**MOTIVATION**

- Search queries are an outcome of some task.
- And tasks revolve around real world objects i.e. Entities.
- Can entities and their categories be used to extract Tasks?

**CONTRIBUTIONS**

- Exploit entities to extract tasks from search logs.
- Use entity type (category) information to group related tasks.
- Use implicit and explicit means to evaluate our approach with existing task extraction baselines.

**METHODOLOGY**

A single user goal can be represented by several queries. Cluster queries in each category into distinct tasks.

**Entity Tagging and Query Aggregation**

- Identify all the entities in a query.
- Aggregate queries as per their entity-type.

**Task Extraction Algorithm**

**Input:** Category hierarchy $\mathcal{H}$, Queries $\mathcal{L}$, $\text{min}_{sp}$, $\text{min}_{ac}$

**Output:** Category hierarchy $\mathcal{H}'$ with tasks

1. for $q_i, q_j \in \mathcal{L}$ do
2. sim$(q_i, q_j) = \sum_h w_h \cos(f_{k1}, f_{k2})$
3. end for
4. for category $C_i \in \mathcal{H}$ do
5. for parent $P_{ij} \in \text{par}(C_i)$ do
6. if $\frac{|C_i \cap P_{ij}|}{|C_i|}$ $> \text{min}_{sp}$ then
7. merge$(C_i, P_{ij})$
8. end if
9. end for
10. end for
11. for category $C_i \in \mathcal{H}$ do
12. $C_i' = \text{dpmmeans}(C_i, \text{sim})[8]$
13. end for
14. for category $C_i' \in \mathcal{H}'$ do
15. for queries $q_{ij} \in C_i'$ do
16. if $\text{sc}(q_{ij}) < \text{min}_{ac}$ then
17. merge with nearest cluster $\in \{\text{par}(C_i') \cup \text{child}(C_i')\}$
18. end if
19. end for
20. end for

**Category based operations:**

- Merge queries of low resource categories with parent node.
- Queries may be incorrectly mapped to a task cluster.
- Re-assign such queries with low cluster scores to tasks on parent or child nodes.

**EVALUATION**

**Intrinsic Evaluation**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Intra-cluster</td>
<td>0.56</td>
<td>0.57</td>
<td>0.43</td>
<td>0.13</td>
</tr>
<tr>
<td>Inter-cluster</td>
<td>0.82</td>
<td>0.84</td>
<td>0.98</td>
<td>0.11</td>
</tr>
</tbody>
</table>

**Precision - Recall Curves**

**Term Prediction**

**EXAMPLE OUTPUT**

- **Organizations**
  - Company
  - Educational Institute
  - Military Unit

**References**