From Information

To Meaning

Kno.E.Sis

Ohio Center of Excellence in Knowledge-enabled Computing

www.knoesis.org
Wright State University (WSU) is truly world class. In a ranking based on Microsoft Academic Search, WSU shares the 2nd position among Universities in the area of World Wide Web research. The rankings are based on the 5-year h-index, a measurement of productivity and impact of a scholar’s research as well as the number of citations their research receives in other scholars’ published work. Details available online at: http://j.mp/www-0313

Organization (H-index)
1. Microsoft (24)
2. Yahoo Research Labs (20)
3. IBM (17)
4. Stanford University (16) #1
5. Google. Inc. (12)
7. Wright State University (11) #2

How did WSU go from no WWW acknowledgement 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, ability to span foundational research to development of technology and applications that have real-world impact, ability to win highly competitive federal funding that is complemented by industry gifts and contracts, collaborations that span working with local industry to top institutions in the world, and agility that is driven by vision that keeps its researchers’ one step ahead of competition. The end result is exceptionally well qualified graduates that have gone on to the top career choices that include tenure track positions in research universities, research scientists 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) collaborating 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/were awarded 9 patents in the last three years.

Wright State University, represented by Kno.e.sis, is a member of the World Wide Web Consortium, which has resulted in a number of standards related outcomes including an international standard.
Student 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 get exceptional jobs:
- Satya Sahoo, Tenure Track Faculty, Case Western Reserve University,
- Ramakanth Kavaluru, Tenure Track Faculty, University of Kentucky,
- Meena Nagarajan, Research Scientist, IBM Almaden Research,
- Prateek Jain, Research Scientist, IBM TJ Watson Research,
- Ajith Ranabahu, Software Engineer, Amazon.

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

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.
  David Carral Martinez gave invited talk at 2012 Geo-Vocabulary Camp at GI Science in Dayton.

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 BIBM2012 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 of top conferences (ISWC, IJCAI, CIKM, EKAW, ESWC, etc.) in our area. A few of our PhD students have served on over 15 PCs before graduation — an assistant professor seeking tenure considers this an achievement. Three current Kno.e.sis PhD students have over 400 citations each — also a rarity!

Kno.e.sis’ Ajith Ranabahu received the prestigious Fukuoka Ruby Technology Innovation Award; his academic entry competed among 82 international submissions and later received WSU’s Presidential Commendation for Excellence in co-curricular activities.

Within five years, Kno.e.sis attracts top world-wide talent to graduate program. In 2010, Adila Krisnadhi, Ph.D. student, received the Fulbright Indonesia Presidential Scholarship for 2010-2013. We also attracted Sanjaya Wijeratne, the top student of University of Moratuwa’s class, Sri Lanka’s best engineering school.

Brian Diekelman won the CECS Outstanding BS-Computer Engineering Student 2012-2013.
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 h-index of 79 and over 25,000 citations, he is currently one of the world’s top 100 authors in Computer Science, top 1-3 authors in World Wide Web and top 20 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 5 and 10-year h-index.
- Prof. Guozhu Dong, with over 4,600 citations, 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 promoted to Associate Dean for Research. He was also selected as 2013 CECS Outstanding Service Award.
- Prof. Pascal Hitzler was selected for 2013 Outstanding Faculty Member and 2011 Early Career Award for CECS. He was also awarded the “Outstanding Academic Title 2010” 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 5-year h-index.
- Prof. T.K. Prasad won the 2011 Fritz J. Russ Award presented by the Dayton Section of IEEE.
- Professor Thomas Wischgoll was elected the 2012 Outstanding Faculty Member.

Kno.e.sis faculty are world class and compete favorably with top 20 universities.

Kno.e.sis faculty are highly visible and active in professional services through editorial boards of well over 10 journals, organization (as steering/general/program chair) of over 10 international events each year and 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 last 36 months, Kno.e.sis Computer Science faculty have published 7 books, 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 that can detect these diseases at an early stage and determine the severity of the disease at that stage. Thus, the general objective of this project is to develop a novel rationale for 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

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. In recent years, technologies such as genomics, transcriptomics, and metabolomics have allowed a broader and more holistic study of life. Working together with the Nuclear Magnetic Resonance lab at Wright State University and the Air Force Research Lab, we are developing web-based analysis platforms that allow scientists to integrate information from different -omics technologies to obtain a clearer understanding of the marvelous complexity of interactions in all living things.

Keywords: bioinformatics, genomics, metabolomics, transcriptomics, eScience
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 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 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 Decision Making

High Confidence Protein Structure Prediction (NIH)

Understanding protein structure and the forces that drive protein folding is one of the most fundamental and challenging problems in biochemistry. Finding computer-based methods for predicting the structure of proteins has remained a challenging task, even as computing power and algorithm sophistication has grown. In collaboration with Dr. Jerald Alter’s lab, (Department of Biochemistry and Molecular Biology, Wright State University) we have developed a technique that improves the reliability of protein structure prediction algorithms by including experimental information in the model selection process. MRAN - Modification Reactivity Analysis combines experimental data from proteolysis or residue modification reactions with computational modeling of protein structure to yield highly-reliable predictions of protein structures. The resulting models are of suitable quality to serve as targets for pharmaceutical drug design.

Keywords: protein folding, protein structure, drug design
Life science researchers currently search and sift through a growing amount of scientific literature to gain insights and elicit knowledge. This research creates and applies contextually relevant background knowledge to ease the challenging tasks of information extraction, search and exploration. A detailed background knowledge is created using DOOZER, a tool to create an initial domain model by mining relevant Wikipedia content, followed by a focused knowledge (entity-relationship) extraction from relevant scientific literature using shallow NLP techniques. Life scientists then use SCOONER, a tool that supports knowledge exploration. This research is evaluated and used by biologists at the Air Force Research Lab in the area of human performance and cognition.

Keywords: automatic domain model extraction, focused knowledge extraction, semantic knowledge exploration, knowledge elicitation, human performance and cognition, DOOZER, SCOONER

Reduce Chronic Heart Patient Readmission using Low Cost Sensors

Reducing hospital readmission for chronic heart patients using low cost sensors 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.
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, Treatment and Addictions Research (CITAR) and Kno.e.sis provides an alternative to traditional interview of subjects with the study of Web 2.0 empowered social platforms, including Web forums for detecting patterns and changes in the non-medical use of pharmaceutical and other illicit drugs.

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 networks in a more concerted manner for effective organizational sense-making in such contexts.

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Reducing hospital readmission for chronic heart patients using low cost sensors and mobile application supported semantic computing:

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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)
- Semantics and Services Enabled Problem Solving Environment for Trypanosoma cruzi (NIH: 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)
- III: Small: Tron - Tractable Reasoning Ontologies (NSF: PI Hitzler)
- CT-Based Diagnosis of Diffuse Coronary Artery Disease (NIH-NHLBI: PI Wischgoll)
- Collaborative Research: SoCS Social Media Enhanced Organization Sensemaking in Emergency Response (NSF: PI Sheth)
- EAGER: Knowledge Transfer Oriented Data Mining with Focus on the Decision Tree Knowledge Type (NSF: PI Dong)
- EAGER: Expressive Scalable Querying over Linked Open Data (NSF: PI Sheth)

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