

# A Fuzzy Methodology for Data Valuation



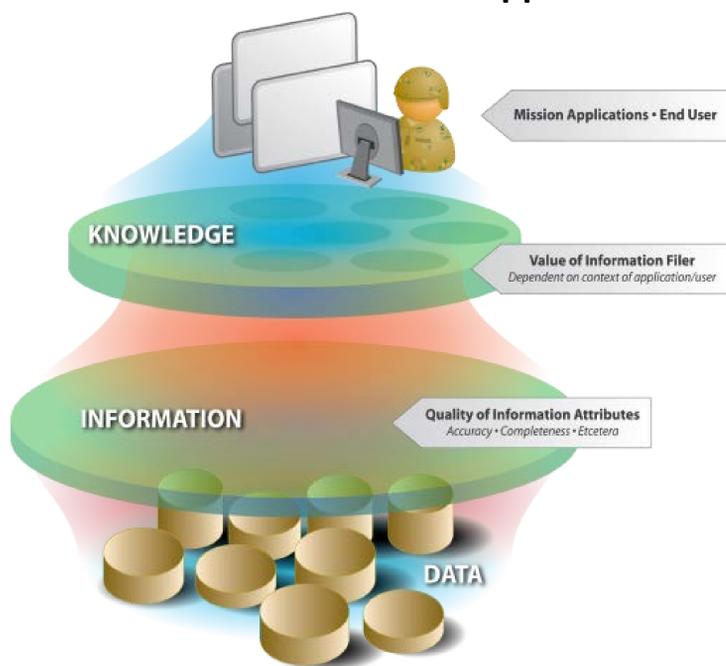
## S&T Campaign: Information Sciences

1. Human and Information Interaction-Collaboration & Negotiation
2. System Intelligence and Intelligent Systems: Computational Intelligences

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## Research Objective

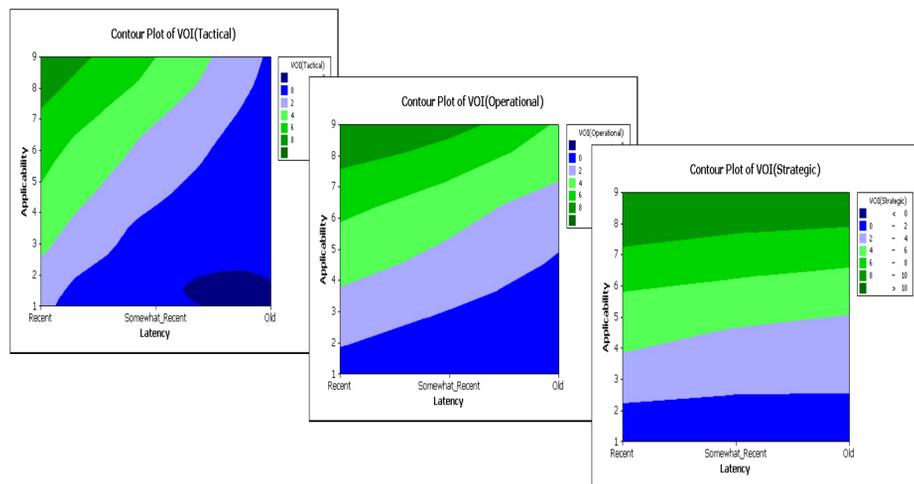
The focus of this research is to experimentally characterize how context, source, content and latency shape the perceived value of information ... and how to effectively leverage this knowledge to improve the efficacy of information retrieval and decision support tools.



Information Valuation Framework

## Challenges

- Cognitively aligning computational and cognitive analysis.
- Metrics are unknown and potentially intractable.
- Military information architectures support pedigree but maybe insufficient for Vol calculus.
- Knowledge elicitation requires coupling military, computer and cognitive sciences.



Note: All correlation distribution shows strong positive association. Means are statistically great than zero.

## ARL Facilities and Capabilities Available to Support Collaborative Research

- Tactical Information Exploitation Laboratory (APG) with a complement of academic / government textual and visual analytic tools set in an unclassified location.
- Multi-disciplinary team that includes: computational and social scientist.
- Publications:
  - T. Hanratty, R.J. Hammell II, and E. Heilman, "Capturing the Value of Information in Complex Military Environments: A Fuzzy-based Approach," Proceedings of the 2012 IEEE International Conference on Fuzzy Systems (FUZZ-IEEE 2012) as part of the 2012 World Conference on Computational Intelligence (WCCI 2012), pp. 142-148, 10-15 June 2012, Brisbane, Australia.
  - T. Hanratty, R.J. Hammell II, B. Bodt, E. Heilman, and J. Dumer, "Enhancing Battlefield Situational Awareness Through Fuzzy-based Value of Information," Proceedings of the 46th Annual Hawaii International Conference on Systems Sciences (HICSS 2013), pp. 1402-1411, 7-10 January 2013, Maui, Hawaii.
  - T. Hanratty, J. Dumer, R.J. Hammell II, Z. Tang, and S. Miao, "Tuning Fuzzy Membership Functions to Improve Value of Information Calculations," Proceedings of the 2014 North American Fuzzy Information Processing Society Conference (NAFIPS 2014), 24-26 June, 2014, Boston, MA.
- Detail early finding:
  - Prototyped fuzzy inference engine to calculate Vol based on information content, source and latency.
  - Validated approach within laboratory pilot experiment showing high correlations between model and tested subject response.

## Complementary Expertise/ Facilities/ Capabilities Sought in Collaboration

- Experts in cognitive engineering with emphasis on decision theory, semantic perspective
- Theoretical approaches for amalgamating complementary and contradictory information in time sensitive environments (argumentation and critical decision making)
- Advance visual analytics for exploring ill-defined problems (narrative based alternative).