1 Introduction

Place holder

2 Related work

Place Holder

3 Definitions and problem statement

In this section we formally define the notations and the problem we will be dealing with.

3.1 Set-up

As stated, in our problem we have a set of people $\mathcal{H}$ who are part of an organization already. Our aim is to find a new set of people H from a candidate set C (clearly $H \subseteq C$) such that adding these new set maximizes the utility of the hire, subject to a budget constraints k, i.e. $|H| = k$. The utility of hire depend on two parameters, namely the team which is denoted by graph G and the task distribution $\mathcal{T}$. We present the details about the parameters first and then present the formal definition of the utility.

3.1.1 Organization graph G

The nodes in graph $G(V, E)$, represented by the set $V = \{\mathcal{H} \cup C\}$, denote the people. As can be seen that it includes the people that are present in the organization already $\mathcal{H}$ and the set of candidates C. The edge set of graph G is denoted by E. An edge $e \in E$ is weighted, the weight $w(e)$ denotes the communication cost between the two people which are the endpoints of e. We assume the weight of all the edges involving even the candidates are known.

Further we use the notation $G_{V'}$ to denote the induced sub graph of G taken over the node set V'.

3.1.2 Task Distribution $\mathcal{T}$

We assume that the set of tasks are not known beforehand. Instead a probability distribution over the task is defined. $\mathcal{T}$ denotes the distribution.

3.1.3 Utility of an hire

The utility of the hire depends on the people who are hired and the tasks for which they are hired. Precisely we assume the $util(G_{V'}, T)$ denotes the utility of a node set V', people who are hired, for a task $T \in \mathcal{T}$. The overall utility can then be computed as,

$$util(G_{V'}, \mathcal{T}) = \sum_i Pr[T_i] \times util(G_{V'}, T)$$

Given this utility measure, we next proceed to define the expected gain from a possible hire set. Recall H denotes a possible set of hiring. Then the gain of this hire is,

$$\delta(H) = util(G_{\mathcal{H} \cup H}, \mathcal{T}) - util(G_{\mathcal{H}}, \mathcal{T})$$

We are now ready to define our problem of hiring a team that maximizes hiring utility.

Problem 1 (HireMax). *Given $G = (V = \{\mathcal{H} \cup C\}, E)$, denoting the set of all people and their communication costs, find a hire set H from a candidate set of hire C under a budget constraint k which implies that $|hireset| = k$, such that adding the hire set to the existing set of hired people $\mathcal{H}$ earns the highest expected gain in utility, $\delta(H)$.*

References