

# Jibonananda Sanyal

*Team Leader and Staff Scientist: Scalable and High Performance Geocomputation,  
Geographic Information Science and Technology Group,  
Oak Ridge National Laboratory*

*Knoxville Business Journal's 40 under 40 honoree ([link](#))*

## Contact Information

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## Experience

2016 – Current: Team Leader, Scalable and High Performance Geocomputation at the Oak Ridge National Laboratory (ORNL), [www.ornl.gov](http://www.ornl.gov)

Leading a select team of ~20+ individual researchers (PhDs, postdocs, MS, and subcontractors, not accounting for matrixed individuals) to provide their vision and leadership to define and align their activities with the projects, the group, and the division science agenda. Conducting research at the intersection of high performance computing leaning towards the exascale, extreme scale data and analytics including image processing, simulation and modeling, visualization, scalable machine learning, web-services and APIs for big-data applications, producing both research and operational systems that address challenges in energy, national security, environmental, and other geospatial needs at local, regional, national, and global scales.

The specific applications are many: GIS, climate, IAV research, situational awareness, remote sensing, urban-science, multi-scale and multi-resolution simulation and modeling, building energy modeling, transportation, model-predictive control, as well as agent-based models.

Leading the group's multi-petabyte image processing needs and defining the growth strategy for future hardware, software, and scalable computational needs. This includes architecting multi-objective workflows across multiple clusters and strategies to scale to the Titan supercomputer and beyond.

Specific projects/programs:

***EAGLE-I:*** Serving as the program manager for EAGLE-I, DOE's operational situational awareness tool for the energy sector, and provides high-resolution real-time data of the sub-sectors of electricity, oil and natural gas, petroleum, and coal resources. EAGLE-I is used by FEMA, DHS, USDA, and several other federal, state, and local agencies to deliver the emergency response function for the nation.

***Exascale Systems to build the Metropolitan Systems Energy and Economic Dynamics (Metro-SEED) Framework:*** Cities comprise many interdependent, interconnected, critical infrastructures, and human systems, many of which are modeled individually, but in order to optimize the design, planned evolution, and operation of cities, it is essential that we not only characterize these systems and processes, but also understand how they interact. Coupled multi-scale models to combine localized weather, human activity to inform agent-based transportation model, the resulting building energy models, and governed by socio-economic drivers, are being used to facilitate this discovery process. This is multi-DOE lab effort and I serve as the ORNL technical lead.

***Energy-Water Nexus Knowledge Discovery Framework:*** To meet this need of the energy-water nexus (EWN) community, an Energy-Water Knowledge Discovery Framework (EWN-KDF) is being built accomplish the objective of creating a robust data management and geovisual analytics platform that

provides access to disparate geospatial Earth science and critical infrastructure data, socioeconomic data, and emergent ad-hoc sensor data, and to provide a powerful toolkit of analysis algorithms and compute resources to empower user-guided data analysis and inquiries. Serving as the Co-PI and systems lead.

**Global Accelerated Settlement Discovery:** The objective of this effort is to deliver a suite of high performance machine learning and specifically deep learning model training and prediction strategies, effective data management at the pre-exascale, and super-efficient image data workflows to support the need to accelerate global scale human settlement knowledge discovery using very high resolution (0.5 m) imagery for various humanitarian as well as intelligence needs. Serving as the PI. This includes a 25 million core hours allocation on the Titan supercomputer.

2013 – 2016: R&D Staff at the Oak Ridge National Laboratory (ORNL), [www.ornl.gov](http://www.ornl.gov)

*Projects as PI, Co-PI, or Investigator:*

**Lab-Corps Team-Tunation:** Entrepreneurial Lead of ‘Team Tunation’ in DOE’s 7-week technology incubator program aimed at developing a viable business model from DOE funded research. <http://energy.gov/eere/technology-to-market/lab-corps-teams#tunation>

**Modernizing the AMO Software Suite:** Overhauling the software suite for DOE’s Advanced Manufacturing Office to use latest software development tools and techniques to create cross-platform software. The final suite will operate on desktop, web, as well as tablet devices across different operating systems. Served as PI.

**IGATE-E CHP:** Development of web-based national scale analytics to understand the potential and opportunities of using combined heat and power generation. Served as an investigator.

**OpenStudio Results Framework:** Development of an interoperable results schema for EnergyPlus simulation engine for interoperability. Served as the PI. <https://github.com/NREL/EnergyPlus/tree/ResultsSchema>

**Autotune:** A methodology for calibrating building energy models (BEM) is aimed at developing an automated BEM tuning methodology that enables models to reproduce measured data such as utility bills, sub-meter, and/or sensor data accurately and robustly by selecting best-match E+ input parameters in a systematic, automated, and repeatable fashion. Big-data management and data movement of about 270 TB+ was undertaken and a web interface to enable data access from the database was made in addition to creating dashboards for simple visual analytics. Served as an investigator. <http://rsc.ornl.gov/autotune/>

**XSEDE and OLCF computational allocation for Autotune:** Massively parallel simulations using competitively allocated HPC resources from the Extreme Science and Engineering Discovery Experiment (XSEDE) and the Oak Ridge Leadership Computing Facility (OLCF). Machines include Nautilus and Kraken from the National Institute of Computational Sciences, Gordon at the San Diego Supercomputer Center, Blacklight at the Pittsburg Supercomputer Center, Wrangler at the Texas Advanced Computing Center, and Titan at the OLCF. Served as Co-I.

**Roof Savings Calculator:** Department of Energy’s advanced roof and attic simulation calculator to enable comparisons of energy saving retrofits for roofs. <http://rsc.ornl.gov/>

**Provenance Data Management:** Creation of provenance enabled data management for real-time sensor data from ORNL’s Flexible Research Platforms (FRP), including web-enabled visualization of the provenance graph and interactive exploration of the FRP models. Architected multi-level authentication with individual user permissions with a de-coupled, multi-system database architecture.

**Modbus XML schematization for seamless interoperability:** Development of interoperable schemas for interoperability of sensors and controls based on the Modbus Protocol. <https://github.com/ORNL-BTRIC/ModbusXMLSchema>

- Volttron Agent Development:*** Development of control agents for device control and data archival on the Volttron platform. Investigation includes scalability studies of the platform.  
<https://github.com/VOLTTRON/volttron>
- Others:*** EnergyPlus – whole building energy simulation engine enhancements, OpenStudio Refrigeration module design, and web-enabled heat-pump design simulation model, Flexible Research Platforms data architecture, consolidation, and readiness.
- 2011 – 2013: Research Associate Postdoc at the Oak Ridge National Laboratory (ORNL)  
Projects include Autotune and the Roof Savings calculator described previously. These were multi-year projects spanning both appointments.
- 2009 – 2011: Research Assistant to Dr. Philip Amburn at the Northern Gulf Institute (NGI)/ Geosystems Research Institute (GRI), High Performance Computing Collaboratory (HPC<sup>2</sup>), Mississippi State University.  
[www.northerngulfinstitute.org](http://www.northerngulfinstitute.org), [www.gri.msstate.edu](http://www.gri.msstate.edu),  
***Project: Visual Analytics for Assessment and Interpretation of Simulated River Flooding***  
Co-developer for a visual analytics tool for the simulated river flooding scenarios for the NWS Lower Mississippi River Forecast Center. Software development included the design of projection classes and geo-scientific data readers. Research involving geo-spatial visualization of ensemble river simulations was conducted.  
[www.gri.msstate.edu/research/visualization.php](http://www.gri.msstate.edu/research/visualization.php)
- 2007 – 2009: Research Assistant to Dr. Robert Moorhead at the Northern Gulf Institute (NGI)/ Geosystems Research Institute (GRI), High Performance Computing Collaboratory (HPC<sup>2</sup>), Mississippi State University.  
[www.northerngulfinstitute.org](http://www.northerngulfinstitute.org), [www.gri.msstate.edu](http://www.gri.msstate.edu)  
***Project: Visualization Techniques for Improving Public Understanding of Severe Storms***  
Designed and developed immersive 3D visualization techniques for the study of severe storms. It included the use of vGeo for developing hurricane visualizations for hurricane experts.  
P.I: Robert Moorhead, [www.gri.msstate.edu/research/visualization.php](http://www.gri.msstate.edu/research/visualization.php)
- 2006 – 2007: Research Assistant to Dr. Valentine Anantharaj at Geosystems Research Institute (GRI), High Performance Computing Collaboratory (HPC<sup>2</sup>), Mississippi State University.  
[www.gri.msstate.edu](http://www.gri.msstate.edu), [www.hpc.msstate.edu](http://www.hpc.msstate.edu)  
***Project: Rapid Prototyping Capability of Earth-Sun System Sciences***  
Encoding of NOAA LSM data into NetCDF using its Java library. Also included was the evaluation of CDAT, IDV, OPeNDAP geo-spatial data server, OCAPI Matlab interface, and developing Perl scripts for processing and quality assurance of data from SCAN sites.  
[www.gri.msstate.edu/research/sensors\\_modeling.php](http://www.gri.msstate.edu/research/sensors_modeling.php)  
[www.gri.msstate.edu/research/hydro.php](http://www.gri.msstate.edu/research/hydro.php)
- 2005 – 2006: Software Engineer at Product Operations Division of Sasken Communication Technologies Limited, Bangalore, India  
[www.sasken.com](http://www.sasken.com)  
***Project: Aria – Complete 3G solution***  
Member of the product integration team for a complete 3G mobile solution. Activities involved code-base management, integration, and testing, both on the simulator and by the use of hardware debuggers on the form factor board.

## Education

- 2007 – 2011: PhD (Doctor of Philosophy) in Computer Science  
Department of Computer Science and Engineering, Mississippi State University, USA  
***Dissertation: Uncertainty Visualization of Ensemble Simulations.***  
Simulated severe weather events using the Weather Research and Forecast model, used operational HEC-RAS flood simulations from the NWS Lower Mississippi River Forecast Center to evaluate and developed uncertainty visualization techniques, and developed ensemble analysis software tools for

- operational forecasting.  
[www.cse.msstate.edu](http://www.cse.msstate.edu)
- 2006 – 2009: MS (Master of Science) in Computer Science  
Department of Computer Science and Engineering, Mississippi State University, USA  
[www.cse.msstate.edu](http://www.cse.msstate.edu)
- 2002 – 2005: BS (Bachelor of Technology) in Computer Science and Engineering  
University College of Science & Technology, University of Calcutta, India  
10<sup>th</sup> rank in the University  
[www.cucse.org/](http://www.cucse.org/), [www.caluniv.ac.in/](http://www.caluniv.ac.in/)
- 1998 – 2001: BS (Bachelor of Science) in Computer Science  
St. Edmund's College, North-Eastern Hill University, Shillong, India  
Gold Medalist and 1<sup>st</sup> rank in the University  
[www.sec.edu.in/](http://www.sec.edu.in/)

### Grants/Funding/Projects

1. PI, Accelerated Global Settlement Discovery, Titan supercomputer allocation, 25M core-hours. FY17-18.
2. Program/Project Manager, EAGLE-I, DOE OE, FY16-current, ~\$2M/year
3. Co-I, Energy-Water Nexus Knowledge Discovery Framework, DOE BER, FY16-FY18, \$10.4M originally; ~\$2M post-budget.
4. Co-I, Urban Exascale Computing, DOE multi-lab, FY16-FY18, ORNL share \$50K, \$150K, future TBD.
5. PI, Modernizing the AMO Software Suite, DOE AMO, FY16-18, \$1.65M.
6. PI, Openstudio/EnergyPlus Results Framework, DOE BTO, FY14-15, \$50K.
7. PI, Provenance Sensor Data Management, DOE, FY13, \$40K
8. Co-PI, IGATE-E CHP, DOE, FY16, \$150K
9. Co-PI, Migration of DOE's Roof savings Calculator, Carlisle, FY15, \$41K
10. Co-PI, Competitive XSEDE supercomputing time allocation on supercomputers at PSC, TACC, SDSC, and NICS, FY15, 750K hours
11. Co-PI, Development of a Web-Based Energy savings calculator for Air Tightness, ABAA, FY16, \$140K

### Peer-Reviewed Journals

1. Evaluation of "Autotune" calibration against manual calibration of building energy models, G Chaudhary, J New, J Sanyal, P Im, Z O'Neill, V Garg, *Applied Energy*, 2016
2. Eric Ragan, Alex Endert, Jibonananda Sanyal, and Jian Chen, "Characterizing Provenance in Visualization and Data Analysis: An Organizational Framework of Provenance Types and Purposes", In *IEEE Transactions in Visualization and Computer Graphics*, pp. 31-40, 22(1), 2015.
3. James Nutaro , David Fugate , Teja Kuruganti , Jibonananda Sanyal , Michael Starke, "Cost Effective Retrofit Technology for Reducing Peak Power Demand in Small and Medium Commercial Buildings", In *Science and Technology for the Built Environment*, 2015, doi:10.1080/23744731.2015.1047719
4. Castello, Charles C., Sanyal, Jibonananda, Rossiter, Jeffrey S., Hensley, Zachary P., and New, Joshua R., "Sensor Data Management, Validation, Correction, and Provenance for Building Technologies." Technical paper TRNS-00223-2013.R1. In *ASHRAE Transactions and Proceedings of the ASHRAE Annual Conference*, Seattle, WA, June 28-July 2, 2014

5. Mellot, Joe, New, Joshua R., and Sanyal, Jibonananda, “Cool Roofing: Analysis of Energy Consumption for Cool Roofing”, In *Western Roofing - Insulation and Siding*, pp. 50-56, issue January/February, 2014
6. Jibonananda Sanyal, Richard Edwards, Joshua New, and Lynne Parker, “Calibrating Building Energy Models Using Supercomputer Trained Machine Learning Agents”, In *Concurrency and Computation: Practice and Experience*, vol. 26, no. 13, 2014
7. Zachary Hensley, Jibonananda Sanyal, and Joshua New, “Provenance in sensor data management”, In *Communications of the Association for Computing Machinery*, vol. 57, no. 2, pp. 55-62, 2014. DOI=10.1145/2556647.2556657 <http://doi.acm.org/10.1145/2556647.2556657>
8. Zachary Hensley, Jibonananda Sanyal, and Joshua New, “Provenance in Sensor Data Management”. In *Queue*, vol. 11, no. 12, 2013. DOI=10.1145/2559899.2574836 <http://doi.acm.org/10.1145/2559899.2574836>
9. Mellot, Joseph W., New, Joshua R., and Sanyal, Jibonananda. “Preliminary Analysis of Energy Consumption for Cool Roofing Measures.” In *RCI Interface Technical Journal*, vol. 31, no. 9, pp. 25-36, October, 2013
10. Jibonananda Sanyal, Song Zhang, Jamie Dyer, Andrew Mercer, Phil Amburn, and Robert J. Moorhead, “Noodles – A Tool for Visualization of Numerical Weather Model Ensemble Uncertainty”, In *IEEE Transactions on Visualization and Computer Graphics*, vol. 16, no 6, pp. 1421-1430, November/December, 2010.
11. Jibonananda Sanyal, Song Zhang, Gargi Bhattacharya, Phil Amburn, Robert Moorhead, “A User Study to Compare Four Uncertainty Visualization Methods for 1D and 2D Datasets”, In *IEEE Transactions on Visualization and Computer Graphics*, vol. 15, no. 6, pp. 1209-1218, November/December, 2009.
12. J. Sanyal, Phil Amburn, S. Zhang, J. Dyer, P. J. Fitzpatrick, Robert J. Moorhead II, “User Experience of Hurricane Visualization in an Immersive 3D Environment”, In *Lecture Notes in Computer Science*, Springer-Verlag, ISVC (1) 2008: 867-878.

## Technical Reports

1. Ozgur Ozmen, James J Nutaro, Jibonananda Sanyal, Mohammed M Olama, *Simulation based testing of control software*, ORNL/TM-2017/45, 2017.
2. Sanyal, Jibonananda, Fugate, David L., Woodworth, Ken, Nutaro, James J., & Kuruganti, Teja. *Embedded Volttron specification - benchmarking small footprint compute device for Volttron*. United States. 2015. doi:10.2172/1214028
3. New, Joshua R., Levinson, Ronnen, Huang, Yu (Joe), Sanyal, Jibonananda, Miller, William A., Mellot, Joe, Childs, Kenneth W., and Kriner, Scott, “In-Depth Analysis of Simulation Engine Codes for Comparison with DOE's Roof Savings Calculator and Measured Data”, *ORNL report*, ORNL/TM-2014/218, June 27, 2014, 69 pages.
4. New, Joshua Ryan, Yu Huang, Ronnen Levinson, Joe Mellot, Jibonananda Sanyal, and Kenneth W Childs. 2014. “Analysis of DOE S Roof Savings Calculator with Comparison to Other Simulation Engines”. United States. *ORNL Report*. doi:10.2172/1185373. <http://www.osti.gov/scitech/servlets/purl/1185373>.
5. Sanyal, Jibonananda and New, Joshua R, “Oak Ridge Institutional Cluster Autotune Test Drive Report”, *ORNL report*, ORNL/TM-2014/46, February 17, 2014.
6. Hensley, Zachary P, Sanyal, Jibonananda, & New, Joshua Ryan. *Tracking Provenance in ORNL's Flexible Research Platforms*. 2013. United States. doi:10.2172/1136793
7. Ranjan, Niloo, Sanyal, Jibonananda, & New, Joshua Ryan. *In-Situ Statistical Analysis of Autotune Simulation Data using Graphical Processing Units*. 2013. United States. doi:10.2172/1093099

8. New, Joshua R., Huang, Yu (Joe), Levinson, Ronnen, Mellot, Joe, Sanyal, Jibonananda, Miller, William A., and Childs, Kenneth W., “Analysis of DOE's Roof Savings Calculator with Comparison to other Simulation Engines”, *ORNL report*, ORNL/TM-2013/501, November 1, 2013, 63 pages

### Software Guide and Manuals

1. Jibonananda Sanyal and James Nutaro, “The ModBus XML Schema Definition Specification: Version 0.9b”, 2014
2. Jibonananda Sanyal and James Nutaro, “ModBus XML Driver Generation Guide”, 2014

### Peer-Reviewed Conference Papers/Posters

1. Budhendra Bhaduri, Mark Tuttle, Amy Rose, Jibonananda Sanyal, Devin White, Gautam Thakur, Hsiuhan Yang, Melanie Laverdiere, Matthew Whitehead, Taylor Hauser, Jacob McKee, Data and Geocomputation: Time Critical Mission Support for the 2017 Hurricane Season, *AGU Annual Meeting*, New Orleans, 11-15 December, 2017.
2. Bhaduri, Budhu; Foster, Ian; Chandola, Varun; Chen, Bob; Sanyal, Jibonananda; Allen, Melissa, and McManamay, Ryan, Energy-Water Nexus Knowledge Discovery Framework, *AGU Annual Meeting*, New Orleans, 11-15 December, 2017.
3. Helia Zandi, Ed Vineyard, Jibonananda Sanyal, David Fugate, Teja Kuruganti, Home Energy Management Retrofit Control Platform, IEA Heat Pump Conference, Rotterdam, Netherlands, 15-18 May, 2017.
4. Sanyal, Jibonananda, Nutaro, James J., New, Joshua Ryan, Fugate, David L., and Kuruganti, Teja, The Modbus Definition Language Specification: A first step towards device interoperability, *Building Simulation 2015*, Hyderabad, India, December 2015.
5. Jackson Stone, Jibonananda Sanyal, Charles Castello and Joshua New, “Gamification and Visualization of Sensor Data Analysis in Research Buildings”, In *MODSIM World 2015*, Virginia Beach, VA, March 31 – 2 April, 2015. (Special Guest)
6. Sanyal, Jibonananda and New, Joshua R., “Building Simulation Modelers - Are We Big Data Ready?”, In *Proceedings of the ASHRAE/IBPSA-USA Building Simulation Conference*, pp. 449-456, Atlanta, GA, September 10-12, 2014.
7. Adams, Mark, Sanyal, Jibonananda, Fricke, Brian, and Benne, Kyle, “Refrigeration Modeling Components in OpenStudio”, In *Proceedings of International Refrigeration and Air Conditioning Conference*, Purdue, West Lafayette, IN, USA, July 14-17, 2014
8. Sanyal, Jibonananda and New, Joshua R, Pragneshkumar Patel, George Ostruchov, “Uncertainty Analysis of a Heavily Instrumented Building at Different Scales of Simulation”, In *Proceedings of 3rd International High Performance Buildings Conference*, Purdue, West Lafayette, IN, USA in July 14-17, 2014.
9. New, Joshua R. and Sanyal, Jibonananda, “Supercomputers (Titan!), Big Data Analytics, and Energy Efficient Robo-Homes”, In *Codestock*, 77 slides. Knoxville, TN, July 11-12, 2014
10. Sanyal, Jibonananda and New, Joshua R., “Supercomputer Assisted Generation of Machine Learning Agents for the Calibration of Building Energy Models”, In *Proceedings of the Extreme Science and Engineering Discovery Environment (XSEDE13) Conference*, San Diego, CA, July 22-25, 2013. Selected as a prestigious ‘Lightning Talk’ for the plenary session.
11. Mellot, Joseph W., Sanyal, Jibonananda, and New, Joshua R., “Preliminary Analysis of Energy Consumption for Cool Roofing Measures”, Presented at the *International Reflective Roofing Symposium, the American Coating Association's (ACA) Conference*, and in *Proceedings of the ACA's Coating Regulations and Analytical Methods Conference*, Pittsburgh, PA, May 14-15, 2013.

12. Jibonananda Sanyal and Joshua New, "Simulation and Big Data Challenges in Tuning Building Energy Models", In *IEEE Workshop on Modeling and Simulation of Cyber-Physical Energy Systems*, Berkeley, May, 2013.
13. Jones, Chad, New, Joshua R., Sanyal, Jibonananda, and Ma, Kwan-Liu, "Visual Analytics for Roof Savings Calculator Ensembles", In *Proceedings of the 2nd Energy Informatics Conference*, Atlanta, GA, Oct. 6, 2012.
14. New, Joshua R., Sanyal, Jibonananda, Bhandari, Mahabir S., Shrestha, Som S., "Autotune E+ Building Energy Models", In *Proceedings of the 5th SimBuild of IBPSA-USA*, International Building Performance Simulation Association (IBPSA), Aug. 1-3, 2012.
15. Sanyal, Jibonananda, Al-Wadei, Yusof H., Bhandari, Mahabir S., Shrestha, Som S., Karpay, Buzz, Garret, Aaron L., Edwards, Richard E., Parker, Lynne E., and New, Joshua R., "Building Energy Model Calibration using EnergyPlus, Machine Learning, and Supercomputing", In *Proceedings of the 5th SimBuild of IBPSA-USA*, International Building Performance Simulation Association (IBPSA), Aug. 1-3, 2012.
16. Jibonananda Sanyal, Song Zhang, Philip Amburn, Jamie Dyer, John van der Zwaag, Derek Irby, Robert J. Moorhead, "FloodViz – An Ensemble Enabled Tool for River Flood and Inundation Mapping", In *IEEE Visweek 2011*, Providence, Rhode Island, USA, 23 – 28 October, 2011.
17. Jibonananda Sanyal, Song Zhang, Jamie Dyer, Andrew Mercer, Phil Amburn, and Robert J. Moorhead, "Uncertainty Visualization of Ensemble Weather Forecasts", In *Bays and Bayous Symposium 2010*, Mobile, Alabama, USA, December 1-2, 2010.
18. Jibonananda Sanyal, Phil Amburn, Song Zhang, Patrick J Fitzpatrick, Robert Moorhead, "Applying Immersive Visualization Techniques to Analyze Model Outputs: A Case Study of Hurricane Lili", *Proceedings of IEEE Visualization 2008*, Columbus, Ohio, USA. Recipient of the Best Poster Award
19. Jibonananda Sanyal, Phil Amburn, Song Zhang, Patrick J Fitzpatrick, and Robert J Moorhead, "3D Immersive Visualization for Evaluation of Mesoscale Model Outputs Simulating Hurricane Lili's (2002) Rapid Weakening", *Proceedings of IEEE Oceans 2008*, Quebec City, Canada, 2008.

### Other Publications/Talks/Posters

1. Kumar, Jitendra, Hoffman, Forrest M., New, Joshua R., and Sanyal, Jibonananda, "Reimagining Climate Zones for Energy Efficient Building Codes", Presented to Technical Committee 4.2 - Climatic Information, Research subcommittee, In *ASHRAE Annual Conference 2014*, Seattle, WA, June 28-July 2, 2014
2. Vasile Tudor Garbulet and Jibonananda Sanyal, "Visual Data Analysis in Building Model Calibration", *Report as part of the Science Undergraduate Laboratory Internships (SULI) program*, August 8, 2014.
3. Vasile Tudor Garbulet and Jibonananda Sanyal, "Witty Interface for Visual Data Analysis in Building Model Calibration", *Presented as part of the Science Undergraduate Laboratory Internships (SULI) program*, August 8, 2014.
4. Jackson Stone and Jibonananda Sanyal, "Gamification: A New Approach to Data Analysis", *Report as part of the Science Undergraduate Laboratory Internships (SULI) program*, 2014.
5. Jackson Stone, Jibonananda Sanyal, and Charles Castello, "Gamification: Gamification and Analysis: A New Approach to Data Analysis", *Poster as part of the Science Undergraduate Laboratory Internships (SULI) program*, 2014.
6. Hensley, Zachary, Sanyal, Jibonananda, and New, Joshua R., "ProvDMS -- A Provenance Data Management System for Sensor Data", *Presented as part of the Science Undergraduate Laboratory Internships (SULI) program*, August 8, 2013.

7. Ranjan, Niloo, Sanyal, Jibonananda, and New, Joshua R., “In-Situ Statistical Analysis of Autotune Simulation Data using Graphical Processing Units”, *Presented as part of the Science Undergraduate Laboratory Internships (SULI) program*, August 8, 2013.
8. Sanyal, Jibonananda, New, Joshua R., and Edwards, Richard E., “Calibration of Building Energy Models: Supercomputing, Big-Data and Machine-Learning”, In *Proceedings of the ORNL Postdoc Symposium*. Oak Ridge, TN, July 19, 2013.
9. Al-Wadei, Yusof H., New, Joshua R., and Sanyal, Jibonananda, “Interactive Web Design through Survey and Adoption of Modern Web-Technologies”, *Presented as part of the Science Undergraduate Laboratory Internships (SULI) program*, August 2012.
10. Jibonananda Sanyal, Song Zhang, Philip Amburn, Jamie Dyer, Andrew Mercer, Robert J. Moorhead, “Uncertainty Visualization of Weather Ensembles”, *NGI Annual Conference*, 2011.
11. Jibonananda Sanyal, Philip Amburn, Jamie Dyer, Song Zhang, Robert J. Moorhead, “Visualization of River Forecast Ensembles”, *NGI Annual Conference*, 2011.
12. John van der Zwaag, Derek Irby, Jibonananda Sanyal, Philip Amburn, Jamie Dyer, Song Zhang, “FloodViz - Visual Analytics for Assessment and Interpretation of Simulated River Flooding”, *NGI Annual Conference*, 2011.
13. Jibonananda Sanyal, Song Zhang, Jamie Dyer, Andrew Mercer, Philip Amburn, and Robert J. Moorhead, “Visualizing Uncertainty of WRF Ensemble Parameters”, *NGI Annual Meeting*, Mobile, AL, May 2010.
14. Jibonananda Sanyal, Philip Amburn, Derek Irby, John van der Zwaag, Song Zhang, and Robert J. Moorhead, “Level-of-Detail for Terrain Rendering”, *NGI Annual Meeting*, Mobile, AL, May 2010.– Recipient of 3<sup>rd</sup> prize in the poster contest
15. Philip Amburn, Jamie Dyer, Jeff Grascnell, Derek Irby, Robert Moorhead, David Ramirez, David Reed, Jibonananda Sanyal, John van der Zwaag, David Welch, and Song Zhang, “Flood Visualization: Visual Analytics for Assessment and Interpretation of Simulated River Flooding”, *NGI Annual Meeting*, Mobile, AL, May 2010.
16. Keqin Wu, Jibonananda Sanyal, Song Zhang, Phil Amburn, and Robert J Moorhead, “Using LIC-like Flow Vis Technique to Visualize Hurricane Lili’s Rapid Weakening”, *NGI Annual Meeting*, Mobile, AL, May 2009.
17. Keqin Wu, Song Zhang, Jibonananda Sanyal, Phil Amburn, and Robert J Moorhead, “Using FlowVis Techniques to Study Hurricane Cases”, *NGI Annual Meeting*, Mobile, AL, May 2009.
18. Jibonananda Sanyal, Phil Amburn, Robert J Moorhead, and Patrick J Fitzpatrick, “Visualization of Numerical Model Outputs of Hurricane Lili’s Rapid Weakening in a Virtual 3D Environment”, *NGI Annual Meeting*, Biloxi, MS, May 2008.
19. Jean Mohammadi-Aragh, Derek Irby, Jibonananda Sanyal, Phil Amburn, Robert Moorhead, Song Zhang, and Keqin Wu, “Improving Public Understanding of Catastrophic Events”, *NGI Annual Meeting*, Biloxi, MS, May 2008.
20. Y Ling, V Anantharaj, Q Lu, J Turk, P Houser, J Sanyal, “A computational framework for the evaluation of satellite precipitation estimates for hydrological applications”, *American Geophysical Union 2007 Fall Meeting*, San Francisco, California, USA, December 20, 2007.

### **Invited Talks**

1. ORAU Stem Stories, 20 April, 2017.
2. Invited plenary "Lightning talk", XSEDE, San Diego, July 25, 2013
3. Supercomputing and BTRIC, National Renewable Energy Laboratory, June 22, 2013
4. Uncertainty in Ensembles, Oak Ridge National Laboratory, 29 August, 2011



5. Visualization of Weather and Flood Simulation Ensembles, Scientific Computing Institute, University of Utah, 8 July, 2011
6. Visualizing Uncertainty in Ensemble Simulations, Lawrence Livermore National Laboratory, 1 July, 2011

### **Panels/Advisory Committees**

1. Panel on Engaging the Public, Nuclear Science Week, 2015.
2. ORNL IoT Workshop, 7 August 2015.
3. DOE's Open Energy Information Systems workshop participant led by Lawrence Berkeley National Laboratory (LBNL) to identify research requirements and funding objectives. June, 2013
4. EnergyPlus Results Schema Design Advisory Committee, DOE/LBNL, 2014
5. Improving NGI Research Transitions to Applications, NOAA-NGI Annual meeting, Mobile, Alabama, May, 2011
6. Panel for REU students, CSE, Mississippi State University, 2011

### **Awards, Honors, and Recognition**

1. Knoxville Business Journal's 40 under 40 awardee, January 2018.  
<https://www.knoxnews.com/story/money/business/2018/01/03/jibonananda-jibo-sanyal-37-staff-scientist-and-team-lead-scalable-and-high-performance-geocomputatio/931435001/>
2. Significant Event Award, 'Seamless transition of EAGLE-I from DOE HQ to ORNL', Oak Ridge National Laboratory, 2017.
3. 'Original 6 Trailblazers', Oak Ridge National Laboratory, October, 2014.
4. 'Lightning Talks', Plenary Session, XSEDE, San Diego, July 2013
5. Outstanding Research Award, Geosystems Research Institute, 2011
6. Graduate Student of the Month of August 2010, CSE, Mississippi State University, 2010
7. 3<sup>rd</sup> Position, Posters, Northern Gulf Institute Annual Conference, 2010
8. Best Overall Award, Photo Contest, Northern Gulf Institute Annual Conference, 2009
9. Best Poster Award, IEEE Visweek, 2008
10. 10<sup>th</sup> Rank in B.Tech. Computer Science & Engineering, 2005 (class of 38)
11. 1<sup>st</sup> Rank and Gold Medal in B.Sc. Computer Science, 2001 (class of 45)
12. Gold Medal for the Best Graduate Award, 2001 (in about 5000 university students)

### **Leadership**

ASHRAE TC 4.2 Climate Change, Research Chair and Voting Member  
ASHRAE TC 4.7, Energy Calculations, Corresponding Member  
Founding member, International Building Simulation Performance Association, USA, East TN chapter, 2014  
Member, Research sub-committee, International Building Simulation Performance Association, 2015.  
Founding member, Research Chair, and President, Oak Ridge Postdoctoral Association, 2013 - 2014

### **Service**

Chair, AGU session, Data and Tools for Knowledge Discovery Around the Energy-Water Nexus, Posters and talks, New Orleans, LA, 11-15 December, 2017.  
Program Committee, Visualization and Data Analysis, San Francisco, CA, 2016.  
Chair, Workshops, ACM/IEEE Joint Conference for Digital Libraries, Knoxville, TN, 2015.  
Program Committee, Winter Simulation Conference, Huntington Beach, CA, 2015.  
Program Committee, Winter Simulation Conference, Savannah, GA, 2014.

Organizing Committee, 2nd Annual ORNL Postdoc Research Symposium, 10 July, 2014  
Organizing Committee, 1st Annual Postdoctoral Research Symposium, 2013  
Special Tracks Committee, Immersive Visualization, International Symposium on Visual Computing, 2011  
Chair, Student Volunteers, IEEE Visweek, Providence, Rhode Island, USA, 2011  
Chair, Student Volunteers, IEEE Visweek, Salt Lake City, Utah, USA, 2010

Grant Reviewer for European Union Research Council, 2017.  
Grant Reviewer for ORNL LDRD funding proposals, 2016, 2017.  
Grant Reviewer for National Research Foundation of Singapore, 2016.  
Grant Reviewer for ORNL SEED funding proposals, 2015.

Reviewer for IEEE Vis, InfoVis, VAST 2017  
Reviewer for Building Simulation, 2015  
Reviewer for IEEE Vis, InfoVis, VAST 2015  
Reviewer for ASHRAE Annual Conference, 2015  
Reviewer for Cartography and Geographic Information Science, 2015  
Reviewer for Spatial Cognition and Computation: An Interdisciplinary Journal, 2015  
Reviewer for Sensors, 2014  
Reviewer for the Bulletin of the American Meteorological Society, 2014  
Reviewer for ACEEE, 2014  
Reviewer for WinterSim, 2014  
Reviewer for EuroVis, 2013  
Reviewer for IEEE Vis, InfoVis, VAST 2013  
Reviewer for IEEE Vis, InfoVis, VAST 2012  
Reviewer for IEEE Transactions in Visualization and Computer Graphics, Information Visualization, 2012  
Reviewer for Eurographics, 2012  
Reviewer for EuroVis, 2012  
Reviewer for International Symposium on Visual Computing, 2011  
Reviewer for IEEE Transactions in Visualization and Computer Graphics, Visweek, Vis 2010  
Reviewer for IEEE Transactions in Visualization and Computer Graphics, Visweek, Vis 2009

Judge, Game Development Competition, MS Middle School, Summer, 2011  
Judge, Game Development Competition, MS Middle School, Summer, 2010

Graduate Ambassador for Department of CSE, Mississippi State University, USA, 2009, 2010  
Editor of *Reflections '04*, the Departmental magazine of CSE, University of Calcutta, India, 2004  
Member of college automation team for St. Edmund's College, Shillong, India, 2000-2001  
Member of web-site development committee of St. Edmund's College, Shillong, India, 2000-2001  
Volunteered at the Bethany Society for the Blind, Shillong, India, 1996

### **Student/Postdoc Mentoring**

Anne Berres and Kuldeep Kurte, postdocs, 2017-2018  
Mark Coletti, postdoc 2016-2017  
Henok Astabha, Akash Roy, and Briana Williams, 2017  
Daniel Graves, ORNL 2016 - 2018  
Andrew Valesky and Joshua Lipstone, ORNL 2015  
Jackson Stone, ORNL, 2014  
Student sessions at XSEDE 2013  
Zachary Hensley and Niloo Ranjan, ORNL, 2013  
Yusof-Al-Wadehi , ORNL, 2012

### **Creative Works**

Cover design of *Reflections '03*, the departmental magazine of CSE, University of Calcutta, 2003  
Let's get creative, Short story, In *Reflections '03*, CSE, University of Calcutta, 2003

Cover design of *The Edmundian '00*, the college magazine of St. Edmund's College, 2000  
Reply to a scientific love letter, Short story, In *The Edmundian '99*, St. Edmund's College, 1999

### Media:

1. Knox News: <https://www.knoxnews.com/story/money/business/2018/01/03/jibonananda-jibo-sanyal-37-staff-scientist-and-team-lead-scalable-and-high-performance-geocomputatio/931435001/>
2. NewsWise: [http://www.newswise.com/doescience/?article\\_id=680461&returnurl=aHR0cHM6Ly93d3cubmV3c3dpc2UuY29tL2FydGlibGVzL2xpc3Q=](http://www.newswise.com/doescience/?article_id=680461&returnurl=aHR0cHM6Ly93d3cubmV3c3dpc2UuY29tL2FydGlibGVzL2xpc3Q=)
3. Oak Ridge Today: <http://oakridgetoday.com/2017/09/07/ornl-helps-emergency-responders-with-hurricanes-harvey-irma/>
4. HPCWire: <http://www.hpcwire.com/2014/09/23/autotune-software-helps-model-energy-use/>
5. ArchNews: <http://www.achrnews.com/articles/127844-oct-14-2014-autotune-software-makes-it-quicker-easier-to-model-energy-use-of-buildings>
6. Phys.org: <http://phys.org/news/2014-09-team-autotune-software-quicker-easier.html>
7. GCN: <http://gcn.com/articles/2014/10/16/energy-management-tools.aspx>
8. Sourceable.net: <http://sourceable.net/autotune-software-help-building-energy-modelling/>
9. Tempsensornews.com: <http://www.tempsensornews.com/Research/quicker-easier-cheaper-modeling-of-energy-use-of-buildings/>
10. XSEDE scientific spotlight
11. National Institute of Computational Sciences article: <https://www.nics.tennessee.edu/autotune>
12. Education and Outreach XSEDE: <https://www.xsede.org/education-outreach-blog/-/blogs/500432>
13. IndideHPC online article: <http://insidehpc.com/2013/03/08/autotune-supercomputer-assisted-calibration-for-better-energy-models/>

### Professional Affiliations (Member and Nominated)

American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE)  
Association for Computing Machinery (ACM) Member  
Institute of Electrical and Electronics Engineers (IEEE) Society Member  
International Building Simulation Performance Association (IBPSA)  
American Geophysical Union (AGU) Member  
Upsilon Pi Epsilon Scholars Honor Society  
National Scholars Honors Society

### Scholarship

North Eastern Council Scholarship and Book Grant of the Government of India for the B.Tech. program in Computer Science and Engineering (2003, 2004, 2005), ~ Rs. 18,000 per year