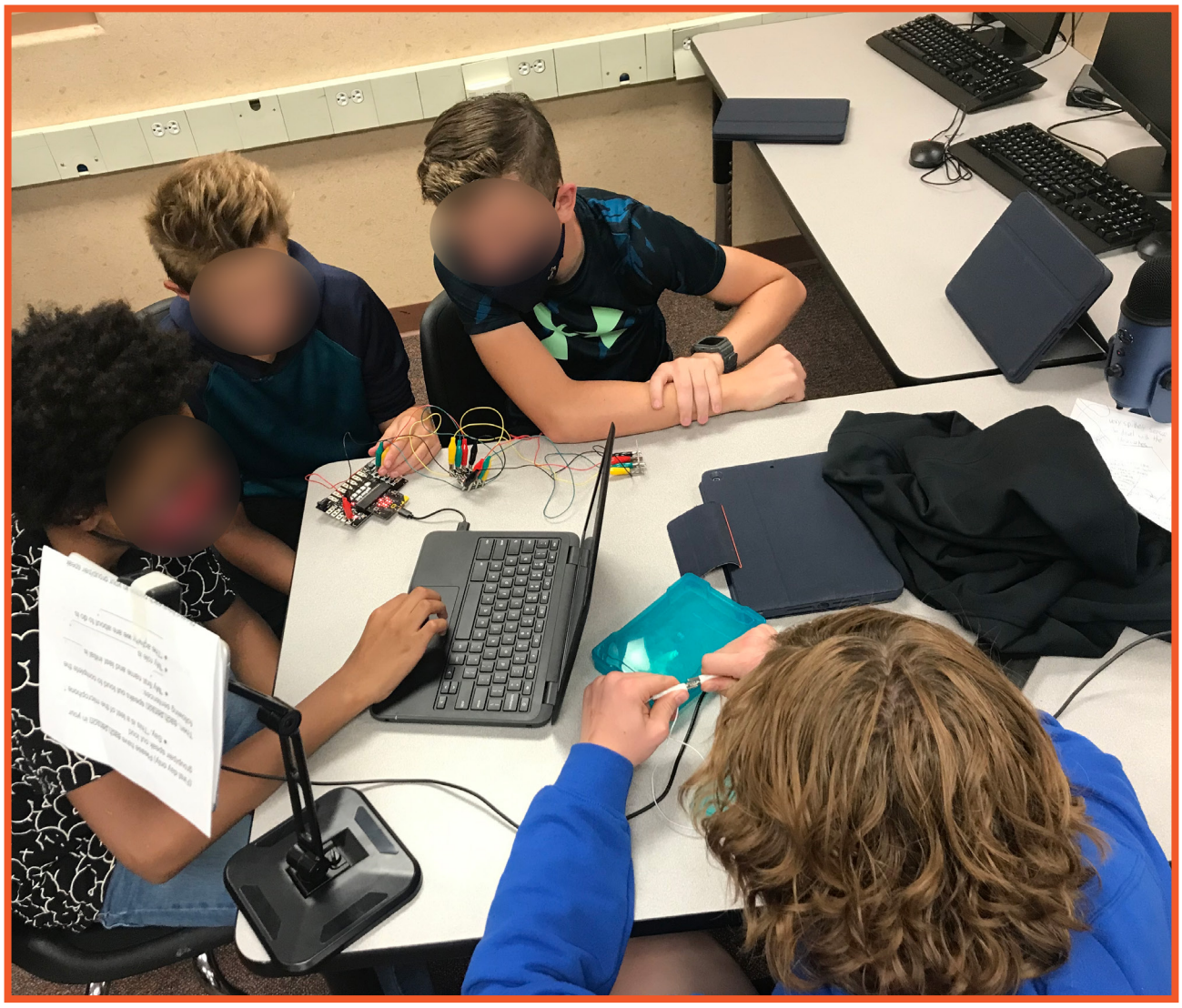
iSAT Snapshot

NSF AI INSTITUTE FOR STUDENT-AI TEAMING FALL 2021



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Publications & Outreach

Member Spotlight

Learn more about our members!



Meet Dr. Jeff Bush, one of iSAT's Strand 3 researchers and a Research Associate for the Institute of Cognitive Science at the University of Colorado Boulder. Jeff's research focus is on technology to support teachers during formative assessment.

Q: What sparked your interest in the role of AI in education?

A: As a highschool math teacher I quickly realized the tremendous potential for technology and AI to both offload demands on teachers for both grading, feedback and creating contexts for exploration. This led me to graduate school where I was eager to find technology solutions to better support teachers in improving their assessment and instructional practices so they can focus on creating meaningful connections and fostering community in the classroom. While working on my PhD, I worked on a wide range of education technology and teacher learning related grants with my advisor, Professor David Webb. This included grants on teaching computational thinking (Scalable Game Design), designing and evaluating mathematics simulations for classroom use (PhET), and improving how technology gives feedback on learning to both students and teachers (Woot Math). While these projects were AI tangential, none of them addressed the components of AI that I find most interesting, AI learning standards, the social and ethical implications, and how data analytics can scale work that was previously not feasible. After graduating in 2020, I was thrilled to be included with iSAT since I had not yet had the opportunity to connect my interest in AI with my experience in the learning sciences, classroom technology and working with teachers.

Q: What question or challenge were you setting out to address when you started this work?

A: I am particularly interested in examing how technology has been traditionally used in classrooms to improve schooling as we know it rather than rethinking how schooling happens and how students interact and develop in school environments. iSAT brings momentum around re-thinking and re-envisioning what is valued and who gets to (not) succeed in classrooms. I want to see how an AI agent and AI-infused curriculum can bring something refreshing and new to classrooms that might yet not have seen technology as an ally.

Q: What's your favorite place in the world?

A: Before graduate school, I spent my summers leading canoeing and backpacking trips for the YMCA. We were based out of a camp in northern Minnesota at the edge of the Boundary Waters Canoe Area Wilderness. My heart still longs for that place with its tranquil blue waters, loons calling one another across the lake, sphagnum moss under your toes and the soft glow of sunlight peeking through cedars and white pines.

Q: Who was your childhood hero?

A: That would be my grandfather, Robert P. Bush; he worked to provide psychiatric care to those who couldn't otherwise afford it, built beautiful furniture in his home woodshop and enjoyed cheesy jokes with his contagious roaring laughter. He also had this homemade Dodge van he had converted into a camper, decades before it was trendy :-).

From the PI



If I have to think of one word to describe my feelings on iSAT as we close out this quarter and a year of ups and downs, that word is "gratitude." I'm grateful for our amazing team of staff, volunteers, and teachers who have risked life and limb to ensure that we are achieving our broader impacts of engaging with hundreds of middle school students while collecting much needed data for our foundational research. I'm grateful for our wonderful research team and our leaders who are working around the clock to advance our ambitious research agenda and to our amazing Community Hub and Executive Committee for their innovative ideas to foster institute-wide communication.

I'm grateful to our school district partners whose enthusiastic support ensures that iSAT research is grounded in the realities of the classroom where it can have maximal impact. I'm grateful to our funders, the National Science Foundation, whose awesome investment in our team has made it possible for iSAT to pursue its bold vision of blending foundational AI and use-inspired research with responsible innovation, broadening participation, workforce development, & community engagement. And finally, I'm grateful for the upcoming new year, and new hopes and opportunities that it promises to bring.

Wishing iSAT colleagues and friends a happy holiday and looking forward to seeing everyone in the new year!

Cross-strand Callout

Collecting Classroom Data and Building the (Technical) System!

iSAT Ventures into Classrooms

During our summer, we formed our cross-strand Fall 2021 Data Collection team to begin the all-important task of going into real K–12 classrooms to support teachers implementing our Curriculum Units and collect the data we need to develop our AI Partner.

This fall, with the help of 24 volunteers, researchers, and iSAT staff members, we collected 352 audio sessions with approximately 24 hours of student collaboration data, and about 150 video files of students collaborating on the unit.

3 St. Vrain Valley Schools (SVVSD) and 9 Denver Public Schools (DPS) teachers implemented the 5 lesson curriculum across 13 classrooms and over 39 class periods during the fall while iSAT researchers observed the classrooms and collected video and audio data of students working together. Data was only collected from consenting students (and their parents), and their interactions were recorded with a Yeti microphone connected to an iPad as our main setup. We also collected comparison audio from a Sony recorder, or a Zoom handheld recorder. A camcorder and a wide-angle camcorder captured video of the consented groups. Sometimes an iPad was used to record close-up videos of interactions among students.

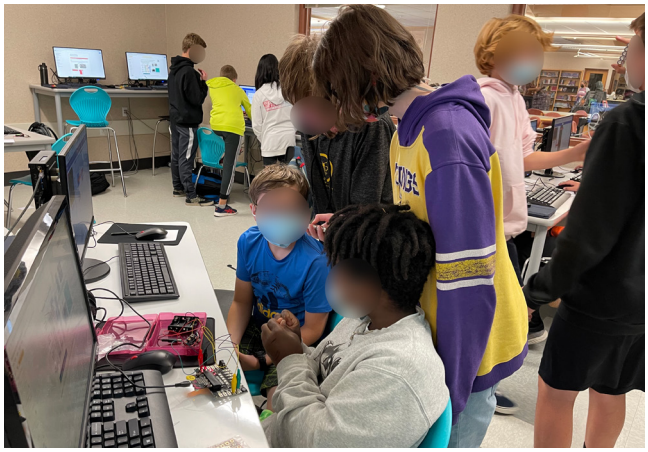
As data comes in a team at the back-end is hard at work at cataloging it, checking quality, doing preliminary annotations and transcriptions, and making recommendations for the next round. So it is very much a continuous process and we are now gearing up for a new round of in-classroom data collection with a new cohort of teachers starting this Spring.

THANK YOU!

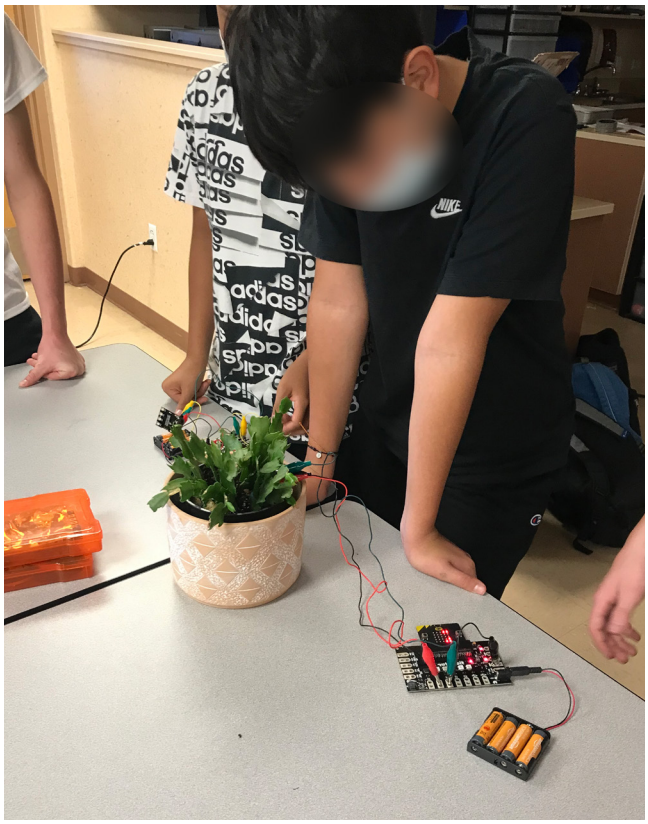
SchoolWide Labs Team
Tammy Sumner
Bill Penuel
Jennifer Jacobs
Quentin Biddy
Jeff Bush (co-lead)
Srinjita Bhaduri
Jay Luther
Colin Elliott
Tom Curran

Data Collection Core Team
Sidney D'Mello (Lead)
Rachel Lieber (co-lead)
John Weatherly (and Curve 10)
Rosy Southwell
Wayne Ward
Nikhil Krishnaswamy
Peter Foltz

Data Collection Volunteers
Elsy Meis
Rachel Dickler
Cher Harty
Shiran Dudy
Ananya Ganesh
Nancy Hoang
Kaleb Bishop
Guojing Zhou
Alayne Benson



St. Vrain Valley School District middle school students work on the Sensor Immersion unit.



Denver Public School students measure the amount of water present in this plant's soil using a sensor.

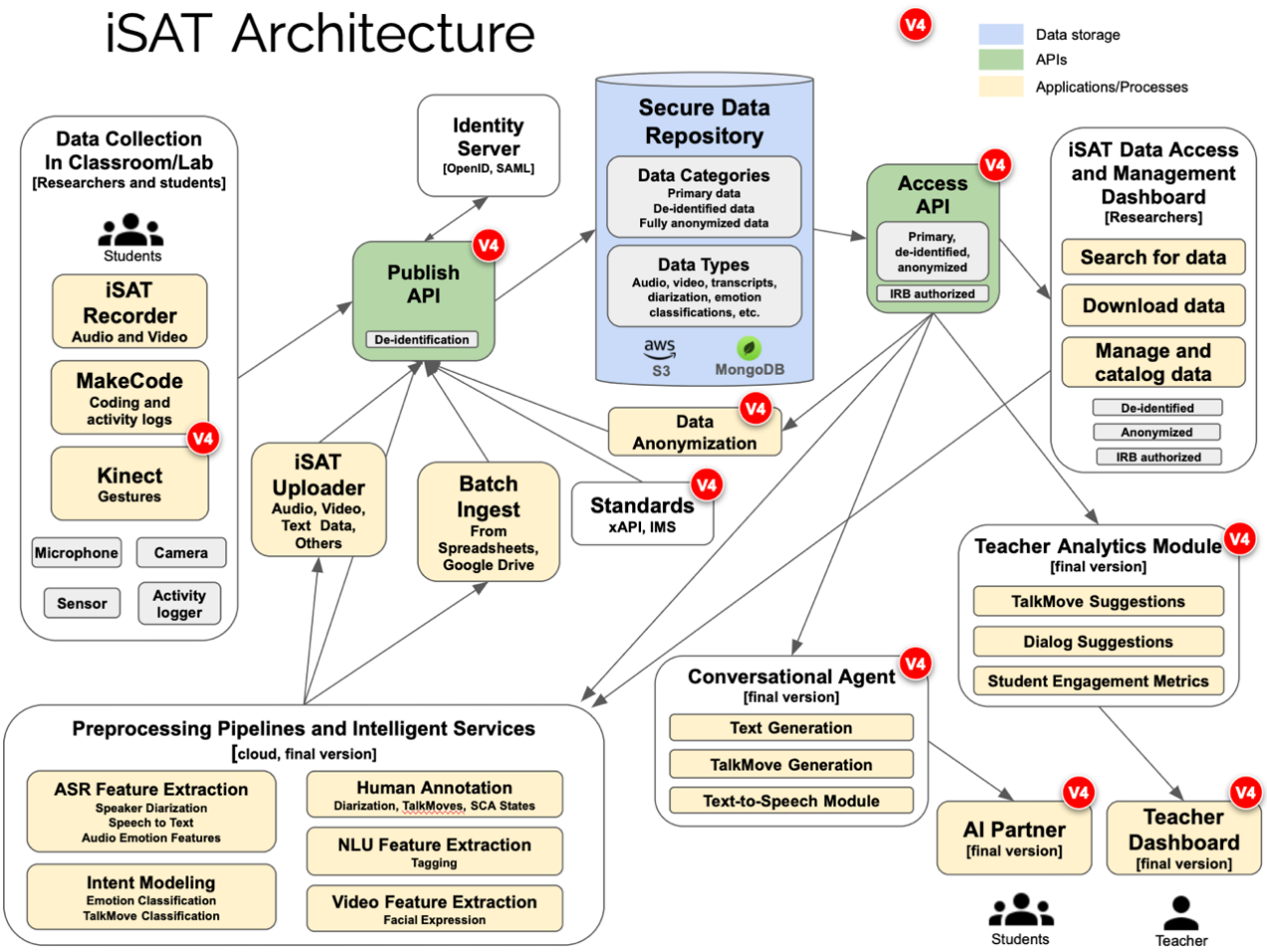
Building the (Technical) System

Build the System is a new cross-strand group focused on designing the software components and architecture for the AI Partner. The group convened over the fall to identify and design individual software components (e.g., Speech Recognition, Diarization, Automated Tagging) and the technical infrastructure that will enable the different components to interact with each other in real-time and offline. This work includes considering what kinds of training data we'll need to collect in to build machine learning-based models and how it can be securely stored and processed with an emphasis on privacy and access controls.

The group also works to identify and share expertise as well as establish development best practices that can be used across the organization. Over the last three months, the group has:

- Identified approaches to building the technical system pipeline via microservices.
- Began an inventory of existing components and code across iSAT.
- Created Guidelines for including repositories in the iSAT Organization on GitHub.
- Began collecting code repositories in the iSAT Organization on GitHub.
- Identified strategies for structuring GitHub code repositories: Submodules.
- Refined a series of diagrams to describe the iSAT Architecture and Timeline.

The work will continue to create a roadmap and implement an initial MVP which connects multiple components in the architecture to take classroom data as input, process it through intelligent services, and produce output for students or teachers. The group will continue to coordinate with the strands on design input in order to ensure that iSAT has a flexible technical architecture that can support both research and implementation for analyzing classroom interactions offline and ultimately real-time classroom interactions.



Schematic of iSAT's Technical Architecture.

Redefining Classroom AI Capabilities

Strand 1

We last left our intrepid Strand 1 researchers on the precipice of the incoming classroom data from our cross-strand data collection team. As this new data comes in, the Strand 1 team spent the quarter facing a new challenge—how exactly will we use this data to define the capabilities of our AI Partner?

What Can Our AI Partner Hear & Understand?

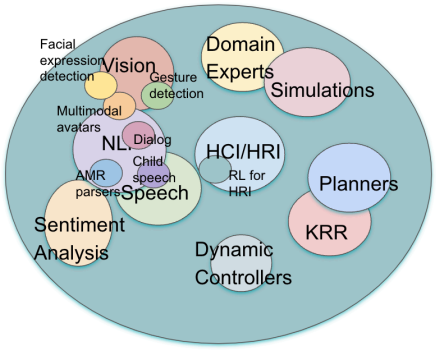
Before our future AI Partner can help facilitate small group classroom collaborations, it'll need to recognize what students are saying. Strand 1's Speech Recognition team was hard at work this quarter to help make this a possibility. This group of researchers selected five sessions of datasets collected from various Denver Public Schools and St. Vrain Valley Schools middle school classrooms. The team manually transcribed and annotated mark times when each student was speaking (to the nearest 0.1 sec). These data are being used to evaluate both background filter performance and diarization performance using Automatic Speech Recognition (ASR) — the process of automatically transcribing audio input.

To facilitate this work, the team installed the recently released SpeechBrain system and provided samples of speech from each target student. The team then used the novel approach of having the system filter out from these sample segments that do not contain speech from any of the target speakers.

The group will continue the current work on filtering background noise and tuning Google ASR for optimum performance, including providing language model context. They will also be augmenting the existing hardware testing pipeline and building a similar pipeline compatible with cameras.

In conjunction with the Speech Recognition team, the Annotation Working Group and the Content Analysis team are also piloting other types of annotation of the students' utterances. These include a straightforward on-topic/off-topic classification, more Abstract Meaning Representations (AMRs), and a layer of Rhetorical Structure Theory (RST). In addition, Strand 1 is engaged in developing a new AMR parsing model that will encompass this new, preliminary RST (RST) annotation. Experimental results are expected soon! To parse the student dialogues from our classroom datasets, the team is also working on a few shots learning model—an object categorization machine learning model that aims to learn information about object categories from a handful, rather than hundreds or thousands, of training samples. The teams' best AMR parsing results so far have been an 81.4% accuracy rate on a medium sized model, and they hope to test larger AMR parser models in the coming weeks.

Recent Strand 1 Advances in AI Capabilities



Our Dialogue Management team was also hard at work helping our future AI Partner understand student speech. This quarter, the team worked on two dialogue systems surveys: one that describes current dialogue models and architecture, and another focused on designing human-centered dialogue systems. The latter explicitly recognizes the different stakeholders in the dialogue process and focuses on the areas of end-user needs, design values, and data collection as well as an evaluation of these systems.

What Can Our AI Partner Understand & Do?

As several teams work toward creating the ears and eyes for the Partner, other Strand 1 teams—with the help of Strands 2 and 3—are working to help the Partner understand what to do with this information.

The Annotation team worked toward creating annotations that will help our AI Partner detect which students are working toward the assigned task and which students are off task. On-task students might be talking about the content of the class, for example, or they might be talking through a group assignment. The group also hopes to annotate "attentiveness" and "mind-wandering," as well as students who are moving the conversation forward. As their work progresses, the Annotation team will work closely with Strand 3 for guidance on socially relevant annotations, such as inclusive speech versus harmful speech.

While the Annotation group strives to help our AI Partner understand what constitutes on-topic and off-topic behavior, the Reinforcement Learning (RL) — a machine learning paradigm that allows AI agents to learn how to take actions (i.e., learn policies) in an environment by interacting with it or by observing others' interactions — team focuses on enabling the AI Partner to learn and improve discourse policies from real interactions in the classroom. The team works closely with our Strand 2 experts on Collaborative Problem Solving skills to understand which policies will help the AI Partner learn. During this quarter, the RL team developed a new RL approach that enables them to teach a single agent to learn a basket of policies instead of only one. In the coming quarters, the team hopes to adapt their approach to the classroom with the goal of seeing if they can tune the AI Partner's behavior on the fly to match teachers' changing objectives.

Exploring Collaboration Dynamics

Strand 2

A big part of iSAT's mission is to create an AI Partner who helps teachers facilitate collaborative and equitable learning outcomes for small groups in the classroom. This quarter, the team science and human-computer interaction experts in Strand 2 have made important progress in understanding the framework needed to help small groups develop successful collaboration skills and how to support teachers help their students develop these skills.

What Skills Should Our AI Partner Develop?

Strand 2's Framework Development team is dedicated to figuring out a huge overarching question for our institute: *Exactly what skills should our AI Partner help students develop?*

To answer this question, the team hammered away at developing a framework of collaborative problem-solving (CPS) skills our future AI Partner will learn so it can assess and encourage small group interactions.

The team's main goals are to determine behaviors and skills that underlie successful collaborative problem-solving. The team formulates metrics to measure these skills with a focus on how skills emerge over the course of problem solving and with the goal to model metrics in real time, such as the state of CPS can be fed to the teacher and/or AI Partner.

While closely collaborating with Strand 1's Reinforcement Learning team on the CPS skill measurement, the team will use data collected as part of the AI Collaborative Learning (AICL) environments work underway by Strand 2 to test the assumptions of the framework and further develop metrics used to asses CPS. In addition, the team is also using data collected from a previous NSF-funded project on remote CPS, in which teams collaborate within a Minecraft (a popular sandbox video game) task, to create influence metrics that will be adapted as part of this framework. This study is the first step in formulating a finalized metric for the equitable interaction skill found in the framework. The team also collaborates with Strand 3 to assess what actions should be taken in response to the measurement of a skill.

Collaborative Problem Solving (CPS) Skill	Predominant Problem Solving Phase
Building/assessing understanding	Understanding problem
Social Cohesion	Team building
Engagement	Coordination
Negotiation	Reflecting and checking work / Understanding problem
Consensus Reached	Understanding problem
Planning/enacting plans	Understanding problem
Trust	Team building
Adapting team role/social role	Coordination
Equitable interaction	Coordination
Questioning/seeking help	Coordination / Team building
Member checking	Reflecting and checking work / Understanding problem
Reflection	Coordination

CPS skills and their corresponding problem solving phases.

How Will Our AI Partner Talk to Teachers?

While the Framework Development team has been hard at work figuring out the most effective CPS skills to measure and implement, the Classroom Orchestration group has spent the past quarter collaborating with K–12 teachers on the best ways to present classroom data to teachers in real time.

The Classroom Orchestration team conducted two participatory design studies with eight Wisconsin-area teachers to determine what type of information would be most useful to them on a teacher dashboard. With the teachers' input, the team created



Strand 2 co-lead Leanne Hirshfield (right) discusses Strand 2's work on the AI Partner with Strand 2 student Elsy Meis (left) and Strand 1 postdoc Shiran Dudy (center).

dashboard mockups and further iterated on the designs with a focus on specific features.

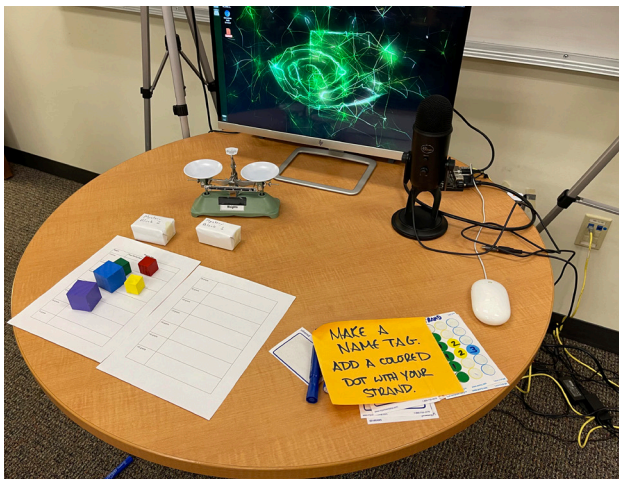
Initial analysis from the studies showed that teachers emphasized that their needs change based on the goals of each specific class. For example, some teachers preferred a general overview that directs them to where they need to focus their attention while others were more interested in diving deeper into the data to see classroom trends, to improve current and future instruction. While teachers found it helpful for group and class level information to be presented during class, most preferred information at the individual level for post-class analysis.

Based on the dashboard designs created through the Wisconsin-area participatory design studies, the team began mock-ups for dashboards to use in the University of Colorado Boulder iSAT Lab. The iSAT Lab dashboard mockups are being designed with the Sensor Immersion work by Strand 3 in mind, but they are mostly focused on designs that can span a range of curriculum activities. In the coming quarters, the team plans to develop and use the first version of their dashboard with six teachers in Wisconsin.

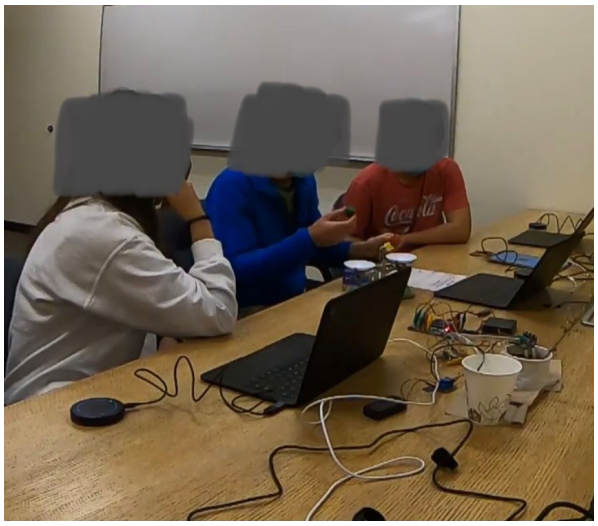
iSAT Lab Experiments

Strand 2 also led the effort to create iSAT's very own lab in CU Boulder's Center for Creativity and Innovation (CINC) in Boulder, Colorado. The lab functions as both a research study facility and a space for all students to gather, network, and collaborate.

iSAT researchers developed studies for this lab in which students, staff, and faculty at CU Boulder work on collaborative problem solving while our researchers collect video and audio recordings of their interactions on the same equipment used by our researchers to collect classroom data. The main goal for this lab work is to test collected data on Collaborative Problem Solving skills to advance team science and to look into human-AI teaming strategies. These recordings will also further help our Strand 1 researchers with their data annotation, multi-modal, and content analysis efforts by providing them with cleaner, easier-to-process data than what is collected in noisy K–12 environments. The various teams will then use their improved data analysis processes to optimize our K–12 classroom data.



A fibonnaci weights task setup in iSAT's new lab.



Research particpants engaging in a collaborative task in the iSAT Lab.

Creating Equitable Learning Outcomes

Strand 3

During this quarter, our Strand 3 researchers continued working directly with K–12 students and teachers to ensure iSAT fulfills its mission to create equitable and socio-collaborative learning experiences for all students. Strand 3's work over the quarter amplified the voices of students from all backgrounds to inform the data analysis work of our Strand 1 researchers and the team science and human-computer interaction work of our Strand 2 researchers.

Helping Students Understand AI

Strand 3's Co-design team engaged with K–12 students and teachers to co-design a middle school unit focused on helping students understand, critique, and design basic AI systems. The educators who have been involved include two leaders from iSAT's partner districts, as well as teachers of educational technology, English Language Arts, World Geography, Mathematics, and history. They also had an educator from an after-school education program focused on Media Literary and Agency.

The unit being designed presents a challenge to students: *How can we design video games and game ecologies that are free from racism?* Students are presented with evidence of bias in the design of a popular middle school video game, Minecraft, and racism in discussion forums about the game, and invited to consider the source of the problems they encounter and design solutions to them. Along the way, students learn about how chatbots work, what algorithmic bias is, how classifiers work, and on reinforcement learning.

The goal is to complete development of the unit in time for a small group of 3-4 teachers to implement the unit in spring 2022, before iterating on the unit in a way that integrates the work of Strand 1 and 2. Strand 1 and 2 researchers are already part of the extended co-design team. Since September, the team has completed a storyline for the unit, that is, a detailed outline of the lesson level questions students will investigate, what they will do in each lesson, what they learn, and what questions emerge from each lesson. In addition, the team has drafted roughly half of the lessons for teachers and engaged teacher co-designers in a weekend session where they solicited feedback on initial lesson designs.

In addition to continuing to design the unit, the team, led by postdoctoral scholar Dr. Areej Mawasi, conducted interviews with co-design participants to learn more about their experience of co-design. A key finding from the analysis was that the co-design process allowed for collaborative learning and interactivity among participants with different kinds of expertise and allowed for intergenerational collaboration. They also found intentional design aimed toward bringing together diverse forms of expertise was perceived as a "safe space" for collaboration. Educators and youth who took part in the co-design process this summer were positive about the importance of this work, which, as one educator noted, ". . . disrupts power dynamics. It disrupts our notion of what curriculum can be and look like. And then I think ultimately it infects the K-12 space with something that actually seats or has the potential to seat young people as co-conspirators in developing their own learning."

"It disrupts power dynamics. It disrupts our notion of what curriculum can be and look like."

Creating Immersive AI Experiences for Students

While the Co-design team worked toward helping students understand how bias can occur in AI applications, the Sensor Immersion team implemented a student-centered curriculum co-designed with teachers to immerse K–12 students in the fundamental concepts of AI.

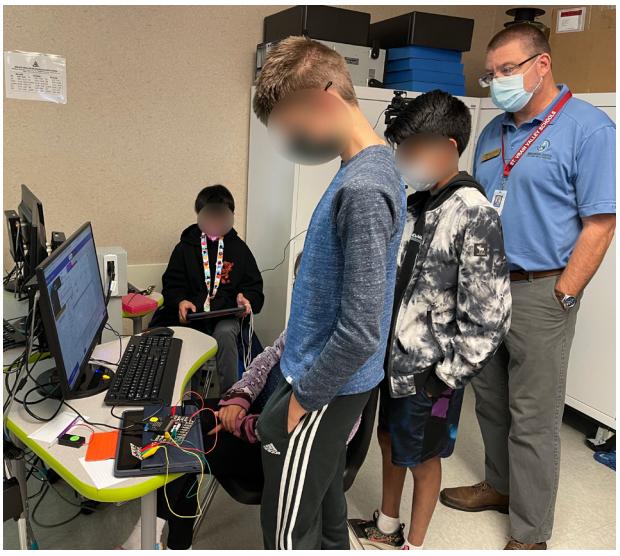
In the Sensor Immersion curriculum, students investigate a programmable sensor system called the "DaSH" (Data Sensor Hub) to engage in computational thinking. The DaSH allows students to design, program, and build a custom system to help them gather data about the world around them. They then use this data to answer questions they have and create solutions for real world problems. For example, students worked with a sensor that measured how much water was present in the soil of a plant to determine how much water was needed to help the plant survive.

The Sensor Immersion curriculum was implemented by 3 St. Vrain Valley School teachers and 9 Denver Public School teachers, reaching about 250 students in St. Vrain Valley School District (SVVSD) and 675 students in Denver Public Schools (DPS). The team also analyzed data from the pre/post surveys of student experiences of lessons 2 and 4 of the iSAT Sensor Immersion unit and started the process of prototyping visualizations, report, and dashboard



Strand 3 researcher Quinten Biddy helps SVVSD students with a Sensor Immersion task.

content for teachers and researchers to use. To help collect this data, the team worked with a group of CU Boulder Senior Software Engineering Capstone project students to instrument the Makecode environment to collect a record of all actions performed by the students. They also worked with the cross-strand iSAT Infrastructure team to build and test iSAT's new audio/video recorder.



iSAT K—12 Partner / Strand 3 researcher Axel Reitzig looks on as SVVSD students work on a Sensor Immersion lesson.

In the coming quarters, the team would like to build an extension unit with St. Vrain Valley School teachers using smart cities as a context and incorporating more AI learning standards from the AI4K12 framework. The team also hopes to build asynchronous professional learning opportunities related to Sensor Immersion to improve scalability.

What Should our AI Partner Do — and Not Do?

This fall the Learning Futures team processed the data and interactions from the summer's Learning Futures Workshop. This workshop engaged 30 high school-aged youth from California and Colorado to deliberate the role of AI in supporting classroom collaboration. During this interactive 5-day summer workshop, these youth expressed and explored their hopes and concerns of the use of AI in the classroom. The team focused on the youths' dreams for the best-case scenario use of AI in classroom settings, challenging the students to expand their imaginations about the possible ways AI could support their learning. The team also focused on the youths' concerns with having an AI Partner in their classroom and asked them to think about what they wouldn't want the Partner to be able to do.

The researchers found that the youth consistently expressed their desire for affirming interactions from an AI Partner. They want their contributions heard, attributed, and to have meaning within the classroom. However, they did not want the Partner to report any poor behavior to their teacher. The youths also want agency over the AI Partner and would like the ability to turn off the Partner at their will, but they felt they would be willing to "give up" data about themselves in exchange for features they value.

The team is currently using this information on the dreams and concerns of youth to inform the larger Institute on the role of our AI Partner in the classroom. The team hopes to have youths identify and analyze system inequalities at school and within institutions for their next workshop.

Across the Institute

iSAT's Expanded Community Hub

How do we coordinate diverse perspectives from more than 90 contributors across nine nationally distributed institutions, two school districts, two non-profits, and two industry partners? One way is through our Community Hub. We integrate all our members within this Community Hub to promote multidisciplinary collaboration, knowledge sharing, and synergies across the Institute and with external partners to ensure that the Institute is more than the sum of its parts.

To help accomplish this, the Community Hub: (1) establishes institute-wide communications (e.g., newsletter, email-lists) and broader knowledge sharing (e.g., website, social media) and helps plan the annual meetings/retreats; (2) supports management and participatory governance processes; (3) provides professional development opportunities; (4) organizes research colloquia centered around knowledge exchange; (5) coordinates research experiences for K–12 teachers and high school students; and (6) coordinates research exchanges across Institute partners and industry affiliates.

We've recently expanded the Community Hub to include members across our three strands. Postdoctoral scholars Areej Mawasi (Strand 3), Rachel Dickler (Strand 2), and Shiran Dudy (Strand 1) and Worcester Polytechnic Institute Assistant Professor Jacob Whitehill (Strand 1) have joined our Communications and Outreach Coordinator, Alayne Benson, to provide the multidisciplinary expertise needed to identify and promote cross-strand collaboration opportunities across iSAT.

The team meets bi-weekly to discuss what their strands are working on and to brainstorm how the team can help the strands make connections to improve innovation and minimize overlap. The team also helps plan various professional development opportunities for iSAT members, such as the Student Development program led by Rachel Dickler. Every month or so iSAT's undergraduate and graduate students meet in an online Student Forum that features workshops on funding, research opportunities, giving presentations, networking, writing papers, and more. Students also share-out their current projects with the group to get feedback.

The Community Hub also plans iSAT's whole team meetings, all community events, and supports the Executive Committee with any community-building initiatives, such as retreat planning. Over the upcoming quarters, the team plans to kickoff research exchanges, develop the iSAT Precollege Program, expand our public outreach, and create new professional development opportunities.

The Members of the Newly Expanded Community Hub



Shiran Dudy
Strand 1



Jake Whitehill
Strand 1



Rachel Dickler
Strand 2



Areej Mawasi
Strand 3



Amy Corbitt
Communications
Professional



Alayne Benson
Communications
Coordinator

Amplifying Members' Voices

iSAT's Executive Committee

iSAT welcomed new members into its annually rotating Executive Committee at the start of our second year. These cross-strand and cross-organizational members include Sidney D'Mello (PI, CU Boulder) who serves as the chair, James Pustejovsky (Strand 1, Brandeis University), Jeff Flanigan (Stand 1, University of California Santa Cruz), Kaleb Bishop (Strand 2, CU Boulder), Jeff Bush (Strand 3, CU Boulder), and Areej Mawasi (Strand 3, CU Boulder) with Alayne Benson serving as the committee's facilitator. Since then, the team has met frequently to reach three main goals by the end of their tenure: 1. Improve cross-strand communications; 2. Plan the yearly iSAT retreat; and 3. Plan iSAT's ethics trainings.

During this quarter, the Executive Committee has focused most of its attention on improving cross-strand communications. The team identified four possible ways to achieve this and formed subcommittees to further explore these options. One group focuses on developing an iSAT podcast and created a prototype to iterate on with the greater iSAT team. Another group focuses on developing an intranet or wiki for iSAT members. A third team explores team-building and engagement tools to try out in the various institute meetings, such as Jamboard, Gather.town, Pear Decks, and more, while the fourth group works on ways to make iSAT's meeting more inclusive for all members.

The Executive Committee presented their ideas and prototypes to the entire iSAT team later in the quarter before breaking attendees into breakout groups to provide feedback on the various ideas using Jamboard. Rounding off the meeting, the Executive Committee brought attendees back to fill out an anonymous survey to measure their meeting experience.

In the coming quarters, the Executive Committee hopes to broadly implement their plans for improving communications before moving on to planning iSAT's next retreat and our ethics trainings.

The 2021 - 2022 Executive Committee Cohort



James Pustejovsky
Strand 1



Jeff Flanigan
Strand 1



Kaleb Bishop
Strand 2
Student Rep



Areej Mawasi
Strand 3



Jeff Bush
Strand 3



Sidney D'Mello
Chair



Alayne Benson
Facilitator

Trainee Scene

Meet our awesome students and postdocs!



Jay Luther
Strand 3

Name of advisors: Dr. Tamara Sumner

Research focus: My research focuses on using AI to improve the quality of online education. My focus within this is still in development.

What are you working on? My current work is on building professional learning resources for middle school teachers centered around our Sensor Immersion project, including developing and updating tutorials for use in classrooms. I then support a few of these teachers directly in their efforts to ensure that we can record high-quality data in their classrooms. I also am the main contact with our partner Sparkfun, who develops the sensors we use in the Sensor Immersion curriculum.

How does your work contribute to iSAT? My work helps generate and collect the data that is being used in our efforts to create a collaborative AI agent. With my prior experience in computer hardware, I support teachers with their data displays and answer technical questions surrounding the sensor system and Makecode's block-based programming environment.

Upcoming publications/submissions: My poster submission to SIGCSE (Understanding Affordances of Online and In-Person Professional Learning for Teaching Integrated Sensor Systems with a Phenomenon-Based Inquiry Approach) was rejected, I am planning to adapt it for an additional submission using the feedback provided, most of which was superficial requiring small updates.

Fun fact: I lived in Germany for a year! In that time I was able to see 10 different countries and work in a German company for 6 months.



Elsy Meis
Strand 2

Name of advisor: Dr. Leanne Hirshfield

Research focus: Major: Creative Technology & Design
Minor: Writing

iSAT research focus: Human-Computer Interaction, User Experience, User Interface

What are you working on? I'm currently running a human-robot interaction study that investigates how high school-aged students of co or interact with and perceive educational robots in ways that might be different from their white peers.

How will your work contribute to iSAT? I believe social robots can be a hugely powerful educational tool. That said, in order to use them to their fullest potential, it's important that we as researchers take an informed approach and really understand how we're situating an embodied AI agent in a student's world. Social robots are at their best when they are comfortable and intuitive to work with, and we want to make sure that we are getting a diversity of perspectives when it comes to these aspects.

Upcoming publications/submissions: My collaborators and I are targeting Alt HRI, a track for the ACM Conference on Human Robot Interaction, for publishing our results.

Awards: A recent award includes the 2020 Chancellor's Fellowship



Maggie Perkoff
Strand 1

Name of advisor(s): Drs. James Martin and Clayton Lewis

Research focus: Natural Language Processing and Assistive Technology

What are you working on? I'm currently experimenting with different multi-task learning models that incorporate speech act information into a sentence-pair classification model. The goal of multi-task learning is to improve the accuracy of a primary task (in this case classifying sentence-pairs with a TalkMove) with related language tasks that can provide more contextual information for the model.

How will your work contribute to iSAT? This work will improve our ability to annotate classroom conversations with their corresponding TalkMoves. TalkMoves refer to the instructive motivation behind a particular teacher utterance, including: "Keeping Everyone Together", "Pressing for Accuracy", and "Pressing For Reasoning". We can share the TalkMoves with teachers to provide more insight into their current student interactions and in later stages of the iSAT program we can incorporate TalkMoves into a generative model for our AI partner to use. Ideally, other researchers will also be able to leverage a multi-task learning model to improve the accuracy of other tasks within our language model pipeline.

Upcoming publications/submissions: We intend to submit this work for the 2022 Artificial Intelligence in Education Conference as well as the rolling submission deadline for the Association of Computational Linguistics.

Awards: Coleman Institute Fellow

Fun Fact: This winter I will be a volunteer ski coach for the Ignite Adaptive Sports program at Eldora mountain.

New Quarter, New Faces!

Growing our team and our impact.

We're excited to welcome two new staff members to our team!

At long last iSAT has a Data Manager! We're thrilled to welcome Aravind Bisegowda Srinivas to this much-needed role. Aravind is a graduate student in the Computer Science program at CU Boulder. He comes to us from MiQ Digital, where he worked as a Software Engineer for two years developing and maintaining data ingestion pipelines and micro-services that facilitated the mangagement of programmatic ad-campaigns. As our Data Manager, Aravind works to establish and implement a data lifecycle management system that is expressly designed to support state-of-the-art natural language processing and multimodal machine learning.

iSAT's communications needs are growing, and so is our communications team! Amy Corbitt joined the Community Hub as our new Communications Professional. Amy comes to iSAT with a degree in Journalism and extensive experience in communications, public relations, and marketing. Prior to iSAT, she worked for 12 years as an editor and production manager for The Best Publishing & Distributing Company. As iSAT's Communications Professional, Amy will support our Communications Coordinator with social media, website updates, creating content, and more!



Aravind Bisegowda Srinivas
Data Manager



Amy Corbitt
Communications Professional

iSAT Publications and Outreach

Take a deeper dive into our work!

Published & Submitted Papers

Booth, B., Hickman, L., Subburaj, S. K., Tay, L., Woo, S., & D'Mello, S. K. (2021). Integrating psychometrics and computing perspectives on bias and fairness in affective computing: A case study of automated video interviews. *IEEE Signal Processing Magazine, 38(6)*, 84-95.

D'Mello, S. K., Tay, L., & Southwell, R. (in press). Psychological measurement in the information age: machine-learned computational models. *Current Directions in Psychological Science.*

Mawasi A., Cortez A., McKoy A., Penuel W. (In Review). *"It disrupts power dynamics": Co-Design Process of AI Literacies Curricula as a Space for Intergenerational Learning with Distributed Expertise*. 16th International Conference of the Learning Sciences – ICLS 2021.

Pugh, S., Rao A.R., Stewart, A.E.B., D'Mello, S.K. *Do speech based collaboration analytics generalize across task contexts?* [Submitted]. Society for Learning Analytics Research 12th International Learning Analytics and Knowledge Conference.

Sumer, O., Goldberg, P., D'Mello, S. K., Gerjets, P., Trautwein, U. & Kasneci, E. (in press). Multimodal engagement analysis from facial videos in the classroom. *IEEE Transactions on Affective Computing*.

Sun, C., Shute, V. J., Stewart, A. E. B., Beck-White, Q., Reinhardt, C. R., Duran, N., & D'Mello, S. K. (in press). The relationship between collaborative problem solving processes and objective outcomes in a game-based learning environment. *Computers in Human Behavior*.

Tay, L., Woo, S., Hickman, L., & D'Mello, S. K. (in press). A conceptual framework for investigating machine learning measurement bias. *Advances in Methods and Practices in Psychological Science (AMPPS).*

Presentations

D'Mello, S. K. (November, 2021). *Understanding human functioning & enhancing human potential through computational methods* [virtual event]. Partnering in Education Research (PIER) Fellowship at Harvard University.

D'Mello, S. K. & Philip, T. (September, 2021). *National AI Institute for Student-AI Teaming* [virtual event]. Panelist at the Center for Integrative Research in Computing and Learning Sciences (CIRCLS '21) Convening.

D'Mello, S.K. (September 30, 2021). *AI Institute for Student-AI Teaming* [virtual event]. Presentation to interdisciplinary graduate course: Intelligent Tutoring Systems. University of Central Florida.

Hirshfield, L. (2021, October 21). *Using non-invasive brain measurement to predict social, cognitive, and affective states in real time.* INC Day 2021: the Brain in Action. University of Paris, Neuroscience and Cognition Institute.

Hubbard, L.J. Guest Lecture at Colorado School of Mines: Human Robot Interaction, CSCI 436/536 with Professor Tom Williams

Online

Mawasi, A. (June, 2021). *We Are Data, a web project by Cairotronica Festival of Electronic and New Media Arts & IMPAKT, Centre for Media Culture, the American University in Cairo.* https://wearedata.impakt.nl/#Landing_Page

Dickler, R. with Society for Learning Analytics Reseach (2021, November 9). Learning with and from artificial intelligence-driven analytics. *Medium.* https://medium.com/solar-nexus/learning-with-and-from-artificial-intelligence-driven-analytics-88ee4d5ed3f"

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