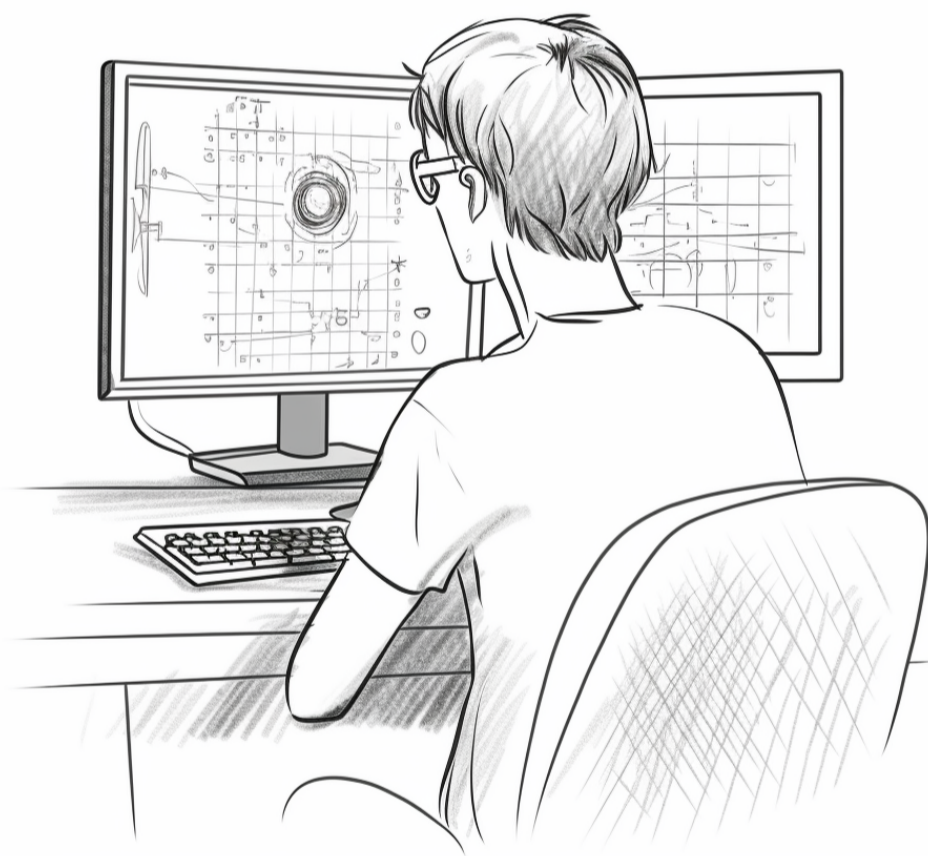

Researching Developer Efficiency: Recording Physiological Indicators of Cognitive Load through Wearable Tech in Software Engineering

Master's Thesis Offer

Did you ever review the source code of another developer? If so, depending on several factors, such as familiarity with the style of coding, you experienced more or fewer difficulties doing that. You experienced a higher or lower cognitive load. In fact, software development includes several tasks that can lead to a high cognitive load. High cognitive load can facilitate making mistakes and introducing errors into software. Thus, an interesting question evolves: Can we quantify the cognitive load experienced by developers while they are trying to understand source code?

Indeed, novel wearables provide us with the possibility to continuously obtain objective indicators for cognitive load. Using wearable electroencephalography (EEG) devices we can measure brainwaves, using wristworn devices we can measure heart rate and perspiration, and using eye-trackers we can measure pupil dilation. All these measurements can indicate changes in cognitive load.



A software developer in a stationary study setting. Generated with Midjourney.

As part of your master's thesis, you will have the exciting opportunity to work with innovative wearables and measurements. Your tasks will involve gathering and analyzing physiological data from study participants, which will contribute to a valuable dataset for researchers seeking to identify links between cognitive load and software development practices. The research you undertake has the potential to enhance productivity among software developers and bring about positive changes across the industry.

Through your work, you will gain knowledge of how wearables can be practically applied in studies with human participants, as well as enhancing your abilities in data processing and analysis. You will also develop a deeper understanding of cognitive load and its importance in gaining valuable insights into our work behavior. The use of body sensors is rapidly expanding, even in software engineering, and this thesis will equip you for these emerging trends.



Objectives

The key objectives for this master's thesis are:

- To collect data from participants in a predefined lab study using a setup of novel wearables.
- To preprocess and analyze collected data.
- To relate the measurements to cognitive load.

Methodology

- Data collection: You will provide study participants with wearable devices and will lead them through a predefined experiment where they have to execute code comprehension tasks of different difficulties that are shown to them on a screen.
- Data preprocessing: You will process the collected physiological data so that it can be used for further analysis.
- Statistical analysis: You will run statistical analyses that help to understand the properties of the data collected.

Requirements and Expectations

Some of the following points should apply to you. You have:

- Some experience with data analysis in Python or R.
- An interest in how studies with human participants can be conducted.
- An interest in body sensors with a focus on wearable EEG and eye-tracking devices.
- An interest in publishing your work for the research community to build upon it.

Contact

If you are interested or would like to get more information please contact:

Fabian Stolp
Fabian.Stolp@hpi.de
+49 (0) 331 5509-3453
G-2.1.11, Campus 3

Bert Arnrich
Bert.Arnrich@hpi.de
+49 (0) 331 5509-4851
G-2.1.14, Campus 3

