SAND2022-7184R

UT Austin's 2022 Sandia Day Summary Report

March 30 - 31, 2022

On March 30th and 31st, 2022, the University of Texas at Austin (UT) Office of the Vice President for Research (OVPR) hosted Sandia National Laboratories (Sandia) for "Sandia Day at UT Austin" to understand the status of the strategic partnership and explore opportunities for partnership growth. The event brought together more than 115 UT and Sandia participants including executive leadership, researchers, faculty, staff, and students. Sandia Day primarily consisted of a half-day leadership meeting, a research poster session and networking event, and three break-out sessions focused on strategic priority areas: Microelectronics, Energy and Climate Security, and High-Performance and Edge Computing. Appendix A contains the full Sandia Day agenda. Additional meetings and workshops (adjunct meetings) were held in conjunction with Sandia Day to maximize partnership exploration. Adjunct meetings were Hypersonics, Decarbonization, Disinformation, and Battery Workshops. A summary of Sandia Day events, sessions, and meetings follows.

Campus Tours (3/30/22, 3-5pm)

On March 30th, the UT team kicked off Sandia Day by providing more than 20 Sandia participants with a tour of three facilities demonstrating world-class UT capabilities. Michelle Garel hosted the Texas (TX) Robotics Lab tour which demonstrated multi-department collaborations in space, vehicles, drilling, manufacturing, nuclear, defense, and medical fields. Paul Navratil (Director of Visualization) hosted a tour of the Texas Advanced Computing Center (TACC) Visualization Lab (VISLAB) that demonstrated the intersection of human perception and large-scale visual analysis provided by the world's largest university-based supercomputer. Peter Flemings (Professor, Geological Sciences) hosted the Jackson School of Geosciences Methane Hydrates and Pressure Core Center Lab tour to demonstrate world-class research into drilling, sampling, and analysis of methane hydrates as a future energy source.

Leadership Session (3/31/22, 8am-12pm)

UT Attendees: Dan Jaffe, Jennifer Lyon Gardner, John Ekerdt, Andreas Matouschek, David Mohrig, Daniel Arriaga, Eloisa Acha, Sanjay Banerjee, Omar Ghattas, Brian Korgel, Karen Willcox, Jean Anne Incorvia, Erhan Kuatanoglu, Surya Santoso
Sandia Attendees: Basil Hassan, Justine Johannes, Nadine Miner, Hannah Stangebye, Alex Roesler, Kate Helean, Scott List, Jim Stewart, Rob Leland, Patrick Blonigan, Brad Aimone, Manuel Garcia, Craig Lawton

Key UT and Sandia leadership stakeholders gathered for the Sandia Day morning session to review ongoing collaborations, discuss each institution's strategic objectives and plans, and shape future UT-Sandia collaborations. The leadership session's primary objective was for stakeholders to understand the growth potential and recommit to current and future cooperative partnerships.

Dan Jaffe (UT Vice President for Research) presented welcome remarks, introductions, and the importance of the UT-Sandia partnership to UT.

Basil Hassan (Sandia Deputy Chief Research Officer) provided an Alliance Partner update and stated Sandia's commitment to UT as a key university collaborator.

Justine Johannes (Sandia Director and UT Campus Executive) provided a partnership update reviewing the successes such as talent pipeline, joint research, current Sandia-funded projects (37 projects, $3.8M), and strategic opportunities.

Leaders from each of the meeting's strategic focus areas presented opportunities for partnership growth and development:

- Microelectronics by Kate Helean (Sandia) and Sanjay Banerjee (UT)
- High-Performance Computing & Edge Computing by Jim Stewart (Sandia) and Omar Ghattas (UT)
- Energy Resiliency and Climate Security by Rob Leland (Sandia) and Brian Korgel (UT)

Discussion
John Ekerdt (UT, Associate Dean for Research, Cockrell School of Engineering), Andreas Matouschek (Assoc. Dean for Research in the College of Natural Sciences), and David

Mohrig (Assoc. Dean of the Jackson School of Geosciences) led a collaboration discussion focused on UT-Sandia opportunities to team on pursuing "big ideas" and responding to larger funding opportunities together. Attendees anticipate requests for proposals (RFPs) in strategic areas, such as for the Creating Helpful Incentives to Produce Semiconductors (CHIPS) Act (Microelectronics), Hydrogen Hubs and other Energy/Climate related calls. There was broad consensus for continued UT-Sandia teaming on RFPs and other big ideas, such as UT's Permian Basin Development Lab (PEDL).

The meeting concluded with briefings about recent joint UT-Sandia successes with the idea to replicate these successes:

- Patrick Blonigan (Sandia) presented UT-Sandia successes on Sandia's Autonomy for Hypersonics' (A4H) Mission Campaign projects, leading to the development of a strong UT-Sandia partnership in hypersonics, including partnering on a NASA awarded project, "Full Airframe Sensing Technology (FAST)", led by Noel Clemens, Jayant Sirohi, and Karen Wilcox (UT) (awarded 2020, 3 year, $3.3M award)
- Jean Anne Incorvia (UT) and Brad Aimone (Sandia) presented about the CO-designed Improved Neural Foundations Leveraging Inherent Physics Stochasticity (COINFLIPS) project success funded by the DOE Office of Science (awarded 2021, 3 year, $6M award)
- Surya Santoso (UT) and Manuel Garcia (Sandia) presented about the successful UT-Sandia collaborations in Improving Energy Grid Resilience with two projects: "Critical Node Identification and Modeling" funded by the Sandia Resilient Energy Systems (RES) Grand Challenge and "Improving Grid Resilience with Optimal Restoration Utilizing Energy Storage" funded by the DOE Office of Electricity (OE)

Strategic Areas and Priorities

Microelectronics

Sandia and UT are both strong in microelectronics research. With Sandia's Microsystems Engineering Science and Applications (MESA) complex and Center for Integrated Nanotechnology (CINT), Sandia brings a world class, U.S. critical, rad-hard, and secure-manufacturing microelectronics capability. UT's Microelectronics Research Center and the Nanomanufacturing Systems Center (NASCENT), along with the recent TX Institute of Electronics (TIE) $100M award, is a microelectronics research leader, with a concentration on advanced packaging and Heterogeneous Integration (HI). Because of the complimentary expertise in microelectronics, UT-Sandia partnering and collaboration are strong.

Microelectronics is one of the biggest focuses for current Sandia-funded research projects. In 2022-23, there are 11 Sandia-funded UT research projects related to microelectronics, totaling more than $900k and engaging 14 UT graduate research students. Despite this impressive portfolio, UT-Sandia leadership agreed there is room for microelectronics partnership growth.

To facilitate open discussions, UT and Sandia signed a microelectronics technology nondisclosure agreement (NDA) on 3/28/2022. In addition, UT invited Sandia to provide consultation on planning and disposition of the recent TX TIE award. Both institutions will look to partner on anticipated microelectronics RFPs.

High Performance Computing

Both Sandia and UT are leaders in High Performance Computing (HPC). UT operates the TACC which is one of the world's largest university-based supercomputers. The center's mission is to enable advanced science discoveries through the application of advanced computing technologies. Sandia operates several world-class HPC systems in support of national security missions. Sandia's Computing and Information Science (CIS) investment area funds research and development to advance the frontiers of science and engineering for our nation. Sandia and UT are highly connected in the HPC and CIS areas within the Oden Institute, at institutional leadership levels and across many other departments and organizations.

As data science and data hubs increasingly consume more of the world's energy (by 2030, 20% of world's energy is anticipated to be consumed by computing resources), energy-efficient computing is a major, and growing, area of research at Sandia. UT's and Sandia's HPC and CIS expertise are enabling capabilities and will contribute to the partnership opportunities underway in microelectronics and climate/energy security areas. Sandia and UT are well poised to increase joint research in HPC/CIS as funding opportunities present themselves.

Climate Security and Energy Security

UT and Sandia are preparing for anticipated RFPs from U.S. infrastructure bill(s). Sandia Day was a great way for potential collaborators to meet in person and continue to develop connections and partnerships to be ready to jointly respond to anticipated RFPs.

Sandia priorities in this area are technologies and innovation around climate security and energy/grid resilience, including research in key areas such as energy storage, enhancing U.S. renewable energy production, power electronics, hydrogen (production, storage, etc.), and decarbonization.

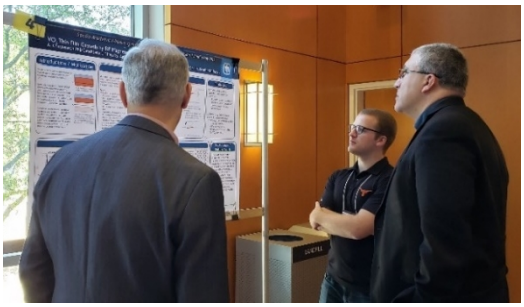
UT priorities in this area include comparing supply chain and environmental impact of energy systems, cross-departmental efforts around multiphase flow at earth scale, creating resilient energy systems using Machine Learning (ML), space and remote sensing, and end-to-end modeling of extreme weather events.

UT and Sandia agreed that climate modeling and other climate change research areas are prime for enhanced partnering. Furthermore, advancing geosciences capabilities are key to U.S. focus on climate security, including methane monitoring (Artic contrast) and carbon sequestration. Because UT and Sandia are both leaders in these areas, collaboration opportunities should continue to be explored.

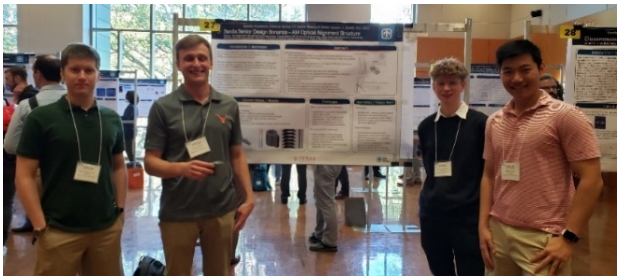
Summary

Partnership opportunities in microelectronics, climate and energy security, and HPC/CIS collaborations are numerous. Forming connections and having technology discussions early will position teams to be "left of RFP" and enable rapid, high-quality responses. Additional areas ripe for collaboration include cooperation computing, digital twin, rad-hard magnetic computing, and disaster response. Ideas on how to best prepare for UT-Sandia collaboration readiness included hosting workshops (like A4H Autonomy Field Day, and Neuromorphic Computing workshop) to build network relationships and prepare white papers that coalesce ideas in preparation for joint research proposals. Leadership will continue to identify new and emerging interdisciplinary strategic focus areas and develop roadmaps as the UT-Sandia partnership continues to grow and evolve.

Research Poster Session (3/31/2022, 12-2pm)



The UT OVPR hosted the Spring Sandia Research Poster event during a networking lunch that included an opportunity to learn about on-going Sandia-funded research at UT. Student researchers presented their work on 25 of the 35 currently funded Sandia research projects, representing more than $3.2M. In addition, the Sandia-sponsored undergraduate Mechanical Engineering Senior Design Bonanza team presented their project "AM Optical Alignment Structure", and two UT students who participated in Sandia's CINT Summer 2021 program (Eva Natinsky, MS ME, and Aminur Chowdhury, MSE PhD candidate) presented their ongoing research. Appendix B contains the presented posters along with UT and Sandia contact information.



Breakout Sessions (3/31, 2-4pm)

There were three breakout sessions in the afternoon: Microelectronics, High-Performance and Edge Computing, and Energy Resiliency and Climate Security. Facilitators led the sessions and presented the following meeting objectives:

- Understand each institution's priorities and capabilities
- Identify big ideas to jointly pursue external funding opportunities
- Establish new connections between institutions and individual researchers
- Capture opportunities to partner on existing projects

Microelectronics

UT: John Ekerdt (Lead), Eloisa Acha (Facilitator), Michael Cullinan, Jean Anne Incorvia, Xiuling Li, Jaydeep Kulkarni, Emanuel Tutuc, SV Srinivasan, Alex Demkov, Tanya Hutter, Ray Chen, Praveen Pasupathy
Sandia: Scott List (Lead), Remi Dingreville, Brad Aimone

Scott List presented the UT-Sandia goals and intended outcomes on current and future microelectronics collaborations. John Ekerdt presented background on the current collaborations, including a new proposed Heterogeneous Integration (HI) fab facility funded by the recent TIE award on which Sandia is providing consultation. Scott List led a round table discussion for attendees to discuss their work and benefits of UT-Sandia

collaborations. There was a focus on what would be expected out of the new fab, such as a photonics-based interposer, work with photonics, and industry partnering.

Actions

- Sandia and UT to share a list of capabilities to connect people
- UT support team will follow up with SV/Sanjay (UT) for upcoming actions
- Follow up with Rick McCormick (Sandia) and SV (UT) to setup follow-on workshop (N. Miner)

High Performance and Edge Computing

UT: Omar Ghattas (Lead), Ufuk Topcu, John-Paul Clark, Andreas Gerstlauer, Ray Chen, James Boyle, Jacob Rohan, Raghavendra Bollapragada, Alex Liu (ARL)
Sandia: Jim Stewart (Lead), Hannah Stangebye (Facilitator), Katrina Ward, Patrick Blonigan, Alex Roesler, Travis Bauer

John-Paul Clark is chairing a technical committee on human-machine teaming and asked for clarity on Sandia's work in this arena. He is working to certify machines that mirror how humans are certified (from a decision-making perspective). He wants to determine when the machine should take over, and when the machine has greater knowledge than the human.

The discussion turned to emphasis on access to students. This access should go both ways, which means undergraduate students who intern at Sandia can be recommended to UT faculty advisors. Julie Pham in Karen Willcox's team is an example of a success story for this approach.

Actions

- Hannah to email all attendees with Nadine's contact information (complete)
- Ensure all attendees are invited to the next Sandia info. session
- Dr. Bollapragada asked about adding his info. to Sandia expertise repository
- Alex & Patrick to connect on digital twin
- Follow up with John Clark on human-machine interface connections (Miner)

Energy Resiliency and Climate Security

UT: Brian Korgel (Lead), Emily Cole (Facilitator), Michael Young, David Mohrig, Peter Flemings, Tom Juenger, Dev Niyogi, Erhan Kutanoglu, Javad Mohammadi, Layla Parast, Surya Santoso, Ed Yu, David Goldstein, Ken Wisian, Brent Austgen, Baris Bilir, Joshua Yip, Edward Yu, Layla Parast, Tom Juenger, Ravi Srinivasan

Sandia: Rob Leland (lead), Nadine Miner, Thushara Gunda, Cliff Ho, Erik Spoerke, Charles Hanley, Lance Hansen, Manuel Garcia, Alan Nanco

Orientation briefings kicked-off this session. Nadine Miner (Sandia, UT Austin Campus Partnership Manager) presented about the UT-Sandia partnership and mechanisms for collaborations. Rob Leland briefed Sandia's Climate Security initiative, Fossil Energy and Carbon Management (FECM), Transportation and Industrial Processes, and the Energy and Homeland Security Investment Area. Brian Korgel briefed major UT initiatives in Energy and Climate.

Next, the meeting attendees formed subgroups to facilitate smaller group discussions. Each subgroup was asked to identify a "big idea" for UT and Sandia to jointly pursue that would make an impact. The target areas identified could be pursued for joint external funding opportunities, establish new connections between institutions and individual research, and capture opportunities to partner on existing projects.

Climate-Water-Energy-Land-Nexus Subgroup
UT: Michael Young, David Mohrig, Peter Flemings, Tom Juenger, Dev Niyogi
Sandia: Rob Leland, Thushara Gunda

Big Idea Summary
Develop a system for a modeling and monitoring ecological systems that enables integration of both above ground and below ground measurements in support of carbon cycling (including methane). This capability would support cooperative monitoring activities as well as energy development questions.

Discussion
The group discussed primary global challenges regarding climate change. One problem is land use that will continue to be dominated by energy development in the next 50 years, with important ramifications for food security with reduced space for crops world-wide. Reducing production of carbon is a big focus area for food production, but limited tools exist to monitor ideas related to incentivizing carbon sequestration through plants and natural ecosystems.

Sandia and UT have complementary capabilities that could be leveraged for this effort, including the Long-Term Ecological Research site and Light Detection and Range (LIDAR) sampling at UT, as well as atmospheric monitoring stations, distributed acoustic sensing, and army partnerships. Integrating field measurements with satellite measurements can increase the measurement confidence. Numerous questions exist in this space. Sponsorship could range from tackling fundamental science with funding

potential through NASA, NOAA, NSF, DOE, BER, and funding for national security applications from DOD and others.

Actions

- Sandia will participate in UT's Permian Basin Energy Development Laboratory (PEDL) planning. (Ben Cook/Sandia, Brian Korgel/UT)
- Hydrogen Hub workshops and teaming – both Sandia and UT are already involved in Hub proposals. Look for opportunities for UT-Sandia teaming (Don Conley and Kristen Hertz/Sandia, Mark Shuster and Brian Korgel/UT)
- Work to align Grid Resilience teams in advance of anticipated infrastructure RFPs (UT-Sandia partnership team)

Resilient Energy Grid Subgroup
UT: Erhan Kutanoglu, Javad Mohammadi, Layla Parast
Sandia: Charles Hanley, Lance Hansen, Manuel Garcia, Alan Nanco, Nadine Miner

Big Idea Summary
Develop an integrated energy grid simulation platform modeling and simulation tool to allow leadership/researchers to understand key aspects of a future (20+ years) resilient energy grid. This would include decentralized energy resources, high electric vehicle (EV) penetration, flexible generation types and loads, storage at multiple scales, and aggregation of energy sources. Development of this type of future "ideal" resilient energy grid simulation would provide a vision and timeline of what key elements are needed to attain a resilient grid.

Discussion
There may be a knowledge gap about future resilient energy grid structure and operation, especially under stressful conditions. A simulation platform should include transmission, geographical elements, metrics associated with community equity and resiliency, etc. Massachusetts Institute of Technology (MIT) has developed a energy grids simulation tool. Georgia Tech also has an Energy Grid gameplay/what-if scenario tool. So, the first step is to understand other capabilities. Team proposed an initial real-world test case to concretely demonstrate the veracity of a resilient energy grid. To make this idea come to fruition, community equity should be built by including stakeholders such as Joint Base San Antonio, Fort Hood, and other communities, and identify additional stakeholders and what their questions/needs are (DOD, Dept Homeland Security, DOE, etc.).

Actions

- Consider requesting small seed-funding from UT and/or Sandia to jointly fund exploration on Simulation Platform idea, define what a future scenario would look like, complete competitive analysis to differentiate and valuate the project (Sandia/UT leads to be identified)
- Discuss idea of Simulation Platform with Craig Lawton (Sandia) and Sergio Castellanos (UT, equity) (Miner, Hanley)

Industrial Decarbonization / Solar Subgroup
UT: Surya Santoso, Ed Yu, Brian Korgel
Sandia: Cliff Ho

Big Idea Summary
Sandia and UT identified five topics for potential projects or larger ideas

- Combining Sandia's expertise in concentrating solar with UT's expertise in solar cells to enhance cell efficiency
- Converting H_2 to forms such as ammonia for transportation
- Building collaboration involving UT's Process Science and Technology Center (PSTC) for decarbonization studies of chemical processes
- Developing new, sustainable materials for carbon intensive industries, such as cement and steel production (UT Civil, Environmental and Architectural Engineering department has sustainable material, cement & steel experts)
- Optimizing a renewable resource portfolio including location, storage, processes, renewables & life cycle analysis

Discussion
PSTC is at UT's Pickle campus and has pilot scale research funding to look at decarbonization and electrification of chemical processes, process optimization, control, and safety. This is a separations facility with reactive distillation and includes development of amines for point-source carbon capture. Production, deployment, and use of materials, such as cement, steel, and plastics add significantly to carbon production, thus methods for lifecycle analysis of sustainable materials are important. Maria Juenger is a UT concrete researcher.

Actions

- Possible LDRD project idea for enhancing solar cell efficiency, which was deemed the easiest project to gain some initial momentum together
- Explore other topics with further discussion and inclusion of additional experts from both sides

Adjunct Meetings – 3/30-4/1/2022

Army Futures Command (AFC) + UT + Sandia Collaborations (3/30, 8-9:30am)

UT: Fran Heil (Host, OVPR), Emily Cole, Bob Hebner
Sandia: Alan Nanco (Lead), Matt Lewis, Lance Hansen, Nadine Miner
AFC: Elise Joseph, representing Lauren Boteler AFC S&T Director

AFC discussed the development and upcoming release of several documents relevant to the UT-Sandia-AFC Collaboration: Power and Battery Integration Framework, Army Modernization Strategy, and Operational Energy Strategy. There are currently six Army modernization priorities: long-range precision fires, next generation combat vehicles (NGCV), Future Vertical Lift (FVL), Network/C3I, air and missile defense, soldier lethality. AFC has nine research priorities: hypersonic flight, disruptive energetics, RF electronic materials, quantum, autonomy, artificial intelligence, synthetic biology, material by design, additive manufacturing. There is strong overlap with UT and Sandia expertise and priorities in these areas. Sandia discussed the long-standing collaboration with both UT and AFC, and the programs, capabilities, and opportunities for joint UT-Sandia-AFC collaboration.

Actions

- Elise will take info to AFC Leadership and obtain guidance on how to proceed
- Nanco/Heil will have 1-on-1 meeting to discuss current UT projects sponsored by AFC and brainstorm how to leverage Sandia expertise (completed 3/31)
- Sandia and UT invited to AFC Vertex Event – 4/20 and 21 in Austin (complete)
- Elise suggests "home-on-home" visit with key leaders from UT, Sandia, AFC to discuss teaming and collaboration opportunities

Hypersonics (3/30/22, 12-1pm)

UT: Todd Humphreys, Noel Clemens, Efstathios Bakolas, Topcu Ufuk, Tom Underwood, Karen Willcox
Sandia: Alex Roesler (Lead), Hannah Stangebye

Alex Roesler presented a summary of Sandia's hypersonics programs and introduced the High-Op Tempo for Hypersonics program. This multi-agency funded program seeks to increase the number of sounding rocket tests, therefore providing more opportunities to test next-generation technologies in relevant environments. The program is designed to include university, small business, and commercial partners. Todd Humphreys, Karen Willcox, and Noel Clemens all connected with Alex to explore opportunities for their technologies to be incorporated into a future flight test.

Decarbonization (3/30/22, 12-2pm)

UT: Brian Korgel (Lead), Ben Liebowitz, Hao Zhu, Alex Hanson, Michael Baldea, Joan Brennecke, Joaquin Resasco, Don Siegel, Maggie Chen, Lance Manuel, Krista Hopkins (Admin for Energy Institute)
Sandia: Cliff Ho (Lead), Nadine Miner

The objective was to identify collaborative opportunities in energy, climate change, and industrial decarbonization. Industrial decarbonization means there will be more dependency on renewable energy which can be intermittent, thus resulting in dependence on use of energy storage. This drives a need for new materials for energy storage: chemical fuels, thermal energy, and batteries. There was interest in increasing lifecycle, modeling, simulation, and analysis capabilities for electric power grids. Tools of this type can be used to evaluate and balance power more strategically and test out ideas around increasing grid resiliency by evaluating and controlling end-use resources (demand-side response). MIT has an energy lifecycle analysis tool but having a more all-encompassing tool could be very beneficial. A tool of this type could answer questions like, "Can you get to net zero by 2050?" If a collaboration occurred to create a "Next Gen" Energy Lifecycle modeling, simulation and analysis tool, Sandia may be better positioned to lead, maintain and distribute this type of effort. UT may be better able to lead agile development with research and students at a lower cost.

UT is an Industry-University Cooperative Research Center (IUCRC) for "SPF2050 - Center for a Solar Powered Future" funded by the National Science Foundation (NSF). Industry membership is $50K/year with sponsors getting an Industry Advisory Board (IAB) position and help define research directions with the IAB.

UT is leading the PEDL proposal which proposes use of 2 million acres of UT and TX University System lands in the Permian Basin for a large-scale, real-world energy research test bed. Sandia is partnering on PEDL (Ben Cook, Sandia point of contact), along with Texas A&M, NM State, and National Renewable Energy Lab (NREL). PEDL memorandum of understanding (MOU) is being developed. UT anticipates a PEDL-type installation would require $50M - $100M annually in research funding from public/private/federal/industry sources.

Actions

- Hao Zhu to connect with Tu Nguyen and Charlie Hanley's to discuss electric power grid analysis, balance power more strategically (including use of Electric Vehicles), advancing data analytics, etc.
- Make connection between Georgia Bettin, the Geothermal Manager at Sandia, and Brian Korgel/UT, especially about PEDL proposal

- Introduce Maggie Chen to Geoff Klise manager of Sandia wind group at Sandia (Nadine made an e-intro on 4/21/2022)
- Pursue ability for Sandia to become a IURC SPF2050 member (Miner)
- Continue Sandia engagement on PEDL (Miner, Cook, Korgel)

Disinformation (3/31/22, 9:30-11am)

UT: Kiril Avramov, Sika Jarvenpaa (IROM), Alex Lui (ARL), Tricia Moravec* (IROM), Ravi Srinivasan (ARL)
Sandia: Thushara Gunda (Lead), Travis Bauer, Sean DeRosa*, Danielle Sanchez*, Steve Verzi*, Kat Ward, Matt Windsor* (* virtual)

There are several on-going UT and Sandia projects in disinformation. A UT project in collaboration with North Carolina State University focuses on training and validating classifiers that look at narratives through rhetorical devices from the central to the fringe, focusing on the Malaysia Airlines Flight MH17 downing. Thushara's UT Academic Alliance LDRD project focuses on developing empirical insights into how human's uptake disinformation. Matt's and Danielle's work is focused on using human subject experiments to understand nuances related to experts. Alex and Ravi are collaborating with Kiril and Thushara on analytical dataset nuances. Disinformation studies most often deal with very large datasets. Travis Bauer/Sandia has a server with Elasticsearch for storing bigger datasets, but UT's Ryan Custer may have a better way to handle large data sets. Ideas that emerged for further consideration were the importance of timing (hot war vs. frozen conflicts vs. hybrid approaches and transcription of pauses in speeches as tokens to support ML analytics, the role of data voids in perpetuating disinformation, and evaluating effectiveness of counter strategies.

Actions

- Steve and Travis will coordinate on statistical analysis of speech text
- Matt/Sandia will coordinate to catch up on relevant research in this space
- Travis and Kat integrating lexicon matching with rhetorical devices
- Thushara will set-up monthly meetings to coordinate on related efforts, starting with curated datasets (Kat/Kiril) (completed)
- Travis Bauer will share disinformation work if possible
- Travis Bauer will connect with UT's Ryan Custer re: handling large data sets

Battery Materials/Storage (3/31/22, 9:30-11am)

UT: Dave Metlin (Lead), Wen Song, Jamie Warner, Don Siegel (ME Chair), Benny Freeman, Krista Hopkins (Energy Institute Admin), Guihua Yu
Sandia: Erik Spoerke (Lead), Cliff Ho

Discussion centered around the question "What are problems that the UT Energy Institute and Sandia can collaborate on?". Large-scale battery storage development is further back than people think it is. What's needed is a full-scale demonstration for non-lithium batteries, such as sodium- and potassium-ion based batteries, because there are lithium-ion safety issues. Research is needed in hybrid energy storage solutions with fast/slow ramping and large capacity storage, including both bulk storage (e.g., thermal) and battery technologies. Sandia can provide access to larger-scale testing, providing a good motivation for collaboration. Additional Sandia user-facilities available to UT are the CINT fabrication facility (free to CINT users) and the National Solar Thermal Test Facility (NSTTF).

The group discussed idea of creating a UT-Sandia Center or Institute for multi-scale continuum analysis approach to evaluate spatial and temporal needs in energy storage: nanoscale (atomistic) to centimeter (cell) to meter to kilometer. UT is one of *the* leading universities for battery chemistry and energy storage and the idea of continuum of scales (Erik S.) is an important consideration. Sandia managers in this area include Charles Hanley and Babu Chalamala.

Actions

- Eric Spoerke will follow up on idea of multi-scale continuum approach to analysis and creation of a collaborative center/institute (Spoerke)

Appendix A: Sandia Day Agenda

SANDIA DAY
at UT AUSTIN

March 30 - 31, 2022 | Austin, TX

Wednesday, March 30, 2022

3:00 pm	Campus Tours	Monochrome for Austin Statue (2400 Speedway)
	• Anna Hiss Gymnasium - Robotics Center	
	• Texas Advanced Computing Center (TACC) – Visualization Lab (VISLAB)	
	• Methane Hydrates and Pressure Core Center	
5:00 pm	No-Host Sandia Social	Brewatorium (6015 Dillard Cir)

Thursday, March 31, 2022

8:00 am	Welcome & Introductions (Dan Jaffe)	Main Building 212
8:30 am	Partnership Review (Justine Johannes & Basil Hassan)	Main Building 212
9:00 am	Sandia & UT Strategic Areas / Priorities	Main Building 212
	• Microelectronics (Kate Helean & Sanjay Banerjee)	
	• High-Performance Computing & Edge Computing (Jim Stewart & Omar Ghattas)	
	• Energy Resiliency & Climate Change (Rob Leland & Brian Korgel)	
10:30 am	Break	Main Building 212
10:45 am	Leadership Discussion	Main Building 212
11:15 am	Sandia & UT Joint Technical Success	Main Building 212
	• Karen Willcox & Patrick Blonigan	
	• Jean Anne Incorvia & Brad Aimone	
	• Erhan Kutanoglu, Surya Santoso, & Manuel Garcia	
11:45 am	Closing Comments	Main Building 212
12:00 pm	**UT-Sandia Research Poster Session & Networking Lunch**	WCP 2.410 & 2.412
2 – 4 pm	**Breakout Sessions**	
	Microelectronics	WCP 3.114
	• Sandia Lead(s): Kate Helean & Scott List	
	• UT Lead: John Eckert	
	• Facilitator: Eloisa Acha	
	High-Performance & Edge Computing	WCP 1.106
	• Sandia Lead(s): Jim Stewart & Alex Roesler	
	• UT Lead: Omar Ghattas	
	• Facilitator: Hannah Stangebye	
	Energy Resiliency & Climate Change Impacts on National Security	WCP 2.302
	• Sandia Lead: Rob Leland	
	• UT Lead: Brian Korgel	
	• Facilitator: Emily Cole	

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National Nuclear Security Administration

Appendix B: Research Poster Sessions Presentations

Sandia National Laboratories — Sandia Day at UT Austin — TEXAS The University of Texas at Austin

Poster Session

Sandia-Funded UT Austin Collaborations

Thursday March 31, 2022

Poster #	Topic Grouping	Project Funding	Sandia Day Poster Title	Sandia Investment Area	Sandia PI	UT Faculty	Student Researcher
1	Microelectronics	Academic Alliance LDRD	Radical doping of commercial polymers for increased energy density	Nuclear Deterrence (ND)	Leah Appelhans, Sarah Russell	Nate Lynd, ChemE	Jared Keever, Chemistry, PhD Candidate
2	Microelectronics	Academic Alliance LDRD	Resolving Thermal Expansion Mismatch in Epoxies	Nuclear Deterrence (ND)	Erica Redline, Jeff Foster, Chad Staiger, Jason Dugger	Zachariah Page, Chemistry	Meghan Kiker, Chemistry, PhD Candidate
3	Microelectronics	Academic Alliance LDRD	Dual-band Angle Dependent MWIR Absorber	Nanodevices and Microsystems Research	Charles "Tom" Harris	Dan Wasserman, ECE	Alexander Ware, ECE, PhD Student; Morgan Bergthold, ECE PhD Student
4	Microelectronics	Academic Alliance LDRD	VO_2 Thin Film Growth by RF Magnetron Sputtering on YSZ Substrate	Nanodevices and Microsystems (NM)	Albert Talin	Alex Demkov, Physics	Adam Christensen, Physics, PhD Candidate
5	Microelectronics	Academic Alliance LDRD	Modeling Electromagnetic Interference and Coupling in Nanoscale Systems	National Security Programs (NSP)	Calvin Chan	Ali Yilmaz, ECE and Jean Anne Incorvia, ECE	Andrew Maicke, ECE
6	Microelectronics	LDRD Core Project	Domain wall magnetic tunnel junction synapses for Bayesian neural networks	Advance Science and Technology	Chris Bennett	Jean Anne Incorvia, ECE	Samuel Liu, ECE, PhD Student
7	Microelectronics	Mission Campaign	Spectroscopical Evaluation of Shear-induced Chemical Changes and Structural Transformations in Bulk Metallic Glass (BMG)	Resilient Agile Deterrence (RAD)	Michael Chandross	Filippo Mangolini, ME/Texas Materials Institute	Hsu-Ming Lien, Material Science and Engr, PhD Student
8	Microelectronics	CINT Summer Researcher	Reconstruction of sparse, nanoscale metrology data for efficient process control	Academic Alliance/LDRD/CINT	Remi Dingreville	Michael Cullinan, ME	Eva Natinsky, MS ME
9	Microelectronics	CINT Summer Researcher	Photocatalytic degradation of volatile organic compounds using Au plasmonic nano-islands on TiO_2	Academic Alliance/LDRD/CINT	Ting Willie Luk	Tanya Hutter, ME	Aminur Chowdhury, MSE, PhD Student
10	High Performance/Edge Computing/Neurmorphic Computing	Academic Alliance LDRD	Co-Design of Next-Generation Neuromorphic Architectures	Computing and Information Sciences (CIS)	Frances Chance	Andreas Gerstlauer, ECE	James Boyle, ECE, PhD Candidate
11	High Performance/Edge Computing/Neurmorphic Computing	Academic Alliance LDRD	Decoding Auditory Tones from Brain Signals Recorded using OPM-MEG	NEW IDEAS (NI)	Amir Borna	Jun Wang, Speech, Language, & Hearing Sciences; Debadatta Dash, Dell Medical - Neurology	Kristin Teplansky, Speech, Language, & Hearing Sciences, PhD Candidate
12	High Performance/Edge Computing/Neurmorphic Computing	Academic Alliance LDRD	M+ (M=Ca,Yb) Cations Bound to Molecular Cavities: A New Strategy for Incorporating Molecular Quantum States into Quantum Information	NEW IDEAS (NI)	Timothy Zwier	Pengyu Ren, BME	Cole Allen, MD Chemistry
13	High Performance/Edge Computing/Neurmorphic Computing	Mission Campaign	NeuroGrid: Robust Autonomous Localization using Multi-Resolution Grid Codes	Autonomy for Hypersonics (A4H)	Felix Wang	Renato Zanetti, AE	Kristen Michaelson, Aerospace Engineering, PhD Student
14	High Performance/Edge Computing/Neurmorphic Computing	Mission Campaign	Improved discretization for a modified mixed trajectory pursuit-evasion game	Autonomy for Hypersonics (A4H)	Kyle Williams	Todd Humphreys, AE	Zacharias Komodromos, ECE, PhD Candidate
15	High Performance/Edge Computing/Neurmorphic Computing	LDRD and Direct Funded	Advanced Capabilities and Radiation Modeling in Silicon-on-Insulator Technology	LDRD and Direct Funded (from ASC)	Sapan Agarwal, Travis Forbes	Jaydeep Kulkarni, ECE, NASCENT	Jacob Rohan, Computer Engineering, PhD Student; Alex Nguyen, Comp Engineering, PhD Student
16	High Performance/Edge Computing/Neurmorphic Computing	Direct Funded	Implementing stochastic noise from voltage-controlled magnetic tunnel junctions	DOE Office of Science	Brad Aimone and Conrad James	Jean Anne Incorvia, ECE	*Dr. Jaesuk Kwon, ECE, Postdoc with COINFLIPS*
17	Energy/Climate Security	Academic Alliance LDRD	Computational Support Informing Bioinspired Harvesting of Rare Earth Metals	Materials Science (MS)	Erik Spoerke	Pengyu Ren, BME	Justin Gourary, BME, PhD Candidate
18	Energy/Climate Security	Mission Campaign	Risk-Averse Investment Optimization for Power Grid Resilience to Winter Storms	Resilient Energy Systems (RES)	Brian Pierre	Erhan Kutanoglu, ORIE; Surya Santoso, ECE	Brent Austgen, ORIE, PhD Candidate; Joshua Yip, Baris Bilir
19	Energy/Climate Security	Direct Funded	Particle Energy Storage for Gen3 Concentrated Solar Power	Direct Funded	Cliff Ho, Jeremy Sment	Maggie Chen, ME	Kaden Plewe, ME, PhD Candidate
20	Energy/Climate Security	Direct Funded	Optimal Black-Start Restoration Assisted by Mobile Energy Storage	DOE Office of Electricity	Brian Pierre and Manuel Garcia	Erhan Kutanoglu, ORIE; Surya Santoso, ECE	Joshua Yip, ECE, PhD; Baris Bilir; Brent Austgen
21	National Security	Academic Alliance LDRD	Sample-to-answer point-of-care diagnostics using strand exchange signal processors	Bioscience (BIO)	Taylor Moehling	Andrew Ellington, Molecular Biosciences (PRESENTER)	*Sanchita Bhadra, PhD (Staff Researcher, Molecular Biosciences)*
22	Information/Disinformation, National Security	Academic Alliance LDRD	Influential Factors Impacting Disinformation Uptake	National Security Info Science & Tech	Thushara Gunda (PRESENTER)	Tricia Moravec, Business, Risk & OpMgmt	TBD
23	Information/Disinformation	Academic Alliance LDRD	Value of Uncertainty Reduction for Machine Learning Predictions	Computing and Info Sciences (CIS)	Michael Darling, David Stracuzzi	Eric Bickel, ME	Jason Boada, Operations Research, PhD Candidate
24	Information/Disinformation	Academic Alliance LDRD	Identifying Rhetorical Devices in Natural Language Models	National Security Programs (NSP)	Katrina Ward, Hamilton Link	Dr. Kiril Avramov, College of Slavic and Eurasian Studies	Ryan Williams, Public Affairs, PhD Candidate; Taylor Ham, MA Slavic Studies
25	Information/Disinformation	Core LDRD	Advanced Decision Analytics Capability Development and Analysis Support	Core LDRD Funded	Stephen Henry	Eric Bickel, ORIE	Colin Small, ORIE, PhD Candidate
26	Information/Disinformation	Core LDRD	A Machine-Learning Framework for Peridynamic Material Models with Physical Constraints	Core LDRD Funded	Marta D'Elia	John Foster, PGE, Oden	Xiao Xu, Oden Institute, PhD student
27	Manufacturing	Academic Alliance Funded	Sandia Senior Design Bonanza - AM Optical Alignment Structure	Academic Alliance Sponsored	Michelle Pang	Richard Crawford, ME; Carolyn Seepersad ME	Alec Biggerstaff, BS ME; Thomas Brown, BS ME; Logan Henry, BS ME
28	High Performance/Edge Computing/Neurmorphic Computing	Core LDRD	Discontinuous Petrov-Galerkin Methods for Transient PDEs	Computing and Information Sciences (CIS)	Nathan Roberts	Leszek Demkowicz, Asst Director Oden Institute	*Judit Munoz-Matute, PostDoc Oden Institute*