Nuance Reasoning Framework

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Introduction

- Principal Research Engineer at Nuance Research Lab in Sunnyvale, CA, USA

- Part of group working on knowledge representation and reasoning

- Lab does applied and foundational research in the area of AI & NLP

- ~ 15 researchers and engineers with diverse backgrounds KR, Semantic Web, NLP and Dialog.
Motivation

- Imagine an automotive assistant embedded in your car which can assist you with finding parking.

- You are driving on a rainy day and have to find parking near downtown until 5pm.

- To complete this request, the automotive assistant must consider many implicit factors – time, location, preferences.
Motivation

– A specialized reasoning module is necessary to reason over the implicit factors – time, location, preferences

– Need for a framework which allows
  – Plugging in specialized reasoners
  – Identify which reasoners to invoke
  – Combine response from different reasoners
AI Contextual Reasoning Framework
Overview

**Nuance Reasoning Framework**
Performs contextual reasoning to infer implicit constraints, needs, etc. to deliver personalized results.

**Intelligent Knowledge**
Considers explicit constraints and output of reasoning to retrieve best results that fulfill the user’s request.

**Contextual Reasoner**
- POI
- Parking
- Fuel

**Spatial Reasoner**
- Restaurants

...
Nuance Reasoning Framework

Performs reasoning over explicit and contextual information to personalize and deliver high quality results

Key Features

- **Flexible Framework**: Allows a wide range of reasoning techniques to be easily integrated and accessed via a unified interface.

- **Reasoner Arbitration**: Automatically decides which reasoners to use.

- **Consistency Checker**: Merges inferences from multiple reasoners into a consistent conclusion.

- **Pre-Built Reasoning Engines**: Provides pre-built reasoning engines to support frequently occurring reasoning requirements such as:
  - Spatial Reasoning
  - Temporal Reasoning
  - Contextual Reasoning

Semantic Query: “Find parking near the stadium”
Parking (x) & Stadium (y) & Near (x, y)

New Query
Parking (x) & Stadium (y) & isCovered (x, true) & Distance (x, y, z) & (z < 0.5mi)

Precipitation: Yes
Future Direction

– Ongoing development of additional reasoners

– Machine learning based arbitration/mediation strategies

– Richer representation of contextual information