

### **Consent to Participate in a Research Study (Behavioral Component)**

**Title of the Project: Understanding Program Structure Representation via fNIRS**

**PI: Westley Weimer PhD Computer Engineering, University of Michigan**

**Co-investigator: Yu Huang, University of Michigan**

**Co-investigator: Kevin Leach, PhD Computer Engineering, University of Michigan**

**Co-investigator: Xinyu Liu, University of Michigan**

**Co-investigator: Xiaosu Hu, PhD Psychology University of Michigan**

**Co-investigator: Jessica Kim, University of Michigan**

**Co-investigator: Ioulia Kovelman, PhD Psychology, University of Michigan**

### **Invitation to Participate in a Research Study**

We/I invite you to be part of a research study about **software engineering**. You must be 18 or over to participate in this study.

**This consent document consists a description of the specific research activities you are asked to participate in.**

### **Description of Your Involvement**

If you agree to be part of the research study, we will ask you to complete the following:

- 1. Complete a questionnaire about your basic information, programming experience, your GPA, and your coursework. (2 minutes)**
- 2. Review a training video in which you will learn how to provide answers for programming questions we will ask you to complete in the fNIRS. (20 minutes)**
- 3. Wear a fNIRS cap and complete three sequences of questions. You will be asked to complete data structure and mental rotation tasks while being scanned. You will have 30 seconds to answer each question, with time for breaks between questions and between sequences. (60 minutes)**
- 4. Have a conversation-based post-questionnaire with the study staff, talking about how you get decisions for some of the tasks. (5 minutes)**

### **Benefits of Participation**

Although you may not directly benefit from being in this study, others may benefit because neural representations of code synthesis in the human brain are unexplored.

In modern Software Engineering and computer science education. It is, therefore, of great interest to software companies and institutions to improve the training of software engineers. One part is to understand how programmers think when they are doing software engineering tasks. The other part is, based on how the programmers think, how to improve their thinking and skills to perform software engineering tasks. Similarly, the education of software engineering can benefit from the understanding of how programmers think to improve the training process. The purpose of this study is to learn more about the cognitive processes involved in this task, especially in comparison to mental rotation tasks in which you will decide whether two shapes can be rotated to overlap perfectly.

You are being asked to participate in this study because it requires participants with some computer science knowledge, such as data structures (equivalent to EECS280 and EECS 281), to perform a number of tasks while undergoing an fNIRS scan. If you do not have the required fundamental knowledge, you cannot participate in this study.

### **Risks and Discomforts of Participation**

There may be some risk of temporary discomfort or boredom while being scanned by the fNIRS machine. These risks are minimal and you are able to stop participating in the study at any time for any reason without consequence.

fNIRS stands for functional near-infrared spectroscopy. It works by shining light on your scalp and measuring how the light scatters within your skin to measure brain activity near the surface of your head. This technique **does not** expose you to electric or magnetic fields **nor** any sort of ionizing radiation. fNIRS has previously been safely used in multiple studies with no reported problems or damage occurring to participants.

In addition, data breaches may result in the disclosure of personal data. We will not collect or store personal identifiers such as your name or age. Additionally, research data collected from you will be anonymized after collection and stored on an encrypted volume.

As with any research study, there may be additional risks that are unknown or unexpected.

You should not participate in more than one study without approval from the researchers involved in each study.

### **Compensation for Participation**

For your complete participation in this research project, you will receive **\$50**. If you withdraw from the study before it is finished, you will receive **\$20** instead. You are responsible for traveling to and from the testing facility and any associated parking. This money will be given to you as cash or check, depending on your choice and the availability of funds.

### **Confidentiality**

We/I plan to publish the results of this study. We/I will not include any information that would identify you. Your privacy will be protected and your research records will be confidential.

It is possible that other people may need to see the information you give us as part of the study, such as organizations responsible for making sure the research is done safely and properly like the University of Michigan or government offices.

### **Storage and Future Use of Data**

I/We will store your data/specimens for future research studies. Your name and other identifying information will be secured and stored separately from your research data at the University of Michigan.

Consent to Use Data/Specimens in Future Research

*I agree that my data/specimens may be used in future research.* YES \_\_\_\_\_ NO \_\_\_\_\_

\_\_\_\_\_  
Signature

### **Voluntary Nature of the Study**

Participating in this study is completely voluntary. Even if you decide to participate now, you may change your mind and stop at any time. **You do not have to answer a question you do not want to answer. Just tell me/us and I/we will go to the next question.** If you decide to

withdraw before this study is completed, your data will be destroyed. You will receive compensation even if you decide to withdraw from this study.

The researchers may remove you from the study even if you want to continue your participation if the researchers believe it is not in your best interest to continue, if your condition changes and requires treatment, or if you do not follow the instructions from the researchers.

#### **Contact Information for the Study Team**

If you have questions about this research, you may contact Yu Huang (yhhy@umich.edu), Kevin Leach (kgleach@umich.edu) or Xinyu Liu (xinyuliu@umich.edu).

#### **Contact Information for Questions about Your Rights as a Research Participant**

If you have questions about your rights as a research participant, or wish to obtain information, ask questions or discuss any concerns about this study with someone other than the researcher(s), please contact the:

University of Michigan Health Sciences and Behavioral Sciences Institutional Review Board  
2800 Plymouth Road  
Building 520, Room 1169  
Ann Arbor, MI 48109-2800  
Phone: (734) 936-0933 or toll free, (866) 936-0933  
Email: [irbhsbs@umich.edu](mailto:irbhsbs@umich.edu)

#### **Consent**

By signing this document, you are agreeing to be in the study. I/we will give you a copy of this document for your records. I/we will keep one copy with the study records. Be sure that I/we have answered any questions you have about the study and that you understand what you are being asked to do. You may contact the researcher if you think of a question later.

*I agree to participate in the study.*

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Printed Name

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Signature

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Date