

PROJECT REPORT



Neuro Nexus

Project Name

Neuro Nexus (Cognitive Brain Games)

Team Members

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INTRODUCTION

This comprehensive report offers an extensive analysis and description of our semester project, **Neuro Nexus**, in the field of Web Engineering. **Neuro Nexus** is a web application developed using the ReactJs framework and the MERN (MongoDB, Express.js, React.js, Node.js) stack, designed to address the need for cognitive brain function improvement. By providing an assortment of interactive and captivating games, the application caters to clients of all age groups, offering a unique and engaging platform to enhance their cognitive abilities.

The purpose of this report is to present a comprehensive overview of **Neuro Nexus**, an innovative web application developed as part of our Web Engineering semester project. In the digital era, where cognitive abilities and mental agility play an increasingly significant role in personal and professional success, it emerges as a groundbreaking solution to foster cognitive brain function improvement. With a meticulous focus on user engagement and utilizing the state-of-the-art ReactJs framework, **Neuro Nexus** offers a dynamic and immersive experience that promotes cognitive development. This report delves into the detailed analysis, covering scope, requirement elicitation process, and an exploration of prominent features.

PROBLEM STATEMENT

Cognitive decline and the deterioration of cognitive brain functions are prevalent challenges faced by individuals of all age groups in today's fast-paced and demanding world. Factors such as aging, sedentary lifestyles, and limited mental stimulation contribute to the decline in cognitive abilities, leading to reduced productivity, decreased quality of life, and increased dependency on others. Recognizing the critical need to address this problem, our project, **Neuro Nexus**, seeks to provide an innovative solution by leveraging web technology and gamification to improve cognitive brain functions.

The problem at hand is that there is a lack of accessible and engaging platforms specifically designed to target and enhance cognitive abilities. Traditional methods of cognitive improvement, such as textbooks or mundane exercises, often fail to captivate users and sustain their interest over time. Moreover, individuals may not have access to specialized cognitive training programs or resources due to various constraints, such as cost, availability, or geographical limitations.



To combat this problem, **Neuro Nexus** aims to bridge the gap by offering a web-based platform that provides interactive and entertaining games designed to specifically target cognitive brain functions. By incorporating gamification principles, **Neuro Nexus** seeks to

engage users, motivate them to actively participate in cognitive training, and sustain their long-term commitment to improving their cognitive abilities.

The solution provided by **Neuro Nexus** is essential because it offers a convenient, accessible, and enjoyable means for individuals to proactively address their cognitive health. By providing a platform that combines scientific research, user-centric design, and gamified experiences, **Neuro Nexus** seeks to empower users to take charge of their cognitive well-being, slow down cognitive decline, and enhance their cognitive abilities in areas such as reaction time, memory, attention, problem-solving, etc.

By addressing the problem of cognitive decline and the lack of engaging cognitive training platforms, **Neuro Nexus** offers a compelling solution that has the potential to positively impact individuals' lives. The availability of an accessible and stimulating platform for cognitive improvement can lead to increased productivity, improved academic and professional performance, enhanced mental well-being, and an overall enriched quality of life for users.

REQUIREMENT ELICITATION

1. Analyze existing cognitive training platforms and gamified applications to identify successful features, best practices, and potential areas for improvement. Incorporate these ideas into our own design,
2. Determine the desired user experience, including intuitive user interfaces, personalized profiles, progress tracking, and performance analytics.
3. Identify technical requirements, such as the use of the MERN stack (MongoDB, Express.js, React.js, Node.js), scalability, cross-platform compatibility, and integration with external services or APIs.
4. Define requirements for game diversity and the inclusion of UI elements to enhance engagement.
5. Specify requirements for accessibility, ensuring that the platform supports multiple devices and screen sizes.
6. Prioritize requirements based on their importance, feasibility, and potential impact on enhancing cognitive brain functions.

IMPLEMENTATION METHODOLOGY

1. Engineer a game-based solution for the problem statement. Use a learning plus entertainment approach.
2. Target all audiences. Implement an appeal-to-all UI and game design, while keeping user functionality simplistic.
3. Allow users to make personal accounts to provide feedback on cognitive brain function improvement.

FEATURES

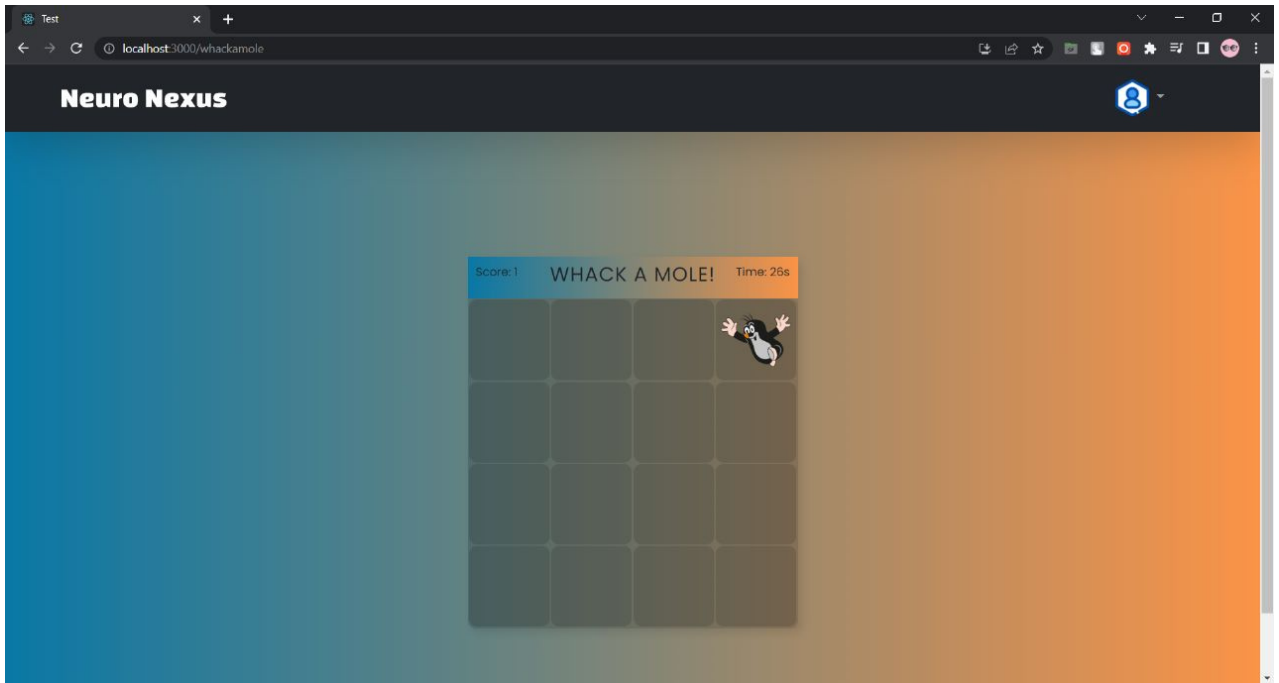
1. Login and signup to create a user account. This will be used to track game scores and provide feedback on cognitive brain function improvement.
2. A home screen with simple navigation elements.
3. Cognitive Brain Games.
4. A statistics page to display feedback on scores over multiple attempts.

WHACK-A-MOLE

The Whack-a-Mole game is a classic arcade-style game where the objective is to hit as many moles as possible within a limited time. The game consists of a grid of holes, and a mole randomly pop up from the holes for a brief duration. The player's task is to quickly click or tap on the mole to score points.

Purpose:

Whack-a-Mole is a simple yet entertaining game that focuses on the cognitive brain function of '**Reaction Time**'. Players must be quick in their response to score the most points. This game is an amazing way to train visual senses.



In the ReactJS implementation, the game is built as a component-based structure. The main component serves as the container for the entire game logic and user interface. This component renders a grid of holes using nested component arrays. A mole 'travels' across the grid, appearing at a different grid after a set of time, or if ANY grid hole is clicked by the player.

The ReactJS implementation allows for efficient state management, event handling, and reusability of components, making it easy to maintain and expand the game with additional features or customizations.

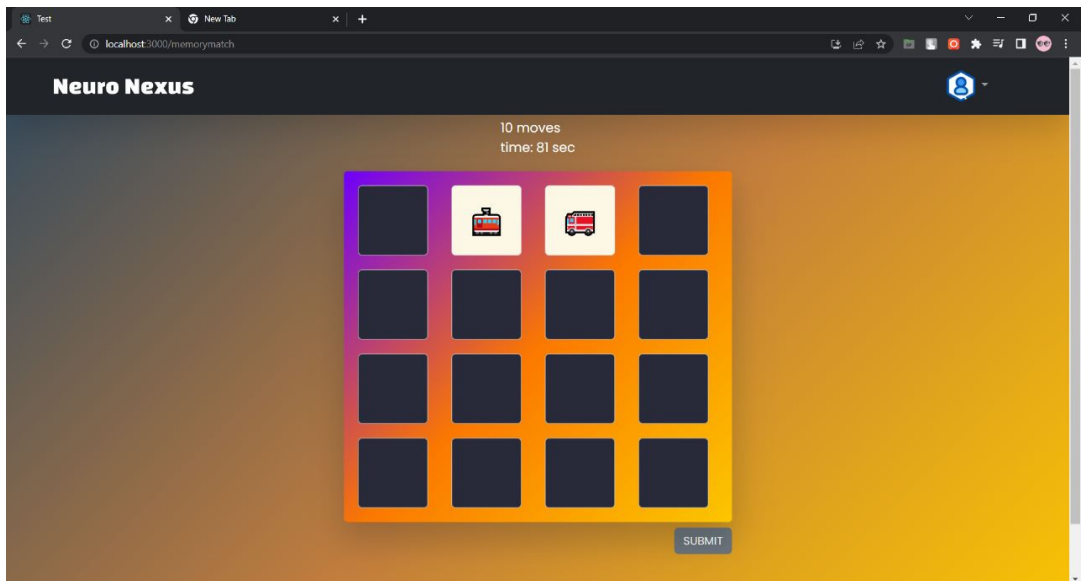
MEMORY MATCH

'Memory Match' is a popular card-matching game that tests players' memory and concentration skills. The objective of the game is to find and match pairs of cards with identical images. The game begins with all cards face-down, and the player flips over two cards at a time to reveal their images. If the two cards match, they remain face-up. If they don't match, they are flipped back face-down, and the player continues their turn.

Purpose:

As the name suggests, this is a brilliant way to train your '**memory skills**', another important cognitive function. The aim is to solve the puzzle in as less moves and time as possible, by 'remembering' where the cards are.

The ReactJS implementation of “Memory Match“ also utilizes a component-based architecture, storing an array of grid cards in a main component. Each grid card has a picture on it that needs to be matched with the other. Each memory card keeps track of its state, such as whether it's face-up, face-down, or matched.



At the start of the game, the cards are shuffled, and their positions within the grid are randomized. The player interacts with the game by clicking or tapping on face-down cards to reveal their images. The game keeps track of the cards the player has revealed and checks for matches.

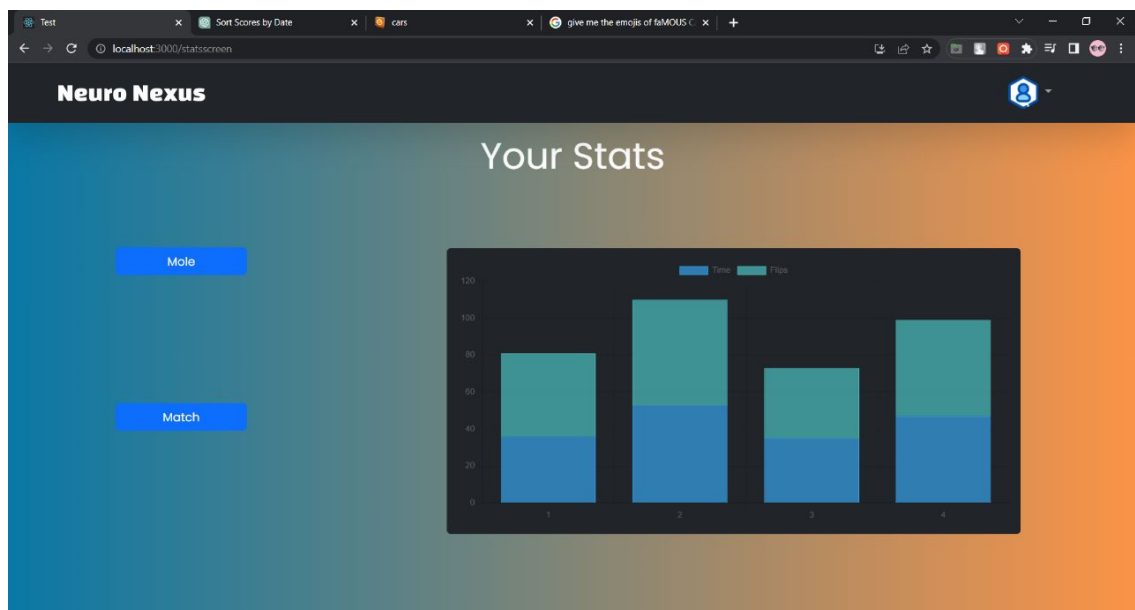
If the player selects two cards that match, those cards remain face-up, indicating a successful match. The player earns points or some form of progress for each successful match. If the player selects two cards that do not match, they are flipped back face-down, and the player's turn continues. The game keeps a counter of the number of moves and time taken to calculate the final score.

“Memory Match“ in ReactJS provides an engaging and challenging experience for players as they exercise their memory and cognitive skills to uncover matching pairs of cards.

STATISTICS

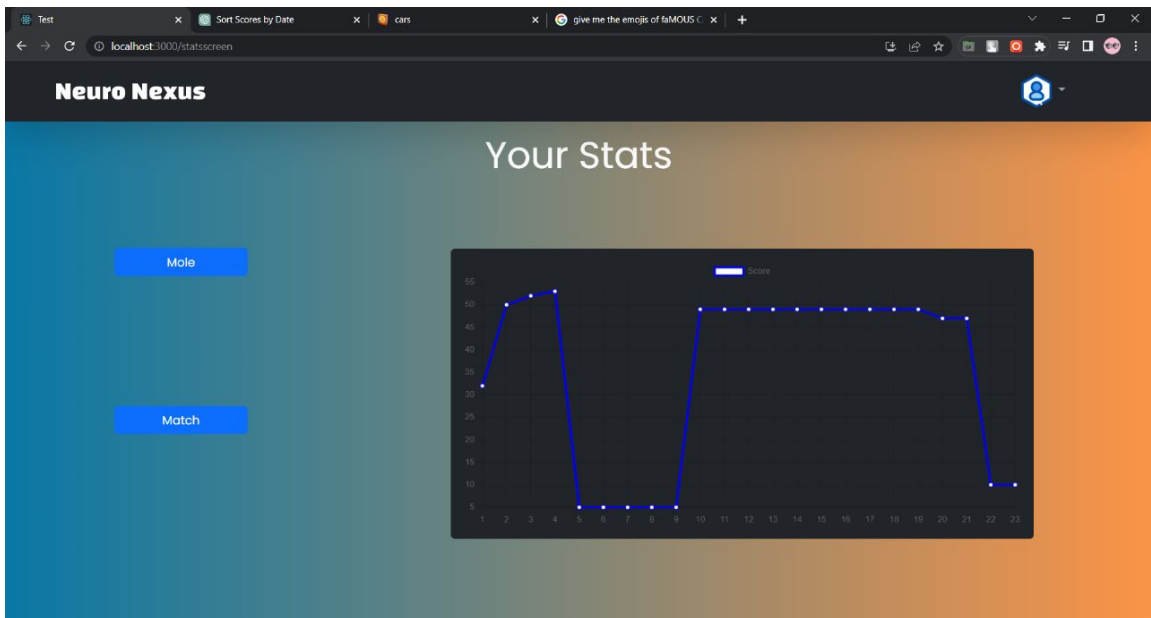
The Statistics web page is a data-driven platform that provides visual representations of the performance and progress in two different games: Whack-a-Mole and Memory Match. The page aims to help users analyze and compare their scores, time taken, and number of flips in an intuitive and informative manner.

Upon visiting the Statistics web page, users are presented with a user-friendly interface that showcases the data visualizations and relevant game statistics. The page is divided into two sections, buttons for each game's chart and the corresponding chart.



In the Whack-a-Mole section, a line chart is displayed, representing the scores achieved over time. The x-axis represents time, while the y-axis represents the scores. The line on the chart shows the trend of the scores, allowing users to track their progress and observe any patterns or improvements over multiple game sessions.

In the Memory Match section, a stacked bar chart is utilized to present the relationship between time taken and the number of flips. Each bar in the chart represents a game session, and the bars are divided into segments indicating the time taken and the corresponding number of flips. The length or height of each segment represents the duration or quantity of flips, respectively. This visual representation allows users to compare and analyze their performance in terms of efficiency and strategy, identifying any correlations between time taken and the number of flips.



The Statistics web page integrates data from both games to provide users with comprehensive insights and facilitate their understanding of their gaming skills and progress. The data is retrieved for each user from Mongo Atlas Cloud Service against email ID.

SCOPE

The scope of **Neuro Nexus** encompasses the development of a robust web application that serves as a comprehensive platform for cognitive brain function improvement. Through captivating games meticulously designed to target specific cognitive domains, it caters to users of diverse age groups, including students, professionals, and seniors. The project's scope also encompasses the creation of personalized user profiles, game progress tracking, performance analytics, and a vibrant social integration component to foster a sense of community and healthy competition among users.

Additionally, **Neuro Nexus** is implemented using the MERN stack, ensuring scalability, security, and seamless integration of various technologies.

CONCLUSION

With the development of **Neuro Nexus**, we strive to take a step towards changing the way individuals approach cognitive brain function enhancement. By combining the elements of gamification, scientific research, and user-centric design principles, we aim to empower users to take control of their cognitive health and unlock their full mental potential. We hope of making a contribution to the field of cognitive neuroscience and human-computer interaction.