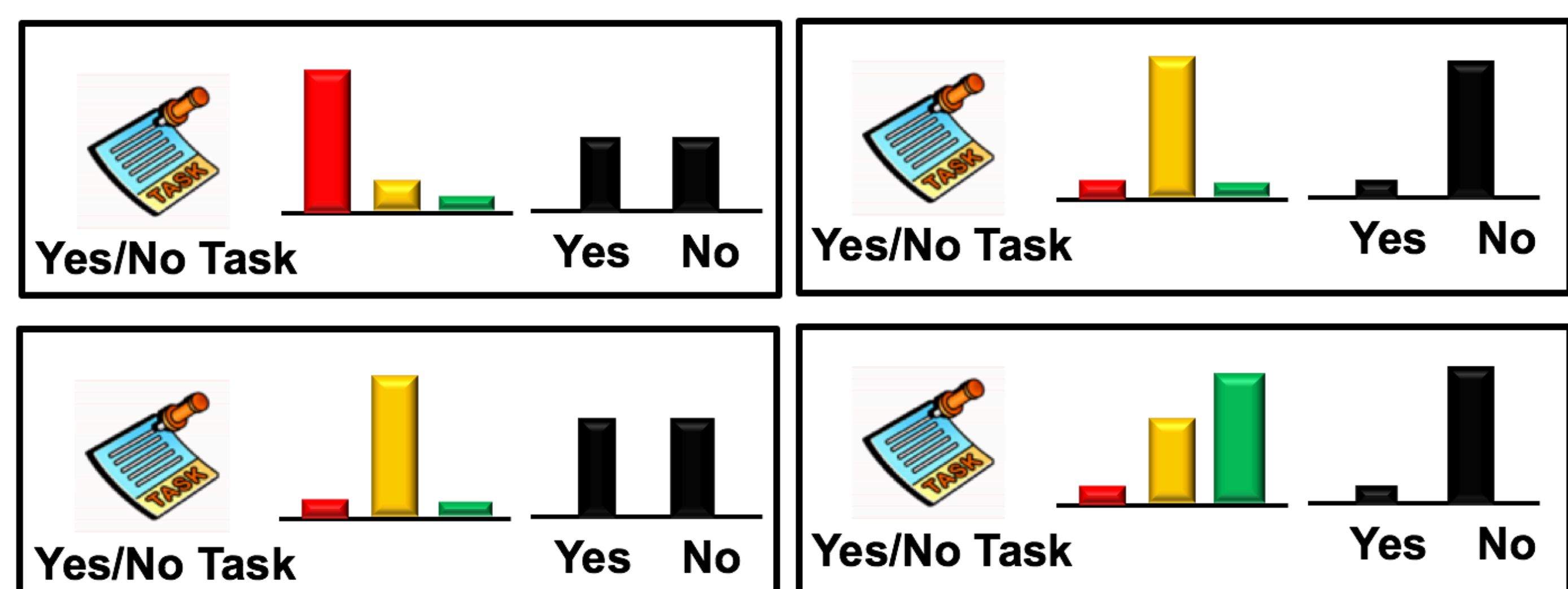
- 2. **Truth for each task** \Rightarrow **Quality for each worker**



Task Assignment

- Select the most suitable tasks for assignment

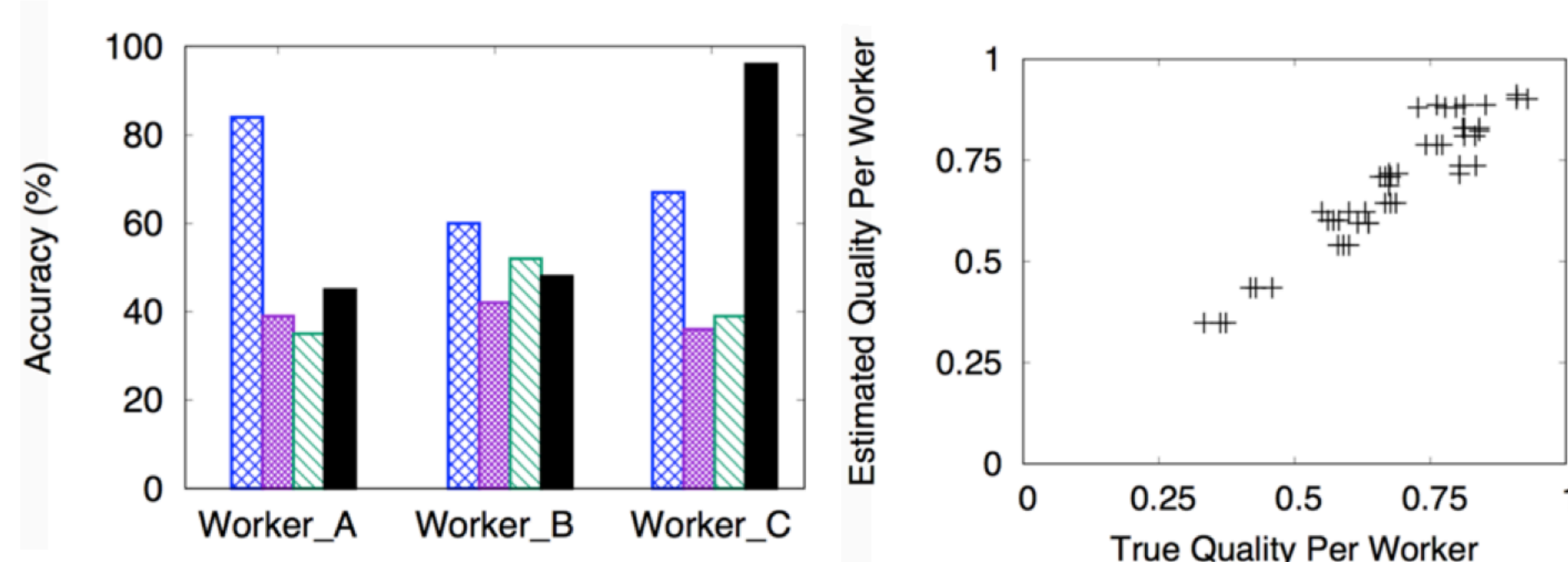
■ Sports ■ Politics ■ Entertainment



(1) Matching Domains
(2) Answer Uncertainty

Experiments

- Worker Characteristics on Dataset D_Item



- System Comparisons

