**A Graph Approach to Unsupervised Intent Recognition**

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**Abstract**

Text and speech intent recognition are central tasks in Natural Language Processing, with widespread industry applications. Their main application, Conversational AI, will alone be worth $14 Billion in 2025, reflecting the ever-increasing demand for AI-powered customer support and engagement. State of the art intent extraction models are predominantly supervised: NLP researchers and practitioners have crafted sophisticated models that compete in performance and in complexity on benchmark corpora of annotated queries. Models are typically classification or sequence models trained on databases of annotated queries then used to predict intents on unseen utterances. But despite the approach’s growing popularity, it relies on extensive human annotations and its opacity provides little to no insights into the structure of intent representation. The unsupervised approach, far less explored, could be used to reduce labelling workload while enabling the elaboration of a clear and concise formal model of natural language intent. We will review key questions on intent recognition, predominant approaches and our preliminary results with an unsupervised approach to intent parsing.

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**Introduction**

Dominant approach is to use deep neural networks (BERT) to achieve few shot learning **[TODO].**

We explored an unsupervised learning approach.

Intent formalisation

Task oriented queries

Corpora

Parsing

Context free grammar, production rules

Verb phrases chunking

**Results**

**Corpus vocabulary is very discriminant but requires labels**

**Formalizing intent**

Hollerit et al, 2013

seed + noise made of a verp phrase and additional phrase constituents

**Meaningful intents can be reconstructed from sentence graphs**

**Semantic hierarchical clustering reveals levels of intent expressivity**

Why hierarchical, not flat?

**Structural and semantic ambiguity limit the model performance**

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**Methods**

**Corpus**

Banking77 [TODO]: a corpus of task-oriented queries

**Parsing**

**Constituency parsing:** [TODO]

- verb phrase chunking

- search with tgrep

**Dependency parsing:** [TODO]

**Named Entity Recognition**:[TODO]

**Filtering**

**Clauses** [TODO]

**Low query complexity** [TODO]

**Low syntactical complexity** [TODO]

Graph-of-words [TODO]

Longest common path similarity: [TODO]

Graph edit similarity: [TODO]

**Mood** [TODO]

Questions were more often filtered than statements and imperative sentences were rare.

**Wordnet**

Filter words in wordnet: non noun or verb constituents. We dropped mispelled words, adjectives, stopwords

**Intent construction**

(Root, Direct object, Entities)

**Semantic Hierarchical clustering**

**Semantic similarity** [TODO]

- Wordnet

**Hierarchical agglomerative clustering** [TODO]

**Generalization**

[TODO]: do other task-oriented corpora have same properties ? (e.g., more questions than other moods, explicit intents)

**Discussion**

**Challenges**

Real life utterance

“I want—I want—something—something—to—to live with.” Excerpt From: Joseph Conrad. “Heart of Darkness”.

Multi-intent utterances

Implicit utterances

Mispelling