Deception Detection in Multicultural Coalitions: Foundations for a Cognitive Model

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Introduction & Presentation Outline

- This paper presents a cognitive approach to deception.
  - Upper-level ontology includes cognition and deception
  - Deception theory - common deception themes
  - Cognition and the use of heuristics for cognitive simplification
  - Preparation Detection Reaction (PDR) deception-detection model
  - Cognitive burden and overload in face-to-face deception
  - Similar cognitive burden in deception detection
- Deception detection in coalition command & intelligence centers
  - Cultural differences in meaning inference & communication style
  - Deception from within the coalition – the ingroup deceiver
- Deception regarding group bias can be detected verbally.
- Adversaries will attempt deception about group membership.
- Deception-detection tools need SOA to be most useful.

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Ontology of Deception – Some Highlights

- Ontology of deception belongs in the upper ontology.
- Inherits properties from cognition and behavior.
- Types of deception
  - Verbal
    - Lies & misleading statements
    - Omission of important details with intent to mislead
  - Non verbal
    - Camouflage - covert channels & hidden messages
- Deception Detection – behavioral & artifact cues
  - Direct personal observation (verbal & nonverbal cues)
  - Recorded observations – voice analysis, body language
  - Linguistic analysis of text – word counts, word associations in formal text, chat transcriptions, & speech transcriptions

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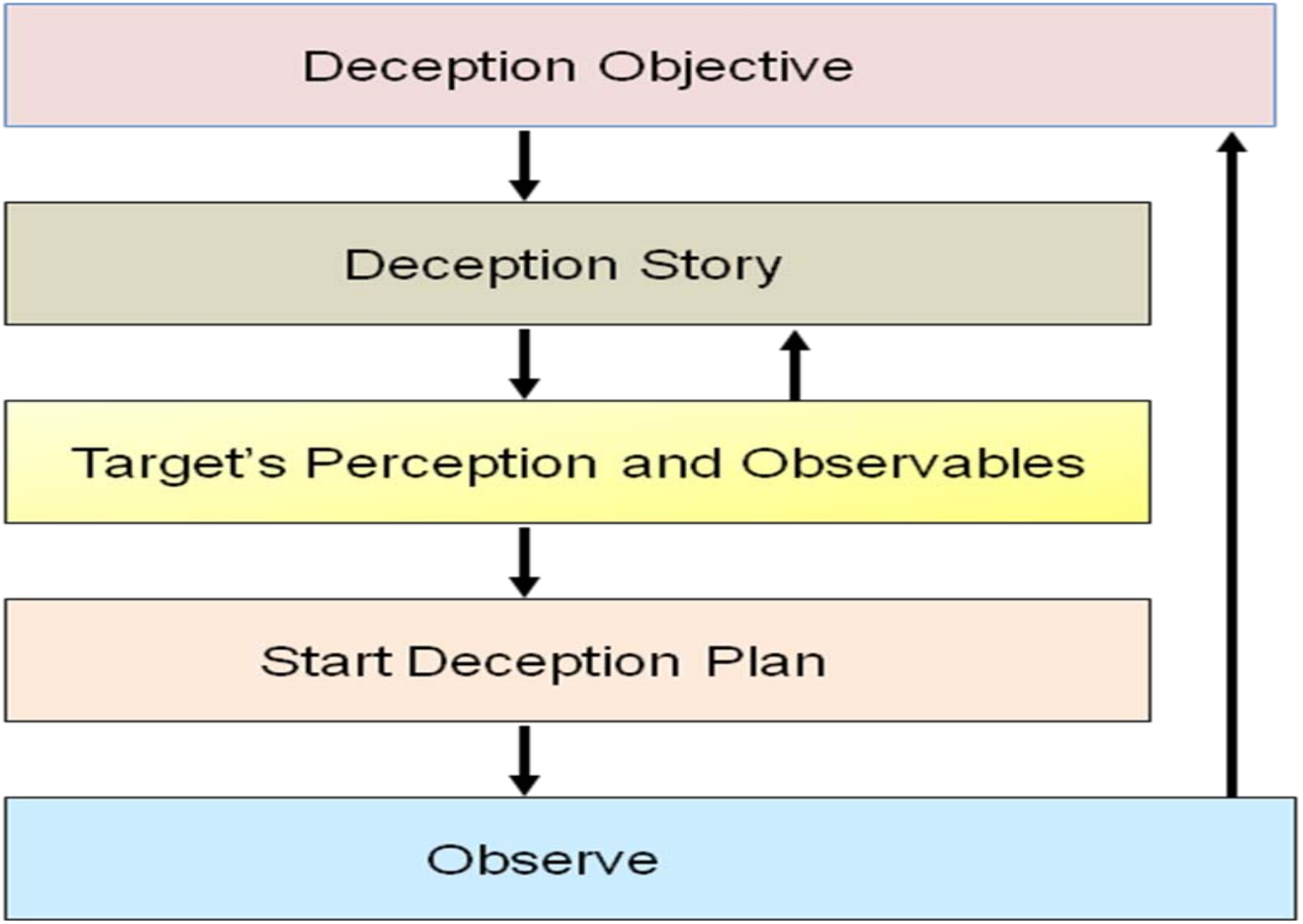
Common Deception Themes



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Commonly Used Heuristics

Heuristics	Definition
Overconfidence	Overestimation of the probability of being right
Availability	Using easily available examples as references
Restriction of search domains	When solving a complex problem and resources (e.g., time, materials, money, personnel, etc.) are limited, the search space for the solution must be restricted to that most likely to yield the desired result using the least amount of resources.
Anchoring and adjustment	Establishing or declaring an arbitrary basis and adjusting around that point
Framing (i.e. setting a frame of reference or point of view)	Emphasizing aspects that are consistent with one's beliefs, values, attitudes, & models, while minimizing or ignoring aspects that are inconsistent with that viewpoint.
Oversensitivity to consistency	Seeing a pattern in noise
Frequency	Approaches with a higher frequency of success (or failure) come to mind before approaches with lower frequencies success (or failure).
"Law" of small numbers	Extrapolation of results from a small population to a larger population
Perceptual resistance to change	After a conclusion has been reached, it is difficult to change.

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Categories of Factors that Affect Heuristics

Factor Type	Characteristics of the level
Cognitive	Most personal and private level, known only to an individual – the smallest sphere of influence
Personality	Affects small-scale groups and people in the immediate vicinity or under the authority of an individual
Organizational	Pertains to larger sphere of influence than any single individual. Include multiple individuals, personalities, and subgroups.
Cultural	Most general and impersonal level – Includes many individuals and organizations. Pertains to the largest sphere of influence, such as coalitions.

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Cognitive Factors that Affect Heuristics

Cognitive Factors	Definition
Arousal	Degree to which the individual is active or passive
Power	Dominant or submissive. (This factor relates to the expert-novice difference.)
Pleasantness	Pleasant or unpleasant
Intensity	Tense or relaxed

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Personality Traits that Affect Heuristics

Personality Traits	Definition
Extroversion vs. introversion	Sociable, assertive, playful vs. aloof, reserved, shy
Emotional stability vs. neuroticism	Calm, unemotional vs. insecure, anxious (Similar to cognitive intensity)
Agreeable vs. disagreeable	Friendly, cooperative vs. antagonistic, faultfinding (Similar to cognitive pleasantness)
Conscientiousness	Self disciplined, organized vs. inefficient, careless
Openness to experience (ability to analyze situations and recognize potential)	Intellectual, insightful, vs. shallow, unimaginative (This factor also relates to the expert-novice difference.)

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Organizational Factors that Affect Heuristics

Organization Factors	Definition
Collectivism and trust	Value and trust of relationship of people in the network
Power distance	Degree of separation (e.g. equality or inequality) between individuals at adjacent or other levels of rank in the society (Relates to cognitive power)
Social network strength	How strong social network connections are (culturally, group strength)
Shared codes and languages	Specialized languages that the network uses
Communication context (high or low)	Implicit meaning in phrases & messages vs. literal meaning of the separate words

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Cultural Factors that Affect Heuristics

Cultural Factors	Definition
Individualism	Degree to which the society reinforces individual vs. collective achievement and interpersonal relationships
Masculinity	Degree to which the society reinforces or does not reinforce male achievement, control and power. Extent to which an individual views the world as competitive rather than nurturing (Relates to power.)
Uncertainty Avoidance	Level of tolerance for uncertainty and ambiguity within the society. Risk propensity of individuals & tendency to avoid unclear outcomes
Perceptual Style	"Filters" or patterns that affect how people identify & react to events
Self concept	Effect of culture on how people perceive, define, portray, value, and view themselves, including but not limited to self esteem.
Time orientation and perception	Time as monochromic, linear primary frame of reference that drives schedules and behavior (Western view) vs. time as a tool to meet the needs of the group, enhance relationships, enhance trust, and share information (Middle-Eastern view)
Ethics and constraints	Moral distinction between good and evil. Extent to which moral behavior is governed by guilt, shame, saving vs. losing "face" and the probability of being caught.
Cause and effect	Degree to which a person's destiny is a result of past actions vs. the idea that an individual has no control over destiny

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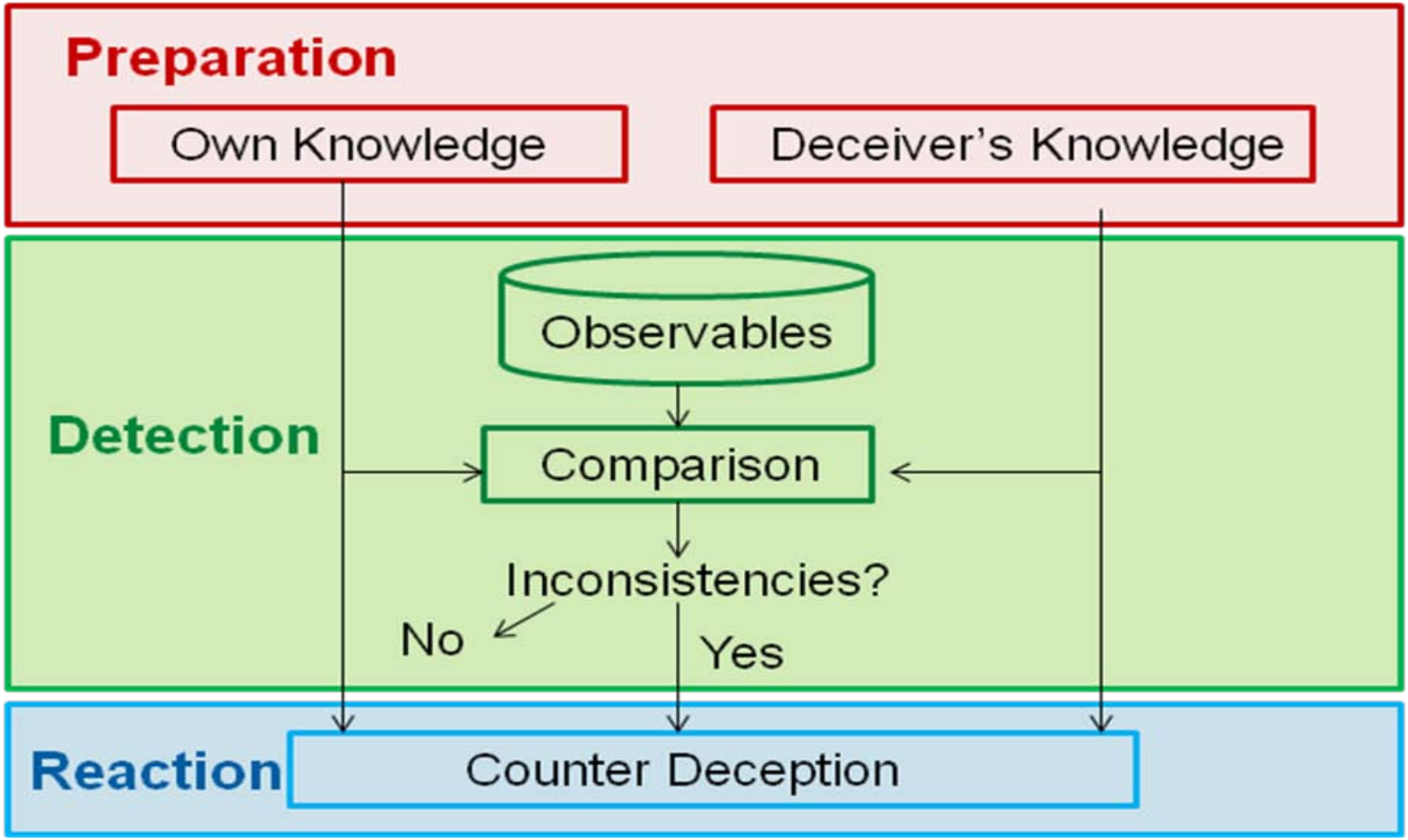
Preparation Detection Reaction (PDR) Deception-Detection model



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Example of PDR Model in Action

- An operator notices a discrepancy in a message.
- Error could be evidence of tampering or an error
- Operator uses experiential knowledge to compare observable data (error in the message) to common errors usually observed in this message format.
  - If the error looks like a common error for this message type, the operator may accept it a an honest mistake on the part of the sender.
  - If the error reflects a gap in the senders knowledge about something that should have been known in a truthful setting, the operator can identify the error as a cue to deception.
- Operator need not prove deception. - Raises an alert to focus more attention on deception's origin.

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Cue Sets and the Use of Heuristics

- Verbal cues alone can trigger a deception alert
- 10,000 cues nonverbal (body language) and paralanguage (voice, tone, rate, volume)
- Nonverbal cues have complex relationships to each other, and to verbal-message content.
  - Facial-muscle group coordination is jerky, uneven in liars.
  - Muscles move smoothly & in concert in truthful situations
- Cognitive burden imposed on deceiver to control many cues simultaneously.
  - Some cues are over-controlled; other cues are ignored.
  - Presents inconsistent , unnatural pattern to an astute observer.
- Deception-detection agent uses heuristics.
  - Simplify the task. Total cue set is too complex to analyze.

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Deception Detection in Coalition Command and Intelligence Centers 1

- Deception poses threats to coalition operations.
- Coalitions members should become familiar with other members' data and message formats – to notice possible deception in messages.
- Communication automation can interfere with deception detection.
  - Face-to-face communication offers riches set of cues
  - Text-based media offer much fewer cues
  - Analysis of text-based messages can be automated.
- Deception detection is a complex task.
- Combination of task complexity and deception has been linked to poor performance in groups.
- Communications-based inefficiency & complex deception environment = a challenge to coalitions.

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Deception Detection in Coalition Command and Intelligence Centers 2

- Language translations can filter out cues to deception. Translators can be “unaware deceivers.”
- Different cultures vary in their ability to discern or infer meaning beyond the literal meaning in textual and verbal communications .
  - The ability to “read between the lines” depends on culture.
  - Middle Easterners are accustomed to more indirect forms of communications.
  - May be able to understand better the intent of a high-content message than a Westerner.
  - Seemingly small detail could signal deception.
  - In contrast, a deceptive message or conversation could express logically inconsistent points of view.
  - Westerner using linear logic more likely to detect this.
- Different cultures interpret imagery differently.

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Group Bias and Deception Challenges

- Detection of group bias can depend on non-traditional key words, e.g. articles, pronouns.
  - Use of articles and demonstrative pronouns commonly refer to outgroups.
  - e.g. “the Sunnis” “those tribes”
  - Choice of honorifics to refer to respected group leaders.
- Deceivers want to gain access to groups in which they are not allowed or they want to avoid being associated with an outgroup to avoid attack.
- Deceivers can come from ingroup or outgroup.
- Ingroup deceivers do not share group’s agenda.
- Ingroup deceivers have an especially negative effect on group performance regardless of whether the deception is detected.

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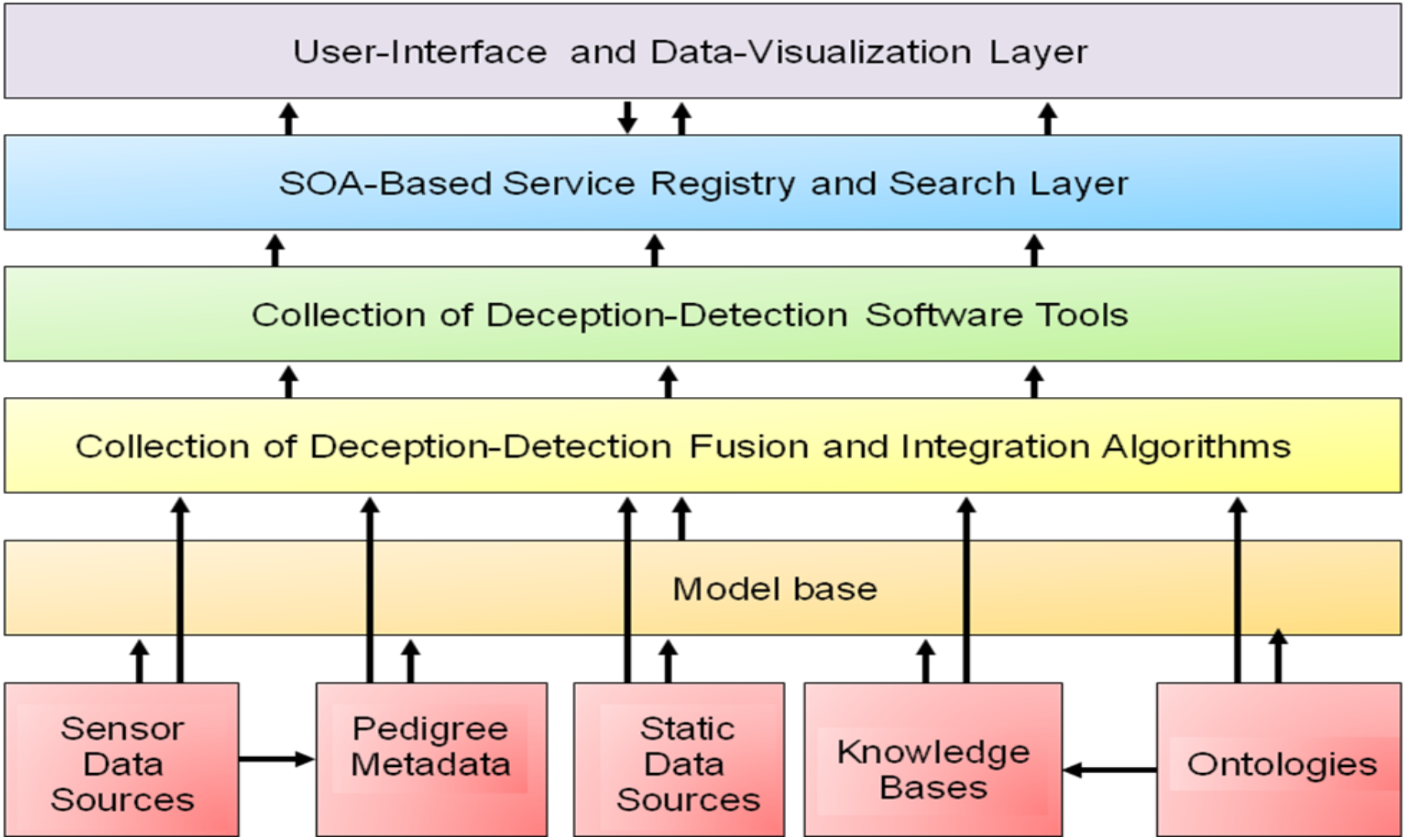
Functional Layers in SOA for Coalition Deception-Detection tool Suite



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