From Information

To Meaning

KnoEsis
Ohio Center of Excellence in Knowledge-enabled Computing
www.knoesis.org
Kno.e.sis’ research in World Wide Web area of Computer Science has placed Wright State University among the top academic institutions in the world. In March 2013, we shared 2nd position in the world based on 5 year impact: http://j.mp/www-Mar13. In April 2014, we are among the top 10 universities in the world based on 10 year impact.

Organization (H-index)
1. IBM ()
2. Microsoft ()
3. University of Manchester () #1
4. Yahoo Research Labs ()
5. Stanford University () #2
6. University of Oxford () #3
7. VU University of Amsterdam () #4
8. Karlsruher Institute of Technology
9. University of Maryland () #5
10. Carnegie Mellon University #6
11. Massachusetts Institute of Technology #7
12. Google, Inc. ()
13. Wright State University (11) #8

How did WSU go from no WWW to world class?

Kno.e.sis is directed by Prof. Amit Sheth, LexisNexis Ohio Eminent Scholar. We have created a world-class ecosystem that combines highly successful faculty with complementary strengths: the ability to bridge the gap between foundational research and the development of technology and applications that have real-world impact, the ability to win highly competitive federal funding (complemented by industry gifts, contracts, collaborations that reach from local industry to top institutions in the world), and an agility that is driven by vision that keeps its researchers ahead of the competition. The end result is exceptionally well qualified graduates that have gone on to top-tier career paths, including tenure-track positions in research universities and research scientist positions in top industry research labs and entrepreneurship.

Partner in Economic Development

Kno.e.sis is actively engaged in regional and national economic developments through a) collaboration with a number of regional and global companies, b) technology transfer and commercialization, and c) by producing world class talent who can innovate. Kno.e.sis faculty and students (some with their industry collaborators from their internship employers) have filed for and/or were awarded 9 patents in the last 3 years.

Our Twitris Technology was awarded a patent in April 2014; more applications are pending.
Student and Alumni Achievements

The most important measure of Kno.e.sis’ success is the success of our graduates, and our graduates are second to none. Results prove such a bold claim. Kno.e.sis PhD and Post Doc alumni go on to have exceptional careers:
- Satya Sahoo, Tenure-Track Faculty, Case Western Reserve University
- Ramakanth Kavaluru, Tenure-Track Faculty, University of Kentucky
- Meena Nagarajan, Cartic Ramakrishnan and Pablo Mendes - Members of IBM’s prestigious Watson Group for Cognitive Innovations at Almaden Research Labs
- Prateek Jain, IBM TJ Watson Research
- Ajith Ranabahu, Amazon
- Christopher Thomas, Samsung Research
- Cory Henson, Bosch Labs

Kno.e.sis MS graduates with a thesis have also had exceptional success, joining high-tech companies such as EMC, CISCO, Bloomberg as well as startups. Another way to measure success is annual compensation, two recent MS graduates started at $110K and $120K in their first year, and a PhD has secured a $175K annual salary before annual bonus.

Keynotes: Have you ever heard of a keynote at an international event being given by a speaker that has yet to complete a PhD?
- Meena Nagarajan — 2010 Social Data on the Web in Washington, DC.
- Cory Henson — 2012 Semantic Interoperability Workshop in Venice, Italy.

Invited Talks at Significant Events
- Pavan Kapanipathi gave an invited talk at the IBM's invitational workshop on Frontiers of Cloud Computing and Big Data, 2014

Major International Awards and Recognition
- Hemant Purohit won UN agency’s ITU's Telecom World Young Innovators 2014 Competition on Open Source Technologies for Disaster Management, based on an idea from his research after competing among 150 worldwide applications, Aug 2014. Brochure
- Pramod Anantharam was selected for the Eric & Wendy Schmidt Data Science for Social Good Fellowship for Summer 2014.
- Hemant Purohit received Google, USAID and ICT4Peace fellowship for CrisisMappers ICCM 2013 at UN Nairobi, selected as one of the 8 international fellows, Oct 2013. Ignite talk Video, Slides
- Ajith Ranabahu (and the Kno.e.sis team), Technology Award at the 2012 Fukuoka Ruby Award Competition. Presented by the Fukuoka Center for Overseas Commerce in America. Competition judged by Yukihiro Matsumoto, the creator of the Ruby programming language. Only academic entry out of 81 to get this prestigious award.

Several Kno.e.sis students are leading organizers of international events, quite rare.
- Delroy Cameron was PC co-chair of the First International Workshop on the Role of Semantic Web in Literature-Based Discovery at BIBM 2012 in Philadelphia.
- Cory Henson was PC co-chair of the 5th International Workshop on Semantic Sensor Networks at ISWC2012 in Boston.

Our PhD students often serve on Program Committees at top conferences (WWW, ISWC, IJCAI, CIKM, EKAW, ESWC, etc.) in our area. Combined, our PhD students have served on over 15 PCs before graduation. An assistant professor seeking tenure considers this an achievement, and quite a few of Kno.e.sis’ recent PhD graduates and current PhD students have over 500 and over 1000 citations—also a rarity!
Professor Amit Sheth and Professor Guozhu Dong are respectively the first and third most cited authors at Wright State University (WSU).

- Prof. Amit Sheth received the 2010 WSU Trustee’s Award for Faculty Excellence, the highest award given by WSU. With an h-index of 85 and over 25,000 citations, he is currently one of the world’s top 50 authors in Computer Science, top 1-3 authors in World Wide Web and top 25 in Databases. (Details at http://bit.ly/MAS-a.) A couple of his advisee (Kunal Verma: PhD, 2006; Karthik Gomadam: PhD 2010) appear in top 50 authors in WWW based on a 5 and 10-year h-index.

- Prof. Guozhu Dong, with over 5,400 citations and an h-index of 35, is one of the top 75 authors in Data Mining. He received the WSU College of Engineering and Computer Science’s (CECS) 2012 Faculty Research Award.

- Prof. Michael Raymer has been promoted to Associate Dean for Research. He was also selected for 2012 CECS Outstanding Service Award.

- Prof. Pascal Hitzler was selected for the 2013 Outstanding Faculty Member and 2011 Early Career Award for CECS. He was also awarded the 2010 Outstanding Academic Title by the American Library Association’s Choice Magazine for his textbook *Foundations of Semantic Web Technologies*. He is the third most cited author at WSU based on a 5-year h-index.

- Prof. T.K. Prasad won the 2011 Fritz J. Russ Award, presented by the Dayton Section of IEEE, and the 2013 CECS Outstanding Overall Faculty Award.

- Professor Thomas Wischgoll received the 2013 CECS Outstanding Service Member Award.

- Professor Shaojun Wang received the 2013 CECS Outstanding Research Award.

Kno.e.sis faculty are highly visible and active in professional services through editorial boards of well over 10 journals, organization (steering, general, program chair, etc.) of over 10 international events each year, and their participation in a large number of program committees. Prof. Hitzler is joint Editor-in-Chief of *Semantic Web Journal*. Prof. Sheth is Editor in Chief of International Journal on Semantic Web and Information Systems.

In the last 36 months, Kno.e.sis Computer Science faculty have released 7 books and created 195 publications, including 36 journal papers and 69 conference papers.
Coronary heart diseases remain one of the leading causes of death in most western societies. Improved diagnostic tools are needed to detect these diseases at an early stage and determine the severity of the disease. The general objective of this project is to develop a novel rationale for the diagnosis of diffuse coronary artery disease (DCAD) using clinical, non-invasive imaging of the coronary arteries. The indices of diagnosis will be validated in studies of an atherosclerotic porcine model with DCAD. Our unique algorithms for accurately extracting morphometric data from computerized tomography angiography (CTA) images of normal and disease patients along with our quantitative approach uniquely position us to undertake this research.

Keywords: medical imaging, image processing, visualization

Social Media Enhanced Organizational Sense-Making in Emergency Response (NSF)

Online social networks and always-connected mobile devices have created an immense opportunity that empowers citizens and organizations to communicate and effectively coordinate in the wake of critical events. Specifically, there have been many isolated examples of using Twitter to provide timely and situational information about emergencies to relief organizations and to conduct ad-hoc coordination. This research involving cognitive scientists and computer scientists at Kno.e.sis, in collaboration with Ohio State University, seeks to understand the full ramifications of using social networks in a more concerted manner for effective organizational sense-making in such contexts.

Keywords: Social Networking, Emergency Response, Content Analysis, Network Analysis, Organizational Sensemaking, Collaborative

Example of coordination during Oklahoma-tornado response based on our investigation into automatically identifying and matching need-offer during emergencies.
The study of biology is undergoing a transformation that is changing the way scientists look at living systems. Traditional studies have focused on just one gene or one protein, ignoring the complex interactions between genes, proteins, and metabolites that give rise to cells, tissues and organisms. Working together with the Nuclear Magnetic Resonance lab at Wright State University and the Air Force Research Lab, we are developing systems to identify complex biological indicators of human performance. Here analysis of urinary metabolite profiles reveal patterns that mirror performance changes observed in psychological tests. Individuals that are susceptible to fatigue exhibit different metabolite profiles than those that are more resistant, providing a biochemical nature of fatigue susceptibility.

Keywords: bioinformatics, genomics, metabolomics, transcriptomics, eScience
Over 300 million people are affected by asthma worldwide with 250,000 annual deaths attributed to the disease. In a collaboration with a pediatrician specializing in asthma care, Kno.e.sis researchers are enhancing our kHealth kit involving mobile computing and multitude of sensors with a knowledge-empowered probabilistic reasoning algorithms for asthma risk assessment (patient health score) and prediction (patient vulnerability score).

Multimodal health signals spanning personal, population, and public health signals are analyzed to understand (e.g., possible triggers) asthma exacerbations which then lead to actionable information for asthma management. Evaluation with pediatric asthma patients at Dayton Children’s Hospital are underway. kHealth technology is also being evaluated with clinical partners on issues of reducing rehospitalization of Chronic Heart Patients and GI surgery patients, and on Behavioral Event Prediction in People with Dementia.


Keywords: Asthma in children, semantic sensor web, semantic perception, probabilistic reasoning, risk assessment, risk prediction

### Federated Semantic Services Platform for Material Sciences (SemMat)

A Semantic Platform for Material Scientists to access and share distributed and heterogeneous data with access control. Project goals are aligned with the White House Materials Genome Initiative to expedite the time taken from materials discovery to deployment.

**Key Technology Advancements**

- Community-driven vocabulary development to enable interoperability
- Incremental building of Materials Knowledge Graph
- Semantically-enhanced Search and Discovery for Material Data
- Secure data sharing and Access control for Materials Data
The non-medical use of pharmaceutical opioids has been identified as one of the fastest growing forms of drug abuse in the U.S. This NIH-sponsored interdisciplinary project between the Center for Interventions and Addictions Research (CITAR) and Kno.e.sis provides an alternative to the traditional interview of subjects with the study of Web 2.0 empowered social platforms, including Web forums and tweets for detecting patterns and changes in the non-medical use of pharmaceutical and other illicit drugs. Research outcome includes making a discovery from social data related to the use of OTC drug for managing withdrawal, information not known to the medical community.

Keywords: prescription drug abuse, drug abuse ontology, semantic entity extraction, relationship extraction, semantic web.

Online social networks and always-connected mobile devices have created an immense opportunity that empowers citizens and organizations to communicate and coordinate effectively in the wake of critical events. Specifically, there have been many isolated examples of using Twitter to provide timely and situational information about emergencies to relief organizations, and to conduct ad-hoc coordination. This research involving cognitive scientists and computer scientists at Kno.e.sis, in collaboration with Ohio State University, seeks to understand the full ramifications of using social contexts.

Sensemaking, Collaborative Decision Making and mobile application supported semantic computing:

50% of chronic heart patients are re-admitted within 6 months of initial hospitalization, costing the US health care industry 17 billion dollars a year. A multidisciplinary team involving a top practicing surgeon in cardiology, a medical informatician and Kno.e.sis’ computer scientists are developing a system involving non-invasive low cost sensors and Mobile Application Based System (MABS) to address this challenging problem.

Keywords: chronic heart failure, cardiology, semantic perception, semantic sensor web, Health 2.0, machine perception – explanation and discrimination, mobile health.

A US President's initiatives targets the non-medical use of opioids. This NIH-sponsored interdisciplinary project between the Center for Interventions and Addictions Research (CITAR) and Kno.e.sis provides an alternative to the traditional interview of subjects with the study of Web 2.0 empowered social platforms, including Web forums and tweets for detecting patterns and changes in the non-medical use of pharmaceutical and other illicit drugs. Research outcome includes making a discovery from social data related to the use of OTC drug for managing withdrawal, information not known to the medical community.

Keywords: prescription drug abuse, drug abuse ontology, semantic entity extraction, relationship extraction, semantic web.
Kno.e.sis is primarily funded by competitive/full F&A federal sources such as NIH, NSF, AFOSR and AFRL. Typical split: Federal 70%, State 20%, Industry 10%. Annual research expenditures since 2010 > $1 million, significant majority for GRA support.

**FEDERAL GRANTS** (Representative Examples)
- Semantic Web Enhanced Clinical Text Understanding for Computer Assisted Coding and Computerized Document Improvement (ezDI: PI Sheth)
- Developing Large Scale Distributed Syntactic Semantic and Lexical Language Models for Machine Translation and Speech Recognition (NSF: PI Wang)
- Quantitative Measurements of Intestinal Metabolites in Healthy and IBS Children (NIH: PI Raymer)
- CT-Based Diagnosis of Diffuse Coronary Artery Disease (NIH-NHLBI: PI Wischgoll)
- eDrugTrends: Trending Social Media Analysis to Monitor Cannabis and Synthetic Cannabinoid Use (NIH: PI Sheth)
- Monitoring Social Media to Help Prevent Juvenile Repeat Violence (Bureau of Justice Assistance: pi Sheth)
- TUES CUTE: Instructional Laboratories for Cloud Computing Education (NSF: PI Chen)
- CityPulse: Smart Data for Smart Cities (EU FP7: PI Sheth)
- Formal RDF Graph Model and Query Engine, and Scalable Parallel Graph Computations at a Massive Scale

**INDUSTRY SPONSORS**

© 2014 Kno.e.sis-Ohio Center of Excellence in Knowledge-enabled Computing
Kno.e.sis Faculty Advisees Are Employed At

- IBM
- BOSCH
- Groupon
- The University of Montana
- EMC²
- Miami Valley Hospital
- College of Charleston (Founded 1770)
- Samsung Electronics - SISA Group
- eBay
- Oracle
- Samsung
- University of Hawaii
- NC State University
- Goldman Sachs
- University of Kentucky
- Akamai
- Cisco
- Accenture
- University of Chicago
- Amazon.com
- Cigna
- Case Western Reserve University
- The University of Chicago