

University of Arizona

Consent to Participate in Research

Study Title: ToMCAT: Theory of Mind-based Cognitive Architecture for Teams

Principal Investigator: Adarsh Pyarelal

Sponsor: This research is funded by the U.S. Department of Defense.

Summary of the research

This is a consent form for participation in a research project. Your participation in this research study is voluntary. It contains important information about this study and what to expect if you decide to participate. Please consider the information carefully. Feel free to ask questions before making your decision whether or not to participate.

The purpose of this research is to develop an artificially intelligent computer agent that can help human teams perform better. If you choose to participate, you will play a Minecraft game with several other people, while the computer agent watches and sometimes provides advice. During the game we will measure your brain activity, eye gaze, heart rate, muscle activity and sweating (and that of the other players) and the computer agent may ask you questions about how you are feeling. We will also videotape you while you play the game. Your participation in the study will take place during four lab sessions and will require about 9.5 hours of your time. There is some risk that someone could recognize you in the videotape, or that you will be upset by the game or the other players. There is no direct benefit to you of participating.

Why is this study being done?

This research study is being done so that we can develop an artificially intelligent (AI) agent that can participate in human teams to improve the team's performance. The first goal of the research is to train the agent to observe the team (including video of the team, chat messages, brain activity, heart rate, sweating and eye gaze) and predict from those observations what the humans are trying to do in the game, how coordinated they are as a team, and how they feel about the game and about each other. The second goal of the research is to train the agent to communicate with the humans and take actions that could improve the team's performance.

What will happen if I take part in this study?

If you choose to participate you will do the activities listed below during four lab sessions along with several other people.

- At the pre-session, you will be asked to answer some brief socio-demographic questions (e.g., your age, ethnicity, etc.) and do a speech/language task where you will read some sentences out loud and provide spoken directions for someone else to navigate from a start to an end point on a map that will be given to you. You will then be asked to schedule times within the next 6-8 weeks to complete the 3 testing sessions.

- At the testing session, sensors will be placed on your torso and head that will measure heart rate, muscle activity, sweating, brain activity and eye gaze. You will also wear a headset with speakers and a microphone. All communication between yourself, the research assistant and other participants will take place via the headset.
- The session will be videotaped. You and the other participants may be able to see each other's videos during the session.
- You will be asked to complete the following three baseline tasks on the computer individually and/or as a team: finger tapping, looking at emotional pictures, and a ping-pong game.
- After the baseline tasks you will play a game in Minecraft. You will be given a tutorial about how to play the game and a chance to practice the game.
- You will then complete a 5-minute competency test so that we can better understand video-gaming proficiency across individuals.
- You and the other participants will be separated by a screen and given a chance to discuss your strategy using either chat messages or conversation via the headsets. You can also chat with the other players throughout the game.
- The Minecraft game will either involve: 1) saving villagers, who are hiding in closed rooms within a building, from various creatures that appear in Minecraft (e.g., zombies, creepers, etc.), or 2) a search and rescue mission where you must navigate through a building and rescue victims and remove hazards. There will be a 20-minute time limit on the game. Your performance during the game will be recorded.
- Every 3 minutes, the computer agent may pause the game and ask you to answer some questions about what you are thinking and feeling. The agent may also offer you some information or advice. The agent may be acting in a truly "intelligent" way, coming up with its own information and advice, or it may be preprogrammed or controlled by the research assistant.
- After the game, all sensors and the headsets will be removed. You will answer another set of questions about your feelings about the game, the agent, and your teammates and the team as a whole.
- Finally, the game may be played back on the computer screen and you may be asked to pause the play-back (by pushing a computer key) at any point that you remember having a plan in mind (e.g., an idea about what you were trying to do, or a plan about a sequence of actions that you intended to take), or changing your plans, or feeling confused about what to do. You will be asked to tell the research assistant what you remember, and the research assistant may ask clarifying questions. This will be audio-recorded and may be translated into text using natural language processing algorithms.

How long will I be in the study?

You will be done with the study after the half hour pre-session and the 3 three-hour lab sessions, all of which will occur sometime in the next 6-8 weeks.

How many people will take part in this study?

Approximately 900 people will take part in this study.

Can I stop being in the study?

Your participation is voluntary. You do not need to participate in this study. If you decide to take part in the study, you may leave the study at any time. No matter what decision you make, there will be no penalty to you and you will not lose any of your usual benefits. Your decision will not affect your future relationship with The University of Arizona. If you are a student or employee at the University of Arizona, your decision will not affect your grades or employment status.

What risks or benefits can I expect from being in the study?

The only risks are that you may find the game to be stressful or you may be upset by the other players. While playing the game, it is also possible that you may experience some motion sickness, but we have measures in place should that occur. There is also a minimal risk that your data, including the videotape, could be accessed by someone not on the research team, although we will be very careful to keep all the data, including the video secure and confidential.

There are no benefits to you for participating, except that you may find it fun to play the game.

Will I be paid for participating in the study or experience any costs?

Participants will receive a \$10.00 Amazon gift card for each hour of the study they complete. You will attend the half hour pre-session and 3 three-hour lab sessions, so you will receive a \$95.00 Amazon gift card at the end of the lab sessions. If you cannot, or choose not to, participate in all the sessions you will still receive gift cards for the sessions you do attend.

You also have a chance of winning an additional \$20.00 Amazon gift card if your team gets the highest score on the video game out of 20 lab sessions.

You also have the option of receiving research credit if you are a student participating for credit through the UA SONA system in the Department of Psychology. Participants will attend the half hour pre-session and 3 three-hour lab sessions, so you will receive 9.5 to 10.0 SONA credits at the end of the lab sessions. If you cannot, or choose not to, participate in all sessions, you will still receive the SONA credits for the sessions you do attend.

If you receive greater than \$50.00, we will be required by UA Financials to record your name and social security number. This information will not be stored, however. It will be recorded as a hard-copy and delivered to the Norton School Business Office as soon as the session ends, or if the business office is closed it will be kept in a locked drawer in the lab, accessible only by senior research staff, and then delivered the next time the business office is open.

Compensation for participation in a research study is considered taxable income for you. If your compensation for this research study or a combination of research studies is \$600 or more in a calendar year (January to December), you will receive an IRS Form 1099 to report on your taxes. Please note, if you are an employee of UArizona, any compensation from a research study is considerable taxable income.

The only costs to you for participating are your time and any transportation costs due to attending the lab session(s).

Will my study-related information be kept confidential?

Every effort will be made to keep your information confidential. All the data for the study will be encrypted and password protected. Most of the measures that you provide in the study will be anonymous. You will be given a random ID number and your name will not be recorded anywhere. The audio and video recordings of the sessions are the only measures that could be used to identify you. You will not be identified in any report or publication of this study. However, you could be identified from the videotape of your session, but the video will not show anything sensitive. It will just show your face and torso as you play the video game. If you are participating with other people, it will also show their faces and torsos. In addition, if you are participating with other people, we will tell all participants in the study that the comments made during the lab session should be kept confidential, but it is possible that participants may repeat comments outside the group.

Any audio data will be made publicly available but no personal information will be attached to any of the audio files. The audio recordings will include anything you or the other participants say during the speech/language tasks at presession as well as the planning and playing stages of the mission. We will ask you and the other participants to not speak your names or the names of other participants to maintain confidentiality; instead, you may call each other by your computer's name or any other anonymous manner. You can review the recording and/or request your recording be removed by contacting the principal investigator of the study (see contact information at the end of this consent form); otherwise, the audio recordings will be kept indefinitely.

We will also be collecting and storing data through REDCap (Research Electronic Data Capture). The REDCap electronic data management (EDM) system at the University of Arizona is housed on 2 virtual servers; one supporting database services and the other web services. In REDCap, appropriate measures are in place to maintain confidentiality and security of all incoming data.

The information that you provide in the study will be handled confidentially. However, there may be circumstances where this information must be released or shared as required by law. The University of Arizona Institutional Review Board; other federal, state, or international regulatory agencies; or the sponsor of the study, if any, may review the research records for monitoring purposes. In particular, representatives of the U.S. Department of Defense will have access to research records as part of their responsibilities for human subjects protection oversight of the study.

Will my study-related information be used for future research?

Information that may identify you, such as the videotape of the session, may be used for future research without additional consent. All data from the study will be kept forever and cannot be withdrawn once it has been collected, with the exception of the audio recordings as explained above.

Your data will also be shared with other research teams collaborating on this study at other universities and research companies. Arizona State University is organizing a secure data base that we

and 12 other research teams will use to share data, including the videos from this study. Your data will be included in this data base and may be used by other researchers in future studies without contacting you.

Who can answer my questions about the study?

For questions, concerns, or complaints about the study you may contact **Dr. Adarsh Pyarelal via phone at (503)-360-8824, or via e-mail at adarsh@arizona.edu.**

For questions about your rights as a participant in this study or to discuss other study-related concerns or complaints with someone who is not part of the research team, you may contact the Human Subjects Protection Program Director at 520-626-8630 or online at <https://research.arizona.edu/compliance/human-subjects-protection-program>.

Signing the consent form

I have read (or someone has read to me) this form, and I am aware that I am being asked to participate in a research study. I have had the opportunity to ask questions and have had them answered to my satisfaction. I voluntarily agree to participate in this study.

I am not giving up any legal rights by signing this form. I will be given a copy of this form.

Printed name of subject

Signature of subject

Date