Differential Privacy Meets Maximum-weight Matching

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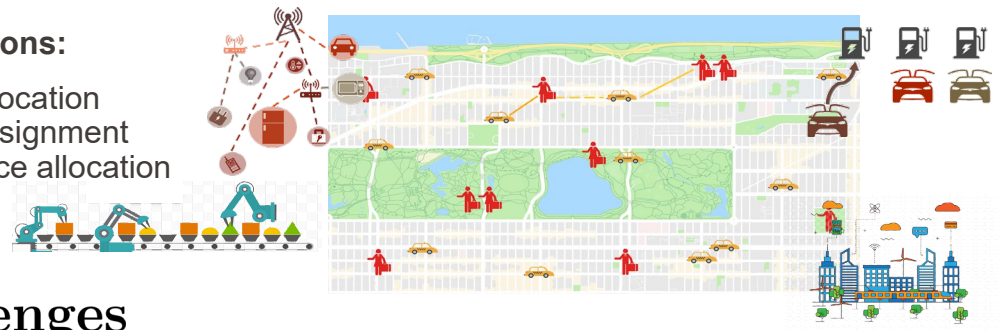
Large-scale Multi-agent Coordination

Applications:

- Role allocation
- Task assignment
- Resource allocation



Challenges

i. **Complexity:** Runtime increases with the total problem size

i. **Communication:** Polynomial number of messages.

ii. **Privacy:** The allocation must match agents to their preferred resources to maximize social welfare, but this preference is exactly what agents wish to hide!

Traditional DP Mechanisms

Consider a very broad class of adversaries and protects all users, independent of their characteristics, by the same guarantee. Yet:

- Users might be willing to **disclose less-sensitive information**
- The **attacker** might already **know** coarser-grained information because it is likely pubic or easily available, and thus, does not need to be hidden
- **Domain characteristics** might exclude a subset of solution

Piecewise Local Differential Privacy

- Local DP indistinguishability inside pre-defined regions
- Allows for **tighter composition** theorems

PALMA:Privacy-Preserving Heuristic for Decentralized Large-scale MWM

i. **Constant** time **convergence**

ii. **No** inter-agent **communication**

iii. **Strong** worst-case **privacy** guarantees

Simulation Results