1. Details of Experiments

1.1 Parameter Settings in Experiments of Crowd Sourcing Platform

We set the inputs U, V, E, w_{et}, and p_{vt} from the used data as follows, based on [Hikima et al. 2021; Ho and Vaughan 2012]:

(i) U: From all tasks, m tasks are extracted as the task set U. The scalar m varies in each experiment.

(ii) V: From all workers, n workers are extracted as the arriving worker set V. The scalar n varies in each experiment.

(iii) w_{et}: We decide the correct judgment for each task in the data by majority vote. Then, let ϕ_s^v be the percentage of correct answers of worker v for topic s. In our experiment, we assume that ϕ_s^v is known a priori, and set $w_{et} := \phi_{s(u)}^v$ for each $e = (u, v)$ and $t \in T$. Here, $s(u)$ means the topic of task u. This setup is based on a scheme that determines the value of solving a task according to the worker's skill. For $e = (u, v)$ where worker v has never solved the topic of task u, we set $w_{et} := 0$.

(iv) p_{vt}: We consider the following logistic function:

$$p_{vt}(x) := r_{vt}\left(1 - \frac{1}{1 + e^{-(x-g_v)/(\gamma|g_v|)}}\right),$$

Let $r_{vt} = \frac{y_{vt}}{\sum_v y_{vt}}$, where y_{vt} is generated from a uniform distribution of $[0.01, 1]$ for each v and t. Constant g_v is generated from a uniform distribution of $[-0.8, -0.4]$ for each v. We set $\gamma = 0.25\sqrt{3}/\pi$. This setting implies that each worker v arrives at time t with the probability r_{vt} and the distribution of the minimum wage that he is willing to work follows a logistic distribution with mean $-g_v$ and standard deviation $0.25|g_v|$.

1.2 Parameter Settings in Experiments of Ride-sharing Platform

We set the inputs U, V, E, w_{et}, and p_{vt} from the used data as follows, based on [Dickerson et al. 2018; Hikima et al. 2021]:

(i) U: We set $|U| = 30$. We divide Manhattan into 20 areas and assign each taxi $u \in U$ an area (potentially the same) that corresponds to its docking position.

(ii) V: We regard the set of all origin-destination pairs of areas as V. Therefore, $|V| = 20 \times 20 = 400$.

(iii) T: We consider 10:00-20:00 of each day as the time horizon and set the total number of rounds $|T| = \frac{60*10}{5} = 120$ by discretizing the 10 hours into a time-step of 5 minutes.

(iv) c_{et}: For each $e = (u, v) \in E := U \times V$, let c_{et} be the time required for taxi u to fulfill request v and return to the docking position. It is calculated from the destination and origin of requester v and the docking position of taxi u. We assume there is no difference in c_{et} for each t.

(iv) w_{et}: Let $w_{et} = -1.0c_{et}$. Parameter 1.0 means taxi driver's opportunity cost for 5 minutes, based on taxi driver's income.

(v) p_{vt}: We consider the following logistic function:

$$p_{vt}(x) := r_{vt}\left(1 - \frac{1}{1 + e^{-(x-\beta\cdot q_{vt})/(\gamma\cdot|q_{vt}|)}}\right),$$

where β and γ are constants. We set $\beta = 1.25, \gamma = 0.25\sqrt{3}/\pi$. Here, r_{vt} (q_{vt}) is the average of the number of requesters' arrivals (actually paid amounts) for v in the hour containing the time step t in the data set. This setting implies that each requester v arrives at time t with the probability r_{vt}, and the distribution of the maximum price that he is willing to pay follows a logistic distribution with mean $1.25q_{vt}$ and standard deviation $0.25|q_{vt}|$.

References

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