



Jibo Community Social Robot Research Platform @Scale

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Figure 1: A previously commercialized Jibo robots are now becoming shared community research platform @scale.

ABSTRACT

The lack of shared community social robot platform has been one of the main reasons that made scalable and replicable research activities in human-robot interaction (HRI) and broader cross-community collaborations difficult. In this tutorial, we introduce Community Social Robot Research Platform, Jibo, which was once a commercialized robot companion for the home. This commercially strengthened robot can now serve as a shared community resource and

research infrastructure, amplifying the potential for scalable, affordable, and replicable social intelligence research. Prior to the tutorial, we will recruit interdisciplinary community researchers to try out the Jibo Research Prototype for at least two weeks and bring their lived experience to the tutorial. The tutorial program consists of four parts: (1) introduction of the envisioned community research infrastructure; (2) hands-on prototyping experience using the platform; (3) share-outs from participants that have hosted the prototype platform; and (4) reflection activity for the future of the prototype, including spaces for generating recommendations for the envisioned community research platform. The outcome of the tutorial will include a consolidated report of community needs, desires, and recommendations for the future development of the prototype. We will also gather participants' reflections of the tutorial and potential of the prototype in their research.

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CCS CONCEPTS

• **Hardware** → **Emerging technologies**; • **Human-centered computing** → **Interactive systems and tools**; • **Software and its engineering** → *Designing software*.

KEYWORDS

Community Social Robot Platform, Embodied Social Intelligence, Scalable and Replicable Research, Human-Robot Interaction

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1 INTRODUCTION

The Jibo Community Social Robot Research Platform (Figure 1) aims to leverage recent advancements in AI and robotics to transform the ways we conduct social robotics, social reasoning, and social intelligence research. We performed an earlier investigation into HRI/HCI community needs and revealed that a lack of shared community platform is one of the main reasons that make scalable and replicable research activities and broader cross-community collaborations difficult [2]. We interviewed 24 leading researchers in the field to gain their perspectives on tools and methodologies in social agent design to reveal where researchers desire more support. The researchers specifically called for more consistent systems, tools, and platforms within the community. A shared community infrastructure leads to shared resources and curriculums, which can also increase participation across interdisciplinary researchers with or without resources to develop and maintain their own platforms. Some researchers quoted that the current methods can be “intimidat[ing] and make people feel like they can’t participate in the research”. We envision that Jibo, a previously commercialized social robot companion for the home, now converted as a community research platform will enable scalable, equitable, and inclusive research opportunities for our communities.

Social robots are powered by social intelligence. Despite their impressive capabilities, large language models like ChatGPT still lack the social and emotional intelligence needed for sophisticated human-AI collaboration especially in a real-time, real-world setting where the present contexts are complex and dynamically changing. With a shared, cloud-connected, open social robot community platform, multidisciplinary communities can collaborate on advancing the field of embodied social intelligence.

While we have worked hard in the past years to convert a previously commercialized robot to a research platform, it is crucial to consolidate community ideas and feedback to augment this affordable, scalable, robust social robot to become a shared community research infrastructure that can impact broadly. The goal is to make the usage of this platform equitable and inclusive, starting by collaborating with a diverse group of academic institutions and multidisciplinary researchers. Down the line, we also envision social robot living labs to support large scale deployment studies, with strict quality assurance and ethical standards in place. This

tutorial will be a starting point to introduce the current research prototype to the HRI community and solicit feedbacks to level it up as a community resource.

2 JIBO COMMUNITY SOCIAL ROBOT RESEARCH PLATFORM

Jibo was a previously commercialized product designed as a daily robot companion for the home. It has conversational skills as well as an attention mechanism that orients its gaze toward a sound source of people’s face. Its skill sets include providing weather forecasts, simple chitchat, music streaming, interactive games, and physical exercise. To provide believable character experiences, it is able to proactively initiate interactions with people by detecting users and offering pleasantries or activities such as sharing fun facts, playing word games, etc. In addition, Jibo shows an animate idle behavior when not engaged with users that involves blinking, looking around at random spots, or self-playing.

To adapt Jibo from a commercial product to one that supports research needs, the tutorial team has extended and developed research-enabling firmware and software over the past years. First of all, Robot Operating System (ROS) allows a flexible control of the core functions of Jibo’s social skills. We have built a graphical user programming interface such as Scratch Blocks¹ for co-design research and AI education use cases. ROS communication can also be easily replaced with cloud messaging systems such as Google’s Firebase², depending on the deployment settings. To comply with Institutional Review Board (IRB) regulations for data privacy and to enable customization per project, we have adapted Jibo to run on our own cloud servers. Our team has also developed a full pipeline to assist the deployment process and sending robots to participants. To further support research activities, we designed Jibo Research Station, as depicted in Figure 1 that incorporates the robot with an embedded computer for extra compute power, a touchscreen tablet to be used as a shared workspace between a user and the robot, and an additional webcam for study data collection. The Station uses an open-source container orchestration platform, Docker Swarm, which allows researchers to manage multiple containers deployed across multiple robot platforms for scalable research.

3 TUTORIAL PROGRAM AND SCHEDULE

3.1 Program

This full-day tutorial will combine a platform introduction, hands-on prototyping, prototyping and lived experience share outs, and reflections and discussions around the platform.

- **Pre-tutorial Lived Experience:** Experiencing technology in a real-life context gives users a unique understanding of it, allowing them to reflect on their needs and concerns [1, 3, 4]. As part of a pre-tutorial activity, we plan to share our Jibo Research Platform prototype with selected research labs to facilitate lived experience. We’ll offer an online session to guide researchers in setting up the platform and creating interactions and skills with the prototype via Robot Operating System (ROS). Afterwards, the participants can implement

¹<http://scratch.mit.edu>

²<https://firebase.google.com>

small interactions aligned with their research agenda or simply experience the platform using its daily interaction features. This lived experience will prepare faculties, students, and other researchers to contribute valuable feedback and recommendations on the tutorial day.

- **Tutorial Day:** The tutorial day will consist of four sessions: (1) introduction of the Jibo Community Social Robot Research Platform; (2) hands-on prototyping activity with 12 Jibo Research Platforms; (3) share-outs from the prototyping session and from participants that have hosted the prototype platform for lived experience; and (4) reflection activity for the future of the prototype, including spaces for generating recommendations for the envisioned community research platform. The outcome of the tutorial will include a consolidated report of community needs, desires, and recommendations for the future development of the prototype. We will also gather participants' reflections of the tutorial and potential of the prototype applied to their research agenda.

3.2 Schedule

The four sessions will be scheduled as the following:

- **08:45 - 09:00: Opening**
Welcome and share tutorial program.
- **09:00 - 09:30: Introduction of Jibo Community Social Robot Research Platform**
Intro to the vision of the community platform and design/technical overview.
- **09:30 - 10:30: Prototyping with Jibo Research Platform**
A hands-on prototyping session with an intro of Jibo-ROS framework. Participants will break out into small groups (2–4 per group) and identify a theme (e.g., interaction design, design research tool, skill development, etc.). Each group will be assigned a tutorial team member with relevant expertise to facilitate brainstorming and implementation.
- **10:30 - 11:00: Coffee Break**
- **11:00 - 12:30: Prototyping with Jibo Research Platform**
Prototyping session continued and prepare for a share out.
- **12:30 - 13:30: Lunch**
- **13:30 - 15:30: Share-outs**
From prototyping session and lived experience participants.
- **15:00 - 15:30: Coffee Break**
- **15:30 - 17:00: Reflection on Community Research Platform**
Discuss considerations for envisioned community platform.
- **17:00 - 17:30: Q&A and Wrap up**
Q&A session with the organizing team and tutorial wrap up.

4 PARTICIPANTS

4.1 Recruitment

We will announce Jibo Research Platform hosting application solicitation soon after the new semester start in January, 2024 via popular HRI mailinglist channels and begin reviewing the applications. We aim to recruit diverse HRI research topic interests and prioritize groups with strong motivation and commitment to participate in the tutorial. Due to funding reasons, we currently can only recruit lived experience participants from the United States, but we hope to

extend the invitation to other parts of the world soon (community research platform is not a single year project). The general participation solicitation will be advertised via the HRI mailinglist channels. Due to limited resources, we will cap the tutorial attendance at 30 researchers.

5 ORGANIZING TEAM QUALIFICATIONS

Our tutorial organizing team consists of researchers and a full stack Jibo software engineer with years of experience developing various parts of the Jibo Research Platform including networking, software design, ROS integration, cloud computing, UI/UX, hardware, etc. The team also has extensive experience deploying Jibos for long-term lived experience studies using 10–100 robots at a time.

The team's expertise also spans multidisciplinary topics in HRI including long-term personalization, co-design and participatory design methodologies, socio-emotive intelligence, social relationship building, qualitative and quantitative methods, and conversational and multimodal AI. The team has lots of experience studying social robots in people's homes, hospitals, schools, and workplaces, supporting various areas of human flourishing including emotional wellness, healthcare, education, social emotional learning, behavior changes, etc.

6 CONCLUSION

In part, because of the success of Large Language Models, we are at an intellectual inflection point where academic communities that have more-or-less operated in silos (human-robot interaction, human-computer-interaction, natural language processing, machine learning) are all starting to think about how to advance the social intelligence machines. What this broader academic community needs to galvanize our efforts is access to a shared, cloud connected, open social intelligence community platform at scale designed to support transformative research and development: namely, the experimental study and computational advancement of the social intelligence of autonomous robots in real-world contexts. The proposed tutorial will introduce the community social robot research platform using Jibo robots and provide participants the opportunity to gain hands-on experience and impact the future direction of the platform through their feedback.

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