BRAUDE
College of Engineering, Karmiel

Capstone Project Phase A

25-1-D-5

ParkinSphere

Development of an Application for Multidisciplinary Care Management and Support for Parkinson's Disease

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AGENDA

1. **Project Overview**
   Introduction, Parkinson’s Disease and Multidisciplinary Care Management, Problem Statement and Analyze problem.

2. **Project Details**
   Project Goals ,Related Work and Project Visualization Choices.

3. **Technical Aspects**
   Project Unique Features, System Design: Architecture, Use Cases, and Prototypes, Expected Achievements.

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INTRODUCTION

PARKINSON'S DISEASE OVERVIEW

1

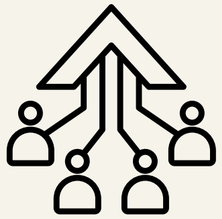
Parkinson's disease (PD) is a progressive condition affecting motor and cognitive abilities, causing tremors, stiffness, and slowed movements.

Patients alternate between "ON" states of better function and "OFF" states of worsened symptoms.

Effective daily management is crucial as there is no cure.

PARKINSON'S DISEASE AND MULTIDISCIPLINARY CARE MANAGEMENT

Multidisciplinary care is key to managing Parkinson's Disease. Role-specific data and visual tools help providers tailor treatments, identify trends, and improve outcomes for patients.



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PROBLEM STATEMENT

Challenges Faced by Care Providers

Fragmented Data

Care providers often rely on scattered data sources, such as paper records, emails, or unstructured digital files, making it difficult to gain a comprehensive view of the patient's condition.

Ineffective Visualization

Existing tools fail to provide role-specific visualizations, leading to difficulty in identifying trends and correlations between movement, nutrition, and exercise for informed decision-making.

By addressing these challenges, the project aims to support care providers with structured, role-specific dashboards to enhance clinical insights.

ANALYZE PROBLEM

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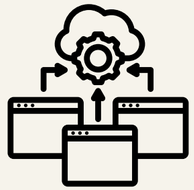

Care providers rely on non-integrated sources, limiting comprehensive assessments.

Physiotherapists, nutritionists, and trainers lack tools tailored to their unique data requirements.

Ensuring secure access while allowing patient control remains a challenge.

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PROJECT GOALS

ParkinSphere : A technological solution

- User-Friendly Platform
- Role-Based Dashboards
- Secure Data Sharing
- Detailed Data Visualizations
- Clear Text Explanations
- Annotation and Notes Features
- Custom Timeframes

RELATED WORK

EXISTING SOLUTIONS

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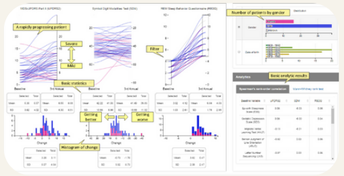
We reviewed Epic's Care Everywhere, T1D Exchange Registry, Winnow, and OnPoint Visualization Tool:

Epic's Care Everywhere

T1D Exchange Registry



Winnow: Interactive Visualization

OnPoint Visualization Tool

They offers:

- ✓ broad access to general patient data across institutions
- ✓ custom data views and trend tracking for specific conditions
- ✓ interactive visualizations for tracking clinical progression

They Don't offers:

- ⊗ dashboards tailored to individual care provider needs
- ⊗ user-friendly for diverse roles in multidisciplinary teams
- ⊗ solutions for handling unique data visualization and care coordination requirements for Parkinson's disease.

PROJECT VISUALIZATION CHOICES

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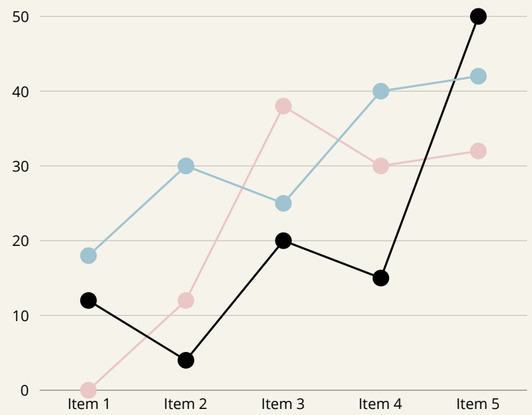
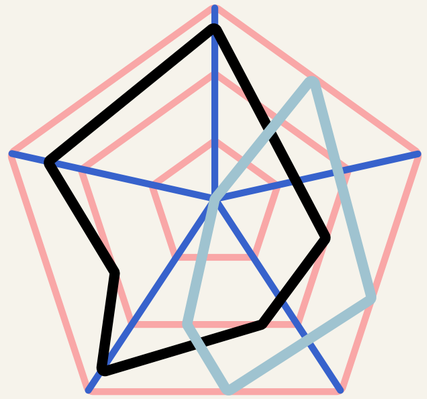
Line Charts



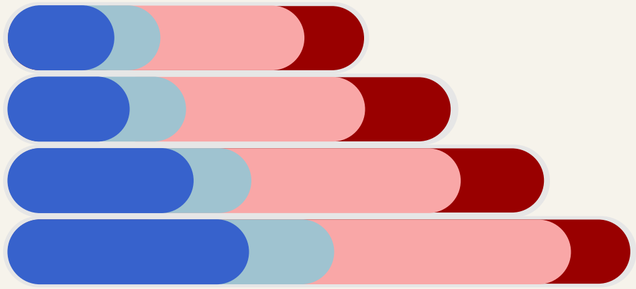
Track trends over time, highlighting patterns like symptom progression

Radar Charts



Summarize multiple metrics in one view, ideal for tracking fitness progress.

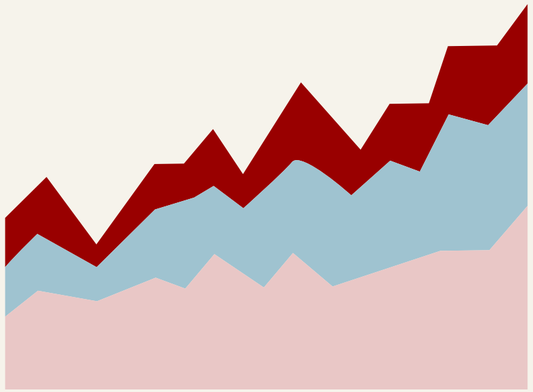
Stacked Bar Charts



Display cumulative data like weekly exercise outcomes or nutrient intake.

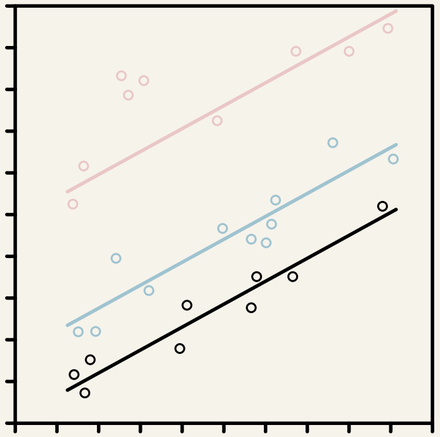
PROJECT VISUALIZATION CHOICES

Area Charts



Illustrate cumulative trends, such as changes in overall health metrics or exercise outcomes over time.

Scatter Plots



Show relationships between variables, such as activity levels and symptoms.

ParkinSphere Unique Features

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Key Features of ParkinSphere

ParkinSphere is designed to support multidisciplinary care providers for Parkinson’s patients by offering:

Role-Based Dashboards: Each care provider- physiotherapist, nutritionist, or fitness trainer-accesses a tailored dashboard designed to meet their specific data needs.

Text Explanations: Each graph and visualization is accompanied by clear, concise text explanations.

Custom Timeframes: Care providers can analyze patient data over specific periods - daily, weekly, or monthly - to identify trends and patterns effectively.

Unified Patient Overview: All providers can view the patient’s daily general well-being and symptom severity to make informed decisions.

Secure Access Control: Patients have full control over their data, granting access to active care providers and revoking permissions when care concludes.

USER-CENTERED DESIGN

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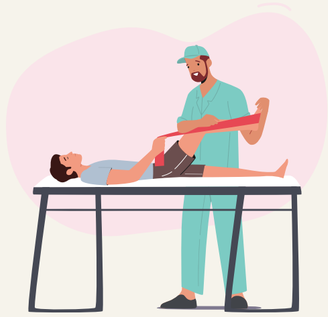
Building on Insights

Our project continues the foundation established by the previous initiative, leveraging their user interviews:

Parkinson's Patients: Insights into daily challenges and data needs.

Care Providers: Identified workflow requirements and visualization preferences.



SYSTEM ARCHITECTURE

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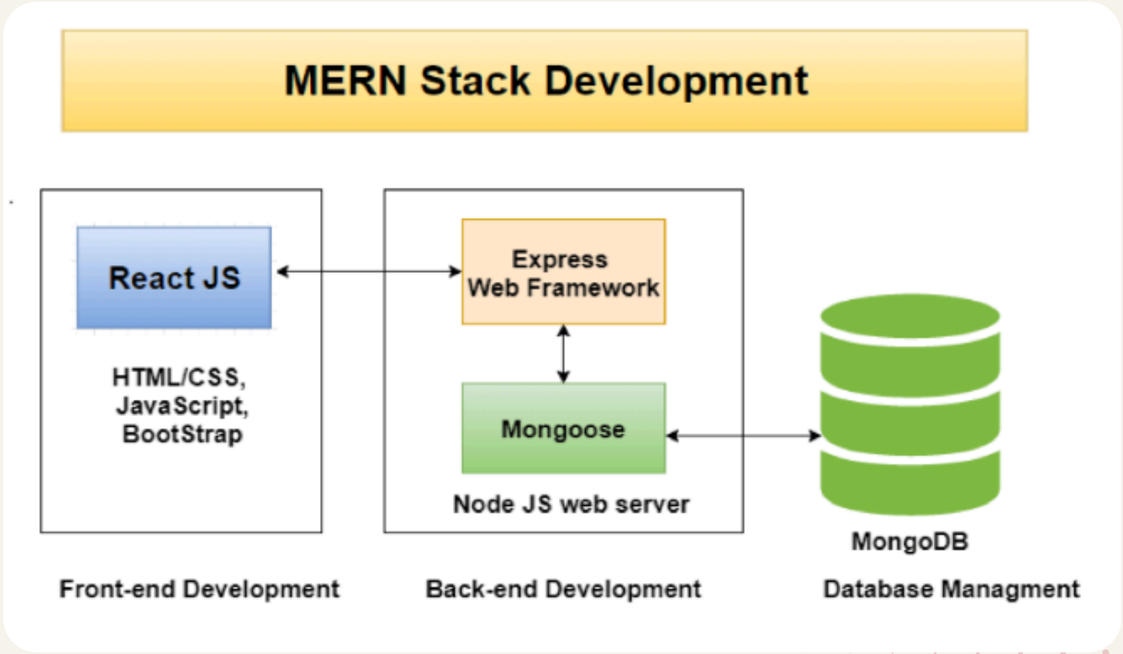
Technical Overview

The application will be built using the MERN stack (MongoDB, ExpressJS, React, and Node.js).
The system is a web-based solution that is accessible from multiple devices, enabling care providers to view patient data, track trends, and make informed decisions.



USE CASE DIAGRAM

How ParkinSphere Works

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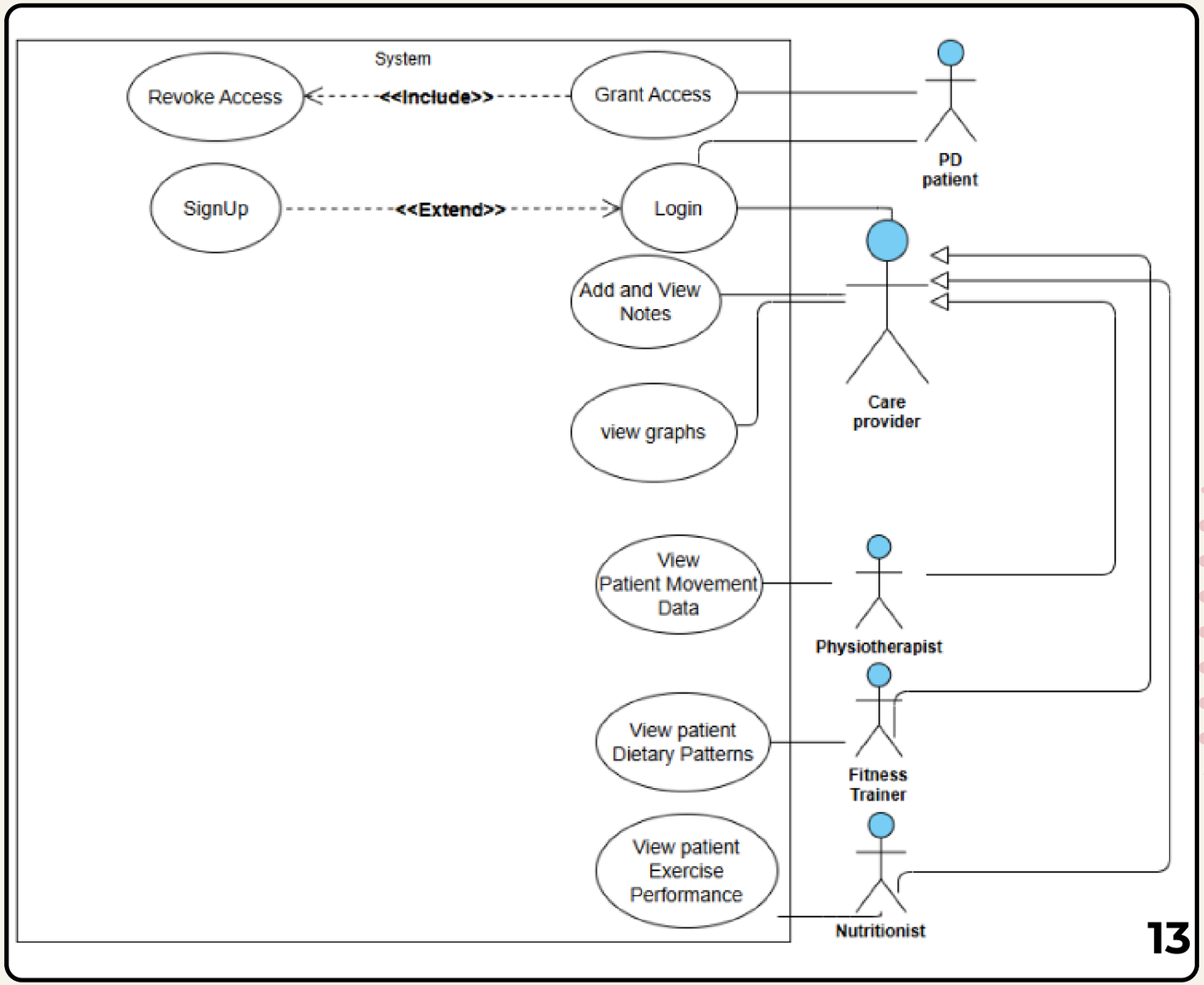
This diagram shows how Parkinson's patients and Care Providers interact with the app.



PROTOTYPE SCREENS

Prototype Screenshots of the App

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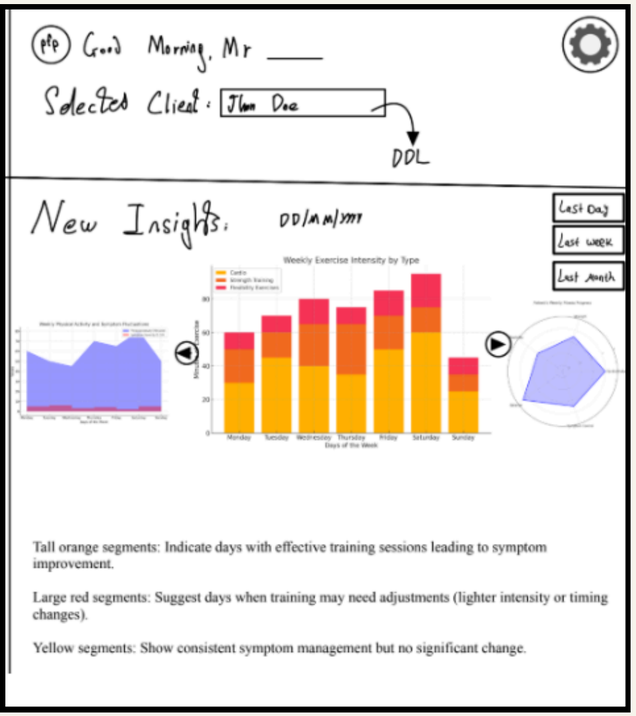
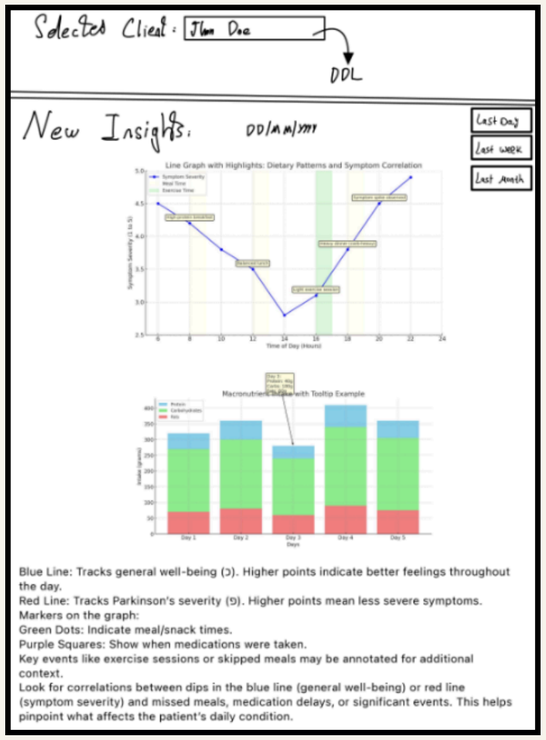
Caregiver screens:



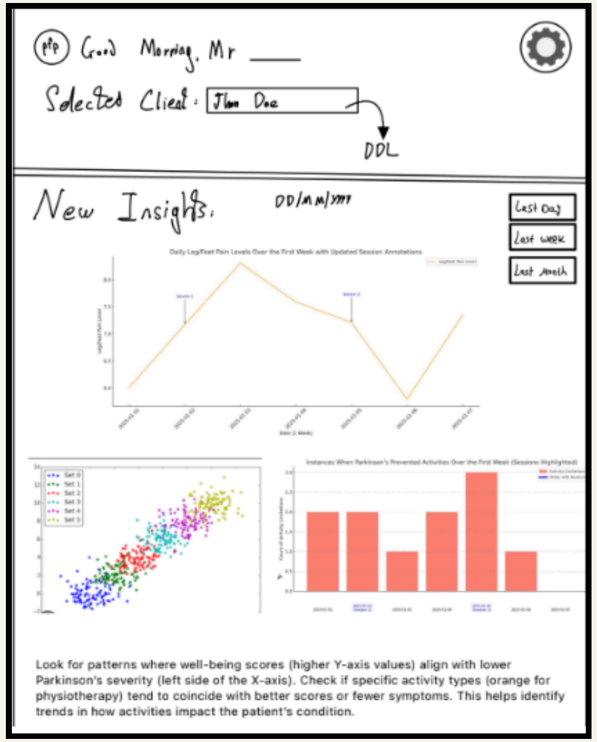
Tall orange segments: Indicate days with effective training sessions leading to symptom improvement.

Large red segments: Suggest days when training may need adjustments (lighter intensity or timing changes).

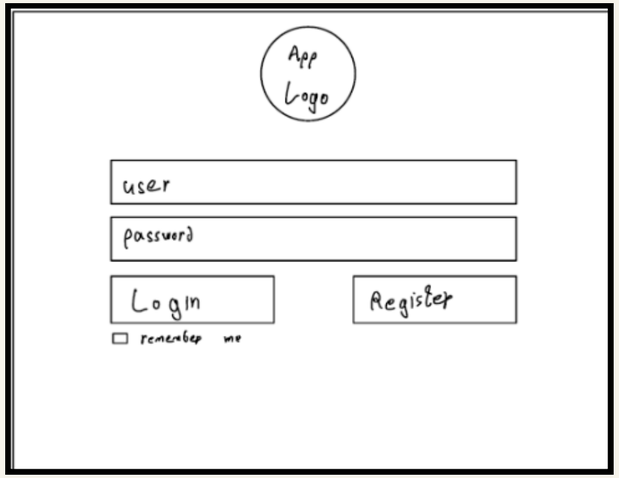
Yellow segments: Show consistent symptom management but no significant change.

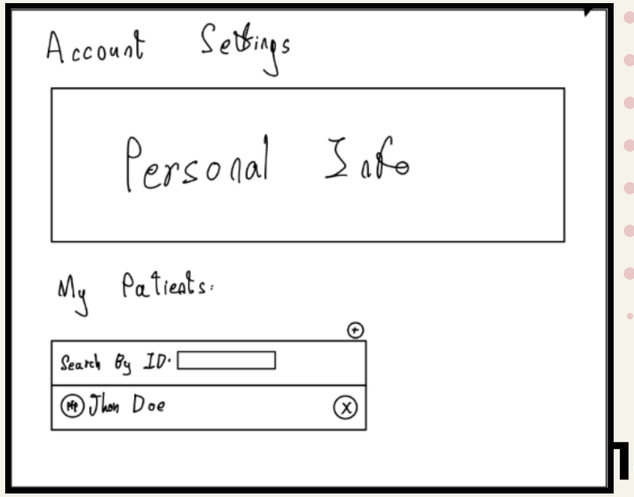


Blue Line: Tracks general well-being (). Higher points indicate better feelings throughout the day.
Red Line: Tracks Parkinson's severity (). Higher points mean less severe symptoms.
Markers on the graph:
Green Dots: Indicate meal/snack times.
Purple Squares: Show when medications were taken.
Key events like exercise sessions or skipped meals may be annotated for additional context.
Look for correlations between dips in the blue line (general well-being) or red line (symptom severity) and missed meals, medication delays, or significant events. This helps pinpoint what affects the patient's daily condition.



Look for patterns where well-being scores (higher Y-axis values) align with lower Parkinson's severity (left side of the X-axis). Check if specific activity types (orange for physiotherapy) tend to coincide with better scores or fewer symptoms. This helps identify trends in how activities impact the patient's condition.





PROTOTYPE SCREENS

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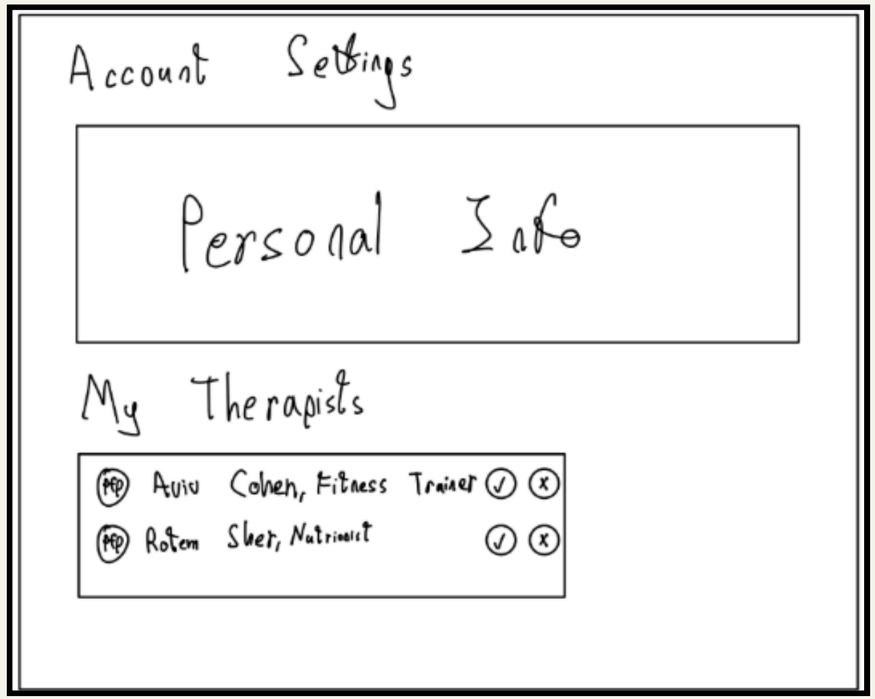
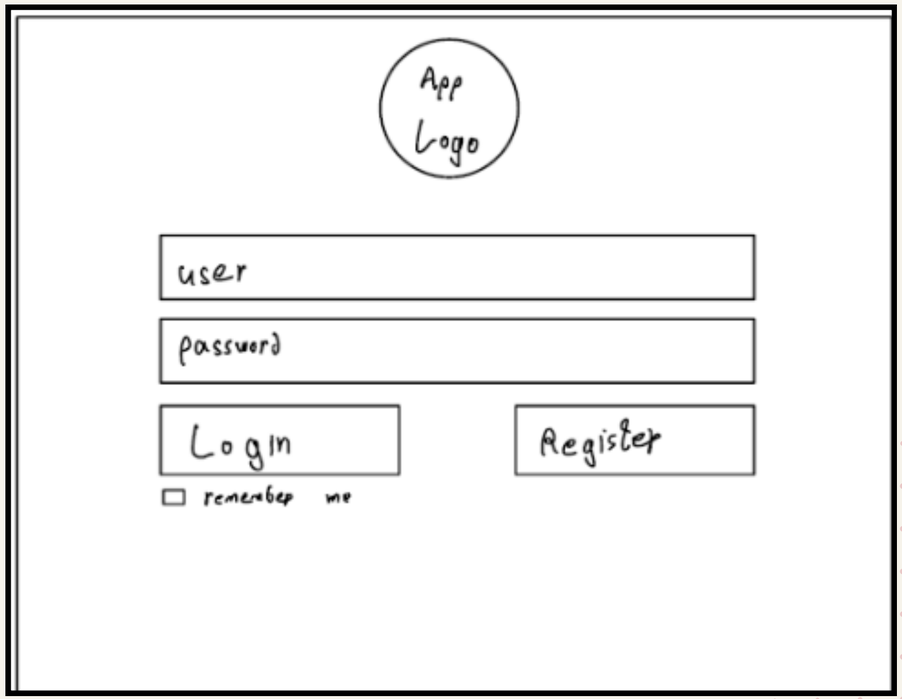
Prototype Screenshots of the App

Parkinson’s patient screens:





EXPECTED ACHIEVEMENTS

Project Outcomes

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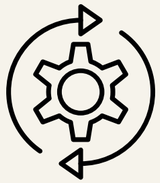


Optimized Workflow

Reducing time spent on manual data interpretation through automated and insightful visualizations.

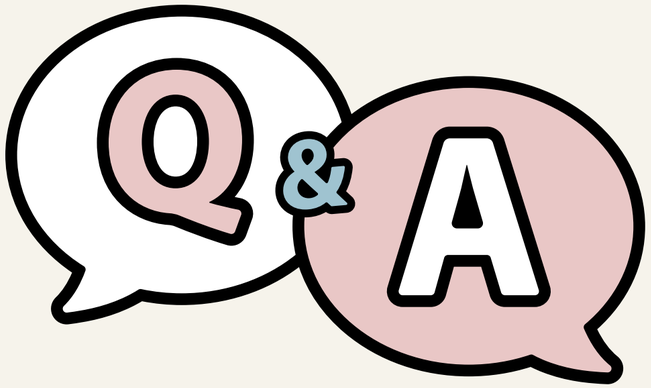
Early Trend Detection

Helping care providers identify emerging patterns in patient data for timely intervention.

Stakeholder Validation

Ensuring the platform meets the practical needs of care providers through direct feedback.

THANK YOU!



Feel free to ask any question