

# Sreenivas Rangan Sukumar

## Work Address:

1 Bethel Valley Road, Building 5700, Mailstop 6085  
Computational Science and Engineering, ORNL.  
Oak Ridge, TN - 37830.

Webpage: [www.ornl.gov/~zqz](http://www.ornl.gov/~zqz)

Email: [sukumarsr@ornl.gov](mailto:sukumarsr@ornl.gov)

Phone (c): 1-865-474-0519

Phone (w): 1-865-241-6641

LinkedIn : <http://www.linkedin.com/in/rangan>

Google Scholar : <http://scholar.google.com/citations?user=gBOgfzwAAAAJ&hl=en>

## RESEARCH INTERESTS/EXPERTISE

**Big Data Analytics:** Knowledge Discovery Architectures and Algorithms, Machine learning, Graph/Relationship Analytics, Data Fusion, Pattern Recognition, Computer Vision, Information Visualization.

## WORK EXPERIENCE

### UT- Battelle, LLC (Oak Ridge National Laboratory), Oak Ridge, Tennessee, USA.

*Group Leader – Advanced Data and Workflows, National Center for Computational Sciences* Oct 2015 – Present

- Leading a team of scientists that design, build and offer creative data science solutions to enable interactive data-driven discovery in science domains spanning astronomy to zoology at scale and performance by leveraging heterogeneous compute architectures hosted by the Oak Ridge Leadership Class Computing Facility (OLCF) and Compute and Data Environment for Science (CADES).

*Research Scientist (R&D Staff) – Computational Data Analytics* Nov 2013 – Sept 2015

- Current responsibilities include the role of *data-scientist-in-residence*.
- Understanding modern high-performance-computing architectures (Hadoop, Cray HPC series, Amazon AWS and YarcData's Urika).
- Studying the scalability of query models (e.g. SQL, NoSQL, Map-Reduce and SPARQL) to variety, velocity and volume dimensions of Big Data.
- Leveraging benchmarks to design future "knowledge" nurturing architectures for Big Data problems.

*Research Scientist (R&D Associate) – Data System Sciences and Engineering* June 2010 – Oct 2013

- Designed and implemented scalable knowledge discovery architectures and algorithms for Big Data analysis problems.
- Published in academic literature, transferred research technology to the commercial market, lead grant proposals and strategic organizational research plans.
- Developed and demonstrated solutions for a wide variety of federal customers in Health, Energy and Public-policy informatics.

### The University of Tennessee, Knoxville, Tennessee, USA.

*Affiliate with the Center for Intelligent Systems and Machine Learning* Mar 2015 – Present

### Oak Ridge Associated Universities, Oak Ridge, Tennessee, USA.

*Post-doctoral Research Associate @ Oak Ridge National Lab, Oak Ridge, TN, USA.* Mar 2009 – May 2010

- Developed research prototypes of machine learning algorithms for data and model exploration of inter-dependent/linked data structures that were applied to electric-grid modernization challenges, dynamics in a production line, fraud/fault detection and social network behavior.

### Photon-X, Inc., Huntsville, Alabama, USA.

*Computer Vision Engineer/ Algorithm Specialist* Dec 2008 – Nov 2009

- Conducted research in 3D-4D sensor design, authored business grant proposals, designed and implemented algorithms for marker-less non-rigid 3D/4D motion capture, extraction, analysis and visualization.

### Imaging, Robotics, and Intelligent Systems Lab at The University of Tennessee, Knoxville.

*Graduate Research Assistant* Aug 2002 – Nov 2008

- Conducted research in data fusion, image processing, 3D computer vision and mobile robotics. Published 19 articles in books, international journals and conferences.

## EDUCATION

- Doctor of Philosophy**, Electrical Engineering, University of Tennessee, Knoxville, USA, 2008.  
Dissertation: Uncertainty minimization in robotic 3D mapping systems operating in dynamic large-scale environments.  
Advisor: Dr. Mongi Abidi CGPA: 4.0/4.0
- Master of Science**, Electrical Engineering, University of Tennessee, Knoxville, USA, 2004.  
Thesis: Curvature variation as measure of shape information  
Advisor: Dr. Mongi Abidi CGPA: 4.0/4.0
- Bachelor of Engineering**, Electronics & Communication Engineering, University of Madras, India, 2002.  
Thesis: Adaptive audio compression for web archival and transmission.  
*Ranked # 1 in a class of 67 students* CGPA: 84%
- Advanced Diploma in Net Centric Computing**, National Institute of Information Technology, India, 2000.  
(Diploma course completed with scholarship and award of excellence)

## INTELLECTUAL PROPERTY / PATENTS

- S. R. Sukumar, M. Shankar and R. Ferrell, *Knowledge Catalysts: Enabling and Exploring Discovery from Big Data*, Provisional Patent Application 61/732,447 approved on Dec 3, 2012, Utility patent US 20140156591 A1 published June 5, 2014.
- S. R. Sukumar. *Scalable Pattern Search in Multi-Structure Data*, US Patent Application 62/106,342, filed January 22, 2015. Utility patent titled "Processing associations in knowledge graphs" applied Jan 22, 2016.

## OPEN-SOURCE SOFTWARE

- GM\_SPARQL: Graph mining using SPARQL - Available for download from <https://github.com/ssrangan/gm-sparql>.
- VizPower: Visualize Power System Dynamics (from simulations and real feeds) on Google Earth - Available at <https://github.com/ssrangan/VizPower>
- ORiGAMI - Oak Ridge Graph Analytics for Medical Innovation is now accessible at <http://hypothesis.ornl.gov>

## PROFESSIONAL ACTIVITIES

- **Grant/Proposal Reviewer**
  - National Science Foundation - Computer and Information Science and Engineering (CISE) Research Initiation Initiative (CRII) Program
  - Oak Ridge National Lab Directors Research and Development Fund
  - Oak Ridge National Lab - SEED Money
- **Publication Reviewer**

Acted as reviewer for the following journals and conferences

Journals:

  - ACM Transactions on Services Computing
  - IEEE Transactions on Visualization and Computer Graphics
  - IEEE Potentials Magazine
  - Elsevier's Information Fusion Journal
  - Emerald's Sensor Review Journal
  - Emerald's Assembly Automation Journal
  - SPIE Journal of Electronic Imaging
  - SPIE Optical Engineering Journal
  - SPIE Optics Express
  - Medical Physics
  - Big Data (Mary-Ann Liebert Publishers)
  - Experimental Biology and Medicine

Conferences:

- IEEE International Symposium on 3D Processing, Visualization and Transmission (3DPVT), 2008.
- IEEE International Conference on Robotics and Automation (ICRA), 2009, 2016.
- IEEE/ASME International Conference on Advanced Intelligent Mechatronics (AIM), 2009.
- ACM/IEEE International Conference on Distributed Smart Cameras (ICSDC), 2009.
- IEEE International Conference on Biometrics: Theory, Applications and Systems (BTAS), 2010.
- IEEE EMBS ORNL Biomedical Science and Engineering Center Conference (BSEC), 2009 -2013.
- IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2011-2012.
- IEEE Energy Conversion Congress and Exhibition (ECCE), 2011 and 2012.
- Sixth Workshop On Big Data Analytics: Challenges And Opportunities (BDAC-15) in conjunction with Super Computing 2015.

Assisted with review of submissions for the following books, journals and conferences

- Super Computing: Workshop on Big Data Analysis, 2013.
- ACM Conference on Information and Knowledge Management, (CIKM) 2013.
- IEEE Transactions on Vehicular Technology
- IEEE Transactions of Image Processing
- International Journal of Shape Modeling
- IEEE Transactions on Man, System and Cybernetics (Part B)
- IEEE International Conference on Image Processing (ICIP) 2005-2007.
- Depth Map and 3D Imaging Applications: Algorithms and Technologies, IGI Global Publishers.

- **Program Committee**

- Member of the Program Committee for the ORNL Computational Data Analytics Workshop, 2013.
- Member of the Program Committee for the Second ACM SIGSPATIAL International Workshop on the use of GIS in Public Health, 2013.
- Publication chair for the IEEE EMBS ORNL Biomedical Science and Engineering Center Conference in 2011, 2013 and 2014-2015.
- Member of the Program Committee for the 4th ACM SIGSPATIAL International Workshop on Analytics for Big Geospatial Data (Big Spatial 2015)
- Member of the Program Committee for the 1<sup>st</sup> International Workshop on Deriving Value from Big Data in Healthcare (in conjunction with IEEE Conference on Big Data 2015)
- Member of the Program Committee for the Mining Big Data to Improve Clinical Effectiveness Workshop (in conjunction with IEEE Conference on Big Data 2015)
- UT-Battelle Scholarship Committee (2014, 2015)
- Member of the Program Committee for the Special Track on Artificial Intelligence in Healthcare (in conjunction with the 29<sup>th</sup> International FLAIRS Conference (2015)
- Strategic Hire Search Committee Chair for Data Scientist position within the Climate Change Science Institute.

- **Student Mentoring in Science, Technology, Engineering and Mathematics (STEM) Education**

- Tyneshia Eaddy -Summer Intern (SULI), Morris College, SC, Summer 2011.
- Jacob Davy - PhD student, Electrical Engineering, University of Tennessee, 2011-2013
- Bill Thompson - PhD student, Statistics, University of Tennessee, Summer 2012.
- Brian Saia- Student Intern (SULI), California State University, Pomona, Summer 2012.
- Lewis Fordjour - Student intern (SULI), Morris college, SC, Summer 2012.
- Jillian Gauld - Post-Bachelors Intern (RAMS), University of British Columbia, Summer 2012.
  - *Recipient of the Canada Graduate Scholarships Master's Award, Canadian Institutes of Health Research.*
- Keela Ainsworth - Student Intern (SULI), Georgia State University, Atlanta, Spring 2013.
- Frank Aline - Student Intern (SULI), New York City College of Technology, Spring 2013.
  - *Currently Business Intelligent Analyst at Vanderbilt University*
- Jessica Wheeler - Student Intern (SULI), Radford College, Summer, 2013.
  - *Pursuing Masters in Math (Ohio State University)*
- Nathaniel Bond - Student Intern (SULI), Cedarville University, Summer, 2013.
- Yifu Zhao - Student Intern (ORSS), Denison University, Fall, 2013.
- Keela Ainsworth - Student Assistant (HERE), University of Tennessee, May 2013-Present.
  - *Won the competitive "ACM Richard Tapia Celebration of Diversity in Computing" Travel Award based on the work done in Spring 2013.*

- *A recipient of the University of Tennessee Chancellors PhD Fellowship.*
  - Jacob Isbell, Zachary Hensley and Samer Salib – Mentored course CSC4903 Research in Computer Science at Tennessee Technological University – Spring 2014.
  - Tyler Brown – Student Assistant (HERE) – University of Tennessee, January 2014- Present.
  - Carlos de-Castillo Negrete (SULI), Yale University, Summer 2014.
  - Larry Roberts Student Intern (SULI), Tennessee Technological University, Cookeville, Summer 2014 and Student Assistant (HERE) – Fall 2015-Present.
  - Robby Fergusson (Haslam Scholar) – University of Tennessee, Summer 2014.
  - Gautam Ganesh – (HERE) University of Texas, Dallas, Summer 2014 (Master’s student)
  - Indigo Jackson – (ORHS Math Thesis Program) Oak Ridge High School, Summer 2014.
    - *Scored a perfect 36 on ACT*
    - *One of 11 Tennessee winners of the National Center for Women and Technology annual award for Aspirations in Computing.*
    - *Third place winner in Tennessee Junior Science and Humanities Symposium*
  - Stefan Blachut – Student (ORSS), Albion College, Fall 2015.
  - Seokyong Hong (Go! Program) – North Carolina State University (PhD student), Oct 2014-Present
  - Jeffrey Graves (HERE Program) – Tennessee Technological University (PhD student), May 2015 – Present
  - Katie Senter (SULI Program) – Pennsylvania State University - Summer 2015.
  - Alexandra Zakrezwska (SULI Program) - Yale University - Summer 2015.
  - Oumar Soulmany Diallo (SECME Program) – Oak Ridge High School – Summer 2015.
- **Invited Talks**
  - “Reasoning with Knowledge Graphs”, Institute for Functional Imaging of Materials, Oak Ridge National Laboratory, August 20, 2015.
  - “Semantic MEDLINE for Precision Medicine”, Federal Big Data Working Group, McLean, Virginia, July 20, 2015
  - “Scientific Insights from Open Health Data”, Health Data Palooza, Washington DC, June 2, 2015. (Also on a panel on Direct to Consumer Data Structures and Scientists for your Government-Sponsored DTC Business.)
  - “Investigative Data Analytics for Healthcare”, Metropolitan Drug Commission/Pain Consultants of East Tennessee, Knoxville, April 20, 2015.
  - “How a computing powerhouse can provide healthcare insights?”, Focus on Therapeutic Outcomes Research Advisory Board Meeting, Knoxville, April 20, 2015.
  - “Semantic, Statistical and Logical Reasoning with Massive Knowledgebases”, Industry Affiliate Workshop – Center for Intelligent Systems and Machine Learning, University of Tennessee, Knoxville, April 17, 2015.
  - “Data Sciences for Healthcare”, Big Data and Analytics Research Center, University of Tennessee, Chattanooga, April 6, 2015.
  - “Semantic, Statistical and Logical Reasoning with Massive Knowledgebases”, School of Communication and Information Sciences, University of Tennessee, Knoxville, March 26, 2015.
  - “Big Data App Store: Democratizing Data-Science with On-Demand Analytics”, SPARK!2015 organized by the Tech 2020 at Commerce Park, Oak Ridge, March 25, 2015.- (<https://www.youtube.com/watch?v=Ik1srP0JzjA>)
  - “Graph Computing at Scale”, Guest Lectures – COSC526: Big Data Mining (Instructor: Dr. Arvind Ramanathan), The University of Tennessee, Knoxville, February 10 and 12, 2015.
  - “Scalable Knowledge Discovery using Semantic Graphs”, NIH Immport Science Meeting, Stanford University, January 22, 2015.
  - “Graph Computing at Scale”, Department of Industrial and Systems Engineering, The University of Tennessee, Knoxville, January 16, 2015.
  - “Machine learning in the Big Data Era: Are we there yet?”, Centers for Intelligent Systems and Machine Learning (CISML), University of Tennessee, Knoxville, August 29, 2014.
  - “Of the People, For the People, By the People 2.0?”- Vision Statement at KDD@Bloomberg: Solve for Good, New York City, August 24, 2014. (<http://www.bloomberg.com/now/2014-08-25/kdd-bloomberg-access-information-will-bring-transformation-markets/>)
  - “Experiences with Data Parallel Frameworks: Plans and Needs for the Future”, Joint Facilities User Forum on Data Intensive Computing, NERSC-Berkeley, June 17, 2014.

- “Machine Learning for Data-Driven Discovery”, Joint Facilities User Forum on Data-Intensive Computing, NERSC-Berkeley, June 16, 2014.
- “Data Science for Discovery”, Joint Institute for Computational Science, The University of Tennessee, Knoxville, March 18, 2014.
- “Common Sense Reasoning with Images”, University of Tennessee, Imaging, Robotics and Intelligent Systems Seminar Series, May 10, 2013.
- “Analytics for Smarter Healthcare”, Tennessee Tech University, Department of Computer Science, Institute for Modeling, Simulation and Discovery, April 19, 2013.
- “An Information Theoretic Approach to Validate Disease Spread Models”, SIAM SEAS Annual Meeting, March 23, 2013.
- “Uncertainty minimization for robots in dynamic environments”, Seminar Series, Redzone Robotics, Pittsburgh, 2007.
- “Large scale terrain mapping for VPG simulators”, 12th Annual Conference of the Automotive Research Center (A U.S. Army RDECOM Center of Excellence for Modeling and Simulation of Ground Vehicles led by the University of Michigan), May 2006.
- “Intelligent 3D sensing in hazardous environments”, American Nuclear Society's track on University Program in Robotics, 2005. (**Press article published based on the presentation in Nuclear News Magazine, August 2005**)
- “3D Data Collection and Vehicle Component Analysis”, 10th Annual Conference of the Automotive Research Center (A U.S. Army RDECOM Center of Excellence for Modeling and Simulation of Ground Vehicles led by the University of Michigan), May 2004.

#### COMMUNITY LEADERSHIP

Leadership Oak Ridge, Oak Ridge Chamber of Commerce, Class of 2015.

Member of the Executive Board of Directors for the Oak Ridge Leadership Computing User Group (July 2014 - Present)

Co-coordinator for Oak Ridge Saturday Tennis - <http://picasaweb.google.com/104604881640384896313> (Since August 2012)

Member of the Board of Directors for the following 501(c)(3) non-profit organizations:

- Oak Ridge Civic Music Association ([www.orcma.org](http://www.orcma.org)) (May 2012 - Present)
- Oak Ridge Tennis Club ([www.oakridgetennisclub.org](http://www.oakridgetennisclub.org)) (June 2012 - May 2015)

#### PUBLICATIONS

##### • Book Chapter

- V. Chandola, J. Schryver, and S.R. Sukumar, “Fraud Detection in Healthcare”, in *Health Data Analytics*, (eds.) Charu C. Agarwal, and Chandan Reddy, CRC Press, ISBN 9781482232110, June 2015.
- S.R. Sukumar, A.F. Koschan, and M.A. Abidi, “3D Imaging for Mapping and Inspection Applications in Outdoor Environments”, in *Depth Map and 3D Imaging Applications: Algorithms and Technologies*, (eds.) Aamir Saeed Malik, Tae-Sun Choi and Humaira Nisar, IGI Global, Hershey, PA, USA, pp. 471-499, November 2011.
- S.R. Sukumar, D. L. Page, A. Koschan, and M.A. Abidi, “Under Vehicle Inspection with 3D Imaging,” in *3D Imaging for Safety and Security*, Springer, Dordrecht, The Netherlands, pp. 249-278, June 2007.

##### • Refereed Journals

- S.M. Lee, S.R. Sukumar, S. Hong and S.H. Lim, “Enabling Graph Mining in RDF Triplestores using SPARQL for Holistic Graph-Analysis”, *Expert System and Applications*, Vol. 48, pp. 9-25, April 2016, (ISSN 0957-4174, <http://dx.doi.org/10.1016/j.eswa.2015.11.010>).
- S.R. Sukumar, N. Ramachandran and R.K. Ferrell, “Quality of Big Data in Healthcare”, *International Journal of Healthcare Quality Assurance*, Vol. 28, Issue 6, pp. 621-634, 2015.
- S. R. Sukumar and R. K. Ferrell, “Collaboration When Working With Big Data: Recording and Sharing Analytical Knowledge Within And Across Enterprise Data Sources”, *Information Services and Use*, Vol. 33(3), pp. 257-270. 2013. (Reappeared as a *featured Article in the Informed Librarian in May 2014*.)
- S. R. Sukumar, P. Govindasamy, A. F. Koschan, D. L. Page, M.A. Abidi, “Image-based thermal modeling and reverse engineering of as-built automotive components - a case study”, *Virtual and Physical Prototyping*, Vol. 5, No. 1, pp. 1-12, March 2010.
- S.-J. Yu, S.R. Sukumar, D. L. Page, A. Koschan, and M.A. Abidi, “3D reconstruction of road surface using an integrated multi-sensory approach,” *Optics and Lasers in Engineering*, Vol. 45, No. 7, pp. 808-818, 2007.

- B. Grinstead, S. R. Sukumar, D. L. Page, A. F. Koschan, and M. A. Abidi, D. J. Gorsich, "Mobile scanning system for the fast digitization of existing roadways and structures", *Sensor Review Journal*, Vol. 26, No. 4, pp. 283-289, 2006.
- S. R. Sukumar, D. L. Page, A. V. Gribok, A. F. Koschan, M.A. Abidi, D. J. Gorsich, and G. R. Gerhart, "A Robotic 3D Imaging System for Under Vehicle Inspection," *Journal of Electronic Imaging*, Vol. 15, No. 3, 033008 1-11, 2006.
- **Premier Refereed Conferences**
  - S.R. Sukumar, "Open Research Challenges with Big Data - A Data-Scientists Perspective", in the *Proc. the IEEE International Conference on Big Data*, pp. 1270-1278, 2015.
  - S- H. Lim, S.M. Lee, G. Ganesh, T.C. Brown and S.R. Sukumar, "Graph processing platforms at scale: practices and experiences, in *Proc. of the IEEE International Symposium on Performance Analysis of Systems and Software*, pp. 42-51, 2015.
  - V. Chandola, S.R. Sukumar and J. Schryver, "Knowledge Discovery from Massive Healthcare Claims Data," in the *Proc. of the 19<sup>th</sup> ACM SIGKDD Conference on Knowledge Discovery and Data Mining*, pp. 1312-1320, 2013.
  - S. R. Sukumar, H. Bozdogan, D. L. Page, A. Koschan, and M. A. Abidi, "Uncertainty minimization in multi-sensor localization systems using model selection theory", in the *Proc. of the IEEE Intl. Conference on Pattern Recognition (ICPR)*, pp. 1-4, 2008.
  - S. R. Sukumar, H. Bozdogan, D. L. Page, A. F. Koschan, and M. A. Abidi, "Learning structurally discriminant features in 3D faces," in the *Proc. of the IEEE International Conference on Image Processing (ICIP)*, pp. 1912-1915, 2008.
  - S. R. Sukumar, H. Bozdogan, D. L. Page, A. Koschan, M.A. Abidi, "On handling uncertainty in the fundamental matrix for scene and motion adaptive pose recovery", in the *Proc. of the IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, pp. 1-8, Anchorage, Alaska, 2008.
  - S. R. Sukumar, D. L. Page, H. Bozdogan, A. F. Koschan, and M. A. Abidi, "MuFeSaC: Learning when to use which feature detector," in the *Proc. of the IEEE International Conference on Image Processing (ICIP)*, San Antonio, Vol. VI, pp. 149-152, September 2007.
  - S. R. Sukumar, H. Bozdogan, D. L. Page, A. F. Koschan, and M. A. Abidi, "Sensor selection using information complexity for multi-sensor mobile robot localization," in the *Proc. of the IEEE International Conference on Robotics and Automation (ICRA)*, Roma, Italy, pp. 4158-4163, April 2007.
  - Y. Yao, S. R. Sukumar, B. Abidi, D. Page, A. Koschan, M.A. Abidi, "Automated scene-specific selection of feature detectors for 3D face reconstruction", in the *Proc. of the International Symposium on Visual Computing*, 2007, also appears as Lecture Notes in Computer Science, *Advances in Visual Computing*, Vol. 4841, pp. 476-487, 2007.
  - S. R. Sukumar, D. L. Page, A. V. Gribok, A. F. Koschan, and M. A. Abidi, "Shape measure for identifying perceptually informative parts of 3D objects," in the *Proc. of the IEEE 3rd International Symposium on 3D Data Processing, Visualization and Transmission (3DPVT)*, pp. 679-686, Chapel Hill, North Carolina, June 2006.
  - D. L. Page, A. F. Koschan, S. R. Sukumar, B. R. Abidi, and M. A. Abidi, "Shape analysis algorithm based on information theory", in the *Proceedings of the IEEE International Conference on Image Processing (ICIP)*, Vol. I, pp. 229-232, September 2003.
- **Proceedings of Peer-reviewed Conferences, Symposia, Workshop and Topical meetings**
  - S. Hong, S.-H. Lim, S. Lee, S.R. Sukumar, R. R. Vatsavai, "Benchmarking High Performance Graph Analysis Systems with Graph Mining and Pattern Matching Workloads", in the *Proc. of ACM/IEEE International Conference for High Performance Computing, Networking, Storage and Analysis (Super Computing)*, 2015 (Accepted as poster).
  - L.-S Tsay, S. R. Sukumar, Larry Roberts, "Scalable Association Rule Mining with Predicates on Semantic Representations of Data", in the *Proc. of the Technology Application of Artificial Intelligence*, 2015.
  - R. Singh, J. Graves, S. Lee, S.R. Sukumar and M. Shankar, "Enabling Graph Appliance for Genomics Assembly", in the *Proc. of the Workshop on Mining Big Data to Improve Clinical Effectiveness in conjunction with the IEEE Conference on Big Data*, pp. 2371-2378, pp. 2015.
  - K. Senter, S. R. Sukumar, R.M. Patton and E. Chaum, "Using Clinical Data, Hypothesis Generation Tools and PubMed Trends to Discover the Association between Diabetic Retinopathy and Antihypertensive Drugs", in the *Proc. of the Workshop on Mining Big Data to Improve Clinical Effectiveness in conjunction with the IEEE Conference on Big Data*, pp. 2366-2370, 2015.
  - S. R. Sukumar, N.A. Bond, K.C. Ainsworth, T.C. Brown, L. Roberts and S. Lee, "EAGLE: An App Store for Urika-GD", in the *Proc. of the Cray User Group Conference*, 2015.

- S.M. Lee, S. R. Sukumar, and S- H. Lim, "Graph mining meets the Semantic Web", in the *Proc. of the Workshop on Data Engineering meets the Semantic Web Workshop in conjunction with International Conference on Data Engineering*, 2015.
- S.R. Sukumar, "Data-driven Discovery: Challenges at Scale", in the *Proc. of the Big Data Analytics: Challenges and Opportunities Workshop in conjunction with ACM/IEEE International Conference for High Performance Computing, Networking, Storage and Analysis (Super Computing)*, November 2014.
- G. S. Thakur, M. M. Olama, A.W. McNair, S.R. Sukumar and S. Studham, "Towards Adaptive Education Assessments: Predicting Student Performance using Temporal Stability and Data Analytics in Learning Management Systems", in the *Proc. of ACM-KDD Workshop on Data mining for Educational Assessment and Feedback*.
- S. Powers and S.R. Sukumar, "Defining 'normal': metrics for mining heterogeneous graphs at large scales", to appear in the *Proceedings of the INFORMS Workshop in Data Analysis*, 2014.
- S. R. Sukumar, "Machine Learning in the Big Data era: Are we there yet?" in the *Proc. of the ACM-KDD Workshop on Data Science for the Social Good. (KDD at Bloomberg - [Accessed 9/25/2014](#))*.
- S. R. Sukumar and M. Shankar, "Data Science for Social Policy: Of the people, for the people, by the people 2.0?" in the *Proc. of the ACM-KDD Workshop on Data Science for the Social Good. (KDD at Bloomberg - [Accessed 9/25/2014](#))*
- S.R. Sukumar, K. C. Ainsworth and T.C. Brown. "Semantic Pattern Analysis for Verbal Fluency based Assessment of Neurological Disorders", in the *Proc. of the IEEE ORNL Annual Biomedical Sciences and Engineering Conference*, May 2014.
- S. R. Sukumar and K. C. Ainsworth. "Pattern search in multi-structure data: a framework for the next-generation evidence-based medicine. " In the *Proc. of the SPIE Medical Imaging: PACS and Imaging Informatics: Next generation and innovation*, pp. 90390O-90390O, February 2014.
- S. R. Sukumar and F. Aline, "Application of Micro-Segmentation Algorithms to the Healthcare Market: A Case Study", in the *Proc. of the IEEE ORNL Biomedical Sciences and Engineering Conference*, May 2013. (doi: 10.1109/BSEC.2013.6618489)
- S. R. Sukumar and J. J. Nutaro, "Agent-Based vs. Equation-Based Epidemiological Models: A Model Selection Case Study", in the *Proc. of Workshop on Verification and Validation of Epidemiological Models IEEE/ASE International Conference on Biomedical Computing*, pp. 74-79, October 2012.
- S. R. Sukumar, M. M. Olama, M. Shankar, S. Hadley, J. J. Nutaro, V. Protopopescu, S. Malinchik, and B. Ives, "Modeling Resource, Infrastructure, and Policy Cost Layers for Optimizing Renewable Energy Investment and Deployment," in the *Proc. of the IEEE Conference on Innovative Technologies for an Efficient and Reliable Electricity Supply (ITERES)*, pp. 151-158, 2010.
- S. R. Sukumar, M. Shankar, M.M. Olama, J. Nutaro and S. Malinchik, and B. Ives, "A Methodology to Consider Electrical Infrastructure and Real-Time Power-Flow Impact Costs Together in Planning Large-Scale Renewable Energy Farms," in the *Proc. of the IEEE Energy Conversion Congress and Exposition (ECCE)*, pp. 674-678, 2010.
- S. R. Sukumar, M. Shankar, M.M. Olama, S. Hadley, V. Protopopescu, S. Malinchik, and B. Ives, "Quantifying State-Policy Incentives for the Renewable Energy Investor," in the *Proc. of the IEEE Energy Conversion Congress and Exposition (ECCE)*, pp. 386-391, 2010.
- S. R. Sukumar, D. L. Page, A. F. Koschan, and M. A. Abidi, "Towards understanding what makes objects appear simple or complex," in the *Proc. of the IEEE International Conf. on Computer Vision and Pattern Recognition, Perceptual Organization Workshop*, Anchorage, June 2008 (doi: 10.1109/CVPRW.2008.4562975).
- A. F. Koschan, V. P. Govindasamy, S. R. Sukumar, D. Page, M. Abidi, and D. Gorsich, "Thermal Modeling and Imaging of As-built Vehicle Components," in *Military Vehicles, Proceedings of the SAE 2006 World Congress, SAE SP-2040*, Detroit, MI, SAE Technical Paper 2006-01-1167, April 2006.

#### **Other Proceedings in Conferences and Meetings**

- S. Chinthavali, S. Lee, S.R. Sukumar, and O. Omitaomu, "Vulnerability analysis of linked electricity generation and river basin systems using an integrated Graph model", to appear in the *Proc. of the Society of American Medical Engineers Critical Infrastructure Symposium*, April 2016.
- M. M. Olama, A.W. McNair, S.R. Sukumar, J. J. Nutaro, "A Qualitative Readiness-Requirements Assessment Model for Enterprise Big-Data Infrastructure Investment", In *SPIE Sensing Technology+ Applications*, pp. 91220E-91220E. *International Society for Optics and Photonics*, April 2014.
- M. M. Olama, G. Thakur, A.W. McNair and S.R. Sukumar, "Early Student Success Prediction in University Courses", In *SPIE Sensing Technology+ Applications*, pp. 91220M-91220M. *International Society for Optics and Photonics*, 2014.

- S.R. Sukumar and N. Bond, "Mining Heterogeneous Graphs using Cray's Urika", in the Proc. of the ORNL Computational Data Analytics Workshop, October 2013.
  - S. R. Sukumar, M. M. Olama, A. W. McNair and J. J. Nutaro, " Concept of Operations for Discovery from 'Big Data' Across Enterprise Data Warehouses ", in the Proc. of the SPIE Defense, Security and Sensing Symposium : Next-Generation Analyst:, Vol. 8758, 875805, 2013 (doi: 10.1117/12.2016321).
  - M. M. Olama, G.O. Allgood, P. T. Kuruganti, S.R. Sukumar, S.M. Djouadi and J. E. Lake, "Steam distribution and energy delivery optimization using measurement and control over wireless sensors", in the Proc. of SPIE Defense, Security and Sensing Symposium: Advanced Environmental, Chemical, and Biological Sensing Technologies VIII, Vol. 802408, 802408, 2011. (doi:10.1117/12.884148).
  - S. R. Sukumar and M. Shankar, "Value-of-information based middleware for autonomic querying of distributed sensor databases", in the Proc. SPIE Defense, Security and Sensing Symposium: Cyber Security, Situation Management, and Impact Assessment II; and Visual Analytics for Homeland Defense and Security I, 77090P, 2010. (doi:10.1117/12.851685).
  - S. R. Sukumar, S.-J. Yu, D. L. Page, A. F. Koschan, and M. A. Abidi, "Multi-sensor integration for unmanned terrain modeling", in the Proc. SPIE Defense, Security and Sensing Symposium: Perception for Unmanned Systems Technology VIII, Vol. 6230, Orlando, Florida, pp. 65-74, April 2006.
  - S. R. Sukumar, D. L. Page, A. V. Gribok, A. F. Koschan, and M. A. Abidi, "Intelligent 3D sensing for robotic inspection of hazardous facilities", Transactions of the American Nuclear Society, Vol. 92, San Diego CA, USA, pp. 54-55, June 2005.
  - S. R. Sukumar, D. L. Page, A. V. Gribok, A. F. Koschan, M. Abidi, D. Gorsich, and G. Gerhart, "Surface Shape Description of 3D data from Under-vehicle Inspection Robot," in the Proceedings of SPIE Unmanned Ground Vehicle Technology VII, Vol. 5804, Orlando, FL, USA, pp. 621-629, March 2005.
- **Technical Reports**
    - S.R. Sukumar and C. Del-Castillo-Negrete, "Machine Learning on Big Data: A Study to Understand Performance Limits at Scale", ORNL Tech Report, TM/2015/344, December 2015.
    - S. Hong, S. Lee, and S-H. Lim, S.R. Sukumar, and R.R. Vatsavai., "Optimizing Graph Operations on Linked Data", ORNL Tech Report, TM/2015/342, July 2015.
    - S.R. Sukumar, N. Ramachandran and R.K. Ferrell, "Data Quality Challenges in Healthcare Claims Data: Experiences and Remedies", ORNL Tech Report, TM/2014/147, April 2014.
    - S.R. Sukumar, J.E. Lake, J. C. Schryver, R.K. Ferrell, A. Sexton, R. Patton, "10-states Provider Enrollment Assessment Methodologies ", ORNL Tech Report, TM/2013/335, January 2013.
    - V. Chandola, S. R. Sukumar, J. Schryver, "Big Data Analytics on Healthcare Claims Data", ORNL Tech Report, TM-2013/83, May 2013.
    - M. M. Olama, G. O. Allgood, T. P. Kuruganti, S. R. Sukumar, H. K. Woodworth, J. E. Lake, "Wireless Sensing, Monitoring and Optimization for Campus-Wide Steam Distribution", ORNL Tech Report, TM-2011/441, January 2012.
    - S. R. Sukumar and M. Shankar, "Understanding outage-activity in the Eastern Interconnect of the U.S Electric Grid", ORNL Tech Report/TM-2009/226, May 2011.
    - J. Stamp, K. Munoz-Ramoz, M. Baca, J. Brainard, M. Hightower, R. Jensen, D.T. Rzy, N. Durfee, F. Li, M. Shankar, S. Adhikari, S.R. Sukumar, S. Brahma, "Initial Phase of Energy Surety Microgrid Analysis for Camp H.M. Smith (Hawaii)", Sandia National Lab, Technical Report.
  - **Publications under review/revision.**
    - S. Hong, M. Lee, S.-H Lim, S.R. Sukumar, R. Vatsavai, "Apples-to-Apples: Comprehensive Evaluation of Graph Pattern Matching in Graph Analysis Systems", under review, ICCS , 2016.
    - S. Hong, S. Lee, S.-H Lim, S. R. Sukumar, R. Vatsavai, "Optimizing Graph Analysis Operations on Linked Data", under review DASFAA, 2016.
    - S. R. Sukumar and L.W. Roberts, "A Knowledge reasoning and Hypothesis Generation Framework using Urika-XA and Urika-GD", under review to the Cray User Group Conference, 2016.

#### IN THE NEWS/MEDIA/PRESS RELEASES

Member of the teams whose research efforts were featured in:

- LA Times, January 23, 2016, "[What killed Cromwell? Or Mozart ? Sleuthing doctors take on the 'ultimate whodunit'](#) (Published January 23, 2016, Accessed Jan 27, 2016)
- The Next Platform, January 7, 2016, "[National lab pushes graph appliances to new points](#)"
- ORNL Research Story Tip, January 5, 2016 , "[Patterns and Predictions](#)"

- DOE Feature, "[ORNL researchers develop smart data tool to accelerate literature-based discovery](#)" (Published December 7, 2015, Accessed Dec 8, 2015)
  - Phys.org - [A cure for medical researchers' big data headache](#) (December 7, 2015)
  - ACM Careers - "[A cure for medical researcher's big data headache](#)" (December 16, 2015)
- OLCF Highlights, December 8, 2015, "[ORNL Helps Transform High Performance Computing](#)", (Highlighted for the data demonstration at Supercomputing 2015).
- OLCF Highlights, October 13 2015, "[Group Leader Tapped for New Data and Workflow Group](#)".
- Notables, Vanderbilt Kennedy Center, June 4, 2015, "[2015 Hobbs Discovery Grants announced](#)".
- OLCF Highlights, May 21, 2015, "[OLCF Helps Lead Cray User Group Conference](#)".
- ORNL Feature, August 2014, [Health data + ORNL computing = Smarter health care: Lab uses big data to solve health care issues](#) (Published August 26, 2014, Accessed Nov 1, 2014)
  - Association of Computing Machinery - [Computing Tames Big Data for Smarter Health Care](#) (Published Aug 27, 2014, Accessed 1 Nov 2014)
  - HPC Wire Magazine - [Healthcare catches data fever](#) (Published October 30, 2013, Accessed 1 Nov 2014)
  - Cray Blog - <http://www.cray.com/blog/unlocking-the-full-potential-of-health-data/>
  - Government Computer News - [How a computing powerhouse delivers healthcare insights](#) (Published January 28, 2015)
- OLCF Highlights, August 2014, "[OLCF Staff Members Take Leading Roles at Joint Facilities User Forum](#)", July 23, 2014.
- ORNL Research Story Tip, November 2013, "[Big Data- Powerful Pattern Discovery](#)"
- Collaborative Forum Community, "[Automating the Provider Enrollment Process for Risk Assessment and Comparative Analysis](#)", 1 October, 2013.
- Fierce Government IT, October 22, 2012, "[DOE labs help CMS manage healthcare data](#)"
- TechNews TMCNet, August 12, 2012, "[CMS unveils Knowledge Discovery Infrastructure, aims for patient data integration](#)"
- Health Leaders Media, May 15 2012, "[Berwick on Analytics: Technology is ready, but doctors need help.](#)"
- GCN , Mar 9, 2012, "[CMS taps analytics to examine big health care data](#)"
- Lockheed Martin Today, Mar/Apr 2011, "[Power Tool: ATL develops software to assist alternative energy project developers](#)".
- The R&D Magazine (www.rdmag.com) and Knox News, October 6, 2010, "[Taking steam out of wasted energy](#)"
- The Nuclear News Magazine, August 2005 - "[Looking to the future: The next 50 years - Robotics for remote and hazardous environments](#)"
- The Chattanooga Times, February 28, 2005 - "[Chattanooga Airport Partners With University of Tennessee To Improve Airport Infrastructure](#)"
- WATE Knoxville Channel 6 TV (www.wate.com) , February 5, 2005 - "[UT lab developing robots for soldiers in Iraq](#)"

Community work mentioned in the media:

- The Oak Ridger, "Holiday festival at revamped Jackson Square to benefit ADFAC", November 2015 (as the Leadership Oak Ridge Class Project).
- STEM Education - Radford University Newsletter, "[Math and Dance Major completes internship at ORNL](#)", September 2013.
- The Oak Ridger, July 10, 2013, "[Oak Ridge 'Team' Efforts](#)"
- Visions Magazine (Oak Ridge), October 2012, "[Open Tennis Saturdays](#)"
- The Oak Ridger , August 28, 2012, "[Open Tennis Saturdays](#)"

HONORS AND AWARDS

**Leadership Oakridge – Class of 2015**, Oakridge Chamber of Commerce, 2015.  
**Best Invention Disclosure Award** – for Semantic, Statistical and Logical Reasoning with Semantic Knowledge Graphs, Computational Sciences and Engineering Division, ORNL, 2015.  
**Finalist, The Beauty of Health Data Competition**, Health Data Palooza, 2014. (Exhibit on floor)  
**Distinguished Employee**, Computing and Computational Sciences Directorate, ORNL, 2012.  
**Chancellors Citation Award for Extra-Ordinary Professional Promise**, University of Tennessee, 2007.  
**Marquis Who's Who in America**, Biography published since 2007.  
**Outstanding Graduate Student Award**, IRIS College of Engineering, University of Tennessee, 2004.  
**Outstanding Undergraduate Student**, Electronics & Communication Engineering, BIST, 2002.

Placed in top 0.1% of the country graduating from high school by the CBSE, India, 1998.  
Offered the prestigious Research Associateship by the **National Research Council/National Academy of Engineers**, 2008.