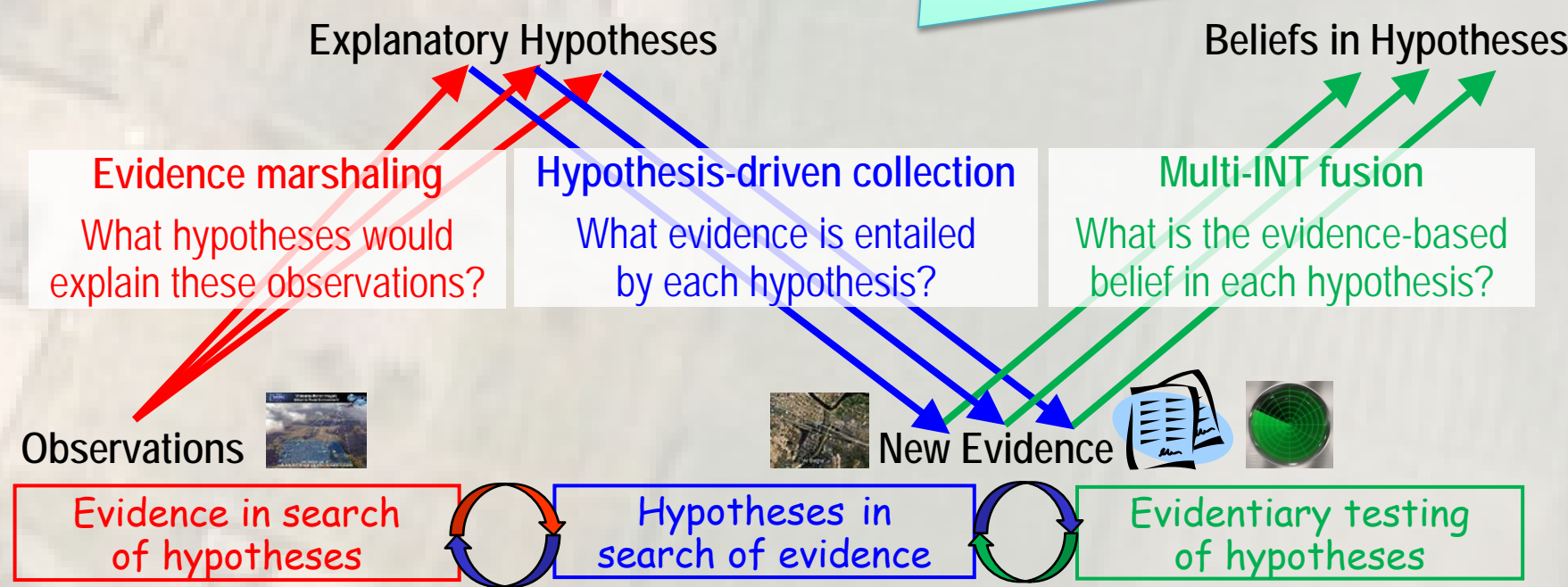


# COGENT: Cognitive Agent for Cogent Analysis

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## Computational Theory of Intelligence Analysis

Developed in the framework of the scientific method and grounded in science of evidence, artificial intelligence, logic, and probabilities. Views intelligence analysis as ceaseless discovery of evidence, hypotheses, and arguments in a complex world that is changing all the time.

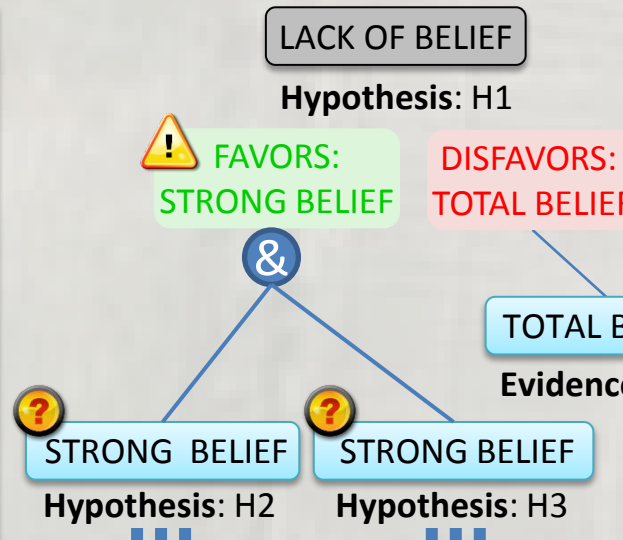


## Mixed-Initiative Reasoning and Learning

### Cogent: Baconian Probabilities with Fuzzy Qualifiers

Evidence Characteristic	Subjective Bayes	Baconian	Belief Functions	Fuzzy	Cogent
Incomplete		✓			✓
Inconclusive	✓	✓	✓	✓	✓
Ambiguous			✓	✓	✓
Dissonant	✓	✓	✓	✓	✓
Believability uncertainty	✓	✓		✓	✓

### Wigmorean Argumentation



### Logic

$B(E10)=TB \vdash$   
 $\vdash B(\neg H1)=TB \vdash \neg H1$   
 $H2 \wedge H3 \rightarrow H1$   
Reduction ad Absurdum  
 $\{H2 \wedge H3 \rightarrow H1, \neg H1\} \vdash$   
 $\vdash \neg (H2 \wedge H3) \vdash$   
 $\vdash \neg H2 \vee \neg H3 \vdash$   
 $\vdash B(\neg H2)=LB \vee$   
 $\vee B(\neg H3)=LB$

Automatic detection of inconsistencies leading to argumentation revision and evidence reevaluation.

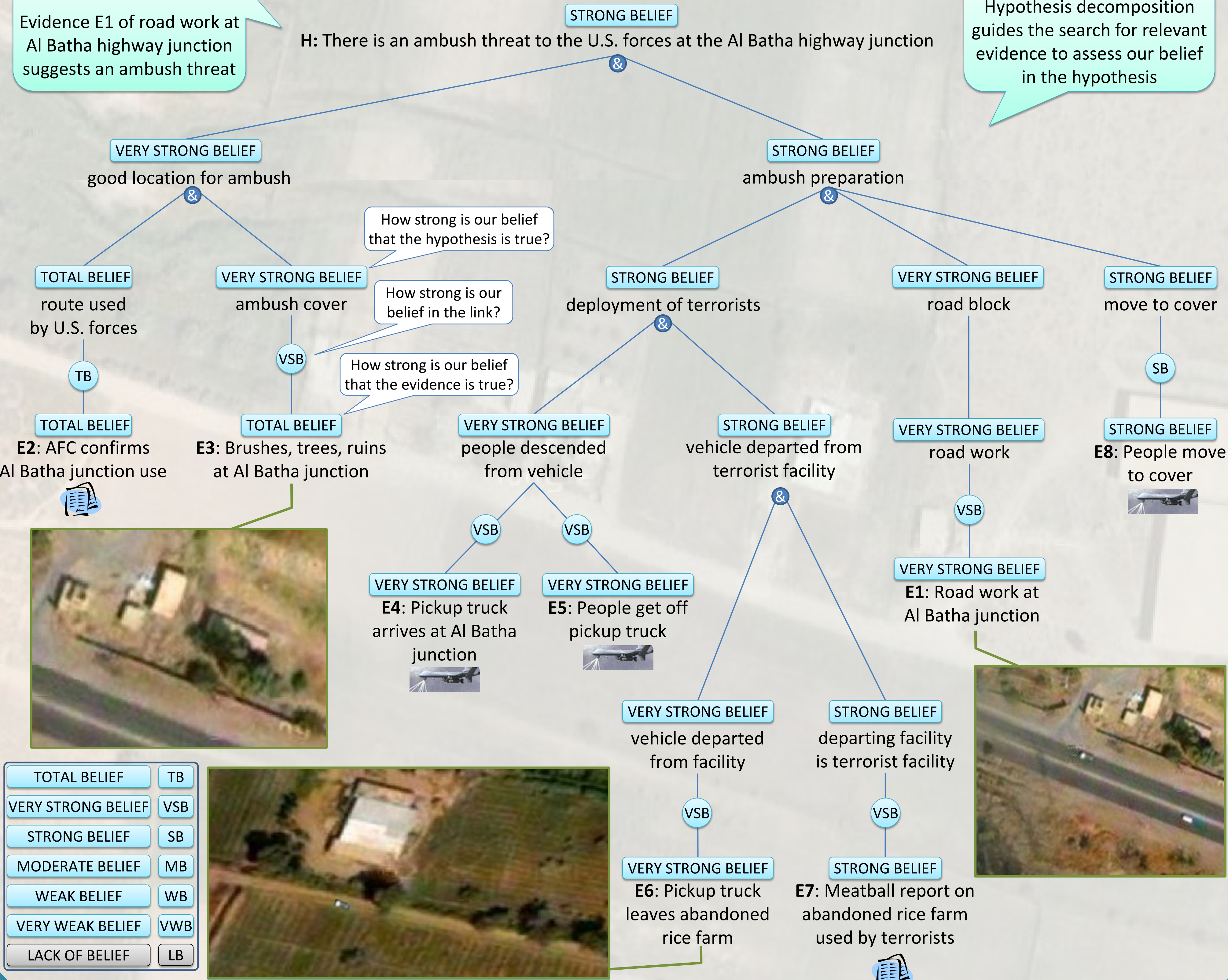
### Hypothesis Formulation

Evidence E1 of road work at Al Batha highway junction suggests an ambush threat

H: There is an ambush threat to the U.S. forces at the Al Batha highway junction

### Real-Time Analysis

Hypothesis decomposition guides the search for relevant evidence to assess our belief in the hypothesis



Cogent, which subsumes both ACH and Rationale, helps analysts in performing better analyses faster because it has solid theoretical foundations in the Scientific Method, Logic, and Baconian Probabilities with Fuzzy Qualifiers, a large amount of knowledge about evidence and its credentials, and domain-specific expertise learned from expert analysts.

It supports analysts in a wide range on analytic complexities: discovery of relevant evidence through hypothesis-driven collection, the crucial assessment of evidential completeness, drilling down to various levels of detail, automatic identification of key evidence and assumptions, what-if reasoning, automatic updating of the analysis based on new evidence, and production of defensible and persuasive arguments.

It provides easy and natural solutions for several critical judgments: simple Baconian-Fuzzy methods for dealing with uncertainty, no numeric probabilities to assess, simpler judgments of relevance due to its use of relevance arguments.

It facilitates analysis compliant with all the ODNI standards of analytic tradecraft (ICD 203).

	Cogent	ACH	Rationale
Probability Theory	✓✓	-	-
Evidence Credentials	✓✓	✓	✓
Argumentation Structure	✓✓	-	✓✓
Knowledge-based Reasoning	✓✓	-	-
Automated Update	✓✓	✓	-
Learning	✓✓	-	-
Key Evidence and Assumptions	✓✓	-	-
Analysis of Competing Hypotheses	✓✓	✓✓	✓
Scalability of Argumentation	✓✓	-	✓

Cogent is a redesign of TIACRITIS that significantly simplifies its interface and interaction, automates probabilistic reasoning, and provides new analytic capabilities. Cogent is not yet implemented. Both TIACRITIS and Cogent have been researched with the funding and collaboration of IC, NSA (NURI), and DOD/CTTSO