Machine Learning Approach to Identifying Neural Features That Predict Rodent Behavior

Requirements and Specifications

Washington State University - Department of Psychology

Nunnerson Computing

Aidan Nunn, Charlie Nickerson

9/21/22

TABLE OF CONTENTS

I. Introduction

Provide a brief description of your project and summarize the objectives. Yes, this is somewhat lifted from the first writing assignment, but this document needs to be self contained and so a new reader needs a 1-2 paragraph introduction to know what the project is about.

This will describe in detail the desired requirements and specifications of the Nunnerson Computing Project. Nunnerson Computing is tasked with designing a machine learning model that can predict imminent alcohol drinking in rodents addicted to alcohol. Nunnerson Computing is also charged with creating a protocol that can assist future researchers in utilizing this model even if they have no experience in coding.

The purpose of this project is to help Angela Hendricks and her team of graduate and undergraduate researchers with speeding up their data collection process. In the past Hendricks and her team have had to manually record video of rodents and record data based on when the rodents looked like they were in the decision making process of consuming alcohol. This project will streamline this process by automating data collection so it no longer needs to be done by a human. Additionally, the data collected from the rodents won't be based on what the researcher observed and instead be based on the statistical probability of the model thus making the data more reliable and less prone to human error.

II. System Requirements and Specification

In this section you will describe the features, functions and other specifications that are requirements for your product. You will also specify the client/stakeholder need(s) that requirement maps to. If you find a stakeholder that your first assignment did not identify, feel free to add them here as required.

Please refer to Section 4.4 in the CptS 322 &&/|| CptS 422 textbooks like "Object-Oriented Software Engineering" to refresh your knowledge on software requirements.

II.1. Use Cases

if applicable, provide some major use-cases that illustrate scenarios for using your product1. Use cases tell a story about how an end user interacts with the system under a specific set of circumstances. You may illustrate the use-cases with UML diagrams.
For each use case, identify the related requirements (you may directly refer to the requirements listed in Section II.2).

II.2. Functional Requirements

List the functional requirements in this section 2.

Include a subsection for each main part/module of your product and list the requirements for the module in that subsection. (Please note that we are not considering any design issues yet. Each module (subsection) refers to a major part/functionality of the product, not to sub-section in the architecture. This classification of requirements is intended to improve the readability of the document.)

Generally, functional requirements are expressed in the form "system must do <requirement>"

Briefly describe each requirement and specify the client/stakeholder need(s) that requirement maps to. Each requirement should appear in ONLY ONE sub-section of the document.

Here is an example template for requirement specification: (the requirement template is formatted with blue for readability. Please remove the color formatting in your document.)

II.2.1. [Machine Learning Model]

Rodent Decision Making Recognition Tool: This machine learning model tool must be able to recognize when a rodent is in the decision making process of consuming alcohol. This model will be tested on female and male rodents that are either addicted to alcohol or are sober. This will be important for knowing when to start and end data collection.
Source: Dr. Hendricks and her team have requested that this be in the project
Priority: Priority Level 0: Essential and required functionality

II.2.2 [Automated Data Collection]

Local Field Potential Data Collection Tool: One the machine learning model recognizes when a rodent is in the decision making process, this tool must begin collecting local field potential data (LFPs) in order to calculate the coherence and power values taking place within the rodent's brain. This is important data for Dr. Hendricks research and is essential to the project
Source: Dr. Hendricks and her team have requested that this be in the project
Priority: Priority Level 0: Essential and required for functionality

II.2.3. [Graphic User Interface]

User Interface for Automated Data Collection of Rodent LFPs: This tool is important for assisting users with using the predictive model to collect data. Users should be able easily import data into the program. This program should then neatly output the LFP data with timestamps of when that data was recorded. This entire process should be intuitive for the user and easily accessible for people who have little experience with coding.
Source: Dr. Hendricks and her team have expressed their desires for having this function in the project.
Priority: Priority Level 1: Desirable Function

List your requirements for the next project module here based on the requirements template

described above. Include a subsection for each part.

II.3. Non-Functional Requirements

List the non-functional requirements in this section. Non-functional requirements define system properties (e.g. reliability, response time and storage requirements, etc.) and constraints (e.g. I/O device capability, system representations, etc.)

Generally, non-functional requirements take the form "system shall be <requirement>." Process requirements may also be listed here (e.g. specifying a particular programming language or development method.) This will include any general testing plans, but there is a later assignment that will go into much greater depth about testing the product.

Please refer to Section 4.4.7 in the book “Object-Oriented Software Engineering” for example categories of non-functional requirements.

You may use the following template for non-functional requirements (Please remove the color formatting in your final document):

[Enter a Concise Requirement Name]:
[provide a concise description, in clear and easily understandable language to specify the requirement]

III. System Evolution

This should describe the fundamental assumptions on which your project is based, and any anticipated changes due to hardware evolution, changing user needs, and so on. This section is useful as it may help avoid design decisions that would constrain likely future changes to your project. They are also designed to identify risk points in your design process, which need to be kept in mind as your development continues. These can be hardware, software, or client issues where your assumptions about what will work or be required end up being incorrect. For example, if you think the computer platform you’re choosing might have driver issues you’ll have to either do significant extra work to fix the drivers or find another platform on a short timeline. That’s something you should note in this section as an anticipated change point

IV. Glossary

V. References

6 Requirements and Specifications