

# ISAT Snapshot

NSF AI INSTITUTE FOR STUDENT-AI TEAMING

Summer 2023



2

In Brief ...

From the PI

3-4

Introducing our  
First AI Partner -  
CoBi!

5-6

Strand 1 Update

7-9

Strand 2 Update

Strand 3 Update

Institute-wide  
Update

10-11

Member Spotlight

New Quarter,  
New Faces!

Publications &  
Outreach

## In Brief . . .

### A quick look at our activities this quarter!

1. iSAT's Co-Principal Investigator Martha Palmer was awarded the 2023 Lifetime Achievement Award by the prestigious Association of Computational Linguistics! This well-deserved award highlights her decades of innovation and hard work. You can read more about it here: <https://tinyurl.com/5abtb86m>
2. Our team members attended, and presented at, several conferences over the summer including the Association for Computational Linguistics in Toronto (ACL 2023), the 24th International Conference on Artificial Intelligence in Education in Tokyo, Japan (AIED23), the International Society of the Learning Sciences in Montreal, Canada (ISLS 2023), and the 31st ACM Conference on User Modeling, Adaptation and Personalization in Limassol, Cyprus (UMAP 2023).
3. iSAT collaborated with a local community outreach center in the Western US. where team members presented about our mission, the Sensor Immersion curriculum, and CoBi - our AI Partner.
4. iSAT's Principal Investigator Sidney D'Mello presented at the Silicon Flatirons Variety Showcase at CU Boulder, which highlights creative startup ventures from the community and the campus. He shared all about iSAT and the great work the team is doing.
5. iSAT welcomed students as part of a partnership with World Denver and TechGirls for a day of job shadowing and learning all about what we do at iSAT. The girls learned about our AI Partner "CoBi" and how it was developed. We love working with youth and empowering the next generation!
6. iSAT's Principal Investigator Sidney D'Mello and Co-Principal Investigator Leanne Hirshfield traveled to Ann Arbor, MI to host a workshop at Toyota Research in North America (TRINA) on trust in human-agent teams and automation. They highlighted the AI Partners being developed in iSAT as examples where trust building is crucial to promote user acceptance.



**Top:** iSAT's Martha Palmer receiving the Lifetime Achievement Award at ACL 2023.

**Bottom:** Students from TechGirls spend the day at iSAT learning what a day at iSAT looks like and all about our AI Partner, CoBi.

## From the PI



We kicked off the summer with our first in-person Site Visit where we welcomed program officers from the National Science Foundation (NSF) and an External Site Visit Team (SVT). After months of preparation and anticipation, it was an exciting and memorable day and a half of presentations, posters, demos, questions, and discussions. The SVT and NSF were very impressed with our vision, work, findings, and teamwork and highlighted the following significant achievements in their report: "(1) Development and deployment of an AI partner prototype in a classroom, involving Institute-wide convergence; (2) Increased scholarly productivity and knowledge transfer efforts through a variety of mechanisms and to a variety of audiences; (3) Collaborative co-design with stakeholders in ways that are having broad impact on foundational research in AI, HCI, and the learning sciences; and (4) The Institute's management structure has continued to adapt and evolve in ways that facilitate convergent interdisciplinary research." These achievements touch on all aspects of iSAT, reflecting the contributions and efforts of our entire team. I'm so proud and thankful for their passion, creativity, and dedication.

The SVT also had several helpful recommendations, and we spent the rest of the summer figuring out the best ways to incorporate their feedback. One major change in the works is the reorganization of the iSAT Operations Team, which includes plans to hire an Associate Director and Large Project Business Manager; both searches are underway. Another is to more concretely operationalize plans to integrate our results and technologies (including new frameworks, methods, metrics) into the AI Partners. A third is to amplify our efforts towards testing, refining, and then evaluating our AI Partners in classrooms. A fourth is to synthesize and disseminate findings from our multi-year research projects such as the Learning Futures Workshops, Responsible Innovation, Automatic Speech Recognition, and the Collaborative Problem Solving Framework. Indeed, Year 4 is shaping up to be an exciting and engaging year.

# Introducing CoBi

Our First AI Partner is in Classrooms Helping Students Collaborate

## What is CoBi?

iSAT has achieved multiple successes in its third year as an Institute and one of the most exciting accomplishments is the Community Builder (CoBi) - our first AI Partner that is currently being tested in the classroom. This interactive AI Partner helps students in developing trusting collaborative relationships with each other. CoBi is student-, teacher-, and classroom-facing, and scaffolds student groups to co-negotiate classroom agreements along four dimensions: being respectful, being equitable, being committed to community, and moving thinking forward. With the help of the teacher, students work in small groups to input their examples of agreements into the CoBi interface. As students engage in collaborative learning, CoBi analyzes student discourse for evidence, or “noticings” for the agreement categories, using iSAT’s fine-tuned models for speech diarization, speech recognition, and discourse classification; eventually the models will also incorporate nonverbal information. The results are aggregated across student groups (to protect student privacy), and then visualized at the classroom level by way of a growing tree animation where the noticings are shown as flowers that bloom. Teachers and students use these visualizations to facilitate reflection and sense-making about their adherence to their agreements (and changes over time), where differences among their perspectives and CoBi’s analysis

provide opportunities to learn about CoBi’s inner workings. This novel AI tool represents next-generation collaborative learning environments where AI becomes a social partner that aims to inspire trust and help students improve their collaboration skills.

## How Did We Get Here?

CoBi was developed over the last three years through a combination of cross-Institute collaboration, co-design work with teachers, and youth-inspired feedback during our annual Learning Futures Workshops (LFW), which consist of a diverse group of high school students and result in crucial input from the participants including what youth want and need our AI Partner to be able to do in the classroom, and—just as important—what they don’t want it to do. When planning the second LFW, we realized that it was challenging for youth to imagine what good collaboration could look like beyond what they had experienced in school. Hence, we took young people to a housing coop where one of our members had lived, one where the membership turned over on a regular basis, but where a common community feeling existed. They met a person who had the role of “community builder,” and the youth got really interested in the idea of shifting the narrative from policing behavior to self-adherence to mutually agreed community agreements. The youth wondered if



With the teacher’s help, students work in small groups to input their examples of agreements into the CoBi interface.

the AI Partner could help them to generate and maintain such agreements and developed a design sketch to embody their ideas. We then held a design convergence sprint where we gathered to sketch out designs based on the youths' ideas, and across many subsequent design sessions, including interviews with teachers and students, conjecture mapping, storyboarding, and prototyping, our team got to the point where CoBi was ready to be put to the test with students this past spring.

### Testing and Refining

CoBi was rolled out for its very first pilot testing in one classroom with a single teacher and 23 students last spring. The testing provided valuable feedback from both the teacher's and students' perspectives. Overall, there was resounding buy-in for CoBi and its features. Students responded with great enthusiasm for the tree design. As one student put it, "The tree is helpful because it blooms as conversation goes on. It's like life and thinking ... a good representation of that." Students were also very interested in transparency - they wanted to be able to see the noticings (which was a feature added right away) and more of them. iSAT was also able to collect another round of data during a summer school camp in June that featured CoBi used in conjunction with the new Sensor Immersion unit - Self Driving Cars (SDC).

The iSAT team quickly got to work updating and improving CoBi. A huge achievement over the past couple of months has been streamlining the user experience (i.e. logging in, setting up CoBi, creating and selecting a lesson, etc.) so that students and teachers can now run the show, eliminating the need for iSAT data collectors to set everything up for the class. Now, the data collectors can shift gears and be able to take field notes while CoBi is being used - reducing the number of researchers needed in the classroom and helping our team expand their repertoires of research skills. Another major update has been improving the underlying computational models to make them more accurate, robust, and generalizable, based on all of the data we have collected over the past three years and using archival data that predates iSAT.

Another key improvement made over summer was refining the community agreements routine. The CoBi team developed a tutorial video to be used with the routine to minimize any confusion and ensure that the students can be self-sufficient in the process. The refined routine now consists of two distinct phases, the first being for establishing the community agreements and developing consensus about them. This is where students first encounter CoBi and learn about the data security and privacy components from the video. The second phase is the revisiting phase where students select a community agreement to focus on for the day, they then set goals and discuss what that agreement means to them. While they work, CoBi listens, and then they reflect on CoBi's analysis using one of the five reflection strategies. The CoBi team piloted the improved routine with all of iSAT during a whole team meeting held in July. This exercise

had multiple benefits including allowing the entire team to experience exactly what students do, as well as testing the process and making sure it was user friendly.



The CoBi tree shows flowers that "bloom" when the students collaborate using the community agreements.

### The Best is Yet to Come

With all of the refinements, iSAT was ready to get CoBi into more classrooms. Over summer, the team held Professional Learning for the new Sensor Immersion (SI) unit - Self Driving Cars (SDC) - as well as the revised Games Unit. Working with our partners from local school districts, iSAT had 15 teachers attend the SI training and 6 attend the Games Unit - which will lead to a record number (hundreds!) of students using CoBi in the fall. During the Professional Learnings, teachers engaged with the CoBi routine wearing their "student hats" and then reflected on how to apply it to their own classrooms. CoBi's integration into the new SDC and Games units will allow students ample opportunities for collaboration and CoBi will help center positive instances of collaboration and provide a great venue for exploring AI and meta collaborative discussions. A greater number of students using CoBi allows us to collect more examples of community agreements - which will lead to finetuning of the computational models. Increased data also allows our team to analyze and make more sense of the types of examples that come in the most.

Another goal for fall is to increase community outreach so iSAT can attract even more diverse user groups for CoBi. For example, over summer the team partnered with a school district to lead an outreach at a local learning center that provides educational, recreational and academic services to its residents, including an onsite tutoring program and a state-of-the-art Robotics Program focused on STEM education. Our team is excited to continue to share CoBi and see where we can go from here!

# Enabling our AI Partners to Hear

## Strand 1

Strand 1 is guided by the foundational question: What AI advances are needed to understand and facilitate collaborative learning conversations? The three research themes identified to help Strand 1 reach this goal are: Speech Processing & Diarization, Content Analysis & Dialog Management, and Situated Grounding.

### Filtering Through the Noise

This team is responsible for ensuring our AI Partners will have hearing that is fine-tuned to classroom environments - a very difficult task! The team is continuously working on improving the training of automatic speech recognition (ASR) models for classroom speech. Team members' recent paper titled "Compositional clustering: Applications to multi-label object recognition and speaker identification," was accepted and will be published in December in ScienceDirect. One application of this work in regards to automatic classroom analysis is that it enables speaker diarization in situations where multiple people are speaking at the same time. In such scenarios, the "clusters" formed by the speaker embeddings over multiple timesteps could correspond to either a single person speaking in isolation ("singleton" cluster) or a set of people speaking simultaneously ("compositional" cluster). The paper presents three new algorithms to tackle this compositional clustering problem automatically.

Other team members have been exploring different ways of improving child speech recognition accuracy by (1) using data



As students collaborate on things such as the Sensor Immersion Curriculum, our Speech Processing team is busy figuring out how to identify who is speaking and what they are saying.

augmentation based on synthetic speech generation and (2) modifying the outputs of the trained ASR models. They have also been collaborating on a project about directly predicting Abstract Meaning Representation (AMR) trees from speech signals. The team continues to make progress and improve what our partners hear as being able to identify who is saying it.

### Understanding and Engaging

As our AI Partner hears what's happening in a classroom, it will need to know how to understand and engage with student and teacher speech to facilitate classroom activity. To achieve this goal, the team has identified three main threads of focus: (1) Abstract Meaning Representation (AMR) for Sensor Immersion Documents and Speech-Aware AMR, (2) Data Annotation for Dynamic Dependency Acts (DDA), and (3) Jigsaw Interactive Agent (JIA) including new content-based JIA Design, Video Analysis, JIA Infrastructure, and Dialogue Synthesis.

Over the last few months, the team has been able to increase the speed of AMR annotation on curriculum documents. They have also established an annotation guideline to annotate AMR for curriculum data, which includes rich layouts, tables and image information. This structured curriculum annotation will offer knowledge graph support for JIA - iSAT's interactive agent used in the Sensor Immersion curriculum. Using Speech-Aware AMR, the Strand 1 team has collaborated on a project with the goal of reducing the two-stage ASR-then-AMR parsing into a single stage text-less Speech AMR parsing. Progress related to Data Annotation for DDA includes the team deploying the DDA annotation tool, and annotating DDA for two datasets: Pulley and Sensor Immersion. They achieved high agreement in Pulley where the annotators have access to the video, while there was lower agreement in Sensor Immersion. They are now planning to exploit the hierarchical labeling scheme as a way to increase agreement further.

A strong focus of this theme is to improve on the first version of JIA - our interactive agent designed to help students while they collaborate on filling out a worksheet and planning a project - and the team has been hard at work! First, after the previous time-based JIA prototype, they have moved forward to develop a content-based design. They collaborated with other strand members to get feedback on research interests, including content-support, creative thinking, collaborative thinking, collaborative learning, equality, and more. They are exploring different research topics to support this content-based design such as AMR annotating on curriculum data, question generation, and future integration with existing dialogue analysis in JIA (such as on task/off task, collaborative problem solving (CPS), and so on).

Second, in aiming for real classroom deployment of JIA, the team is analyzing jigsaw classroom videos from the past year. They have established a team for cross-strand video analysis and initiated a guideline for structured analysis to cover cross-strand research interests.

In addition, the team wants to synthesize student dialogues to stimulate various edge cases in the real world. As observed in the video analysis, various implementations lead to quite different conversational flow and various factors such as absence and grouping will lead to challenging real world cases far beyond theoretical assumptions on the curriculum. One idea is to use Large Language Models to creatively generate those unseen edge cases, especially by using existing observations from structured analysis of real world dialogue examples, and experienced knowledge from teachers, students and other educational experts.

### Finding Common Ground

The AI Partner needs to understand the common ground teachers and students establish when interacting with one another, such as their behavioral and verbal cues, as well as prior goals, expectations, and beliefs they bring into the classroom. To accomplish this, the Situated Grounding theme team has spread their work across three related projects.

#### Create a Taxonomy of Situated Grounding

The team at Brandeis and CSU began constructing, annotating and modeling a taxonomy for common ground based on multimodal channels, including observations, statements, acceptances, doubts and questions, that unify the agreed-upon facts of a group and the questions under discussions.

#### Annotated Dataset of Weights Task Interactions

The team annotated the Fibonacci Weights dataset with collaborative problem solving (CPS) annotations as well as Gesture Abstract Meaning Representation (GAMR), and with help from Strand 2, NICE (for non-verbal, non-gestural behavior).

#### Training models to detect collaborative problem solving facets from multimodal data

An ongoing goal has been to train multimodal CPS detection of the Weights Task interactions and Sensor Immersion classroom data. The team accomplished training detection of the Weights Task and the results were published at AIED 2023 this summer. The multimodal grounding and CPS detection of the Sensor Immersion data set is ongoing.



Strand 1’s Margaret Perkoﬀ presents a paper analyzing automatic speech recognition errors at the 31st ACM Conference on User Modeling, Adaptation and Personalization (UMAP23).



The Fibonacci Weights Experiment in our iSAT Lab provides the opportunity for the Situated Grounding team to develop training models. In the smaller image, the lines illustrate two aspects of multimodal tracking. The team then uses these tracking graphs to perform “situated grounding of objects” during the activity.

# Promoting Equitable and Trusted Interactions

## Strand 2

**S**trand 2 is guided by the foundational question: What advances in theories, interaction-paradigms, and frameworks are needed to orchestrate effective student and teacher interactions with AI partners? The three research themes identified to help Strand 2 reach this goal are: Framework & Measures, Collaborative Learning (non-verbal and verbal communication; peer scaffolding), and UX Design & Multimodal Modeling.

One piece of exciting news for Strand 2 over the summer was the addition of new postdoc Rui Zhang. Rui recently completed her Ph.D. at Clemson's School of Computing with a speciality in Human-Centered Computing. Her dissertation work on the topic of: Structuring AI Teammate Communication: An Exploration of AI's Communication Strategies in Human-AI Teams, will make an excellent addition to the Strand 2 team!

### Framework & Measures

The Framework and Measures theme team focuses on successfully identifying and measuring the basis of collaborative problem-solving skills in social, affective, and cognitive processes, and how to promote equitable and trusted interactions in team problem solving. Over the last few months, team members have continued their work on integrating dynamic measurements influence alongside indices of collaborative solving into the iSAT measurement framework. They are working with Strand 3 researchers (lead by Bill Penuel) to tie the objective influence metric to subjective judgements of influence in the classroom, and they recently submitted a paper to the Journal of Educational Psychology that validates the influence metric as indicators of team member role, task outcomes, subjective perceptions of collaboration, and community agreements via styles of speaking (e.g., individualistic vs. collective speech; talk moves). Finally, they are currently working across strands through iSAT lab studies with the objective of incorporating this measurement frame-

work into the JIA and CoBi AI Partners. In the fall, team members will begin to bridge the gap between researcher and student perspectives by incorporating student perceptions of event boundaries between collaborative stages into the framework.

### Collaboration Processes and Orchestration

This theme focuses on identifying verbal and non-verbal modes of collaborative engagement and identifying peer scaffolding moves, as well as understanding how peers support each other during collaborative learning. Members of this group have been continuing to update the transcript and coding the MakeCode and weights task videos. They have also trained new undergraduate Research Assistants this summer and worked on establishing inter-rater agreement with the new coders. Strand 2 graduate student Indrani Dey has been working on her Masters paper, applying the NICE framework and examining patterns of non-verbal behaviors.

### UX Design & Multimodal Modeling

This theme manages iSAT's lab and collects data centered on collaboration to understand how data can be used to model collaborative behaviors and correspondingly implement these models as part of our future AI Partner. Data collected in the iSAT lab includes video, audio, gesture, eye-movement, behavioral, and survey data. Within this theme, Strand 2 has been working all summer with cross-strand team members on the design and implementation of the JIA partner. Early prototyping in the lab is underway and we are prepping for key Institute-wide convergence meetings in the fall on the design and development of JIA, with an eye toward introducing JIA into classrooms this spring.



As part of a research experience program for high school students, our interns visit the iSAT Lab to learn about what we do in the lab and how it benefits development of our AI Partners.



iSAT researchers participate in the iSAT-CHART Data Jam held at ASU where they analyzed gaze, verbal communication and non-verbal communication in datasets from the iSAT Lab.

# Engaging All Learners

## Strand 3

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? The three research themes identified to help Strand 3 reach this goal are: Learning Futures Workshop, Games Unit, and Sensor Immersion Unit.

### Learning Futures Workshop

The Learning Futures Workshop team carried out its 3rd Spring Learning Futures Workshop (LFW) over 9 weeks last February and March. These workshops have been invaluable to our progress as an Institute - the AI Partner CoBi was developed as a direct result of the feedback from the participating youth. The goal of last spring's workshop was to learn more about how young people and teachers conceptualize ideal reactions between care, authority and independence inside the classroom and how AI might improve or compromise these ideal relations. Over the summer, the LFW team has continued to understand how dreaming, learning, and design are intertwined. With results from the last several workshops, they have been able to more clearly articulate theoretical and methodological contributions with the education and Human-Computer Interaction community, culminating in several submissions to journals and conferences.

### Games Unit

The Games Unit team guides the implementation of the Games Unit curriculum - a sequence of nine lessons designed to focus on teaching AI through investigating causes of racism in gaming and what to do about it - as well as holds Professional Learnings (PL) for our partner teachers in local districts. Over the summer, the team revised the curriculum based on feedback from other Institute members on how we can best integrate CoBi and other AI Partners into the unit, as well as input from teachers and high school students. In late July they also developed and held a Professional Learning workshop, bringing in seven teachers and three administrators, to train on the new curriculum. It is anticipated that between five to nine teachers will implement the revised unit this year, including some teachers from the Professional Development Units that were implemented last April.

### Sensor Immersion

This summer was very exciting for the Sensor Immersion (SI) team! After many months of hard work, they were able to pilot the new Self Driving Cars curriculum in June with a group of students at a free summer camp. Based on feedback during the camp, revisions were made and the first official version of the curriculum was finalized in July. In August, the new curriculum was presented to teachers at a Professional Learning held at iSAT's headquarters at CU Boulder. Teachers engaged with the programming activities, pedagogical reflections, neural network activities and participated in discussions of image recognition and bias mitigation. Eight to 10 teachers



iSAT's Games Unit team holds a Professional Learning for teachers and administrators from one of our partner districts.



Our Sensor Immersion team piloted the new self-driving cars curriculum at a free summer camp hosted by one of our partner districts.

are expected to implement the new unit this school year. In August, the curriculum was presented to partner teachers at a PL at CU. Teachers engaged with the launch, programming activities, pedagogical reflections, neural network activities and discussions of image recognition and bias mitigation. We anticipate 8-10 teachers implementing the unit this school year in our partner districts - resulting in hundreds of students using the curriculum in the coming months.

Also in August, seven new teachers were brought into the Sensor Immersion project and attended a Professional Learning on Sensor Immersion implementation where teachers engaged with SI lessons and then reflected on how to implement that into their classrooms.

### Cross-strand Collaboration

The SI team has been working especially closely with the CoBi design group for both of the curriculum routines as well as User Experience (UE) design and development. There has also been great collaboration with the SI team and Strand 2 - analyzing moments of group work support during the SI curriculum. Strand 3 team members have been working side by side with Strand 1's DDA team to better understand how equitable classroom moves can influence students' learning.

# Improving Data Collection and Design

## Institute-wide

The Institute-Wide team provides resources (data, annotations, technology) to guide iSAT's core research. The three themes are: Classroom Data Collection and Coordinated Analysis, Technical Architecture, and AI Partner Design, Implementation, and Testing. These themes have had a very productive summer!

### Classroom Data Collection and Coordinated Analysis

When school is not in session and they can't be in the classroom, the data collection team is busy working on improving and streamlining data collection. iSAT held a data collection training in early August, which resulted in the data collectors developing additional research skills – specifically how to take field notes. Now that they no longer need to set up and troubleshoot equipment (the Student Recorder has been improved so that students and teachers can now do this themselves), they can take note of student-student and teacher-student(s) interactions. Helping them gain this skill



Thomas leads a field notes training session for our data collectors.

(and for most of the training attendees, this was really the first time they learned about how to take field notes) will help the team tremendously as they are gearing up for large-scale classroom data collection during this coming school year. Not only will iSAT be able to accommodate more classes, but being able to cut down on the number of iSAT team members present in the class will lower the disruption that the presence of researchers in a classroom inevitably entails.

The training also resulted in the agreement to do regular check-in meetings over the coming months to collect reactions, concerns, share best practices and get advice on the field note taking process. The team also wants to build a glossary of terms pertaining to typical student-student and teacher-student(s) interactions to build a common vocabulary and language that they can leverage for both field note taking and memo writing. They are working on the framework to develop a template for memos to ensure consistency in the reporting of findings to the larger iSAT research community.

### Technical Architecture

The role of this team is to develop core infrastructure and components for the AI Partner, support integration of AI models and services into the AI Partner, support secure data storage and access to data collections from the classroom and lab, and configure and operate cloud infrastructure and support iSAT computing needs. They made exciting advancements over the last several months!

The Institute-wide, along with Strand 1, teams designed an architecture for the Jigsaw Interactive Agent (JIA) analysis pipeline. Like the existing analysis pipelines for community agreements, Collaboration and Problem Solving, on/off task/topic, and others, JIA analyzers will receive dialog captured by the audio/video Recorder and be transcribed using Whisper Automatic Speech Recognition (ASR). In addition, JIA will analyze text that is input by students in a Web-based JIA User Interface (UI) in near real time. This architecture will also enable the JIA agent and human 'Wizard of Oz' (WOZ) agents to interact with students by pushing messages that will be displayed in the Web UI. The teams will be working on implementing, deploying, and testing the push messaging infrastructure with the Jia models and both human and AI agents in the fall and winter semesters.

### AI Partner Design, Implementation & Testing

CoBi went through several upgrades this summer to get ready for widespread testing in classrooms this fall. As mentioned in the data collection theme, a big improvement to CoBi has been streamlining the UI to allow the users to login to the student recorder and set up CoBi (creating / selecting a lesson). Students and teachers now run the show and this will allow our testing to expand and the users to have more control over their experience. In addition the team streamlined the process of setting up and managing classes to use CoBi. We have also worked on improving CoBi's underlying computational models including speech recognition, diarization, discourse classification, and selection of noticings to make them more robust, accurate, and generalizable. We are in the process of integrating these revised models in CoBi in time for classroom testing and refinement in the fall. Lastly, we will be demoing CoBi at the 2023 ACM SIGCHI Conference on Computer-Supported Cooperative Work & Social Computing (CSCW) in Minneapolis in October.



Our AI Partner CoBi with the recent upgrades made over summer.

## Learn more about our members!

**M** Meet Dr. Mon-Lin Monica Ko - our Co-lead of the Strand 3 Games Unit theme.



**Q:** What does your research focus on?

**A:** I am a former high school life sciences teacher, and since moving into research, have been researching the dynamic relationship between curriculum materials, teachers, and students in the classroom for a decade. I work closely with teachers to co-design and adapt curriculum materials, analyze what happens in the classroom, and dream up ways to create learning environments where students develop a deeper understanding of the world around them.

**Q:** What is the coolest thing about your research?

**A:** I love working with teachers! Teaching is incredibly challenging, and getting to sit down with teachers to reflect and unpack what's happening in fleeting classroom moments is one of

the best parts of my job. I am always energized when I get a chance to think about how the design of tools, resources, and infrastructures can create environments that fosters inclusive, meaningful disciplinary learning.

On the Strand 3 team, we've been exploring what meaningful learning looks like in a discipline that isn't fully formed at the K-12 level: artificial intelligence! It's exciting to think about how our work can potentially help students become critical consumers and designers of technology that builds more just futures.

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

**A:** My career really changed when I realized that surviving and thriving in academia (and maybe any career!) requires community. I am proud of the incredible colleagues and mentors that I am surrounded by, each of whom play a key role in shaping not just my career but also life trajectory, over the years.

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

**A:** I just moved back to Colorado after a 20 year hiatus, so I look forward to hiking, biking, and running with the mountains in view!

**M** Meet Sierra Rose - the Institute-wide Classroom Data Collection Lead for iSAT!



**Q:** What does your research focus on and what are you working on?

**A:** My main focus is collecting classroom data (videos, artifacts, demographics, field notes) during the Sensor Immersion and AI in Games (and now Self Driving Cars) units. This school year we will largely be focused on the implementation of our AI partner, CoBi, in the classrooms. I am working on transitioning from general classroom data collection on iPads, to classroom data collection that utilizes our iSAT Student Chromebook Recorder and our AI Partner, CoBi.

By having students learn to use the Recorder and CoBi as a part of their everyday education, we can fine tune CoBi, smoothly incorporate CoBi into curriculum, and field notes. We are also refining iSAT's classroom data collection with new consent protocols and data organization.

**Q:** How does your research contribute to iSAT?

**A:** Our classroom data is used for a variety of research projects from curriculum co-design to the design, development, and implementation of AI partners.

**Q:** What is a fun fact about you?

**A:** I have just recently become an avid reader and I have always been into video and board games. I also have a dog and a leopard gecko!

# New Quarter, New Faces!

## Growing our team and our impact.

**W**e're excited to welcome quite a few new members to our team!

Emily Watts is an iSAT data analyst and research assistant who focuses on the collaborative group efforts of students and teachers to create equitable learning environments through the help of AI. Emily collects data through recording and documenting class interactions as they occur. She holds a B.S in Psychology from TCU and is currently interested in the field of Cognitive Psychology with hopes of continuing her education through a graduate program in the future.

Kristin Wright-Bettner develops Abstract Meaning Representations (AMRs) for iSAT's Strand 1 research. These graphical representations of sentence-level semantics are used to help train iSAT's AI Partner's ability to understand and produce natural human language. Kristin holds an MA in Linguistics from CU Boulder and has worked in the field of semantic annotation for over 10 years for CU's Center for Computational Language and Education Research (CLEAR).

Jiani Wang is a Ph.D. student at Worcester Polytechnic Institute and is assisting iSAT with detecting interruptions during group discussions to identify instances where one speaker interrupts another during group conversations and identify the interrupter as well as the timing of the interruptions. Before she began her Ph.D. study, she obtained her graduate degree from Worcester Polytechnic Institute and her undergraduate degree from Hunan University.

Marissa Chitwood is an Institute-wide Graduate Student Research Assistant who uses her background to support interdisciplinary research conducted in each Strand. She holds an MS degree in Neuroscience: Systems, Behavior and Plasticity from Temple University and her research interests encompass the learning sciences and each of the disciplines of cognitive science to study cognition, predictive coding, and artificial intelligence with an aim to optimize individual students' decision-making, reasoning, and learning skills and how focusing on individual skills may lead to improved overall collaboration within the classroom.



Emily Watts  
Data Analyst and  
Research Assistant



Kristin Wright-Bettner  
Senior Professional  
Research Assistant



Jiani Wang  
Ph.D. Student Researcher



Marissa Chitwood  
Graduate Student  
Research Assistant

Get  
Involved!

Email, subscribe, and follow us to learn more!



[info.ai-institute@colorado.edu](mailto:info.ai-institute@colorado.edu)



[www.isat.](http://www.isat.)



[@NSF\\_iSAT](https://twitter.com/NSF_iSAT)

# iSAT Publications and Outreach

Take a deeper dive into our work!

## Published & Submitted Papers

Booth, B., Bosch, N., and D’Mello, S. K. (2023). Engagement Detection and its Applications in Learning: A Tutorial & Selective Review. *Proceedings of the IEEE*.

Bradford, M., Khebour, I., Blanchard, N., and Krishnaswamy, N. (2023) Automatic detection of collaborative states in small groups using multimodal features. *Proceedings of the 24th International Conference on Artificial Intelligence in Education (AIED 2023)*.

Breideband, T., Bush, J., Chandler, C., Chang, M. A., Dickler, R., Foltz, P., Ganesh, A., Lieber, R., Penuel, W. R., Rietman, J. G., Weatherly, J. and D’Mello, S. K. (2023) The Community Builder (CoBi): Helping Students to Develop Better Small Group Collaborative Learning Skills. *Accepted to the 26th ACM Conference On Computer-Supported Cooperative Work And Social Computing (CSCW 2023)*.

Cao, J., Ganesh, A., Cai, J., Southwell, R., Perkoff, M. E., Regan, M., Kann, K., Martin, J.H., Palmer, M., and D’Mello, S. K. (2023) A Comparative Analysis of Automatic Speech Recognition Errors in Small Group Classroom Discourse. *Proceedings of the 31st ACM Conference on User Modeling, Adaptation and Personalization (UMAP ’23)*.

Doherty, E., Spencer, C.A., Eloy, L., Kumar, N., Dicker, R. and Hirshfield, L. (2023) Using Speech Patterns to Model the Dimensions of Teamness in Human-Agent Teams. *Proceedings of the 25th International Conference on Multimodal Interaction (ICMI 2023)*.

Ganesh, A., Chang, M., Dickler, R., Regan, M., Cai, J., Wright-Bettner, K., Pustejovsky, J., Martin, J., Flanigan, J., Palmer M. and Kann, K. (2023) Navigating Wonderland: Highlighting Off-Task Discussions in Classrooms. *Proceedings of the 24th International Conference on Artificial Intelligence in Education (AIED 2023)*.

Ganesh, A., Palmer, M., and Kann, K. (2023) A Survey of Challenges and Methods in the Computational Modeling of Multi-Party Dialog. *Proceedings of the 5th Workshop on NLP for Conversational AI (NLP4ConvAI 2023), pages 140–154, Toronto, Canada. Association for Computational Linguistics*.

Harrison, J., Gorman, J., Reitman, J. G., and D’Mello, S. K. (2023) Toward the Validation of a Novel Measure of Individuals’ Influence During Team Collaborations. *Proceedings of the 67th International Annual Meeting Human Factors and Ergonomics Society*.

Kandoi, C., Jung, C., Mannan, S., VanderHoeven, H., Meisman, Q., Krishnaswamy, N. and Blanchard, N. (2023) Intentional micro gesture recognition for extended human-computer interaction. *In the International Conference on Human-Computer Interaction (pages 499-518). Cham: Springer Nature Switzerland*.

King, B. and Flanigan, J. (2023) Diverse Retrieval-Augmented In-Context Learning for Dialogue State Tracking. *In Findings of the Association for Computational Linguistics: ACL 2023, pages 5570–5585, Toronto, Canada. Association for Computational Linguistics*.

Li, Z., He, X., Whitehill, J. (2023) Elsevier’s Pattern Recognition: Compositional Clustering: Applications to multi-label object recognition and speaker identification. *ScienceDirect Volume 144, December 2023 109829*.

Mawasi, A., Penuel, W. R., Cortez, A., and McCoy, A. (in revision). “They were learning from us as we were learning from them”: Perceived experiences in co-design process. *Mind, Culture, Activity*.

Perkoff, M.E., Bhattacharyya, A., Cai, J., and Cao, J. (2023) Comparing neural question generation architectures for reading comprehension. *Proceedings of the 18th Workshop on Innovative Use of NLP for Building Educational Applications (BEA 2023), pages 556–566, Toronto, Canada. Association for Computational Linguistics*.

Redd, R., Elloy, L., Dickler, R., Reitman, J. G., Pugh, S., Foltz, P.W., Gorman, J. C., Harrison, J. L. and Hirshfield, L. (2023) Synerg-eye-zing: Decoding nonlinear gaze dynamics underlying successful collaborations in co-located teams. *Proceedings of the 25th International Conference on Multimodal Interaction (ICMI 2023)*.

Reitman, J. G., Clevenger, C., Beck-White, Q., Howard, A., Rose, S., Elick, J., Harris, J., Foltz, P. and D'Mello, S. K. (2023). A Multi-theoretic Analysis of Collaborative Discourse: A Step Towards AI-Facilitated Student Collaborations. In *Proceedings of the International Conference on Artificial Intelligence in Education (AIED 2023)*.

Reitman, J. G., Harrison, J. L., Gorman, J., Lieber, R. and D'Mello, S. K. (2023) Communicative Influence: A Novel Measure Integrating Team Cognition and Collaborative Problem Solving. Submitted to the *Journal of Educational Psychology* (under review).

Stewart, A. E., Rao, A., Michaels, A., Sun, C., Duran, N. D., Shute, V. J. and D'Mello, S. K. (2023). CPSCoach: The Design and Implementation of Intelligent Collaborative Problem Solving Feedback. *Proceedings of the International Conference on Artificial Intelligence in Education (AIED 2023)*.

Terpstra, C., Khebour, I., Bradford, M., Wisniewski, B., Krishnaswamy, N. and Blanchard, N. (2023) How Good is Automatic Segmentation as a Multimodal Discourse Annotation Aid? *In Workshop on Interoperable Semantic Annotation (ISA-19)* (p. 75).