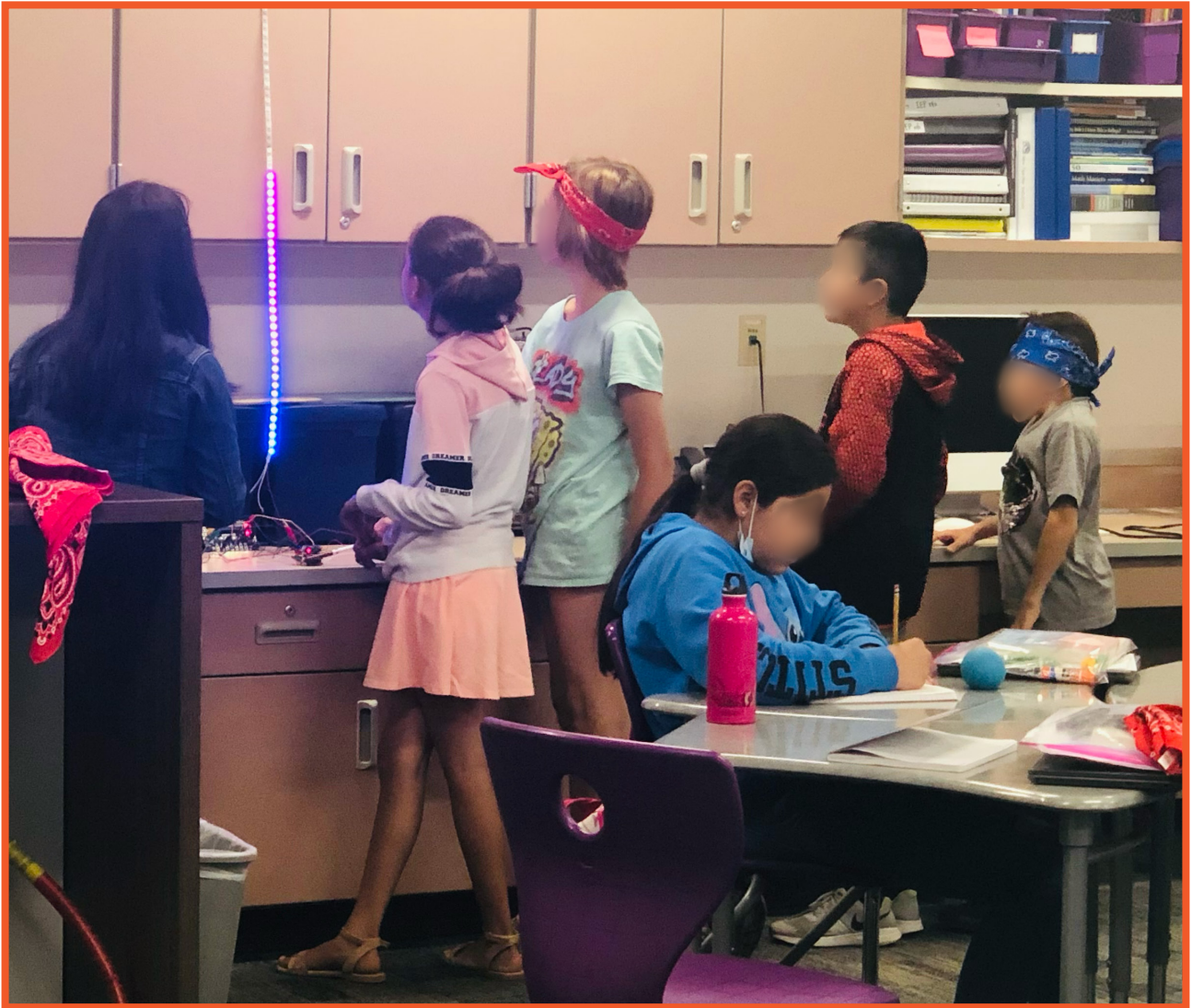


iSAT Snapshot

NSF AI INSTITUTE FOR STUDENT-AI TEAMING

SUMMER 2021



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Member Spotlight

Learn more about our members!



Meet Dr. Arturo Cortez, one of iSAT's

Strand 3 researchers and assistant professor in the University of Colorado Boulder's School of Education. Arturo's research explores "how teachers collectively design for transformative and humanizing learning environments that leverage the everyday cultural practices of nondominant youth in urban settings."

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

A: Ever since I was a teacher in K-12, maybe even when I was a kid, I have been interested in the role of technology in education. I've really loved thinking about how new media, like video games, Twitch, Twitter, TikTok are taken up by young people and how it helps them develop and transform cultural practices. Artificial intelligence undergirds a lot of these platforms... not only do I want to learn more about how AI works, how it mediates my existence, but I want others to learn about it, too and to adapt it and bend it and transform it towards consequential purposes... for justice and

for equity.

Q: What is the coolest thing about your research?

A: The coolest thing about my research is that I get to be a learner over and over again. I love being taught by young people; there is nothing more incredible than when a young person invites you into their world and shares their expertise. It feels like I get to learn a secret language, practice, and way of life. In particular, the way that video games are played now has opened my eyes up to many different learning environments that young people traverse through their lives.

Q: Have you ever met anyone famous?

A: Dolores Huerta. I danced salsa with her under the rotunda at a party in DC once!

Q: What's your favorite band or genre of music?

A: NWA. This is journalism at its finest (h/t Robin D. G. Kelley).

Thank you, Clayton

A tribute to a distinguished career.

A big congratulations to iSAT's very own Dr. Clayton Lewis on his retirement after a remarkable career.

As a member of iSAT's interim Executive Committee, Clayton helped develop our bylaws, inclusiveness policy, and conducted our first internal iSAT feedback survey.

Those in the field of human-computer interaction have no doubt encountered the work of Dr. Clayton Lewis. As professor of Computer Science, Institute Co-Director for Technology at the Coleman Institute for Cognitive Disabilities, and Fellow of the Institute of Cognitive Science,



his work contributed to cognitive assistive technology, programming language design, educational technology, cognitive theory in causal attribution and learning as well as to two methods of user interface design still in regular use in software development organizations around the world.

Through this exceptional and multifaceted work, Clayton's influence has touched the lives of almost anyone who has interacted with a computer.

Thank you for your innovative and impactful research, Clayton!

From the PI



So much has happened since our last newsletter in April 2021. In addition to kicking off our research, training, and outreach in high gear and welcoming many new friends and colleagues, some of us had the pleasure to meet face to face for both social interactions and for intense work sprints. Plans are afoot to facilitate more in-person interactions for our team in Boulder and across the country.

The summer was also a time for reflection. We presented our vision and Year 1 (well seven-month) accomplishments to our esteemed External Advisory Board (EAB) and the National Science Foundation (NSF). I'm delighted to report that both were very impressed with our progress. To quote the EAB, "Embarking on this journey amidst a global pandemic presented innumerable challenges that the iSAT team has adeptly responded to. The team should be commended for the progress and achievements attained during this portion of the first year." Please take a moment to cherish this accomplishment, your role in making it happen. Also, please accept my gratitude for your amazing contributions to iSAT.

The EAB, NSF, and our own self-study conducted by our Executive Committee also provided us with several valuable insights and suggestions. We have given these considerable thought and are implementing several new initiatives over the next several months to make iSAT more effective, efficient, and to deliver a more rewarding experience. Stay tuned!

In summary, Year 1 has been an eventful and exciting journey. I don't know what Year 2 will bring but I'm sure it will be filled with adventure as iSAT enters its terrible twos :)

Happy Birthday, iSAT!

Celebrating one year as the NSF AI Institute for Student-AI Teaming.



Neither COVID nor IRBs nor faulty Zoom calls stay this institute from our mission. The NSF AI Institute for Student-AI Teaming (iSAT) had a busy first year, despite the numerous challenges set by starting an institute in the midst of a pandemic. Within the first three months of launch, we built up our infrastructure and kickstarted our essential activities. By six months, we developed a grant program for our students and postdocs, who are now busy at work on their iSAT-funded projects.

At eight months we filled our External Advisory Board with a star-studded team of researchers and began implementing their feedback on our institute in earnest. Our annual report on our progress to the National Science Foundation was due hot on the heels of our annual EAB meeting, and all hands were on deck to draft our 350 page report! We virtually met with several NSF members to give an overview of our first eight months, and gave a deeper

diver into the research of our three strands, which made for a busy (and consequentially, newsletter-less) third quarter.

In the few months leading up to our one year as an institute, we got researchers into classrooms to work with teachers on our Sensor Immersion Curriculum. We formed a cross-strand team dedicated to collecting classroom data to help develop our AI Partner. This team collected student collaboration data with different microphones to inform future data collections. We also finished our first Learning Futures Workshop to help design the future of AI with young people and our first co-design workshops with teachers and students to develop our storyline unit.

Want to learn more about what all of this means for the future of AI in education? Check out this issue's features on our three research strands!

9 Months, 13 Big Accomplishments (and counting)!

1. Successfully launching the Institute
2. Standing up the Community Hub
3. Multidisciplinary learning & integration towards a shared vision
4. Integrating multiple organizations to develop synergies
5. Building shared values for multidisciplinary and community building via a retreat
6. Launching the iSAT Trainee Grant Program
7. Data curation to facilitate foundational AI research
8. Discovering the stochasticity of future talk
9. move prediction
9. Algorithms that use compositional embeddings to identify multiple simultaneous speakers
10. Grasping the realities of foundational AI research in classrooms
11. Development of the AI-enabled Collaborative Learning Environment (AICL)
12. Implementing the Sensor Immersion Curriculum Unit in classrooms
13. Strategic Partnership with Digital Promise

Co-designing the Future of AI in Ed

Strand 3

The work of our Strand 3 research thrust—which focuses on empowering diverse stakeholders to envision and co-design AI learning technologies—is integral to meeting our central challenge of promoting deep conceptual learning via rich socio-collaborative learning experiences for all students.

To help meet this challenge, our Strand 3 researchers completed the first Learning Futures Workshops this quarter. This workshop focused on engaging nearly 30 high school-aged youth from California and Colorado in reconceptualizing school-based collaboration and designing our AI Partner based on these ideas. The work with these young people is crucial to our understanding of what students 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.

Strand 3 is also co-designing, implementing, and studying innovative middle and high school STEM curriculum supporting AI education, working in close partnership with administrators, educators, and students from Denver Public Schools (DPS) and St. Vrain Valley School District (SVVSD). To this end, the team developed a storyline for a middle school unit that will focus on AI in gaming. A storyline is an outline for a unit that specifies a flow of lessons that build on one another to solve a problem or explain a phenomenon. A possible unit focus was selected through an interest survey given to students, and would engage students in developing understanding of how computers learn in the context of exploring whether games students enjoy like, *Grand Theft Auto*, can be racist. The team recruited teachers for summer workshops and attended professional learning opportunities; then they developed and offered a course on storylining to build capacity for co-design with our K–12 participants and internal iSAT researchers. It is expected that many of the teachers participating in summer co-design workshops will also pilot test the resulting units next year.



Strand 3 researchers Jay Luther, Quentin Biddy, and Jeff Bush work with Denver Public School teachers on the iSAT's Sensor Immersion training.

This quarter, the Sensor Immersion working group revised the Sensor Immersion unit to include more opportunities for productive and authentic student collaboration with the aim of expanding and strengthening the unit to provide an excellent testbed for future AI partners. In this revised unit, students discuss norms and roles for group work, then



An Eagle County student signals their approval of our Sensor Immersion curriculum during STEM week.

develop expertise in wiring and programming one sensor. At the end of the unit, students are placed in new groups with one expert for each sensor where they build a multi-sensor display to help them investigate personally meaningful and/or community relevant scientific phenomena and issues.

A significant component of Strand 3's work this summer was designing and offering professional learning workshops for teachers from participating districts that will be implementing the Sensor Immersion unit this fall. Six SVVSD teachers joined us for three days of Sensor Immersion training where they learned about the SI curriculum, built their own data displays, and engaged in discussions about pedagogy and curricular adaptation. The group has mixed prior experience with programming and sensor hardware, which we anticipate will further strengthen the generalizability of our curriculum. We also added seven new teachers to our DPS cohort which now totals 13! In early August, the DPS new teachers went through a similar training to the SVVSD teachers and then were joined by returning teachers to learn about updates to the Sensor Immersion curriculum, discuss pedagogy, and do rehearsal and role play to get ready for teaching Sensor Immersion.

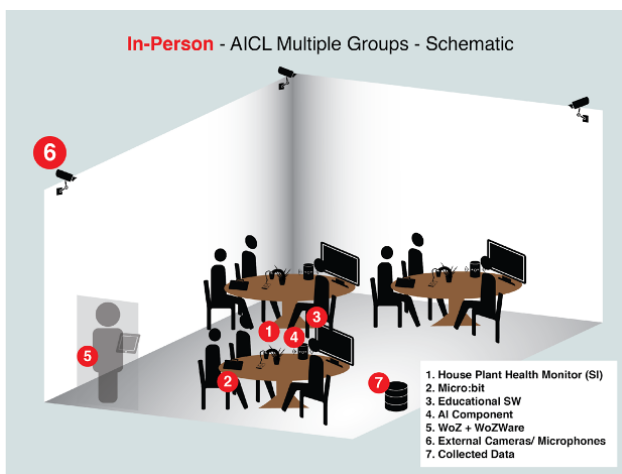
In July, middle school students in Eagle County used the Sensor Immersion curriculum during the STEM week of a free summer camp for local kids put on through a collaboration between the Vail Valley Foundation, University Corporation for Atmospheric Research (UCAR), and the University of Colorado Boulder (CU Boulder). While students engaged with the Sensor Immersion curriculum, iSAT researchers collected audio data of students collaborating in a classroom setting. This data is being used to test speech recognition tools and compare recording setups in preparation for data collection this fall.

All in all, we worked with over 200 teachers, students, parents, and other stakeholder over the course of 28 days, for a total of 5,698 contact hours!

Creating AI-enabled Collaborative Learning Environments

Strand 2

Our team science experts in Strand 2 strive to better understand how students, AI, and teachers can collaborate effectively in both classrooms and remote learning contexts. Their work during our first year focused on designing our AI-enabled Collaborative Learning Environments (AICL), which are set to enter the lab testing phase this fall.



A schematic showing the small group, in-person setup for the AICL.

These environments are the hardware/software interface for the AI Partners our institute is developing. They serve as a research tool, data collection tool, a tool for AI model training and testing, and a learning tool. The AICL merges the foundational AI achievements from Strand 1 with the use-inspired classroom experiences and curriculum developed by Strand 3 to help Strand 2 develop this AI support for classrooms. Furthermore, the AICL has been designed with an adherence to the principles put forth in the Responsible Innovation Framework. Not only does the AICL serve as the underlying technology of the AI Partner, it also provides a tangible platform to unite research conducted by the different strands—a critical goal to avoid the “one-off” studies achieved in academic silos.

The team includes one of our development partners, Curve10, who are leading the development of WoZWare, the software interface that will enable our researchers to test and iterate the different roles and functions of our AI Partner. What started as a collection of ideas in our second quarter and a wireframe in our third quarter, WoZWare is now ready for our researchers to playtest and continue to develop as we

wrap up our fourth quarter and head into year two.

To that end, research in the fourth quarter included drafting and receiving approval for an IRB protocol for CU Boulder data collections with the AICL. We also selected and purchased the hardware equipment for the AICL experiments, including Chromebooks, a Yeti Microphone, a Pal Mini Vu camera, and Microsoft Kinect cameras. Pilot testing was conducted on the modified CPS version of the Sensor Immersion Unit (creating an automated plant watering system through team programming), and results of the pilot studies were used to make minor modifications to the stimulus materials.

To create an effective and engaging AI Partner that helps teachers better reach their students, our Strand 2 researchers spent time this quarter synthesizing research on classroom orchestration. The team also conducted interviews with teachers, and participatory design sessions in which teachers worked on ideas for their dashboard to create a mock dashboard focused on facilitating small group classroom discussions. Other Strand 2 members are also researching key creative problem solving skills that our AI Partner will want to help cultivate in future classrooms.



Data collected from Eagle County students' work with iSAT researchers during STEM week will help inform Strand 2's AICL work.

Lastly, the end of the fourth quarter saw the creation of a new working group in Strand 2 focused on the ‘neuroscience of student AI teaming’. The new working group began to hold meetings and conceptualize research questions and hypotheses to address in year two and beyond, using an extension of the AICL lab environments.

Creating New AI Possibilities

Strand 1

Over the past year and up to the current quarter, our Strand 1 researchers laid the foundational work needed to tackle their main challenge—developing new advancements in how machines process human language, gestures, and emotions.

Strand 1's work centers on developing an interactive AI Partner to listen to and analyze student conversations with the aim of facilitating problem solving. Part of this work includes ensuring the AI Partner generates the appropriate Talk Moves (ways teachers can facilitate the progression of classroom discussion) in a classroom. Three Strand 1 researchers, Ananya Ganesh, Martha Palmer, and Katharina Kann, published the results of their talk moves research this summer, which currently informs the strand's research approaches.

Zeqian Li and Jake Whitehill are researching audio-visual diarization ensemble models using a Zoom-based Collaborative Problem Solving dataset. They are also developing a new clustering algorithm that can handle situations where clusters may be compositional; this has potential applications to speaker diarization with simultaneous speech from multiple speakers.

Strand 1 members also lent their expertise to assist Strand 2 in selecting the audio and visual hardware needed to begin the lab testing of our AI-enabled Collaborative Learning Environments (AICL), and their team has been instrumental in guiding and curating the necessary data needed to create the novel algorithms needed to develop our AI Partner.

For example, Strand 1's co-lead, Ross Beveridge, designed a simple small group task to inspire interesting dialogue and joint problem-solving between students. Named "Fibonacci Weights," students are provided with color-coded cubes that progress in weight following the fibonacci sequence. The stu-

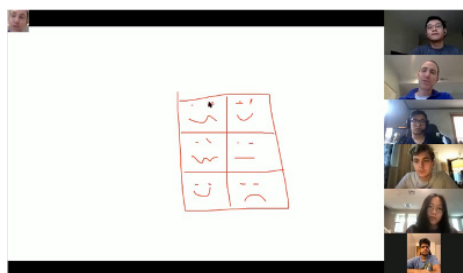
dents are not told the weight of the cubes or about the fibonacci sequence, and they must work together as a team to discover and record the weight of each cube.

This task is designed to capture audio and video recordings of small groups of students collaborating to provide researchers with the data needed to test and improve key elements of the AI Partner.

We can also report on progress in Abstract Meaning Representation (AMR) creation and parsing during our fourth quarter. An AMR is a symbolic representation for the meaning of sentences and dialogue that the classroom agent will learn to reason over. Current work by Jeffrey Flanigan, Jon Cai, and Michael Regan is to extend existing AMR corpora with teacher-student and student-student small group exchanges to support automated AMR parsing. Presently, the group has created and begun experiments with ~1,500 new classroom AMRs covering sensor immersion units in a physics classroom and specific teacher TalkMoves (pressing for accuracy).

In addition, the Automatic Speech Recognition (ASR) processing pipeline design was finalized and a Google Cloud ASR synchronous interface was implemented. This interface was used to process classroom data collected for microphone comparison tests.

Strand 1 researchers Joewie Koh, Shiran Dudy, and Alessandro Roncone have developed a high-level scheme for the agent incorporating modules that promote transparency and facilitate explainable decisions. The team has explored settings where actions are chosen in accordance with multiple objectives and is looking into extending the approach to temporally-based objective optimization.



Jake Whitehill and his student Zeqian Li testing their speaker embedding models.

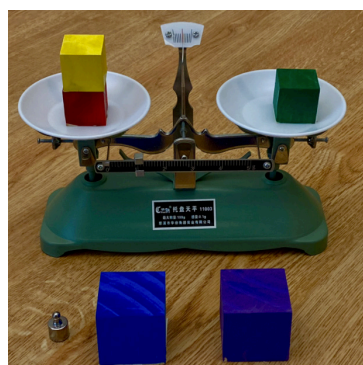


Photo showing the Fibonacci Weights activity.

Cross-strand Callout: Our New Fall Data Collection Team

Developing the next generation of equitable, collaborative learning environments is an exciting and important mission, but one that is nearly impossible without data. Enter our latest cross-strand collaboration endeavour—the iSAT Fall 2021 Data Collection team.

Our creative team-naming chops aside, this team began working in tight sprints over our fourth quarter to determine the best approach for recording high-fidelity audio and eventually video of small groups of students in real-world K–12 classrooms while protecting the privacy and agency of these students and teachers. Those who teach in these classrooms or know anything about analyzing audio data in noisy environments will immediately recognize the enormity of this challenge. How does one get data of multiple groups working together in one room—with students talking over each other and using gestures instead of words—with sufficient quality for automated analysis?

To tackle this challenge, the team includes experts from each of our three strands as well as software development experts. Our Strand 1 automatic speech recognition (ASR) experts are testing a variety of microphones to determine which provide the best audio quality for our data collection needs. Education experts from Strand 3 guide the group by adapting our existing Sensor Immersion curriculum unit for enhanced col-

laboration opportunities and working closely with our K–12 partners to ensure our data collection methods protect students' privacy and do not interrupt classroom activities. Strand 2 experts in team science and computer-supported learning worked with the group to develop data recording and data access solutions that could be incorporated into iSAT's AI-enabled Collaborative Learning Environments (AICL). Software developers worked to implement a standardized data scheme so that the data collected can be easily stored, accessed and analyzed by the strand researchers.

With the spread of the COVID-19 delta variant creating new uncertainty, the team has worked quickly to collect as much data as possible. In July, our school district liaisons and education experts recorded audio from multiple microphones as students worked in small groups on the sensor immersion unit (check out more about this effort in this newsletter's feature on Strand 3!). We are in the process of using the data to determine which mic would provide the best quality.

With the efforts of this group enabling us to take a giant step toward our mission, we end this quarter and begin our second year with visions of our AI Partner helping teachers orchestrate rich, collaborative classroom experiences coming into greater focus.



How it started: The first in-person, cross organizational and cross-strand Fall Data Collection Team meeting in July 2021.



How it's going: Our researchers worked with Eagle County students to collect data on their Sensor Immersion activities.

Meet our awesome students and postdocs!



Areej Mawasi

Strand 3

Name of advisors: Dr. William Penuel and Dr. Arturo Cortez

Research focus: In my interdisciplinary work as a learning scientist, I study learners' engagement and interactions in STEM learning environments with one another and with artifacts like technologies, games, and hands-on activities. In my work, I have addressed learning processes from multiple dimensions, focusing on learners' equitable participation, collaborative learning, efficacy, and self-determination. I also engage in co-design and participatory research towards designing equity-oriented learning environments for and with historically marginalized populations.

What are you working on? Within iSAT, I am working on a co-design project with teachers and youth towards broadening participation in AI education.

How does your work contribute to iSAT? The co-design process with teachers and students will help in understanding ways to integrate AI technologies in classrooms within existing curricula from teachers and students' perspectives. It also will help us understand their perceptions of these technologies, hopes, and ethical concerns as they engage with a curriculum centered on AI education across disciplines.

Upcoming publications/submissions: A fresh publication that was published on July

24, 2021:
Mawasi, A., Nagy, P., Finn, E., & Wylie, R. (2021). Narrative-Based Learning Activities for Science Ethics Education: an Affordance Perspective. *Journal of Science Education and Technology*, 1-11.

Awards: My research work on learners' engagement and participation in informal STEM settings and learning with technology, has been acknowledged by Arizona State University during my doctoral program through multiple awards, like the Dissertation Research Award by Mary Lou Fulton Teachers College (2020) and Outstanding Research Award (2019).



Kaleb Bishop

Strand 2

Name of advisor: Dr. Alessandro Roncone, Dr. Bradley Hayes

Research focus: Research interests include Human-Robot Interaction, Social AI, and Robotics for education

What are you working on? I'm currently running a human-robot interaction study that investigates how high school-aged students of color 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

New Quarter, New Faces!

Growing our team and our impact.



Rachel Dickler
Postdoctoral Strand 2
Researcher

Our small but mighty team has become a lot less small and a lot more mighty this year. What started as group of a couple dozen researchers has grown into a team with 70+ active members out of almost 100 who are part of the broader iSAT community. By year one of our fourth quarter, we've welcomed 26 students and postdocs to our institute, broadened connections with our K12 partners, expanded our development team, and now boast about 46 researchers (and counting!).

Three new postdocs joined our team during our fourth quarter. Rachel Dickler brought her expertise in Human Computer Interaction (HCI) to Strand 2 and is working on our teacher dashboards. Strand 3 gained two new postdocs—Areej Mawasi and Michael Chang. Areej's expertise in learners' engagement and interactions which each other in STEM learning environments informs Strand 3's co-design work. Michael Chang shares his appointment at iSAT with the Center for Integrated Research in Computing and Learning Sciences (CIRCLS), and his computer science background helps guide Strand 3's Learning Futures Workshop work.

We've also introduced three new staff members and positions in the fourth quarter! We now have a part-time Executive Director, Peter Foltz of the CU Boulder. Peter, who also serves as a Strand 2 researcher, works closely with our Principal Investigator, Sidney D'Mello, to provide scientific and executive leadership to iSAT. Peter will

support Sidney with the strategic direction of the Institute and will lead the effort to conduct an analysis of how to organize and operate a successful institute. In addition, he will support program management and lead coordination on software development efforts across the strands. Finally, Peter will work with Sidney and the Community Hub to organize community events.

We're also thrilled to introduce John Weatherley to the team as our new Lead Software Developer/Architect. John brings with him a wealth of experience as a former software engineer for the University Corporation for Atmospheric Research (UCAR) and as a software engineer in education technology and adaptive learning at CU Boulder. He's now iSAT's go-to person for our software development efforts, essentially coordinating among our external contractors, internal staff, and our graduate students.

Finally, we're excited to welcome Rachel Lieber as our new Research Administrative Professional and Institute-wide researcher! Rachel comes to us as a Professional Research Assistant on another Institute of Cognitive Science (ICS) grant at CU Boulder and provides administrative support to our team. As a former teacher with a Master's in Curriculum and Instruction, Rachel also brings with her a K-12 perspective to our research.

We look forward to seeing where our new team members will help take us in the next quarter!



Peter Foltz
Executive Director
Strand 2 Researcher



Areej Mawasi
Postdoctoral Strand 3
Researcher



John Weatherley
Lead Software Developer/
Architect



Michael Chang
Postdoctoral Strand 3
Researcher



Rachel Lieber
Research Administrative
Professional &
Institute-wide Researcher

iSAT Publications and Outreach

Take a deeper dive into our work!

Kaleb Bishop, Haynes, B., and **Alessandro Roncone** (2021). "Teaching Grounded Reading Skills via an Interactive Robot Tutor." Workshop on Robots for Learning at the Human-Robot Interaction annual conference (HRI 2021).

Du, W. and **Jeff Flanigan** (2021). "Avoiding Overlap in Data Augmentation for AMR-to-Text Generation." Proceedings of the Association of Computational Linguistics annual conference (ACL-IJCNLP 2021).

Ananya Ganesh, **Martha Palmer**, and **Katharina Kann** (2021). "What Would a Teacher Do? Predicting Future Talk Moves." Accepted by the Association of Computational Linguistics annual conference (ACL-IJCNLP 2021).

Layne Hubbard, Ding, S., Le, V., Kim, P., Yeh, T. (2021). "Voice Design to Support Young Children's Agency in Child-Agent Interaction." Proceedings of 2021 ACM Conference on Conversational User Interfaces.

Layne Hubbard, Chen, Y., Colunga, E., Kim, P., Yeh, T. (2021). "Child-Robot Interaction to Integrate Reflective Storytelling Into Creative Play." Proceedings of the 2021 ACM Conference on Creativity and Cognition.

Nikhil Krishnaswamy and **Nada Alalyani** (2021). "Embodied Multimodal Agents to Bridge the Understanding Gap." Proceedings of the First Workshop on Bridging Human-Computer Interaction and Natural Language Processing at 16th Conference of the European Chapter of the Association for Computational Linguistics (pp. 41-46).

Zeqian Li and **Jake Whitehill** (2021). "Compositional Embedding Models for Speaker Identification and Diarization with Simultaneous Speech from 2+ Speakers." Proceedings of the International Conference on Acoustics, Speech and Signal Processing annual conference (ICASSP 2021).

Sam Pugh, Subburaj, S.K., Rao, A.R., Stewart, A., Andrews-Todd, J., **Sidney D'Mello** (2021). "Say What? Automatic Modeling of Collaborative Problem Solving Skills from Student Speech in the Wild." Proceedings of the International Educational Data Mining conference (EDM 2021).

Trabelsi, A., Chaabane, M., **Nate Blanchard**, **Ross Beveridge** (2021). "A Pose Proposal and Refinement Network for Better 6D Object Pose Estimation," IEEE Winter Conference of Applications on Computer Vision (WACV 2021) (Best Student Paper Award)

Wang, H., **Vidya Gaddy**, **Ross Beveridge**, and **Francisco Or-**

tega (2021). "Building an Emotionally Responsive Avatar with Dynamic Facial Expressions in Human-Computer Interactions." Multimodal Technologies and Interaction, 5:3.

Booth, B., Hickman, L., Subburaj, S. K., Tay, L., Woo, S., & **Sidney D'Mello** (2021). "Integrating Psychometrics and Computing Perspectives on Bias and Fairness in Affective Computing: A Case Study of Automated Video Interviews." IEEE Signal Processing Magazine.

Booth, B. M., Hickman, L., Subburaj, S. K., Tay, L., Woo, S. E., & **Sidney D'Mello**. (2021). "Bias and Fairness in Multimodal Machine Learning: A Case Study of Automated Video Interviews." Proceedings of the 2021 International Conference on Multimodal Interaction (ICMI 2021).

Shiran Dudy, Bedrick S., and Webber B., Refocusing on Relevance: Personalization in Natural Language Generation, Empirical Methods in Natural Language Processing (EMNLP 2021).

Sidney D'Mello, Jensen, E., Dale, M., Donnelly, P., Godley, A., & Kelly, S. (2021). "Automatically Measuring Features of Teacher Discourse from Classroom Audio in English Language Arts." Paper presented at the annual meeting of the European Association for Research on Learning and Instruction (EARLI 2021).

Sidney D'Mello (2021). "Improving Engagement through Adaptation, Personalization, Design, & the Next Frontier." International conference organized by the OECD Centre for Educational Research and Innovation (CERI).

Sidney D'Mello (2021). Keynote: "From Modeling Individuals to Groups: It's a Multimodal Multiparty." 2021 International Conference on Educational Data Mining (EDM 2021).

Sidney D'Mello (2021). "From Modeling Individuals to Groups: It's a Multimodal Multiparty." Multimodal Artificial Intelligence in Education at the 2021 Conference on Artificial Intelligence in Education (AIED 2021).

Sidney D'Mello (2021). "National AI Institute for Student-AI Teaming." Paper presented at the Workshop on AI-based Multimodal Analytics for Understanding Human Learning in Real-world Educational Contexts (AIMA4EDU) at the 30th International Joint Conference on Artificial Intelligence (IJCAI-21).

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