SEMANTIC TECHNOLOGY FOR
INTELLIGENCE, DEFENSE, AND SECURITY

STIDS 2013

Semantic Technologies for Big Data

THE 8TH INTERNATIONAL CONFERENCE
ON SEMANTIC TECHNOLOGIES
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Mason Inn Conference Center
George Mason University
Fairfax, Virginia Campus

Conference Proceedings

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GEORGE MASON UNIVERSITY

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DATA TACTICS CORPORATION

Preface

The 8th International Conference on Semantic Technologies for Intelligence, Defense, and Security (STIDS 2013) provides a forum for academia, government and industry to share the latest research on semantic technology for defense, intelligence and security applications.

Semantic technology is a fundamental enabler to achieve greater flexibility, precision, timeliness and automation of analysis and response to rapidly evolving threats.

The STIDS 2013 theme is Semantic Technologies for Big Data.

Topics of general interest for STIDS include:

- Creating an interoperable suite of public-domain ontologies relevant to intelligence analysis covering diverse areas
- Ontologies and reasoning under conditions of uncertainty
- Semantic technology and ontological issues related to:
    - Source credibility and evidential pedigree
    - Use of sensing devices including security, e.g. global infrastructure grid (GIG), images and intelligence collection in general
- Usability issues relating to semantic technology
- Best practices in ontological engineering

Fairfax, VA
November 2013

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STIDS 2012 Platinum Sponsor

Data Tactics Corporation is a minority-owned small business that specializes in Data Management, Data Architecture, Data Engineering, Semantic Data Representations, and Big Data. Since 2005, our engineers have been on the forefront of large, multi-domain, data systems supporting Government and commercial organizations. Our engineering staff is over 90% TS/SCI cleared (many with polygraphs) with over 25% having advanced degrees and doctorates.

We offer a suite of solutions to help customers handling very large, "Big Data" problem sets. Our team of senior engineers and data scientists excel at the most intractable problems for customers such as AIR FORCE, ARMY, DARPA, DHS, DNI, NSA and many others. From tactical to strategic efforts, our team has led the creation, integration, and implementation of innovative and proven solutions in the world of Data Alignment, Modeling, and Analytics. We are also very active in standards development including the NIST Cloud Computing and Big Data standards along with Semantic Standards (e.g. BFO, SUMO, DOLCE, etc) and actively contribute to the open source communities (e.g. Apache, Source Forge, GIT, etc).

Data Tactics is highly invested in fostering and/or leading collaborations with academia and national labs in advanced research & development initiatives that support disruptive technologies. Our team brings a rich history of supporting prototyping, experimental technology integration, mission oriented demonstrations, and specifically cloud development and integration.

DATA TACTICS – WHAT WE DO

CLOUD/DISTRIBUTED COMPUTING REFERENCE ARCHITECTURES

- IC ITE DNI Enterprise Strategy
- Army Red Disk/NSA Ghost Machine
- DCGS-A Standard Cloud (DSC)
- Air Force TENCAP

TURNKEY BIG DATA IMPLEMENTATIONS

- Secure Enterprise Hadoop
- Elastic Ingest and Semantic Markup
- Distributed Analytics

ADVANCED ANALYTICS

- Multiple Algorithm Development Programs
- Information Artifact Ontology Development
- Advanced Machine Learning (i.e. NLP) integration
- Advanced Video and Image Entity extraction

SECURE DATABASE ARCHITECTURES

- Secure Entity Database (SED)
- Defense Cross-Domain Analytic Capability (DCAC)

CYBERSECURITY

- Information Assurance
- Security Architecture, Design, and Configuration
- Policies, Process Development, and Validation

STIDS 2012 Keynote Speaker: November 13

Dr. Benjamin Grosof

Highly Expressive yet Scalable Knowledge for Intelligence, Defense, and Security

We present recent results on semantic web knowledge representation & reasoning, and knowledge acquisition, that tightly combine highly expressive rules and ontologies specified semi-automatically -- yet rapidly -- by starting from effectively unrestricted English text. The knowledge employs a new logic, Rulelog, that has strong capabilities to express meta knowledge. Rulelog permits higher-order logic formulas that are defeasible (i.e., can have exceptions). It is rich enough to serve as a relatively direct target for natural language processing, using Textual Logic, a new method that employs logic-based mappings in natural language (NL) text interpretation and text generation.

Rulelog also leverages its meta capabilities to achieve computational tractability via restraint, a new form of bounded rationality. Rulelog, and the Textual Logic that leverages it, constitute a pretty radical step forward in terms of fundamental capabilities in semantic tech, with a number of advantages including in the social scalability of knowledge authoring and reuse. Yet this step is incremental relative to legacy technology, in that the new knowledge representation transforms into the same fundamental logic as used in relational and RDF databases and in commercially predominant business rule systems. It's applicable in several intelligence, defense, and security (IDS) areas including: info access policies (e.g., confidentiality, compliance); info integration, flow and ontology mapping (e.g., in situation awareness); modeling of causal events and risk; intelligence analysis and debate; e-learning (e.g., just-in-time training); contracts (e.g., compliance); question-answering (QA); and NL-based human-computer interaction (HCI).

We discuss some of the exciting opportunities and challenges.

Biography: Dr. Benjamin Grosof

Benjamin Grosof is an industry leader in knowledge representation, reasoning, and acquisition. He has pioneered semantic technology and industry standards for rules, the combination of rules with ontologies, the applications of rules in e-commerce and policies, and the acquisition of rules and ontologies from natural language (NL). He has had driving roles in RuleML, W3C RIF (Rule Interchange Format), and W3C OWL-RL (rule-based ontologies). He led the invention of several fundamental technical advances in knowledge representation, including courteous defeasibility, restraint bounded rationality, and the rule-based technique, which rapidly became the currently dominant approach to commercial implementation of OWL. He has extensive experience in machine learning, probabilistic reasoning, and user interaction design.

Dr. Grosof has experience applying core technology for knowledge, reasoning, and related HCI in a wide variety of application areas, including: trust/privacy/security, contracts, compliance, legal, and services engineering; financial/ insurance services, risk management,and regulations; defense and national intelligence; biomedical research; and data/ decision analytics. From fall 2007 to early 2013, he led a large research program in Artificial Intelligence (AI) and rule-based semantic technologies at Vulcan Inc. for Paul G. Allen; this centered around the SILK system for highly expressive, yet scalable, rules. Previously he was an IT professor at MIT Sloan (2000-2007) and a senior software scientist at IBM Research (1988-2000). He is president of the expert consulting firm Benjamin Grosof & Associates founded while he was at MIT, and co-founder of the recent start-up Coherent Knowledge Systems.

His background includes 4 major industry software releases, 2 years in software startups, a Stanford PhD (Computer Science), a Harvard BA (Applied Mathematics), 2 patents, and over 50 refereed publications.

STIDS 2013 Keynote Speaker: November 14

Dr. Jeffrey Morrison

Exploring the role of Context in Applied Decision Making

Decision makers in operational environments are often surprised by emerging events and have little time to give deep consideration to alternative courses of action before being forced to make a decision. Decision support has evolved over the last 20 years but even today, decision support tools do not dynamically adapt to a decision maker's context. This often results in less than optimal decision making. Recent advances in the fields of cognitive science, the mathematics of decision science, human behavioral modeling, team decision making, knowledge creation and transfer, mental model processes, semantic techniques and human factors present new opportunities to create decision support that is context sensitive, and potentially, proactive. To accomplish this, a systematic exploration of the role of context needs to be studied in decision support systems that enable operational decision making.

Decision making is challenging for a number of reasons. Finding and integrating decision-relevant information is hard. Context is often absent, implicit, sparsely or poorly represented in task environments requiring its laborious and error-prone internal reconstruction by decision makers. The modern pace of operations often means that warfighters find themselves engaging in tasks in ways, and in combinations, for which they hadn't planned, and for which they may not be prepared. This forces decision makers to multi-task amongst many competing and often conflicting mission objectives concurrently.

Next generation decision support will not just "get the decision maker in the ball park" but will be proactive in trying to "keep the decision maker in the ball park"

throughout the process despite the high levels of uncertainty and highly dynamic environments. At the center of this new research initiative is the idea that we can develop technologies that are contextually aware of a decision makers' missions and tasks. It is asserted that algorithms can be developed that effectively anticipate the decision and information needs of decision makers, in many kinds of task environments. Algorithms would then enable the timely presentation of information. Enabling machines to dynamically model and share context with the human decision makers will be key to enabling Proactive Decision Support (PDS). Such decision support will enable the recognition of changes in the environment and the implications for shifting priorities for decisions that could address operational complexity and make enable decision makers to make more optimal decisions, faster.

Biography: Dr. Jeffrey Morrison

Dr. Jeffrey G. Morrison joined ONR's Human & Bioengineered Systems Department (341) as a Program Officer in January 2011 where he leads the Command Decision Making (CDM) program. The program is conducting Basic & Applied cognitive science research for application to individual & group decision making. The current operational focus is on multi-echelon Command & Control. The science focus is on developing Proactive Decision Support tools (PDS) that are aware of mission and tasks context as well as the facilitating the development of a science of Context-Driven Decision Making (CDDM).

Prior to coming to ONR, Dr. Morrison was an Engineering Psychologist / Cognitive Scientist with the Space and Naval Warfare Systems Center – Pacific (SSC Pacific) for 17 years. He was most recently embedded as a Navy Scientist with the Combating Terrorism Technical Support Office (CTTSO) where he served as Chief Scientist to the ASD RDT&E sponsored Human Social Culture and Behavior Modeling Program (HSCB). During 2007-2008, Dr. Morrison was detailed to the Director of National Intelligence where he served as an IARPA Program Manager studying the analytic process and the potential application of virtual world technologies to enable it. Dr. Morrison was a senior scientist supporting several DARPA projects, including the development of user-composable automation for Maritime Domain Awareness (FastC2AP), Predictive Analysis for Naval Deployment Activity (PANDA), and the Augmented Cognition program. He also was principle investigator for numerous ONR sponsored projects, including: Knowledge Web (K-Web), and Tactical Decision Making Under Stress (TADMUS).

Dr Morrison has been the recipient of numerous professional awards including: The 2005 Jerome H Ely Award for Article of the Year in the Journal of Human Factors; the 2004 ONR Arthur E. Bisson Prize for Naval Technology Achievement; and the American Psychological Association - Division 21, George E. Briggs Award for Original Research.