

# iSAT Snapshot

NSF AI INSTITUTE FOR STUDENT-AI TEAMING

Spring 2022



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# Member Spotlight

Learn more about our members!

**M** meet Cher Harty (Clevenger), one of iSAT's Strand 3 researchers. Her research focuses

on teachers' use of Talk Moves, and she is currently working with iSAT's Data Collection

team to analyze

the data coming in from our school partners, Denver Public Schools and St. Vrain Valley School Districts.



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

**A:** The coolest thing about my research is the immense amount of collaboration I get to be a part of on a daily basis. I feel like I have an ever expanding opportunity to grow and learn alongside so many different types of individuals and professionals, while deepening my own understanding and experiences.

**Q: What's a turning point or defining moment in your work as a researcher?**

**A:** A turning point in my research

was going from wanting to gain experience in the field of research in general to knowing that this is where I am meant to be and what I want to do for the rest of my life. Knowing that there is an endless field of opportunities to advance the scientific world of education and that I can play an integral part in that.

**Q: What's your desert island book and why?**

**A:** I'm a Potter head through and through. I grew up reading Harry Potter books and whenever I am under the weather, the movies are my go to comfort, so I would absolutely need these on a desert island.

**Q: Are you a dog or cat person (or bunny, lizard, etc.)?**

**A:** While I have two precious kitties at home, I am an animal lover in general. They don't have to be cute and fuzzy for me to want to give pets and snuggles. In fact, one of my favorite pets growing up was a desert tortoise that roamed our backyard in Arizona.

## In Brief . . .

A quick look at our activities this quarter!

1. Our Executive Committee created guidelines for more inclusive and engaging meetings so all iSAT members feel empowered to share their ideas.
2. The Community Hub submitted a workshop proposal to this year's AI in Education conference to bridge the gap between AI efforts and educational stakeholders' needs.
3. iSAT's technical team built our iSAT recorder—which records and securely stores classroom data—created an automatic processor for blurring faces, and made progress on our cloud infrastructure.
4. Our iSAT researchers are mentoring a Software Engineering Capstone team of seven undergraduates!
5. The Community Hub created our Student Professional Development program, featuring our monthly Student Forums.
6. We've created new working groups focused on classroom data analysis, neuroscience of collaborative learning, Collaborative Problem Solving metrics, teacher dashboard demo, WoZ experiments, and data privacy.
7. We've hired and trained a dedicated team of researchers to collect and curate classroom data in Denver Public Schools and St. Vrain Valley School District.

## From the PI



If I had to pick three words to summarize this quarter, they would be Data, Design, & Demo.

**Data** - Building on our successful classroom data collection activities from Fall 2021, our team has continued to refine and streamline our procedures while collecting data from additional students and teachers in Spring 2022. We have also established a cross-strand working group to coordinate annotation and analysis of this rich dataset, an effort that is already bearing fruit as we are close to submitting our first publication on this dataset.

**Design** - We kicked off the quarter with an intensive in-person design sprint where teams of 15 students and postdoctoral researchers from all three strands spent three intense days envisioning potential metaphors for the AI Partner, building on the findings from the Summer 2021 Learning Futures Workshop. The fact that we were able to mobilize such a large cohort before the winter holidays and in the midst of the Omicron surge is a testament of the enthusiasm and dedication of our team.

**Demo** - We wrapped up the quarter with a goal to integrate our research findings and technologies into a proof-of-concept demonstration of the AI Partner. The demo will integrate the classroom data collection components with our speech, conversation, content, and collaboration analysis techniques, culminating in interactive student- and teacher- facing front-end components. It will entail a major cross-strand integrative effort, building off the latest research occurring in each strand. Stay tuned!



# A Metaphorical Sprint

## Brainstorming Metaphors for our AI Partner

In an effort to dive deeper into cross-strand collaboration, and to form concrete ideas that reflect the joint work of the Institute in its initial year and a half, the first iSAT Design Sprint was successfully conducted as a three day immersive in-person in mid-December, 2021. Consisting of 15 iSAT team members, including research associates, postdoctoral researchers and graduate students from all three strands, and facilitated by team members Bill Penuel, Co-Principal Investigator, Distinguished Professor - University of Colorado, Boulder, Leanne Hirshfield, Co-Principal Investigator, Associate Research Professor - University of Colorado, Boulder, and Rachel Lieber, Research Administrative Professional - University of Colorado, Boulder, the Design Sprint was a collaborative attempt to brainstorm ideas for potential metaphors for the AI Partner.

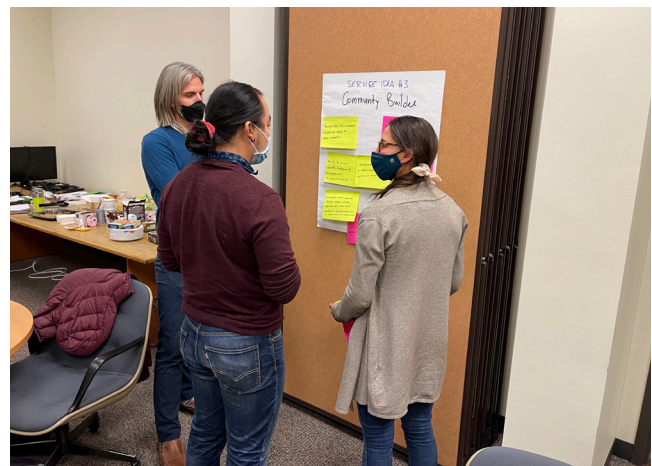
The leadership team worked together to create a vision of what the sprint aimed to accomplish, and the facilitators planned out daily activities designed to generate ideas and to elaborate on those ideas in a way that others could react to, and give input on. The Design Sprint fostered an atmosphere where the sprinters were able to create “clusters” of capabilities around which participants built scenarios of use, anticipated possible challenges, and envisioned ways to engage teachers and students as participants in fleshing out ideas and designs—all in a fast-paced environment with a pre-determined time frame.

The Design Sprint’s creators hoped to achieve several goals. Among the most important included: identifying possible metaphors for our AI Partner, narrowing in on one or more concrete design options, increasing the shared understanding of on-going progress between different strands, and ensuring that all perspectives are valued in the design process. It also provided a way for early career scholars in iSAT to develop their design thinking skills, their ability to balance trade-offs in complex Research and Development processes, and to deepen their understanding of responsible innovation within the field of artificial intelligence.

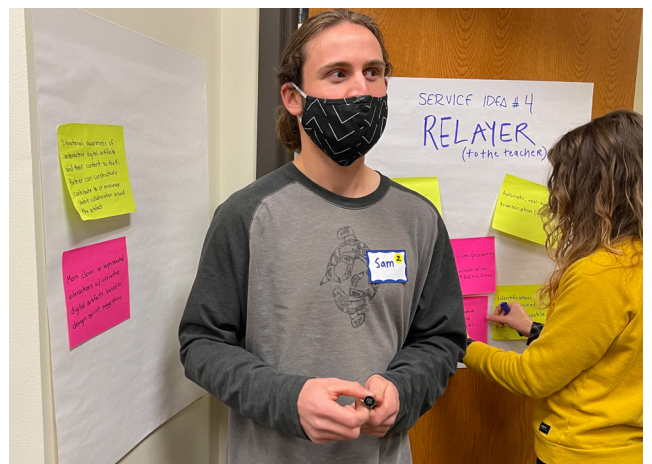
During the intense three-day sprint, the founders’ vision became a reality as cross-strand collaboration and creativity resulted in three groups spontaneously emerging around three metaphors for our AI Partner: 1. The Augmenter (“Augi”): an augmenter of teacher orchestration whose capabilities develop over time; starting as a communication partner who shares data between students and teachers via a dashboard, and



Design Sprinters sort their ideas for the AI Partner into possible metaphors.



Sprinters brainstorm possible functions for the Community Builder (CoBi) metaphor.



Sam Pugh (PhD student) explains the ideas that will eventually become the Co-Pilot metaphor.



## EXPLORE THIS QUARTER

becoming a facilitator of collaborative learning who is able to ask questions and observe student behavior as a way of supporting teacher instruction. 2. The Community Builder: the AI agent (“CoBi”) identifies, encourages, and supports many forms of collaborative participation in small groups—with an emphasis on equitably uplifting non-normative forms of collaboration. CoBi is non-intrusive, interactive, and receptive to student/teacher feedback. 3. The Interactive Co-Pilot: using digital artifacts (e.g., code blocks) and group communication (e.g., transcribed speech, participation dynamics, multimodal contributions to solve problems) to evaluate a group’s collaborative problem solving process, then convey this information to the teacher, as well as support students to engage in constructive and equitable collaboration. The leadership team provided daily feedback for the sprinters, helping them further explore the ideas for these metaphors.

Both the Sprint facilitators and participants emerged from the Sprint with the overwhelming feeling of productivity in not only the ability for participants to generate feasible, tangible ideas about our AI Partner, but in building community and excitement around the challenging work that lies ahead. Facilitator Leanne Hirshfield said, “I was so impressed and excited to see the way the different stand members from different



Our sprinters relax after three days of intense brainstorming.



Design Sprinters enjoy a windy Colorado hike to kick-off the brainstorming sessions. Back left-to-right: Jeff Bush (Research Associate), Rachel Lieber (Design Sprint Co-Lead), Indrani Dey (Student), Alayne Benson (Communications Coordinator) Front: Sidney D’Mello (Principal Investigator)

backgrounds (e.g., natural language processing, learning sciences, content analysis, team science) established common ground and talked through and considered metaphors and design ideas through lenses of different disciplines. Also, most of the Sprinters have spent the start of their iSAT experiences in many, many, many remote zoom meetings, due to the pandemic. To get them all together in a room and feel that energy, enthusiasm, and creativity—it was incredible!!”

Since the conclusion of the Design Sprint, sprinters, along with other iSAT students and postdocs, have been thinking critically about ways to move forward with their metaphors while engaging with students and educators. The groups are working on their own respective conjecture maps, which is a tool used by learning scientists to make clear connections between design decisions and hypothesized outcomes. In particular, the maps are a flow chart that connect the research used to inform the design, the design decisions, how designers think individuals will interact with the design, and the outcomes that are expected as a result of those interactions. They will then come together to form a combined conjecture map analyzing which aspects are compatible or connected from their individual conjecture maps - and focusing on capabilities that are a priority to bring to students and educators. In the near future, they will be working on ways to communicate their ideas to youth and educators and engage in more cross-strand discussions around what iSAT can learn from its community partners.

# A Chatty Agent

## Strand 1

**D**ata, data, and more data! Strand 1 spent our second quarter analyzing the copious amount of student collaboration data from iSAT's fall data collection efforts in classrooms. This research team is tasked with helping the AI Partner make sense of this data to function as an interactive agent that can listen, analyze, and facilitate student collaboration and learning. With six working groups dedicated to the myriad challenges of this task, Strand 1 has exciting progress to report.

### Synergy of Speech and Sight

Strand 1's Multimodal working group helps ensure our AI Partner will be able to understand different modes of human communication, such as speech and gestures. The group focuses on speaker diarization (how to tell who's speaking when), Automatic Speech Recognition (ASR), and computer vision. To ensure the data iSAT collects will facilitate these efforts, the team tests various cameras and microphones to provide specifications and classroom placement recommendations to Strands 2 and 3 for data collection. In addition, the team informs the Fibonacci Weights experiment guidelines for iSAT's Lab Experiments by running the lab's partner location at Colorado State University.

The team is also leading the effort to integrate ASR, diarization, and other technical components into a functional software pipeline for the AI Partner.

Our Speech Recognition team supports these efforts by enabling our AI Partner to recognize the various complexities of human speech. This quarter, the team built pipelines for filtering out background noise based on speaker verification so our Partner could more easily "hear" and understand what students are saying. These pipelines can convert and segment audio, run automatic speech recognition (ASR), and evaluate ASR quality.



Study participants in the iSAT Lab collaborate on the redesigned Fibonacci Weights activity.

### A Natural Communicator

While our Multimodal and Speech Recognition groups have been busy working on our AI Partner's "ears" and "eyes," our Content Analysis, Annotation, and Dialogue Management & Reinforcement Learning (RL) groups have been working toward helping our Partner understand what it's hearing and seeing.

The Content Analysis group focused on their AMR annotation efforts on the data collected from DPS and SVVSD students working through the Schoolwide Labs Sensor Immersion curriculum as well as other related classroom data and teaching materials. This work will help our AI Partner understand key content words and concepts uttered by students. The team will also use these content words to evaluate our ASR quality and on-topic/off-topic detection (i.e., can our AI Partner identify when students are engaged in the topic or are otherwise attending to other matters?). The team hopes to have a preliminary classifier in place by the end of March.

The Annotation group worked in a similar vein, exploring the similarities and differences between standard dialogue act annotation (or segmenting dialogue into grammatical units), Rhetorical Structure Theory (RST), and teacher and student Talk Moves to determine what can be effectively leveraged for guiding our AI Partner's analysis of conversation quality and eventually guide its actions. This work will also assist in enabling our Partner to identify when student groups are on-topic and off-topic, and if each student is engaging constructively in the discussion.

The Dialogue Management & Reinforcement Learning (RL) group was busy submitting papers this quarter! First, a position paper that sheds light on human-centered aspects to consider when developing a conversational system, spanning from data collection to end-user needs, through which we can create more humane technologies. Second, a dialogue system survey that provides a thorough description of best practices, datasets, and future directions. The team also ran multi-objective reinforcement learning (MORL) preliminary experiments designed around a real-world evaluation setting to enable our AI Partner to learn how to adapt to changing objectives in the classroom. This group also started developing a Wizard of Oz (WoZ) design to test and iterate with the help of middle schoolers. This will help the team determine if an embodied agent, or an agent with a physical body, would be more effective with middle schoolers than a disembodied agent, such as a voice from a computer.

### Building iSAT's Technical System

The cross-strand Build the System group contains members from Strands 1 and 2 along with professional technical staff and our development partners with the goals of designing the software components and architecture for the AI Partner. This group will merge and showcase these efforts in a demo of the scientific components (e.g., speech recognition, speech diarization, content analysis) that will process classroom input data and output to a front-end display to inform the design of dashboards for the classroom.



# Creating Collaborative Spaces

## Strand 2

**O**ur second quarter was a busy one for Strand 2! The team formed a new working group focused on the neuroscience of collaborative problem solving, formed stronger connections with Strands 1 and 3, collected group collaboration data, and started initial teacher dashboard designs. Here's how this dedicated team of human-computer interaction and team science experts helped iSAT take a step toward preparing our AI Partner to promote student collaboration and learning.

### Your Brain on Collaboration

What goes on in your brain when you work and learn with others? The new Neuroscience of Collaborative Problem-Solving working group is dedicated to answering this question and more. This newest working group in Strand 2 conducted a literature review of the neuroscience of learning and associated topics, including collaborative problem solving and neural synchronization among collaborative groups to kick off their experimental brainstorming setups.

The team plans to adapt techniques outlined in Terri A. Dunbar and Strand 2's Dr. Jamie Gorman's paper, "Using Communication to Modulate Neural Synchronization in Teams," in which the researchers split neurodynamic states into nine symbols showing the activity levels for both of the team members individually as well as in the context of the other team member. These were then evaluated in terms of neural synchrony between pairs of participants.

The team is working closely with Strand 2's Framework Development and CPS Metrics groups to help them evaluate neural synchrony in classroom settings and how iSAT's future AI Partner could assist groups of students with staying on task.

### Coding Collaborative Problem Solving

Beyond working with the new Neuroscience of Collaborative Problem-Solving group, the Framework Development group has been busy developing a Collaborative Problem Solving (CPS) skill and annotation codebook to use with the data iSAT collected at Denver Public Schools and St. Vrain Valley Schools this past fall.

The team has also created a framework-adjacent working group called CPS Metrics, in which the team works with members from Strands 1 and 3 to work on different communications and discourse annotation schemes and ways to measure non-normative CPS skills, respectively.

### Teacher-informed Dashboards

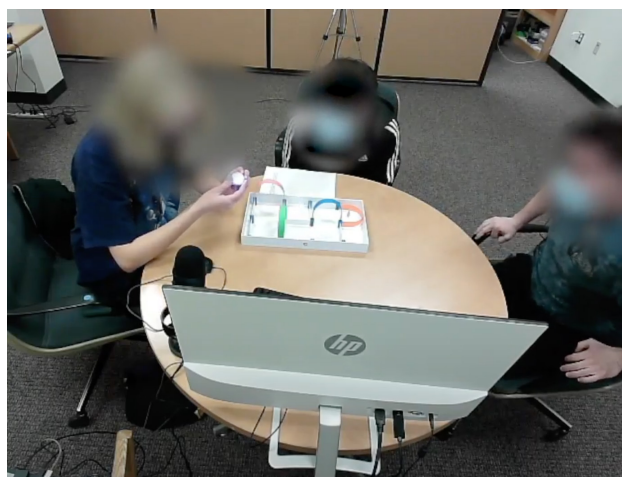
The Classroom Orchestration/Teacher Dashboard working group led the effort to collect feedback from our entire institute on interview protocol for teachers on design of the interactive, user-facing teacher dashboards the team is working on. The team will use this feedback to inform their teacher interviews over the next quarter. After which, they'll bring the results of the interviews to the iSAT team to begin the initial teacher dashboard design.

### New and Improved Experiments!

With a fresh IRB approval in hand, the iSAT Lab Experiments team has set out to collect data on five new activities to better assess team collaboration dynamics. These activities include the Wason Card Task, a new version of the Fibonacci Weights Task, an updated MakeCode Sound Sensor Activity, a new Sphero Task, and a Board Game Task. Strand 1 helped the team with the development of the new tasks as well as the setup of recording equipment for the lab.



iSAT Lab setup with a webcam, Yeti mic, Kinects, and Tobii Eye Glasses.



Study participants collaborate on the new Sphero task in which they program a ball to go through a maze.

# Engaging All Learners

## Strand 3

Over the last quarter, our Strand 3 researchers have continued their work with K-12 students and teachers in classrooms. By empowering our diverse stakeholders to envision and co-design AI learning technologies, the Strand 3 team is starting to hone in on what capabilities would be most useful in our AI Partner from a student's perspective. Strand 3's emphasis on conceptualizing equity in implementation of AI, expanding forms of classroom engagement, and keeping ethical concerns such as privacy and the unequal distribution of harms at the forefront, are helping to ensure iSAT fulfills its mission to create equitable and socio-collaborative learning experiences for all students.

### Helping Students Understand AI through Video Games

A primary goal for the Co-design team this quarter was to complete the first version of a 9-lesson unit on AI for middle school classrooms. To engage the students, the team adopted a "detective narrative" approach across the unit lessons—having the students look for clues and answer questions—with the purpose of helping the students reach their own conclusions about what causes games and gaming ecologies to be harmful to people because of their race and how video games can be designed free from bias.

In order to get the students thinking about what is actually involved in video game design, another important component of developing the lessons consisted of Strand 3 researchers interviewing six game designers, Zoyander Street, Cooper Sanghyun Yoo, Tracy Fullerton, Liz Fiacco, Malik Toms, and Liz Fiacco. These interviews are being used as part of the unit, in which students learn about the game designers' inspirations, goals when they design games, stories they tell through games, and features involved in game design. To support completion of the unit, they expanded collaboration with experts in AI education and game experts to assist in laying the groundwork in the building of the unit. Specifically, the co-design process of the unit extended to involve AI education consultant, Beverly Clarke, who is assisting the team in developing lessons that address major AI concepts.

The next step is getting the unit into the middle school classrooms. Strand 3 has already teamed up with two teachers who will begin Professional Learning in spring and be ready to implement shortly after. Expanding on that, the team is also in the planning stages of a summer Professional Learning workshop where they will introduce the unit to 16 teachers who will implement it in the fall of 2022.

### Imagining Learning Technologies with Learners

Building on the success of last summer's Learning Futures workshop, the team has been focusing on planning for the upcoming spring workshop. By engaging high-school aged youth to help us understand what students want and need our AI Partner to do, we can both increase the usefulness of our AI Partner as well as minimize concerns as to what it shouldn't do. Next quarter, the Learning Futures team will finalize planning for the spring workshop. The feedback these workshops

generate is essential to informing the larger Institute on the role of our AI Partner in the classroom.

In the meantime, team members continue to write and submit additional papers based on data and observations from the summer 2021 workshop including one titled "Conceptual Paper on Relational Privacy for Pedagogical Agents." They also continue to collaborate with Strand 1, hammering out specifics of the feasibility of various desired technical features.

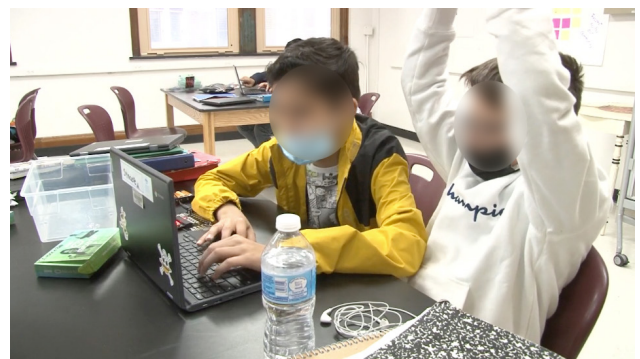
### Expanding Teacher Support

After successfully deploying a student-centered curriculum co-designed with teachers to immerse K-12 students in the fundamental concepts of AI last fall, the Sensor Immersion team has been busy expanding their support for teachers who are using the curriculum along with continuing data collection. The team is currently co-designing the next round of curriculum with Saint Vrain Valley School District teachers.

Over the last quarter, five teachers implemented the Sensor Immersion curriculum in their classrooms—where students investigate the programmable sensor system called the "DaSH" (Data Sensor Hub) to engage in computational thinking and gather data about the world around them. As the Sensor Immersion team learns more about what data is useful and what data could be improved, they are making plans for a refined data collection tool. Being able to identify what the students are specifically doing on the screen (e.g., code being used, any collaboration occurring) will greatly improve the depth of data being collected.

Another major goal for the Sensor Immersion team is to improve curricular resources aimed at supporting the teachers and they are doing this by developing new tutorials and increasing support for hardware and debugging.

In the upcoming months, the Sensor Immersion team will finish the new co-design extension / curriculum with the teachers. They are also in the process of recruiting and onboarding new teachers to work with as well as positioning current teachers to lead sub-groups. The team will also continue to improve and expand learning resources for the teachers.



DPS students celebrate solving a Sensor Immersion exercise together.

## Meet our awesome students and postdocs!



## Michael Chang

### Strand 3 Postdoc

**Name of advisors:** Drs. Thomas Philip and Jeremy Roschelle

**Research focus:** Participatory co-design, data privacy, distributed systems

**What are you working on?** At iSAT, I work on the Learning Futures Workshop, which surfaces the dreams and hopes of youth around the use of AI in classrooms. Our work shows how social dreaming in these co-design contexts are simultaneously constrained by both educational institutional and algorithmic imaginations. Additionally, I consider how to translate those findings into the design of data infrastructure platforms. I have developed a framework for designers to consider how privacy decisions may come

to shape learning inside the classroom.

**How does your work contribute to iSAT?** In accordance with the Institute's commitment to Responsible Innovation, the findings from the Learning Futures Workshop have come to shape the work of iSAT. In the aftermath of the first Learning Futures Workshop, we held an inter-strand design sprint where researchers considered an AI agent that would support youth in developing their ideal collaborative relationships with each other (a major finding from the first workshop). Additionally, we expect our novel data privacy framework to be central to the design of the data infrastructure of the AI agent.

**Upcoming publications/submissions:**

- Submitted to ISLS: Refining Conjecture Mapping for Interdisciplinary Collaboration
- Submitted to RCR: Engaging Youth in Envisioning AI in Classrooms (Lessons Learned)
- Submitted to ETR&D: A pedagogy-centered data privacy framework for classroom technologies

**Student awards:** NSF GRFP (2016)

**Fun fact:** I enjoy tidepooling in Northern California! It can also be fun to do a little ocean foraging; I've foraged seaweed, sea urchins, and mussels in the past.



## Cara Spencer

### Strand 2 Student

**Name of advisor:** Dr. Leanne Hirshfield

**Research focus:** Measurement and prediction of performance and cognitive processes using unobtrusive sensors.

**What are you working on?**

I am in Strand 2, working with the Framework Group and the Neuroscience of Learning and Collabora-

tion Group. I also help out in the AICL Lab where we are collecting data for our multi-modal collaboration research. I am currently creating a text mining script for the Dashboard.

**How will your work contribute to iSAT?** My background in cognitive science and multi-modal research is informing the research design in the AICL Lab and will inform

the analysis in the future. My work also includes our Neuroscience of Learning literature review that is the foundation for the goals of this working group. The text mining script I'm writing will be a part of the suite of capabilities our Dashboard will provide.

**Fun Fact:** I am a huge space nerd and hope to go to space one day.





## Zeqian Li

### Strand 1 Student

**Name of advisor:** Dr. Jacob Whitehill

**Research focus:** Analysis of educational videos with the help of deep learning techniques

**What are you working on?**

Speaker diarization (who spoke when) using both audio and visual information in classroom videos.

**How will your work contribute to iSAT?**

I am working on the speaker diarization module of the system. It can help teachers to know the amount of each student's participating time as well as who is talking at every moment.

**Fun Fact:** I can score MegaStar in a lot of *Just Dance* songs even though I don't do real dance at all.

## New Quarter, New Faces!

### Growing our team and our impact.

**W**e're excited to welcome three new members to our team!

Sierra Rose recently joined our team as a Professional Research Assistant. She assists the Classroom Data Collection team with their data collection efforts in Denver Public Schools (DPS) and St. Vrain Valley Schools (SVVSD). She comes to us from the Emotive Computing Lab at the Institute of Cognitive Science. Sierra has a B.S. in Cognitive and Behavioral Neuroscience and a minor in Computer Science from the University of California, San Diego.

B. Fortunato Agostinho da Silva joined iSAT as a Student Research Assistant. They work with the

Classroom Data Collection team on collecting and analyzing data from our DPS and SVVSD partners. They're currently working on their BS in Computer Science at the University of Colorado Boulder where they also serve as an Instructor's Assistant.

Natalia Wojarnik is a new Data Annotation Analyst for our Classroom Data Collection team. She works with cataloging, cleaning, and annotating our collected data from DPS and SVVSD. She is currently an MS student in Computational Linguistics at the University of Colorado Boulder, focusing on text analysis, text engineering, and data science for linguistics.

Welcome, Sierra, B., and Natalia!



Sierra Rose  
Research Assistant



B. Fortunato Agostinho  
Research Assistant



Natalia Wojarnik  
Data Annotation Analyst

# iSAT Publications and Outreach

Take a deeper dive into our work!

## Published & Submitted Papers

Dey, I., Dickler, R., Hirshfield, L., Goss, W., Tissenbaum, M., Puntambekar, S. (2022). *Using participatory design studies to collaboratively create teacher dashboards*. (Submitted). Artificial Intelligence in Education Conference – AIED 2022.

Dickler, R., Hirshfield, L., Tissenbaum, M., Puntambekar, S., & Dey, I. (2022). *Using human-in-the-loop features to redefine AI dashboards*. (Submitted). Artificial Intelligence in Education Conference – AIED 2022.

Dudy, S., Koh, J., Ebrahimi, A., Rieser, V., Roncone, A., Kann, K. (2022). *Dimensions of human-centered conversational systems*. (Submitted). Transactions of the Association for Computational Linguistics – TACL.

Gorman, J.C., & Wiltshire, T.J. (2022). A typology for the application of team coordination dynamics across increasing levels of dynamic complexity. (in press). *At the Forefront of Human Factors and Ergonomics*

Harrison, J., Jain, S., Dunbar, T., Gorman, J., Varma, S. (2022). *Toward automated detection of phase change in team collaboration*. (Submitted). Cognitive Science Society 2022.

Kann, K., Ebrahimi, A., Koh, J., Dudy, S., Roncone, A. (2022). *Open-domain dialogue generation: what we can do, cannot do, and should do next*. (Submitted). Association for Computational Linguistics.

Hunkins, N., Kelly, S., D'Mello, S. K. (2022). "Beautiful work, you're rock stars!": Teacher Analytics to Uncover Discourse that Supports or Undermines Student Motivation, Identity, and Belonging in Classrooms. Proceedings of the 12th Learning Analytics & Knowledge Conference (LAK 2022). New York: ACM.

Pugh, S., Rao A.R., Stewart, A.E.B., D'Mello, S.K. (2021). *Do speech based collaboration analytics generalize across task contexts?* (Accepted). Society for Learning Analytics Research 12th International Learning Analytics and Knowledge Conference.

Pustejovsky, J., & Krishnaswamy, N. (2022). *Multimodal semantics for affordances and actions*. (Accepted). International Conference on Human-Computer Interaction.

Zeqian, L., Xinlu, H., Whitehill, J. (2022). *Compositional affinity propagation: when clusters have compositional structure*. (Submitted). International Conference on Machine Learning – ICML 2022.

## Presentations

D'Mello, S. K. (February, 2022). *National AI Institute for Student-AI Teaming*. Thirty Sixth Conference of the Association for the Advancement of Artificial Intelligence (AAAI-22).

Gorman, J.C., (February 2022). *Measuring real-time team coordination dynamics: extensible models and metrics for human-AI-robot teaming*. Arizona State University Center for Human Artificial Intelligence and Robot Teaming.

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