

**CHENNAI – PONDICHERRY**

**Scalable Mobile Crowdsensing via Peer-to-Peer Data Sharing**

**Abstract:**

Mobile crowdsensing (MCS) is a new paradigm of sensing by taking advantage of the rich embedded sensors of mobile user devices. However, the traditional server-client MCS architecture often suffers from the high operational cost on the centralized server (e.g., for storing and processing massive data), hence the poor scalability. Peer-to-peer (P2P) data sharing can effectively reduce the server’s cost by leveraging the user devices’ computation and storage resources. In this work, we propose a novel *P2P-based MCS* architecture, where the sensing data is saved and processed in user devices locally and shared among users in a P2P manner. To provide necessary incentives for users in such a system, we propose a quality-aware *data sharing market*, where the users who sense data can *sell* data to others who request data but not want to sense the data by themselves. We analyze the user behavior dynamics from the game-theoretic perspective, and characterize the existence and uniqueness of the game equilibrium. We further propose best response iterative algorithms to reach the equilibrium with provable convergence. Our simulations show that the P2P data sharing can greatly improve the social welfare, especially in the model with a high transmission cost and a low trading price.

**Existing System:**

A P2P-based MCS system, the sensing data may not be reported to and saved in the server; instead, they can be saved and processed in mobile users’ devices distributedly (via some mobile apps or dedicated middlewares) and shared among users directly. The functionality of the server, similar as in traditional P2P networks, is mainly to keep track of each user’s data occupancy information (e.g., which data she has) and network connection information (e.g., IP address of each user). With such information, the server can help users connect and share data with each other. Moreover, data sharing among users can be done based on the local interactions (e.g., via WiFi or Bluetooth) when they are close enough, or directly through the Internet when they are not locally connected.

**Proposed System:**

We propose a general pricing scheme for the data sharing (trading) among data sensors (sellers) and data requesters (buyers), which combines both the revenue sharing scheme and the *quality-based* pricing scheme. With the proposed pricing scheme, the reward for a data sensor from selling data to a data requester consists of (i) a portion of the total benefit that the requester achieves (from consuming the data), and (ii) a quality-aware data price.

We perform the game-theoretic analysis for the data sharing market under the proposed pricing scheme. In particular, we analyze the user behaviors and strategic interactions under the above pricing scheme systematically, for both scenarios of the quality-unaware data sharing and the quality-aware data sharing (capturing whether the data can be sensed and sold in different qualities). We characterize the conditions for the market equilibrium, and prove the existence and uniqueness of the equilibrium. We further propose a generalized best response iterative algorithm that guarantees to converge to the market equilibrium.