Articulate2: Toward a Conversational Interface for Visual Data Exploration

1. Electronic Visualization Laboratory (evl)
University of Illinois at Chicago
www.evl.uic.edu

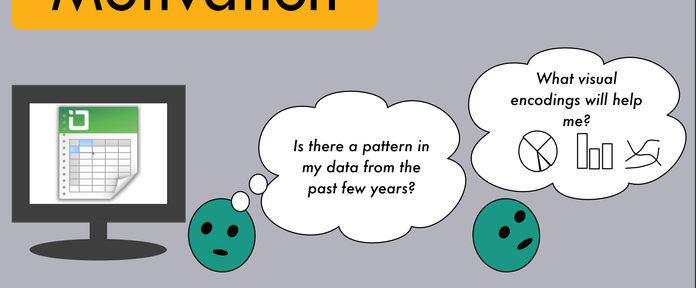
2. Natural Language Processing Laboratory (nlp)
University of Illinois at Chicago
www.nlp.cs.uic.edu

3. Laboratory for Advanced Visualization and Applications (lava)
University of Hawaii at Manoa
lava.manoa.hawaii.edu

Jillian Aurisano[evl]* Abhinav Kumar[nlp] Alberto Gonzalez[lava], Jason Leigh[lava] Barbara DiEugenio[nlp] Andrew Johnson[evl]

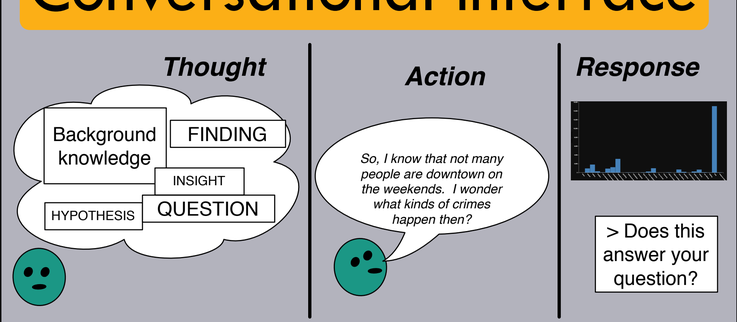
*jauris2@uic.edu

Motivation



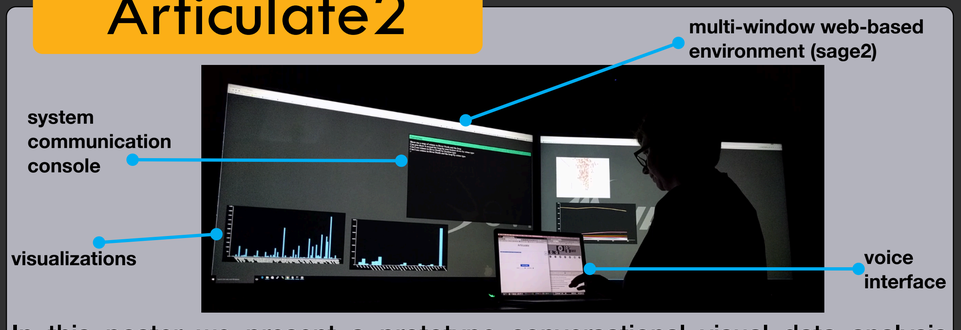
InfoVis novices' struggle with visualization construction. Even with the aid of visualization software, such users may face challenges when translating their questions into appropriate visual encodings, or interactively refining the representation to achieve a desired result.

Conversational interface



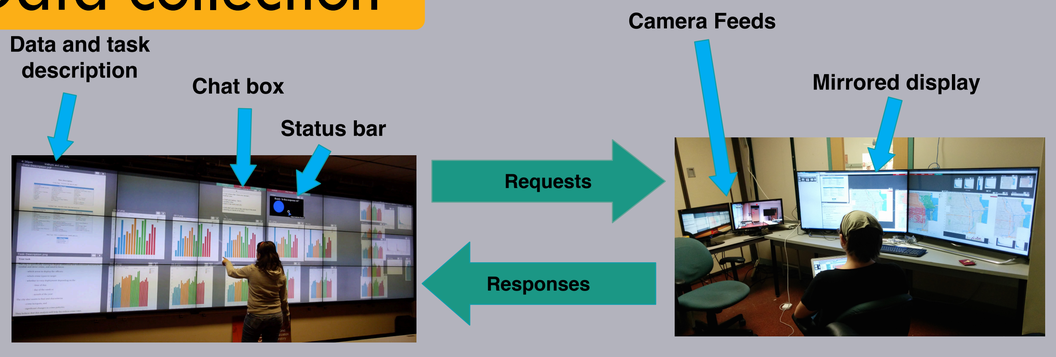
A ***'conversational interface'*** which maintains a dialog with the user through natural language and gestures, could allow users to engage in repeated cycles of visualization generation and modification, asking questions directly through speech.

Articulate2



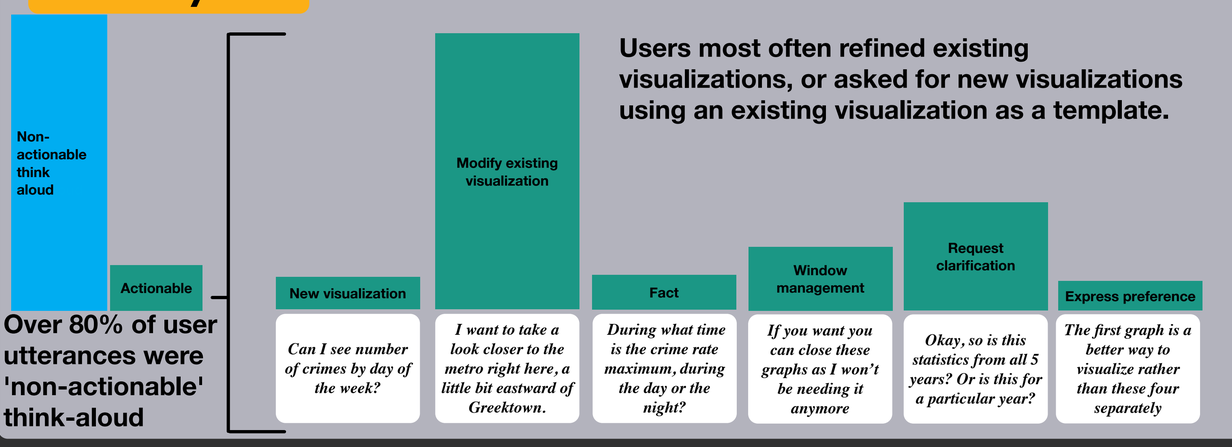
In this poster we present a prototype conversational visual data analysis system. Our prototype was developed from a corpus consisting in 15-subjects engaging in exploratory data visualization with a simulated conversational interface. It features 1) speech to visualization pipeline, 2) classification system to divide utterances into major types, 3) history manager and knowledge-base.

Data collection



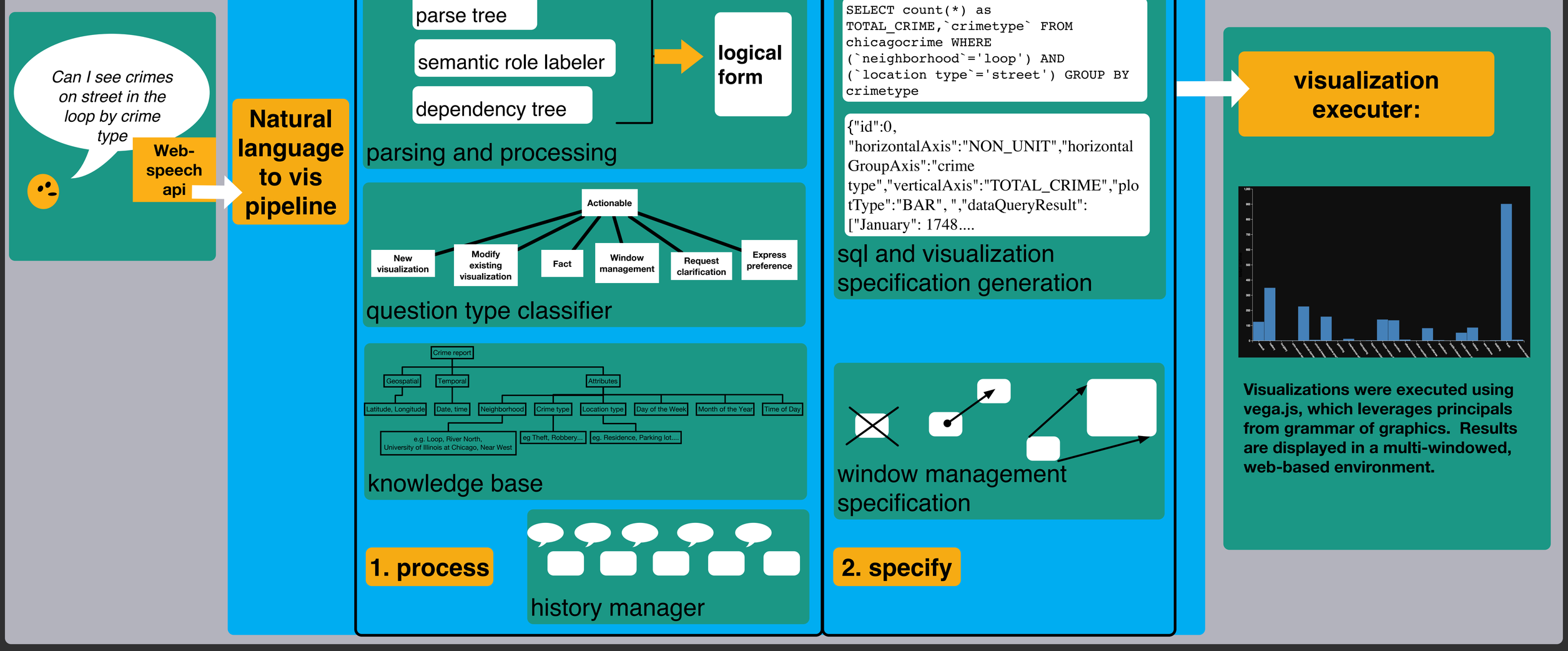
We simulated a conversational interface, by asking subjects to complete an exploratory data analysis problem with a 'remote data analysis expert', who provided visualizations and engaged in a dialog through a chat box.

Analysis

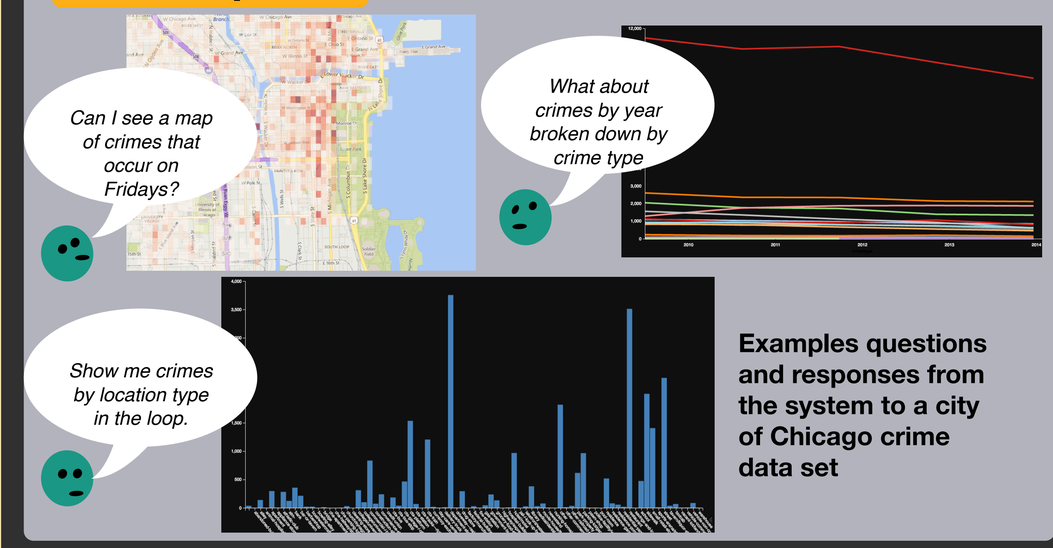


Users most often refined existing visualizations, or asked for new visualizations using an existing visualization as a template.

Architecture



Examples



Examples questions and responses from the system to a city of Chicago crime data set

Question classification accuracy

Classifying questions into major types (new visualization, modify visualization, fact, window management, request clarification, express preference)

Classifier Model	Accuracy
Support Vector Machines	87.66
Random Forest	85.6
Multinomial Naïve Bayes	85.6
Naïve Bayes	74.28

Future work

Future work with focus on:

- Resolving references to on-screen visualizations and objects through speech and gesture

"Can I see this plot <points> but with data for the Loop?"

- Enriched visualization history manager, to provide context to new questions

- Responses to user questions about points of fact and user expressions of preference

- Expanded visualization modification operation

This work is supported by NSF awards 1445751 and 1445796.