
Designing for Agent-Mediated Online Social Connections: Lessons Learned and Potential Challenges

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ABSTRACT

Online education has been gaining popularity over the years. This year, in particular, online education has been normalized because of COVID-19, with many predicting that it is here to stay. Prior research has shown that online learners frequently experience social isolation due to the lack of face-to-face interactions. To tackle this problem, we built a virtual agent, SAMI, that leverages online students' self-introduction posts from the class discussion forum to help them make social connections. The agent has been running on several online classes for three semesters so far. In this position paper, we summarize lessons learned and potential design challenges based on our research with online learners regarding the design of agent-mediated social connections. Even though our work has taken place in online learning, we believe many findings are potentially transferable to other remote communities.

CCS CONCEPTS

• **Human-centered computing** → **Empirical studies in collaborative and social computing; Interaction paradigms.**

KEYWORDS

virtual agent, online learning, remote social interaction, online communities

INTRODUCTION

Online learning, despite its affordability and accessibility, presents many challenges for online learners due to its lack of in-person interactions. Feeling socially isolated is one of the common obstacles online learners encounter when completely separated from the immersive learning context [2]. Social isolation is not only detrimental to online students' mental health, but also negatively correlated with students' learning outcomes, engagement, and class satisfactions [3, 4]. With online education significantly growing due to the COVID-19 pandemic this year, designing technology to help students make connections remotely becomes more important than ever. However, in the CSCW and HCI communities, research on helping online learners connect has only just begun in recent years by exploring the current process of how online learners build social connections [6]. Specific design guidelines of technology to address the challenges and opportunities of building social connections among online learners are still urgently needed [7].

While challenging, building social connections online also has a lot to explore and leverage. For instance, online classes often utilize discussion forums to facilitate class-related discussions, yet many instructors and students also appropriate these forums for students to post self-introductions with the goal of creating online communities. These self-introduction posts are often too overwhelming to go through for students in large online classes that usually have at least 200 students enrolled. To leverage the available data from discussion forum to help online learners build social connections, we developed SAMI, a virtual agent designed to extract relevant details about students from their self-introduction posts to help them make connections¹.

To better design agent-mediated social connections from a human-centered perspective, we have been deploying SAMI in online classes at Georgia Tech's Online Master of Science in Computer Science (OMSCS) program, as well as conducting surveys and semi-structured interviews with online learners about SAMI. In this position paper, we discuss two lessons learned from our prior and ongoing work on the design implications of building agent-mediated social connections: the importance of highlighting shared identities among online learners, and the need to design virtual agent to push online learners to initiate conversations. We then point out potential challenges of designing future agent-mediated social connections, which includes designing for natural human-agent interaction, building inclusive groups across various platforms, and maintaining people's agency in building remote social connections.

DESIGN AND IMPLEMENTATION OF SAMI

SAMI, stands for Social Agent Mediated Interactions, has been running at several classes in the Georgia Tech's OMSCS program for three semesters so far. SAMI was designed to be used on Piazza discussion forum, where online learners usually conduct class-related discussions and posting self-introductions

¹In earlier papers, we have used the name "Jill Watson Social Agent" for SAMI [1, 7]

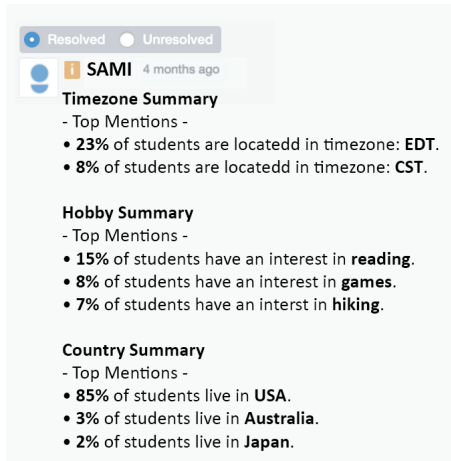


Figure 3: An adapted example of SAMI's aggregated class statistics post on Piazza discussion forum.

at the beginning of the semester. SAMI utilizes natural language processing (NLP) to extract different entities such as hobby, city, country from students' self-introduction posts. Current version of SAMI has two features: putting students in individual groups based on students' preferences such as similar hobbies, similar cities, etc. (see Figure 1), and posting aggregated statistics about the class on a Piazza thread (see Figure 3). To further engage students in building connections, SAMI also posts ice-breaker questions within each group (see Figure 2).

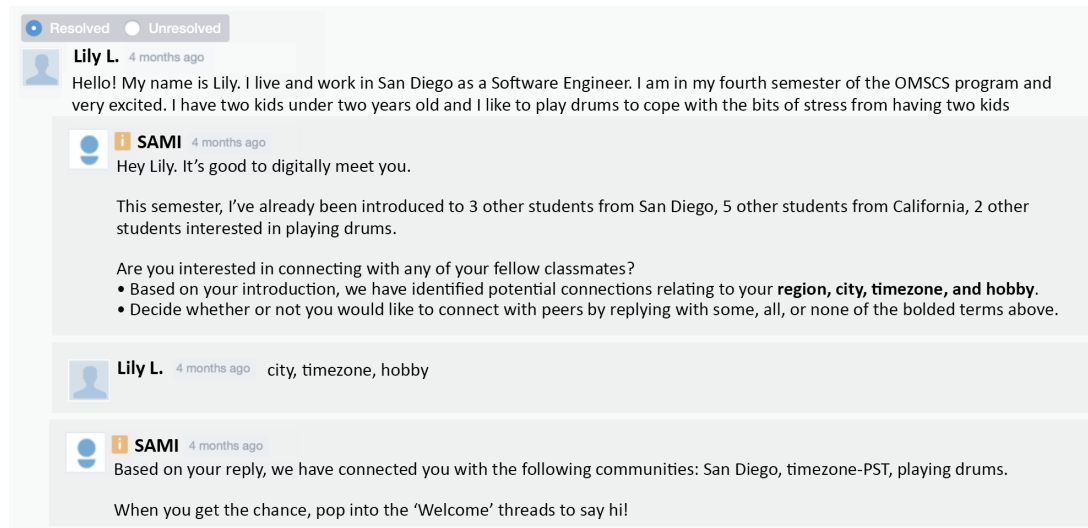


Figure 1: An example of SAMI's interaction with students

LESSONS LEARNED ON DESIGNING AGENT-MEDIATED INTERACTIONS

In this section, we discuss the lessons learned from our prior and current evaluation of SAMI with online learners, through surveys and semi-structured interviews. Specifically, we outline two design implications for agent-mediated social connections: highlighting shared identities and providing motivation for initial interactions.

Highlight Shared Identities

Identifying shared identities, commonalities between online learners such as common hobbies, discussion topics, or experience, is crucial to build social connections among online students [5, 7]. Many

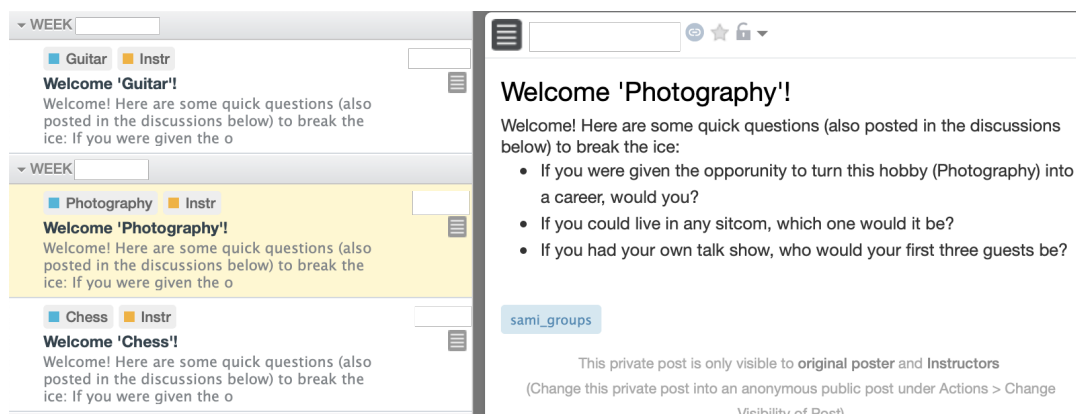


Figure 2: An example of ice-breaker questions within SAMI groups

online learners' existing friendships within the online program are often fostered through identification of similar topics or interests from the self-introduction posts, or through shared experiences such as doing group projects together [5, 7]

In our ongoing research, we discovered that the importance of highlighting shared identities could be attributed to the lack of starting point to build social connections online. Initiating a conversation with someone online with no specific purpose or topic could be difficult and "unnatural" for online learners. Highlighting students' shared identities thus could help alleviate students' burden in discovering common topics to start the conversation.

In the design of SAMI, we utilized the aggregated statistics to provide quick snapshot of the class demographics and thus highlight shared identities at a class level; to help students identify specific individuals who are similar to them, we put individual students with common topics into specific groups and thus initiate the conversation by providing them with a starting point.

Provide Motivation for Initial Interactions

Despite the importance of highlighting shared identities in building social connections online, we found that it is not enough for online learners to initiate interactions with each other. In the previous version of SAMI, we did not put students into individual groups on Piazza, but instead provided the link to other students' self-introductions in the personalized recommendations. Many online learners reported that it was good information to have, but they didn't know what to do with this information

[7]. In our ongoing work, we also found that online learners often need to cross the mental barriers in initiating interactions. We define mental barriers as an internal feeling that prevents them from contacting others such as don't know whether others are willing to connect, don't want to "bother" other people by contacting them, etc.. Even though highlighting shared identities provided a starting point for online learners to connect, it did not ameliorate their mental barriers about reaching out.

Initiating social connections through virtual agents thus requires the agent to scaffold the connection-building process by not only highlighting shared identities, but also motivate and "force" students into initiating interactions. In the current design of SAMI, we thus took the "forced" interaction approach and put students directly in a group with each other. To better scaffold the connection process, in every group created, SAMI also posts several ice-breaker questions to better help students overcome their mental barriers about starting a conversation by answering to SAMI's questions, instead of contacting individual student directly.

POTENTIAL CHALLENGES OF DESIGNING AGENT-MEDIATED INTERACTIONS

In this section, we want to outline several potential challenges that have emerged through our research regarding agent-mediated social connections: the need to design natural individual human-agent interaction during agent-mediated interactions, the challenge of building inclusive online groups across various platforms, and the importance of maintaining people's agency in building social connections online using virtual agent.

Designing for Natural Human-Agent Interaction

Online learners have expressed desire of making their individual interaction with SAMI more "natural", even when SAMI only interacts with students individually for a short period of time— during the personalized recommendations. The reasoning behind this is still not clear to us, but based on our research so far, we believe online environment is inherently less authentic comparing to in-person context. Online learners thus desire to replicate the naturalness of in-person interactions online, which includes making the tools involved more natural as well. Designing for natural individual human-agent interaction has many dimensions to explore such as building the agent's personality and conveying it through dialogues. Many prior work has explored this research space in one-to-one interaction between user and conversational agent, yet how to design the personality and "naturalness" of an agent that's mediating online human interactions remains unexplored at this point.

Challenge of Building Inclusive Groups Cross-Platform

In online entities such as online for-degree programs and remote organizations, multiple platforms are usually employed to facilitate communications at different levels and different topics. For instance, in Georgia Tech's OMSCS program, online learners use Piazza discussion forum for class-related

conversations; Slack workspace for more casual conversations; and other platforms such as OMSCS sub-Reddit for OMSCS-wide communications. *However, not every student enrolls or even participates in all the platforms that are available to them.* Take SAMI in OMSCS classes for example, SAMI currently only runs on the class Piazza discussion forums, and more specifically, the thread students post their self-introductions. This design naturally leaves out students who are not enrolled in the Piazza forum, students who are only lurking around, and students who did not post their self-introductions. The challenges remain on how to design for agent-mediated social connections that can connect everyone, including those who are not enrolled or active in online environments.

Maintaining People's Agency in Building Social Connections Online

As we explore further in this space of agent-mediated interactions, it has come to our attention that there is a potential tension between automating the connection-building process and maintaining online learners' agency in making connections themselves. Many students said that it's good for SAMI to automate some of the repetitive filtering process for them, but they also want to have the flexibility of choosing their own groups to connect with. This causes a tension between the need of "forcing" online social interactions to help people overcome their mental barriers of starting a conversation, and properly maintain people's agency in choosing their own social connections to build. The question thus remains on what stages of the connection-building process should be automated by the virtual agent and what decisions should be left for the users to decide.

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