Intelligent Mobile Crowdsensing with Deep Reinforcement Learning

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Task Allocation Problem for Mobile Crowdsensing

System Model: A task allocation problem aims to plan paths for a group of workers (denoted by U) to complete a set of data collection tasks (denoted by *V) in a cost-effective manner.*



Each worker $u \in U$:

- Initial location $l_{u,0}$ ullet
- Travel capacity $f_{u,0}$
- Unit travel cost c_{μ}
- Unit travel time q_{μ}

Each task $v \in V$:

Location l_{ν}

Objective: Maximize the total profit from the gap between the total compensation for workers' sensing effort and the total budget from completed tasks by planning path P_{1} for each worker $u \in U$.

- Total travel distance of worker u over path P_u should be less than his/her travel capacity $f_{u,0}$.
- For each unit of travel distance, the worker spends time 2) q_{μ} and requires incentive payment c_{μ} .
- Task v can only be completed when a worker reaches 3) location l_{ν} of the task before its sensing deadline τ_{ν} .

- Budget b_{ν}
- Expiry time τ_{ν}

Solution with Deep Reinforcement Learning (DRL)

DRL Approach:



Examples:

The greedy method hires 2 workers to The GDRL method hires 4 workers to complete 9 tasks and earn a profit of 31. complete 18 tasks and earn a profit of 81.



Performance of DRL, Heuristic, and Metaheuristic Methods

Performance Ratio:



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