iSAT Snapshot

In Brief . . .

A quick look at our activities this quarter!

- iSAT launched its Early Career Scholars (ECS) Forum! This progam provides our students, junior faculty members, and early career researchers with a space to develop intensive projects for iSAT, attend professional development workshops, and more!
- iSAT flew in two special guest speakers to talk and visit with our team!
    1. Dr. Carolyn Rosé, Professor of Language Technologies and Human-Computer Interaction and Interim Director, Language Technologies Institute, gave a fascinating talk and met with iSAT's Early Career Scholars this October.
    2. Dr. Barbara Di Eugenio, Professor for the Department of Computer Sciences at the University of Illinois Chicago and one of iSAT's External Advisory Board members, gave a captivating talk as part of the Institute of Cognitive Science (ICS)'s colloquium series and met with our Strand 1 team this October.
- iSAT will lead a workshop on collaborative analytics at this year's Learning & Analytics conference (LAK 2023). Call for papers ends on December 16, 2022. Check out our [workshop website](#) for more info and to submit a paper!
- Our Principal Investigator, Sidney D'Mello, was a featured speaker at CU Boulder Research & Innovation Office's TED-style talks on *Innovation for the Future of Humanity* this October. His talk titled "Building Superhuman Teams" highlighted iSAT's progress towards developing cutting-edge AI technology to build the next generation of diverse talent to help address broad societal problems.
- Congrats iSAT Trainee Grant Program Fall 2022 award recipients!
    - Taehyun Kim and Su-Yeon Choi, University of Illinois, "Enabling Automatic Speaker Identification Using Direction of Arrival"
    - Mariah Bradford, Colorado State University, "Collecting Class room Data for Multimodal Detection of Key CPS Indicators"
    - Indrani Dey, University of Wisconsin, "What do Non-Verbal Indi cators tell us about Collaboration in Small Groups?"

Early Career Scholars members enjoy a morning gathering to discuss outreach projects for Year 3. Top left to right: Jason Reitman, Sierra Rose, and Nancy Hoang. Bottom left to right: Rachel Dickler, Emily Doherty, and Cara Spencer.

From the PI

I'm excited to kickoff iSAT's Year 3. We established the goal of transitioning iSAT from an evolving institute to a mature and impactful one. Our first order of business was to incorporate the valuable feedback from Summer 2022's evaluation period into refining our organizational, management, and evaluation structures. A key component included expanding iSAT's research leadership team, where we welcomed several emerging scholars (i.e., assistant professors and research scientists) to take ownership of key pieces of iSAT's research agenda under the mentorship of the more senior strand leaders. This expanded leadership team now meets biweekly to update each other on progress and challenges and identify opportunities for cross-strand collaborations. Although we still have a long journey ahead, I'm very grateful for the passion and depth of expertise that our new leaders bring to iSAT.

Another exciting development was that we held our long-awaited in-person convergence meeting, where iSAT faculty, research scientists, and postdocs spent two days working and learning together. The primary goal was for convergence of designs and an implementation roadmap for our AI Partners. The secondary goal was to facilitate multidisciplinary integration and multiorganizational synergies across our research strands and institutions. I'm delighted to report that our team overwhelmingly achieved both goals. We concluded the meeting with high-level design specifications for two AI Partner designs, and we're now busy turning these into tangible designs and high-fidelity prototypes for testing in classrooms. We also ended with a better understanding of the research conducted across our very diverse strands, which led to several new cross-strand research collaborations. But beyond these artifacts, what really excited and inspired me was the exhilaration of spending face-time with so many talented and wonderful colleagues after being relegated to a computer screen for two years! I'm eagerly anticipating several such engagements in the months ahead.

AI Partner Design Convergence Meeting
Converging for Optimal Performance

iSAT faculty and postdocs came together from all over the country for a two day, in person meeting at CU Boulder at the end of September. The major goal of the event was to converge on designs for the AI Partner. The design of an AI Partner is a complex endeavor encompassing multiple components and perspectives as noted in Figure 1 below. iSAT has made progress toward these individual components by working within—and between—strands, however we are now at a critical juncture where we must come together and figure out how we will proceed with the design and implementation of the AI Partner.

met for dinner, continuing to share their knowledge, ideas, and hopes for the AI Partner.

A secondary goal of the meeting was to facilitate multi-disciplinary integration and multiorganizational synergies across strands and institutions.

Building on our Metaphors

After our Design Sprint at the end of 2021, three new metaphors emerged that reflected what our researchers had learned after a year of data collection and analyzing that data. The Co-Pilot supports small group task
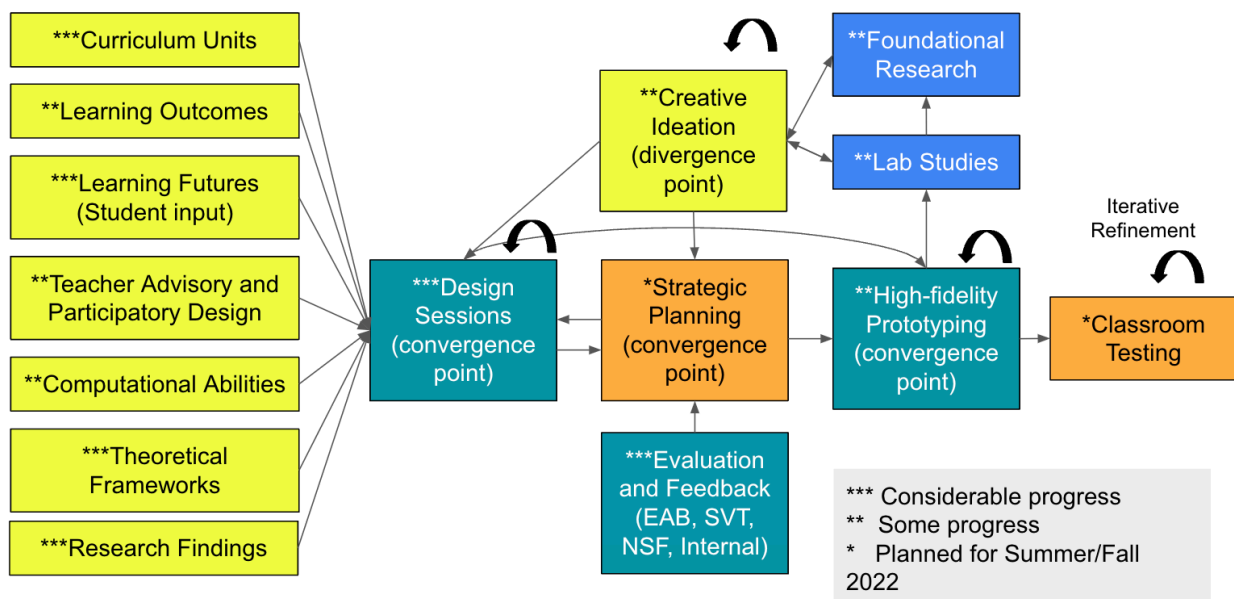

Figure 1: The processes in developing the AI Partner.

To facilitate this, we prepared several short 1-2 page pre-reads on various pertinent topics including the current status of the design and implementation of the AI Partner, findings from the most recent Learning Futures Workshop, findings from interviews with teachers from the Teacher Advisory Board, student outcomes and assessments, potential AI capabilities, status of AI Partner technical development, and more.

The meeting itself was a fantastic two days of brainstorming, discussion, and learning! The collaboration carried over well into the night when team members

progress & collaboration by providing guidance and facilitation. The Augmenter supports teachers in classroom orchestration by distilling information from small group collaborations. The Community Builder supports students in developing trusting collaborative relationships with each other, their teacher, and the AI Partner. Currently we have not added any additional metaphors and instead we used these two days to continue to refine and build upon the metaphors from the first Design Sprint.

The Design Convergence was an opportunity to con-

nect as an institute and identify concrete next steps for our metaphors. The result was team members being able to pinpoint critical milestones and set a roadmap for implementing user-centered design and the various AI partner metaphors, embodiments, and interventions, including acceptance and usability testing. Throughout the two days, a major focus was on two new prototypes related to the metaphors, which are in development and will be implemented into the classroom curriculum in early 2023.

One of the new designs, which is related to the Community Builder, is based on the Live, Love, Light concept which emerged from the students themselves during the last Learning Futures Workshop held in spring. The students visited a 70-person cooperative house to learn about collaboration in the real-world outside of the grammar of schooling. They were introduced to the concept of "Community Agreements"—in which house members collectively and interactively constructed norms for the group and how they work together and hold each other accountable. This shifts the discourse from "disciplining" youth to the youth thinking about accountability for their agreed upon norms. Building on this idea, the team is working on a version of the Community Builder metaphor that facilitates development/discussions around classroom agreements (e.g., being respectful, advancing thinking), uses AI-powered visualizations to identify and display indicators of these agreements at the classroom level, and then uses explainable AI techniques to facilitate a discussion as to how the AI-identified agreements are aligned/misaligned with classroom developed agreements.

iSAT team members are currently working on a roadmap to get the Community Builder into the classrooms, which includes collaborating with our teacher advisory board to get their feedback and then to start testing version 1 in classrooms this winter and spring.

The second advancement is related to the Interactive Co-pilot metaphor. This addition will be embedded within the Jigsaw worksheet in lesson four of the Sensor Immersion curriculum and is tentatively referred to as the Planning Investigation Partner (PIP). PIP will engage in dialog with student groups, helping them with consensus building where they share and pool individual knowledge followed by creative ideation where they use the joint knowledge space to identify a pressing problem in their community. Our team is hard at work hammering out the details of logistics and implementation. The next couple of months should bring measurable progress toward integrating this new Partner into the Sensor Immersion curriculum and Professional Learning for the teachers who will be using it.
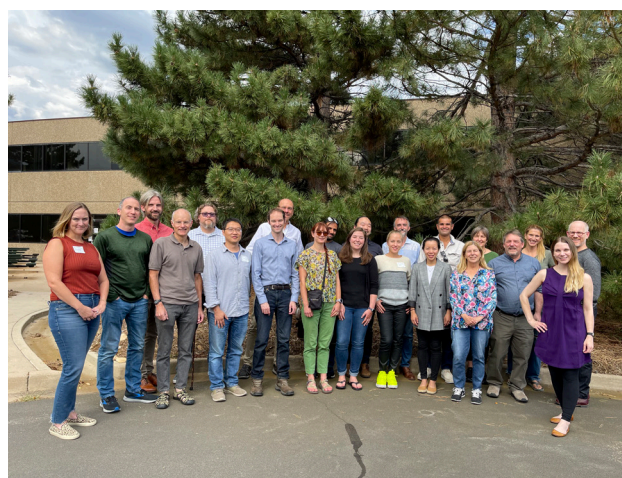
Our team members continue to keep convergence at the forefront of every project and are already looking forward to the next event!

The Design Convergence team discusses the technical infrastructure for the AI Partner.

Rachel Dickler (left) and Rosy Southwell lead the team through a tour of the iSAT Lab.

A motivated Design Convergence team after two days of productive brainstorming and collaboration!

Teacher and Youth-driven Design
Strand 3: Broadening Participation with Co-Design

Strand 3 is guided by the foundational question: In what ways can inclusive co-design processes empower stakeholders with diverse identities to envision, co-create, critique, and apply AI learning technologies for their schools and communities? In year three, Strand 3 is focused on three main research themes to help guide their progress: Learning Futures Workshops, the Sensor Immersion curriculum, and the Games Unit curriculum. This fall, the Strand 3 team continued their collaborative efforts with teachers and students, including the implementation of new curriculum for both the Games Unit and Sensor Immersion in the classrooms, as well as utilizing the findings from the spring Learning Futures Workshop to help inform our next steps for the AI Partner metaphors.

iSAT researchers facilitate a co-design workshop with teachers from a partner school district.

Three new teachers implemented the Games Unit, a sequence of nine lessons designed to focus on teaching AI through investigating causes of racism in gaming and what to do about it, in their classrooms this fall. Based on their feedback, as well as Strand 3 team members' observations, students not only connected to the concepts in the unit, but also drew on their own expertise over the course of the unit. One teacher even chose to begin the school year with the Games Unit to establish routines for conversation and collaboration in his classroom. Strand 3 has been able to collect hours of data from both the curriculum implementations and the professional learning workshops and are drawing upon this data to explore the nature of student learning within the context of the Games Unit. They are examining how students develop new concepts and are tracing how they are expanded upon across the unit, both in smaller groups as well as whole group discussion. The team is following this type of learning to augment how they can see collaboration as a distributed phenomenon that occurs across the unit. They are also using the data to delve into how the team can better engage with teachers as co-designers who de-sign social and technical infrastructures and envision teachers adapting and remixing curricula to (1) foster interdisciplinary learning for students and (2) encourage collaborative innova-tion between and among teachers using these materials.

After participating in iSAT's professional learning workshops held last summer, 15 new teachers were ready to implement the latest Sensor Immersion curriculum with 650 students this fall, which included several new collaborative structures, strategies and tools. The Sensor Immersion team is now reviewing and analyzing the data and developing codes to track support from teachers during group work. Data is also being collected to monitor student learning as shown from explanatory models they develop throughout the unit and a transfer task at the end of the unit. In addition, the Sensor Immersion team is focused on student self-reported experiences with the course from two surveys called SEETs (student electronic experience tracker) that focus on students' perceived relevance, coherence and contribution in relation to the curriculum.

The Learning Futures Workshop held last spring resulted in valuable feedback from the participants, which is now being used to shape the characteristics of the AI partners. These findings have led to novel designs including a new prototype for the Community Builder (CoBi), which helps students and teachers develop and adhere to mutually agreed collaborative agreements (e.g. respect, advancing learning). Strand 3 is continuing to refine curriculum routines around CoBi and the workshop's findings. The third Learning Futures Workshop is being planned for Spring 2023 and the goal is to work with youth and teachers to imagine how expansive data infrastructures can transform the narrative of data collection for AI from surveillance to youth and teacher agency over data. The workshop will be held over nine weeks in-person at a high school in the Western U.S.

Strand 3 team members have also been busy contributing towards furthering iSAT's goals of serving as a nexus point for collaborative efforts, deepening the Institute's knowledge exchange with SoapBox Labs. Team members gave an iSAT presentation to SoapBox Labs' staff at their headquarters in Dublin, Ireland, which led to further discussions and plans for future knowledge exchanges including starting to mutually share methods and techniques for eliciting youth ideas about the role of AI in their lives and education. Our Outreach Coordinator and Strand 3 are also working with our partners
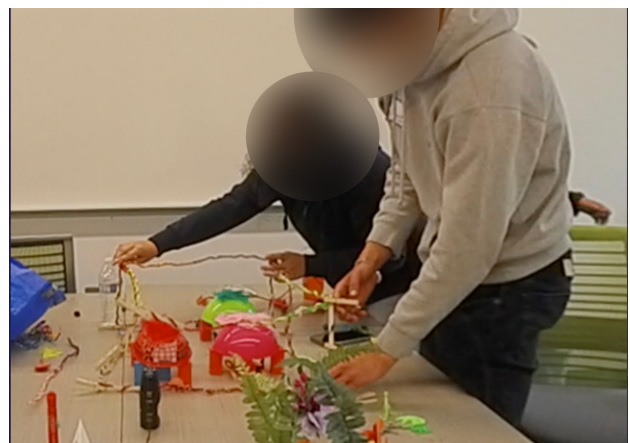
Two youth create speculative worlds during the second Learning Futures Workshop.

in a local district in the Western U.S. to develop a high school internship program which will start this winter. This project aims to develop the interns' capacity to envision, co-create, critique, and apply student-AI collaborative learning technologies in their classrooms and beyond. Strand 3 continues to converge with both Strands 1 and 2, refining curriculum routines around the two emerging AI Partners.

Student-Teacher-AI Teaming
Strand 2: Orchestrating Interactions with AI

The foundational question for Strand 2 is: What advances in theories, interaction-paradigms, and frameworks are needed to orchestrate effective student and teacher interactions with AI partners? To address this, Strand 2 has narrowed their focus toward three main themes: (1) Enacting Framework and Measurement Methods of Student-AI Teaming, (2) Collaborative Learning (non-verbal and verbal communication; peer scaffolding), and (3) Iterative Design and Evaluation of the AI Partner Interface via Human-Centered Design and HCI-Focused Empirical Studies. These themes will help our team science experts in Strand 2 better understand how students, AI, and teachers can collaborate effectively in both classrooms and remote learning contexts.

Measuring Collaborative Problem Solving

Strand 2's Enacting Framework and Measurement Methods theme focuses on the need to: successfully identify the basis of collaborative problem solving skills in social, affective, and cognitive processes, identify features of successful collaboration, identify how to promote equitable and trusted interactions in team problem solving; and lastly, how to measure all of these. The underlying emphasis of this work includes the data-driven development of automatic measures of conversational influence, trust and equitable influence, and complementary theory development, which focuses on the theoretical fundamentals of collaborative problem solving including how communication is coded for problem solving skills, taking the student's perspective on collaborative problem solving, and the dynamics of collaboration where skills are expressed over time and multiple student interactions. Team members have been working on ways to tie dynamic speech flow measures based on recurrence analysis and mutual information to human- and automatic-coded collaborative problem solving skills and facets. Strand 2 is also working to organize an iSAT measurement workshop hosted at Arizona State University early next year in which multiple iSAT and ASU researchers and students will have the opportunity to analyze iSAT data using their methods, come together to share their findings, and work as teams to address existing iSAT research questions and questions that emerge from the workshop.

Non-verbal Collaboration

Related to the theme of Collaborative Learning, a significant goal for Strand 2 this quarter has been to improve understanding of non-verbal aspects of group collaboration such as eye gaze or gesture to better understand and support students' collaborative engagement. Within this larger goal, Strand 2 team members aim to (1) identify types of non-verbal communication in groups, (2) generate coding schemes and rubrics for non-verbal communication, and (3) annotate coding videos based on the rubrics. To achieve this, team members generated a coding scheme that identifies various aspects of non-verbal behaviors including eye gaze (e.g., joint attention, looking at tools/computer, etc.), gestures and body language (e.g., pointing, leaning, manipulating objects, nodding), and emotion (e.g., smile, frown). They then applied this coding scheme to an initial set of 12, 5-minute segments of historical video data collected at the University of Wisconsin. Next, they refined the coding scheme and trained two un-dergraduate students to annotate videos. Following this, the team started annotating iSAT classroom videos and found that the coding scheme works across different sets of data and contexts, indicating that it is robust in identifying non-verbal communication during collaborative learning in groups. Strand 2 has watched an initial set of 15 iSAT classroom videos and annotated two segments. They also have made several recommendations for capturing videos in future classroom implementations based on their analysis. In the coming months, Strand 2 plans to code more iSAT classroom videos and lab videos, manually annotate the videos to coordinate with the automated annotations, and discuss ways to describe meanings of gestures from automated annotations.

iSAT Lab Data Collection

One of the major goals as part of the Strand 2's Iterative Design and Evaluation of the AI Partner Interface theme has been collecting data on collaboration to better understand how data can be used to model collaborative behaviors and correspondingly implement these models as part of our future AI Partner. The data is being collected by the iSAT Lab, which has implemented an initial study this fall consisting of 30 groups total (15 groups of 2 and 15 groups of 3 participants) engaging in five collaborative tasks: Wason Card task, Weights task, Sphero Group Programming task, MakeCode Debugging task, and Board Game task. The team collected approximately 2.5 hours of data for each group in multiple forms including Kinect video, regular video and audio, screen recording, eye tracking with Tobii glasses, and state and trait surveys including affective, social, and cognitive states as well personality and leadership traits.

The next steps involve collaborating with ASU to dive deeply

iSAT Lab participants examine collaborative problem-solving using an eye-tracker.

into analyzing the data. Strand 2 is in the process of organizing the files that will include all transcript data, survey and outcome data, and eye movement data. These files will be the critical groundwork for a data investigation at ASU, where students will apply different approaches to analyzing the data given research questions that are of interest to them, as well as available to the larger iSAT team to support their research. The team will also begin implementing new experiments in the lab that will be focused on explicitly testing initial versions of AI partners with underlying models based on this early iSAT lab data.

Convergence on a Multimodal Interactive Agent
Strand 1: Understanding & Facilitating Collaborations

Our Strand 1 team works toward developing new advancements in how machines process human language, gestures, and emotions to create an AI Partner that can understand and facilitate classroom collaboration. The team kicked off iSAT's third year by identifying three main research themes in which to focus their efforts: (1) Content Analysis & Dialogue Management–Multimodal Interactive Agent (MMIA), led by Jim Martin (CU Boulder), Jeff Flanigan (UC Santa Cruz), and Martha Palmer (CU Boulder); (2) Speech processing and diarization, led by Jacob Whitehill (Worcester Polytechnic Institute); and (3) Situated Grounding, led by James Pustejovsky (Brandeis University) and Nikhil Krishnaswamy (Colorado State University).

Putting the Pieces Together: Jigsaw Worksheets

The Strand 1 team identified the Jigsaw worksheets—completed by middle school students as part of lesson four of the SchoolWide Labs Sensor Immersion Curriculum Unit—as a great dataset for helping our AI Partner understand how students collaborate on tasks and think through problems. While this work engages all three themes of Strand 1, the task of determining optimal interactions between the students and the AI partner is primarily a focus for the MMIA, which is tentatively referred to as the Planning Investigation Partner (PIP).

A Multimodal Interactive Agent

The MMIA team started work on turning the paper Jigsaw worksheet into a digital version that can record how students collaborate on tasks and think through problems. They analyzed the student entries in the Jigsaw worksheets, and—through cross-strand planning meetings—sketched out a road map for developing an engaging MMIA that can scaffold student discussions about sensor projects.

In parallel with this planning effort, the team began annotating the Jigsaw worksheet entries with Abstract Meaning Representation (AMR), OnTask, and Academic Productive Talk (APT) and trained models for each layer. They are also analyzing how Automatic Speech Recognition errors impact each of these downstream tasks.

The team also finished the first pass of the annotation scheme design of the Dependency Dialog Acts, which capture the speaker intention and the threading structure in student conversations. The team is working on annotating and utilizing this framework to provide linguistic insight into high level content analysis tasks, such as Collaborative Problem Solving, APT and equitable conversation.

To increase the amount of student collaboration data, the MMIA team worked with Strands 2 and 3 to analyze the limitations of breakout group conversations around the Jigsaw worksheet and to brainstorm potential improvements to the flow of lesson four. The team is also working with Strands 2 and 3 to conceptualize a set of lab experiments to further define the role of the interactive agent in the Jigsaw worksheet application.

Speech Processing and Diarization

To help our AI Partner understand students when they talk, the ASR/Diarization theme has a new child speech dataset for additional comparisons of off-the-shelf and lab developed ASR systems. They established a corpus of transcribed data for benchmarking, training and fine tuning speaker verification

Strand 1 co-lead, Martha Palmer, outlines the MMIA to iSAT's cross-strand researchers.

models on child speech. This includes sensor immersion transcripts and close-talking microphone recordings from existing corpora, and they continue to achieve improvements in Word Error Rates. The team is also training an interruption detection model.

Our AI Partner will also need to identify who is speaking and when (diarization). To this end, the team has been working on person re-identification applied to school classroom environments, including the application of a state-of-the-art person re-id system to a challenging real-world classroom dataset.

Situated Grounding

Students and teachers establish common ground when interacting with one another through both behavioral and verbal cues, as well as prior goals, expectations, and beliefs. The Situated Grounding team is tasked with identifying this common ground through discourse and gesture. This quarter, the team has finalized the initial guidelines and moved into annotation mode. Targeted datasets include EggNOG—a biological information database—the Fibonacci weights experiments out of our CU Boulder and CSU labs, and Sensor Immersion both in the lab and classrooms.

The Brandeis research team is adjudicating the original Gesture Abstract Meaning Representation (GAMR) annotations on data from EggNOG. To help our AI Partner understand when speakers are referring back to previously expressed thoughts or ideas later on in a conversation, the team is working with student annotators on the coreference multi-sentence AMR annotation across the adjudicated EggNOG speech and gesture AMR.

Lab data collection is underway at CSU and Brandeis, supplemented by Strand 2 data from CU Boulder. This data is being annotated for gesture semantics and object grounding, which is being used to train novel gesture recognition and object grounding models for use on lab, and eventually, classroom data. The group is also working with Strand 2 on non-verbal behavior (NVB) annotation in the classroom.

Towards Evolving into a Mature Institute
Refining Our Organizational Structure

iSAT has come a long way since our start in September 2020. We've stood up the Institute during a global pandemic; we've navigated entering middle school classrooms across two school districts; we've co-designed curriculum units with middle school teachers; we've created new metaphors for the different roles of our AI Partner, and so much more.

In May of this year, we proudly presented our progress to the external Site Visit Team (SVT) who provided a report to the National Science Foundation (NSF). The positive feedback we received energized us to embark on a productive third year. With the SVT's and NSF's helpful guidance, we've refined our organizational structure and are well on our way to evolving into a mature institute.

ing and facilitating collaborations) performance goals and subgoals have been reorganized into three main themes with different leads (Speech recognition, Content analysis/dialogue management, and Situated grounding). In addition, we have three institute-wide research themes as well as themes supporting our strategic impacts, management, and evaluation.

Expanding Our Leadership Structure to Include Theme Leads

Prior to the refinement of our organizational structure, iSAT's core leadership team consisted of our Principal Investigator, Executive Director, and Strand leads. Now, each theme has a designated leader who meets with all the other theme leads
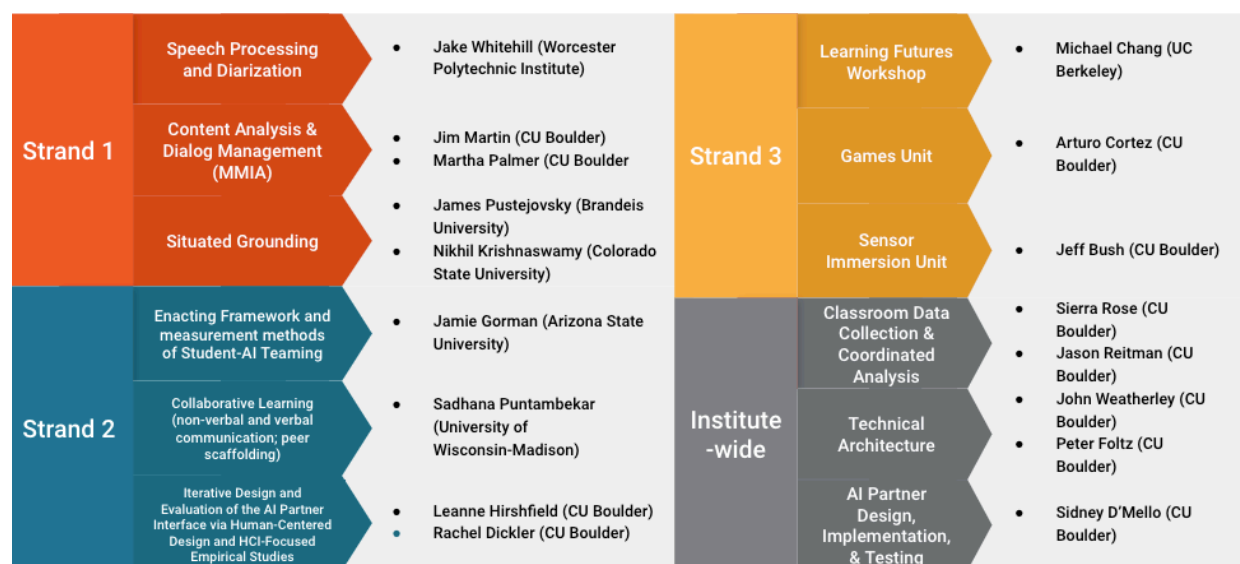

Figure 2: iSAT's research themes and leads.

Merging Ideas, Methods, and Techniques

Over the past two years, our researchers from more than 14 areas from nine universities, along with school districts and technology development partners, have focused on various approaches for creating a safe, effective, and engaging AI Partner for K-12 classrooms. This work has enabled us to form our major goal for our third year: merge these diverse ideas, methods, and techniques to amplify convergence research and develop roadmaps for design and implementation in classrooms.

And this is indeed a major goal! To accomplish this convergence, we have thematically grouped our performance goals and subgoals—around 45!—into research themes (Figure 2). Each of our three research strands have three main research themes (nine total). For example, Strand 1's (Understand-

as well as our Strand leaders during iSAT's bi-weekly leadership team meetings. This expands leadership opportunities for members at all levels of iSAT, with theme leads ranging from postdocs, junior faculty, and research assistants to senior faculty and research scientists. These new leaders also bring a wealth of diverse viewpoints to their roles.

Strategic Planning and Evaluation

The first task for the theme leads was to develop a Year 3 research and development roadmap and a publication plan focusing on the following items:
- Research projects/activities (e.g., problem/question, what data will be collected/used, broad approach, intended outcomes)
- How each project/activity contributes to one or more of: (a) AI Partner development/testing, (b) foundational research within each strand; (c) strategic impacts of ed-

- ucational and workforce development and broadening participation.
- Publication venues and rough timeline for each project/activity including potential "breakthrough" high-impact publications
- Key team members and cross-strand collaborators
- Resources needed (hardware, Institute-wide technical infrastructure, personnel, etc.)

Each theme lead developed a plan, which was then discussed with Institute Management and the leadership team for each strand. These plans were also shared with all of iSAT during our whole-team meetings. As part of our Evaluation Plan, Institute Management and Leadership will review progress and provide constructive feedback on each theme in Q3 (December to February 2023).

We brought these leaders together at the end of this summer for an in-person AI Partner design convergence meeting. To learn more about that meeting and its outcomes, check out our other feature in this newsletter, AI Partner Design Convergence Meeting: Converging for Optimal Performance. With this new structure, we now have increased a shared awareness of major activities across the Institute, helping our members identify greater collaboration opportunities, reduce redundancies, and focus on our mission to build deep conceptual and socio-collaborative learning experiences for all students.

Finally, we've reorganized our six Strategic Impacts by assigning a lead for each impact. Rachel Lieber took on the new role of Outreach Coordinator and oversees iSAT's *Nurture and grow the next generation of talent* and *Broadening participation and diversity* initiatives. Alayne Benson is our internal Community Coordinator and leads our *Multidisciplinary integration and community building, Multi-organizational synergies and achievements,* and *Knowledge Transfer* efforts. Peter Foltz heads our *Impact of the Insitute as a nexus point for collaborative efforts* strategies.

New Quarter, New Faces!

Growing our team and our impact.

We're excited to welcome three new members to our team!

Institute-wide Research Associate Thomas Breideband leverages his interdisciplinary background to support research conducted in each Strand and to facilitate better cross-strand collaborations. In addition to investigating how the integration of Artificial Intelligence in the classroom affects the user experience, Thomas studies how iSAT's in-house AI Partner may also meaningfully support collaborations beyond the classroom. Before joining iSAT, Thomas was a postdoctoral researcher in Gloria Mark's Social Sensing Lab at the University of California Irvine. He holds PhDs in English and Cultural Studies with a focus on Rhetoric and Digital Media from Georgia State University and Johannes Gutenberg-University Mainz (Germany).

Strand 1 Postdoctoral Researcher Jie Cao's research centers around Natural Language Processing and Machine Learning. Before joining iSAT, Jie obtained his PhD from the University of Utah's School of Computing. His past research includes investigating appropriate inductive biases for linguistic structured predictions, e.g., parsing meaning representations, observing psychotherapy interviews, and tracking task-oriented dialogues.

Professional Research Assistant Clay Clevenger graduated from the University of Colorado Boulder with a degree in Astronomy with a concentration in Physics. They are excited to help progress research in iSAT in AI integrated classrooms!

Welcome Thomas, Jie and Clay!

Thomas Breideband
Research Associate
Institute-wide

Jie Cao
Postdoctoral Researcher
Strand 1

Clay Clevenger
Professional Research
Assistant

Member Spotlight

Rachel Dickler: Stand 2 Research Scientist

Q: What is your role at iSAT?

A: I am a Research Scientist in Strand 2 of iSAT and also participate in several Institute-wide activities including supporting the Early Career Scholar forum.

Q: What does your research focus on?

A: My research at iSAT includes understanding group dynamics during collaborative tasks, which I am currently investigating within a laboratory setting. We are able to collect many different data types within the lab using fun technologies such as eye-trackers and Kinect cameras. I am also involved with the development of initial designs for the iSAT AI partners and setting up studies to soon test these partners in the experimental lab.

Q: What's the coolest thing about your research?

A: One of the coolest things about my research would be that I get to work with all of the different teams and individuals across the Institute. Our work in Strand 2 is really centered around integrating ideas from all different fields (computer science, learning sciences, human-computer interaction, education), so it has been exciting to learn from all of the different interdisciplinary researchers on the team!

Q: What has been a turning point or defining moment in your career?

A: A turning point in my career was when I was teaching in a special education classroom and began discovering innovative educational technologies that were being developed at local universities! It is exciting to now be a part of the team that is behind the creation of exciting technology to support teachers and students.

Q: What do you like to do outside of work?

A: Outside of work I really enjoy spending time outdoors exploring nearby hiking trails! We just adopted a kitten named Bob who is now leash trained so he has been joining on many of our recent hikes!

Trainee Spotlight

Jon Cai: Strand 1 Student Researcher

Name of advisors: James H. Martin, Jeffery Flannigan, Martha Palmer

Research focus: Natural Language Processing

What are you working on? I'm working on student conversation content analysis. Specifically, I'm creating a novel Linguistics-based annotation framework (which we call Dependency Dialog Act or DDA) to capture the intention of the students' conversations in classrooms, where we focus on the complex multi-party, multi-thread nature of the conversions in classrooms. I'm also working on improving the performance of AMR (a lexical level semantic representation) as one of the fundamental components of the overall language understanding of student conversations.

How does your work contribute to iSAT? Our effort aims at providing deeper understanding through transparent and explainable algorithms and representations of the classroom conversations, which is crucial when it comes to making the AI Partner be able to be more active. With the help of our frameworks and models, we could better depict how students interact with each other through language and provide help accordingly.

Fun fact: I have discovered that a good visualization can convey ideas really well, which is ironic for me as a language researcher! "A picture is worth a thousand words" really is true! But now I am thinking about how we can use language to vividly draw pictures in people's minds - something I'd like to explore for our AI Partner.

iSAT Publications

Take a deeper dive into our work!

Published & Submitted Papers

Andrews-Todd, J., Jiang, Y., Steinberg, J., Pugh, S. L., & D'Mello, S. K. (in revision). Investigating collaborative problem solving behaviors and outcomes across academic domains.

Booth, B., Bosch, N., & D'Mello, S. K. (in review). Engagement Detection and its Applications in Learning: A Tutorial & Selective Review.

Bush, J., Bhaduri, S., Rummel, M., Chang, M., Biddy, Q. (Under Review 2022). Computing for OUR future: multiple case study analysis of youth's empowerment to use sensor technology to address personally relevant community issues during a career mentor infused STEM program. *International Journal of Child-Computer Interaction*.

Chang, M. A., Philip, T. M., Cortez, A., McKoy, A., Sumner, T., & Penuel, W. R. (2022). Engaging youth in envisioning artificial intelligence in classrooms: Lessons learned. *Rapid Community Report Series. Digital Promise and the International Society of the Learning Sciences*.

Chang, M.A., Dudy, S. (2022). Expansive Participatory AI: Supporting Dreaming within Inequitable Institutions. *Human-Centered AI Workshop, Conference on Neural Information Processing Systems*. New Orleans, LA

Dey, I & Puntambekar, S. (submitted). Non-Verbal Indicators to understand Collaborative in Small Groups. Submitted to the *International Society for the Learning Sciences 2023*.

D'Mello, S. K., Moulder, R., & Jensen, E. (in review). Momentary Measures of Emotions During Learning Prospectively Predict Standardized Test Scores.

Duran, N. D., Paige, A., & D'Mello, S. K. (in revision). Multi-Level Linguistic Alignment in a Dynamic Collaborative Problem-Solving Task.

Cai, J., King, B., Flanigan, J., Cao, J., Perkoff, M., Grace, M., Wojarnik, N., Martin, J., Dudy, S., Walker, M., Palmer, M., Ganesh, A. (2022). Dependency dialogue acts—Annotation scheme and case study. Submitted to *International Workshop on Spoken Dialogue Systems Technology 2023*.

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Hennessy Elliott, C., Nixon, J., Gendreau Chakarov, A., Bush, J., Schneider, M. & Recker, M. (under review 2022). Characterizing teacher support of debugging with physical computing: Towards a debugging pedagogy. *ACM Transactions on Computing Education (TOCE)*.

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Huggins-Manley, A. C., Booth, B. M., & D'Mello, S. K. (2022). Toward Argument-Based Fairness with an Application to AI-Enhanced Educational Assessments. *Journal of Educational Measurement*.

Krishnaswamy, N. and Pustejovsky, J. (2022). Grounded meaning representation for situated reasoning. *Proceedings of the 2nd Conference of the Asia-Pacific Chapter of the Association for Computational Linguistics and the 12th International Joint Conference on Natural Language Process*.

Mawasi, A., Penuel, W., Cortez, A., & McKoy, A. (under review 2022). Engagement with Critical Perspectives of Technologies during Co-Design Process. *Learning, Media, and Technology*.

Mawasi, A., Cortez, A., McKoy, A., & Penuel, W. (under review 2022). "They were learning from us as we were learning from them": Perceived Experiences in Co-Design Process as a Space for Intergenerational Learning with Distributed Expertise. Mind, Culture, and Activity.

Moulder, R., Abitino, A., Booth, B., & D'Mello, S. K. Recurrence Quantification Analysis of Eye Gaze Dynamics During Team Collaboration. Accepted to *Learning Analytics and Knowledge 2023*.

Ward, W., Southwell, R., & Clevenger, C. (2022). "Background filtering for speech recogntition in noisy classrooms." Submitted to the *International Conference on Acoustics, Speech, & Signal Processing* 2023.

Presentations

D'Mello, S.K. presented iSAT research in several invited talks including the Distinguished Research Colloquium Series at the Department of Computer Science, University of Memphis, the National AI Institute for Adult Learning and Online Education, and the School of Psychology, Georgia Institute of Technology. His talk was titled "From Autonomy to Synergy: Envisioning Next Generation Human-AI Partnerships."

Foltz, P. presented a talk on September 8th titled "Applying semantic word embedding models for human performance assessment" at the Idaho National Labs Symposium on AI and Machine Learning.

Foltz, P. presented in a symposium on September 20th at EdTechWeek on AI for Education: Advancements and risks in a changing environment.

Palmer, M. gave a COLING 2022 Keynote address in Gyeongyu, South Korea on October 11, 2022. She is also one of a team presenting a 6-hour EMNLP 2022 tutorial on Meaning Representations for Natural Languages that includes AMR and UMR on Dec 7, 2022.