CISpaces User Guide

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1 Introduction

Collaborative Intelligence Spaces (CISpaces) is a suite of tools and algorithms for the support of sense-making with evidence from various sources, and for the dissemination of natural language reports. This web-based tool is integrated with a fact extraction engine, through which text-based evidence from open sources may be queried, and information extracted may be brought into an analysis. Further information is available at `www.cispaces.org`. The purpose of this document is to provide a short user guide to CISpaces for those exploring this toolkit. The primary contact for further information is Professor Timothy Norman, University of Southampton, `t.j.norman@soton.ac.uk`.

2 CISpaces as an Analysis Tool

Note that in the current version of CISpaces, only Google Chrome is supported as a browser.

2.1 Login and Browse

Via the login screen, access the system using a username/password provided by your system administrator. Two 'open' logins are provided by deafult: username "Ella", password "password"; and username "Miles", password "password".

User "Ella" has a number of example analyses provided as examples (see Figure 1). These include the Non-Combatant Evacuation scenario developed byt the authors as part of a DSTL-funded project, some examples from a VAST (IEEE Conference on Visual Analytics Science and Technology) scenario, and a series of examples developed with the aid of an expert analyst. The analysis "Cap16_Scenario_Large" contains over 100 nodes, and is used to demonstrate the scalability of the algorithms developed. Scenarios have been tested on analyses of over 500 nodes using a consumer PC with response times of the "Evaluate" function (see below) of a fraction of a second.

2.2 View, Evaluate and Report

2.2.1 View

Selecting "View" on an analyst's Browse Box opens the main screen for analysis (see Figure 2). This consists of the following:

Work Box Here, the analysis is presented as a graph with "argument" (blue and purple) and "link" (green and red) nodes.
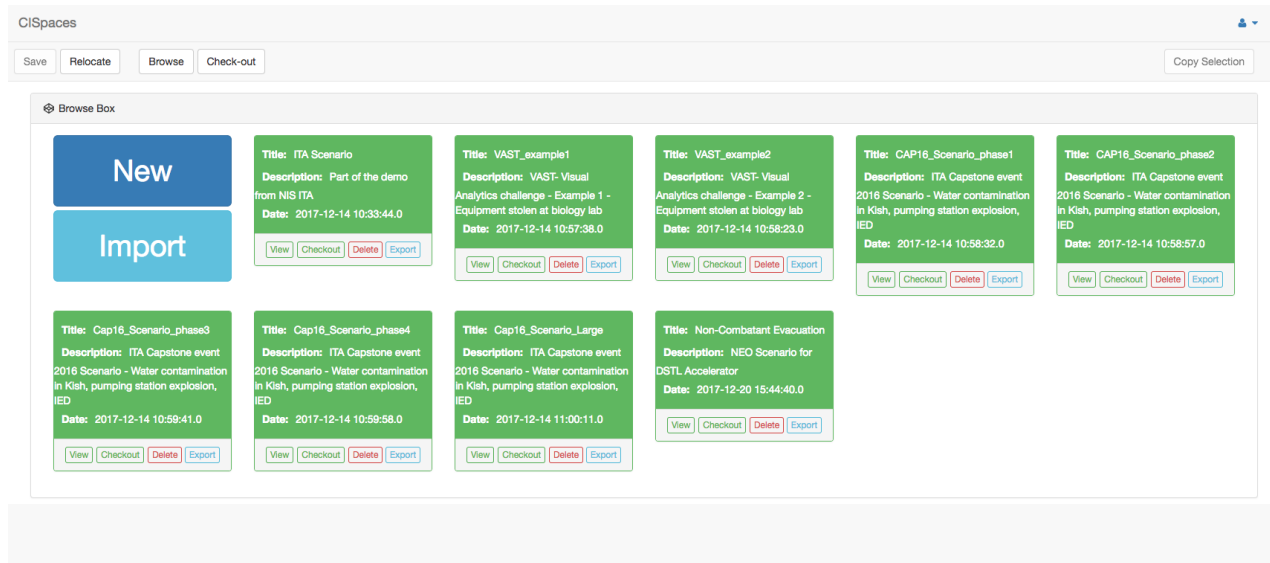
Figure 1: The browse view.

Eval Box Provides access to the two primary support algorithms for computing alternative hypotheses from the analysis displayed in the work box, and for generating a natural language report on this analysis.

Vocabulary and Info Boxes Provide tools for querying and viewing/importing results from fact extraction from social media (see Section 3).

Details Provides a view of the underlying information associated with a node in the analysis graph.

You may not edit the analysis from this view, but you may evaluate and generate reports.

2.2.2 Evaluate

When the "Evaluate" button (in the Eval Box) is clicked, the analysis graph is serialised as a JSON string to the *Evidential Reasoning Service*. This service converts the graph to a set of logic formulae and automatically computes the sets of arguments (purple and blue nodes in the graph) that represent alternative hypotheses. These alternative hypotheses are labelled "Credulous Opt-1", "Credulous Opt-2", etc., each representing a possible interpretation from a credulous reasoning perspective. In Figure 3 there are two credulous options, "Credulous Opt-1" has been selected and the text of the argument nodes that are "in" are coloured green and those that are "out" are red. Arguments that are "in" are part of the alternative hypothesis.

The algorithm is *guaranteed* to compute *all* alternative credulous hypotheses, although there may be none. It is also guaranteed to provide *one and only one* "Skeptical Opt-0" hypothesis (with apologies for the American spelling). There may be no credulous hypotheses, but there is always one sceptical hypothesis; in this case there is only one interpretation of the analysis. The sceptical hypothesis in the example is illustrated in Figure 4.

If there is uncertainty regarding the truth of specific arguments (i.e. if an argument appears in one but not all credulous hypotheses), the text associated with this argument is coloured yellow when "Skeptical Opt-0" is selected. This helps to highlight the parts of the analysis where there is doubt, given the evidence and the relationships among evidence specified by the expert analyst.

The display of alternative hypotheses may be cleared by clicking on the "Clear" button.

2.2.3 Report

A natural language report may be *automatically* generated at any time by clicking on the "Generate Report" button in the Eval Box. The current behaviour of this button is illustrated in Figure 5, although this could easily
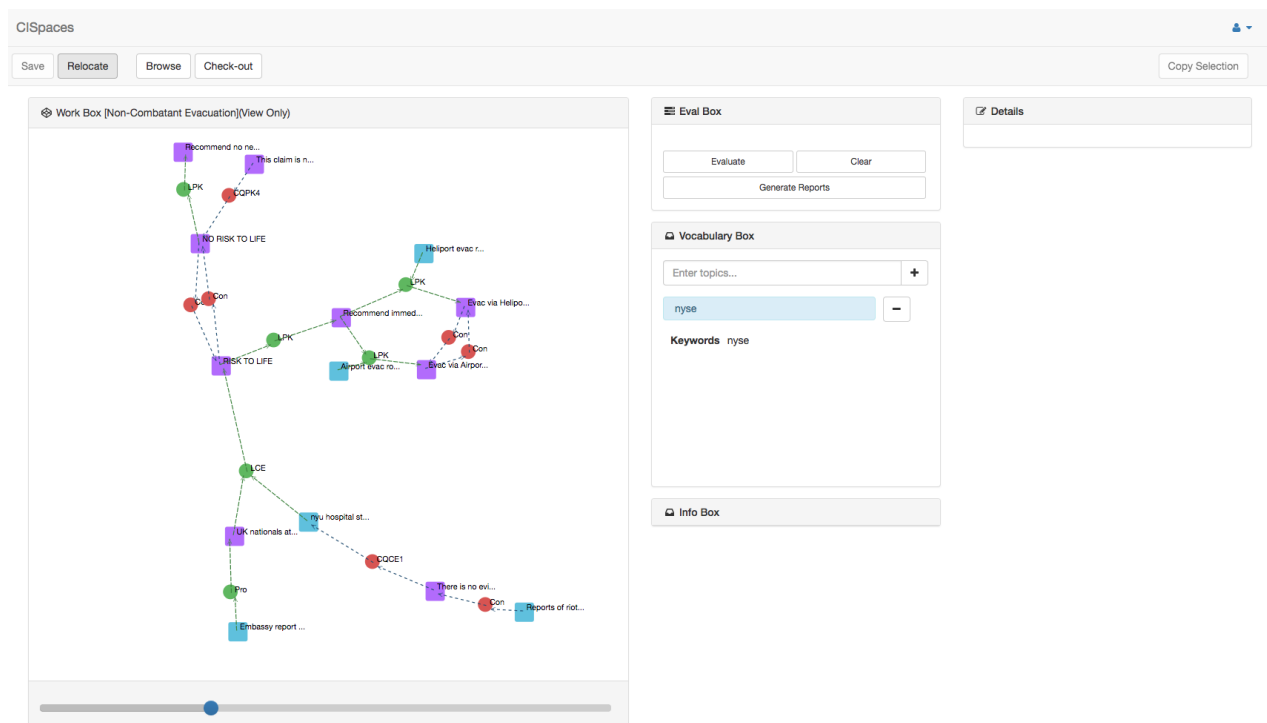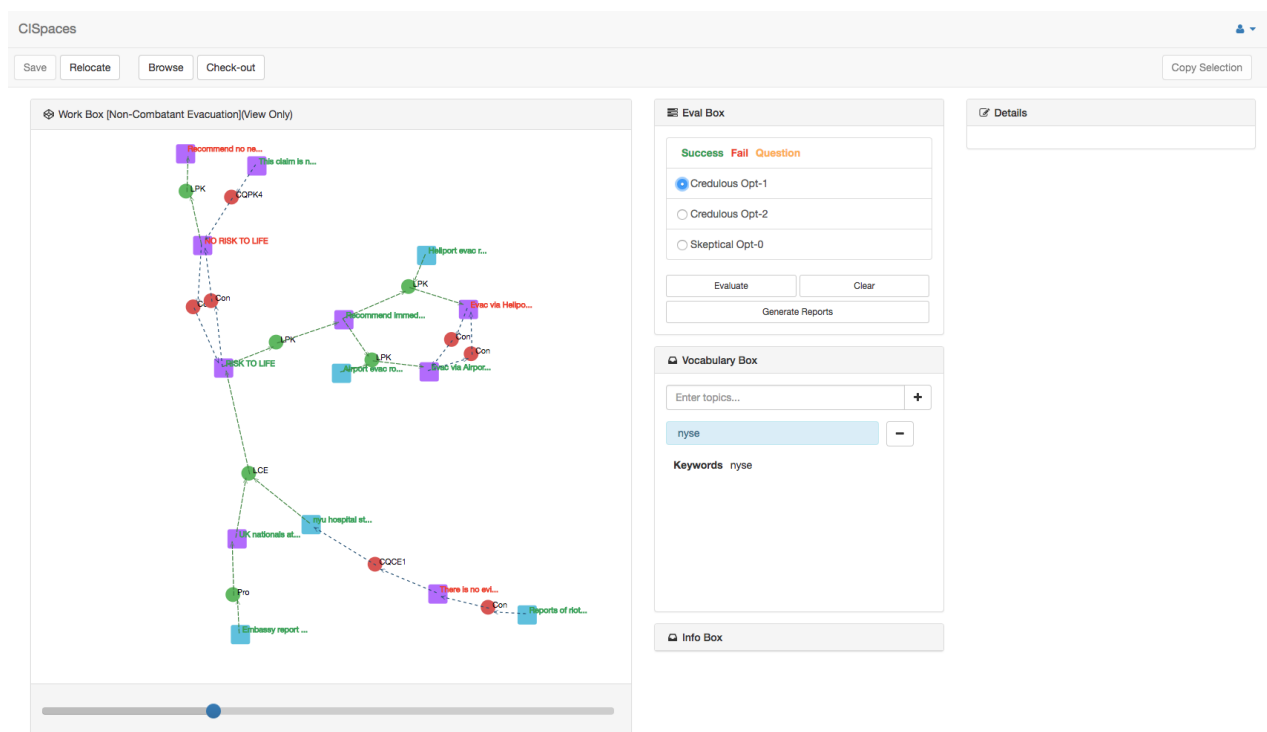
Figure 2: Viewing an analysis.

Figure 3: Credulous Opt-1.
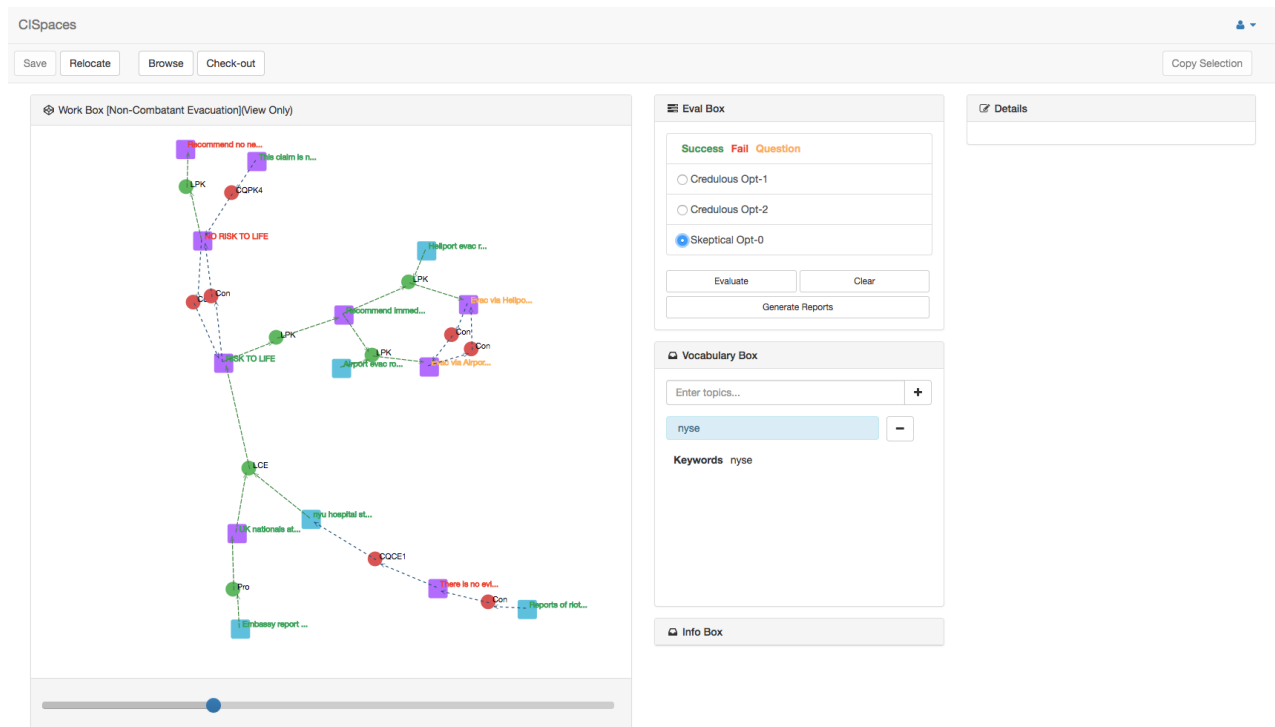
generate an email or be written to file.

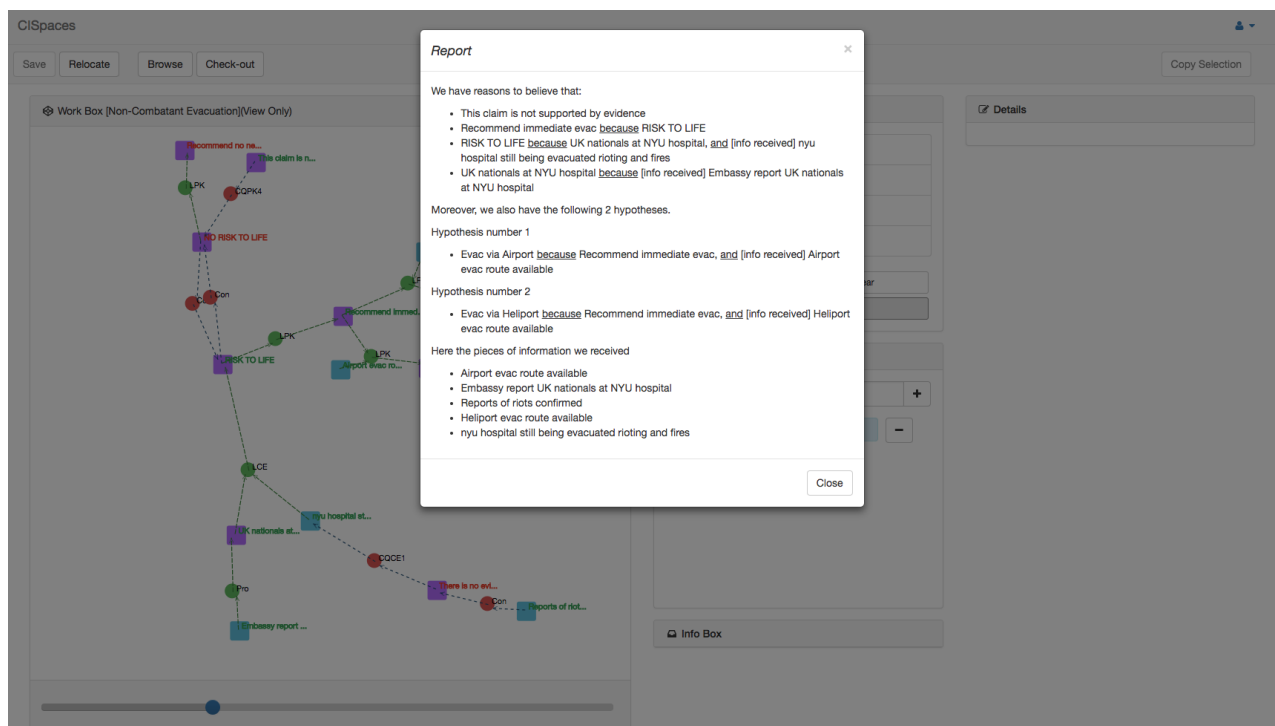Figure 4: Skeptical Opt-0.

Figure 5: Generate Report.

2.3 Authoring an Analysis

An analysis may be "Checked out", which makes available the editing tools.

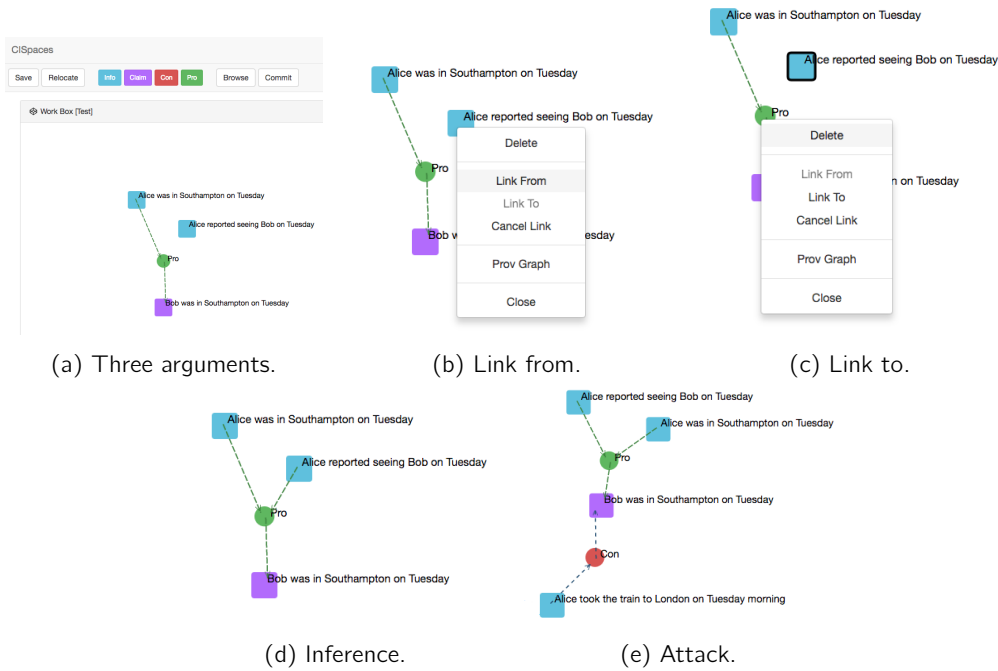To illustrate the authoring of an analysis, I have returned to the Browse view and created a "New" analysis

(a) Three arguments. (b) Link from. (c) Link to.

(d) Inference. (e) Attack.

Figure 6: Specifying a simple inference

called "Test". You may drag and drop nodes onto the Work Box, and double-click argument nodes to edit the content. In Figure 6a, two "Info" nodes have been generated along with one "Claim" node. The distinction between "Info" and "Claim" nodes is intended to allow the analyst to distinguish between information received from external sources and claims made by the analyst in structuring the evidence. Here, I am inferring that Bob was in Southampton on Tuesday, given a report from Alice and information about where she was on that day. I can link evidence to claims via "Pro" *inference* nodes as in Figures 6b-6d.

Clearly, this inference is *defeasible* — new evidence may emerge that leads me to doubt the inference, such as information that Alice took the train to London on Tuesday morning. Such information may "attack" the conclusion as in Figure 6e. I still have no reason to disbelieve what Alice has said, or that she was in Southampton on Tuesday, but I no longer believe the conclusion.

2.4   Argument Schemes and Critical Questions

CISpaces provides means by which certain inferences can be *typed*. These types of inference are referred to as *argument schemes*, and are derived from empirical analyses of human argument across a number of fields including law and political debate. For example, some inferences may be, defeasibly, drawn from evidence from an expert, or an assumed cause may be attributed to an observed effect.

In our example, Alice was in a position to know that Bob was in Southampton, and so we can label the inference ("Pro" node) as such. This is done by double-clicking on the "Pro" node and selecting the relevant argument scheme as in Figures7a–7b.

Associated with each scheme are critical questions that may be asked. These are, again, derived from empirical studies of human reasoning, and serve to support the process of questioning assumptions. In this way, the analyst may mitigate potential biases in reasoning. In Figures 7c and 7d, I have questioned the trustworthiness of Alice as a witness. The asking of this question leads to a relevant claim node being inserted into the analysis that "attacks" the premise selected by the analyst.

The asking of this question undermines the inference, and hence the conclusion (Figure 11a). I may, however, decide that Alice is reliable on the basis of experience, which I can then include as an argument that attacks the question. The inference is, again, supported (Figure 11b).
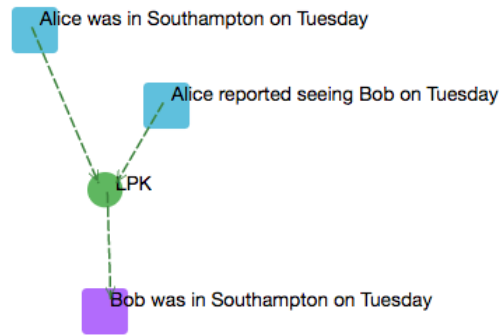
(a) Select scheme.

(b) Labelled inference.

(c) Select critical question.
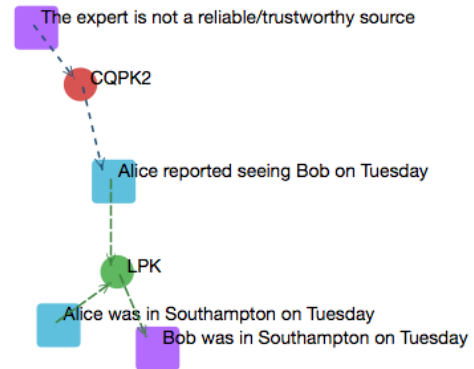
(d) Question asked.

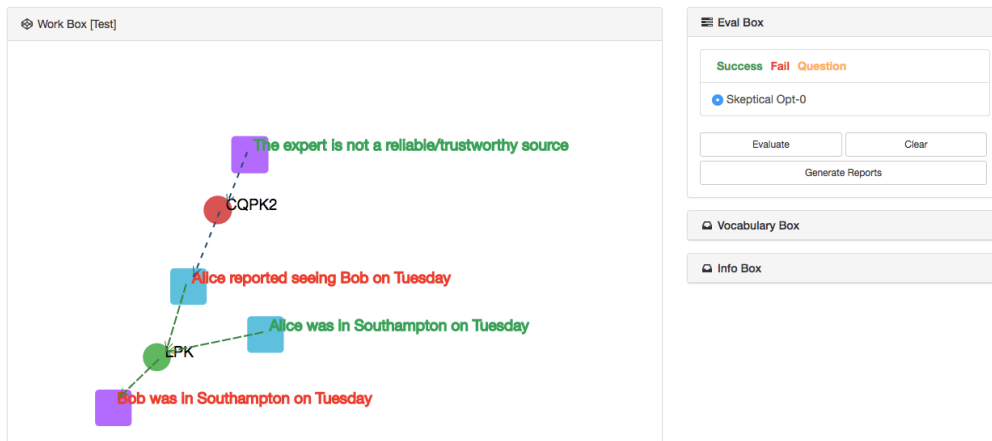Figure 7: Argument schemes and critical questions.
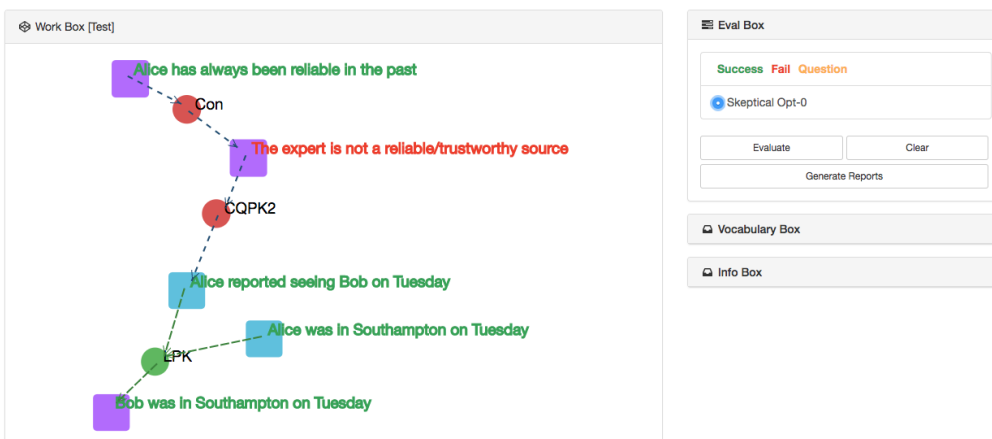
Figure 8: Is Alice reliable?

Figure 9: She has always been so!

2.5   Save/Commit

CISpaces is robust to lost connections to the server running the system, or to the web browser crashing. When you revisit the system with the same login credentials, you should return to the same state of the analysis. Clicking "Commit" commits an update to the analysis and returns you to the "View" state.

Selecting "Save" generates a new version of the analysis with a new description.

3 Fact Extraction

The "Vocabulary Box" and "Info Box" provide the means whereby the analyst may interact with the fact extraction tool. The workflow for interacting with this system is:

- A new vocabulary of interest (watchwords, usernames, locations) is registered via the Vocabulary Box. CISpaces then sends a message to initiate the fact extraction process with this vocabulary.

- The crawler starts capturing content in near real-time from social media, filtered using the requested vocabulary of interest. Raw posts are continually serialized to an ingest folder so original content is always accessible (provenance is preserved).

- The fact extraction polls the ingest folder, aggregates new content using natural language processing to extract factual statements. These are collated by mention frequency and indexed into a database for fast lookup by CISpaces.

- The analyst uses the Info Box to see the latest OSINT posts. Sub-second updates ensure the latest information is always available. At any time an analyst can drag a post into an analysis. This new evidence appears as an info node (blue) in the Work Box.

- Any updates to the vocabulary of interest (e.g. new suspects or target locations) will lead to the fact extraction re-indexing the database.

3.1 Vocabulary Box

The Vocabulary Box controls the vocabulary topics that Fact Extraction will use to parse the incoming social media stream. Vocabulary terms can be used to filter and group social media posts. The vocabulary is shared between all analysts using the same CISpaces server.

Any changes in vocabulary trigger a near real-time re-computation of the database indexes for all crawled social media posts. This means if new terms are identified during an analysis they can be added and all historically crawled posts are automatically re-indexed — data is neither lost nor forgotten.

Initially, both the Vocabulary Box and Info Box will be empty, although if other analysts have used the system, their vocabulary will remain. Vocabulary topics can be added by typing into the text field in the Vocabulary Box and pressing the "+" button. Vocabulary topics can be removed by clicking the "-" button next to the topic you wish to remove (Figure 10).
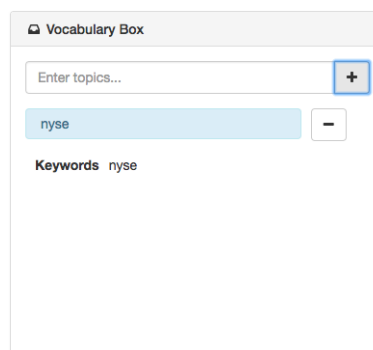

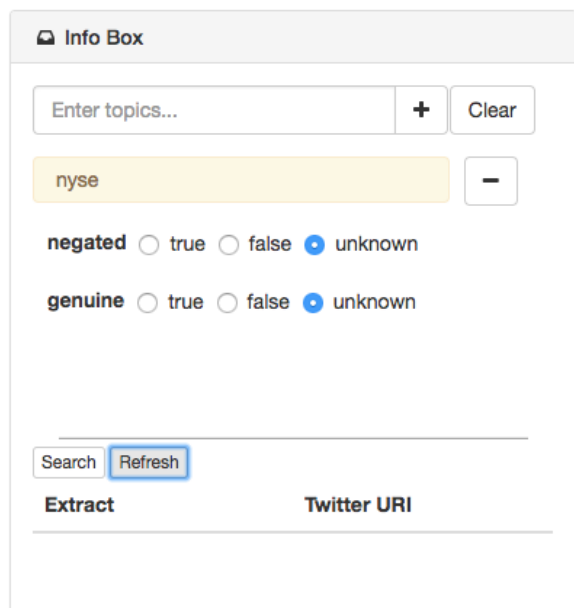Figure 10: Adding a topic to the vocabulary for fact extraction.

3.2 Info Box

The Info Box contains the vocabulary that the system has extracted from the social media stream as defined in the Vocabulary Box. Adding vocabulary items filters the info box so only posts mentioning the vocabulary are shown. Each vocabulary item can be modified by two optional attributes: "negated" and "genuine".
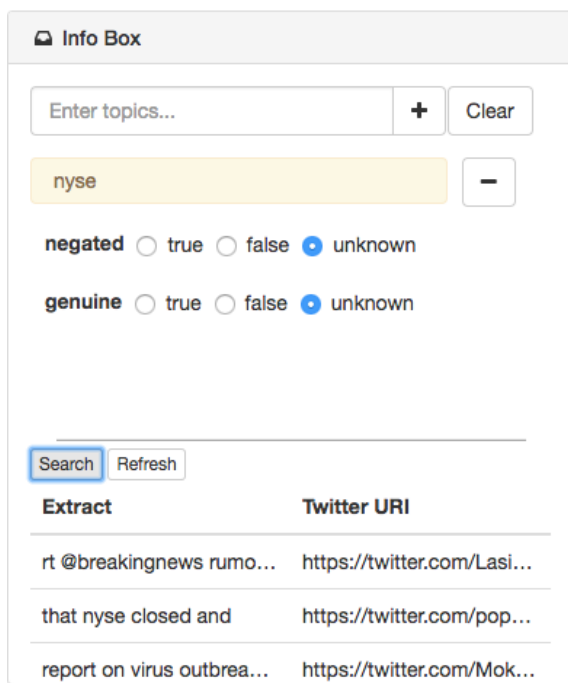
The "negated" attribute filters based on whether the term in the vocabulary has been used in the context of a negated statement (e.g. there is no riot in NYSE). Set the negated attribute to "true" if only negated references are wanted. Set to "false" if only non-negated references are needed. Set to "unknown" if any mentions of the vocabulary is OK.

The "genuine" attribute filters based on if the term has been used in the context of a genuine or fake claim (e.g. reports of rioting in NYSE are debunked). Set the "genuine" attribute to "false" if only mentions of the vocabulary with a claim of being debunked are needed. Set to "unknown" if any mention of the vocabulary is OK.

Once the Vocabulary Box contains some terms, pressing the "refresh" button in the Info Box will show terms for which posts have been found. Thus, the vocabulary present in the Info Box defines a set of query filters (i.e. phrase1 AND phrase2 . . .); pressing the "search" button will present a list of extracts related to all of these topics. Note that if the Info Box contains many topics it is unlikely to have any results, since no post will have a mention of every possible vocabulary phrase.

(a) Refresh Info Box.   (b) Search extracted OSINT.

Figure 11: Querying information extracted from social media.

To modify the query in the Info Box remove topics using the "-" button beside the topic and add topics by typing into the text box and pressing the "+" button. The "negated" and "genuine" attributes of topics in the query may be modified using the radio buttons below the topic name. To undo all modifications and re-populate the Info Box with all topics present in social media stream, press the "refresh" button again.

Clicking one of the queried posts will show its detail in the leftmost pane of the interface. Clicking and dragging a queried post into the Work Box will add it as a blue info node (Figure 12).

Figure 12: Extracted evidence dropped into analysis.