Final Report

Team ID: 5 9 2 0 0 4

Team Members:

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Project Report Format

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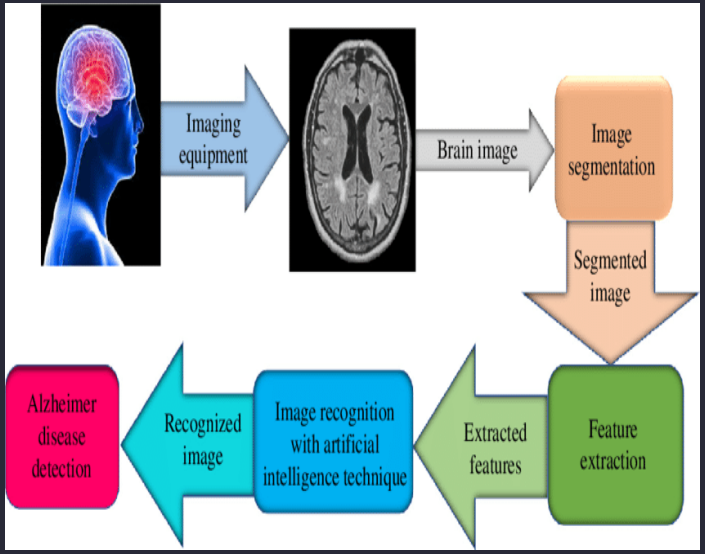
Project Description:

A project on Alzheimer's disease prediction aims to develop a model that can forecast the likelihood of individuals developing Alzheimer's based on various factors such as genetic markers, lifestyle, and medical history. Utilizing machine learning algorithms, the project seeks to enhance early detection and intervention strategies, contributing to better patient outcomes and understanding of this neurodegenerative condition.

ALZHEIMER'S DISEASE PREDICTION



TEAM MEMBERS

- MOHAMMAD SHUJAUDDIN
- DEVANSH BIYANI

Problem Statement

To predict Alzheimer's disease, you could explore machine learning models using relevant features such as cognitive test scores, genetic markers, age, and medical history.
Gathering a diverse dataset and employing algorithms like logistic regression or neural networks may help in building an effective prediction model. Regular validation and testing are crucial for assessing the model's accuracy and generalizability. Consider incorporating advanced techniques like feature selection and dimensionality reduction to enhance model performance. Additionally, collaboration with healthcare professionals ensures a comprehensive understanding of the disease's progression and aids in refining the predictive model. Regular updates and adaptation to emerging research findings will contribute to the model's ongoing effectiveness in Alzheimer's disease prediction

Objective

The primary objective for Alzheimer's disease prediction is to develop a robust and accurate predictive model that utilizes machine learning techniques to identify individuals at risk of developing Alzheimer's based on relevant features. This model aims to facilitate early diagnosis, allowing for timely intervention and personalized care, ultimately improving patient outcomes and contributing to advancements in Alzheimer's research and treatment. Moreover, the objective includes the creation of a user-friendly tool accessible to healthcare professionals, promoting widespread adoption for routine screening. By leveraging data-driven insights, the goal is to enhance our understanding of Alzheimer's risk factors and contribute to the broader efforts in developing preventive strategies. Continuous refinement and validation of the model are essential to ensure its reliability across diverse populations and healthcare settings.

Introduction

Alzheimer's disease prediction involves utilizing machine learning algorithms to analyze relevant data, such as cognitive assessments, genetic information, and medical history. The goal is to develop accurate models that can identify individuals at risk of developing Alzheimer's before clinical symptoms appear. This predictive approach aims to enable early intervention, personalized care, and advance our understanding of the disease for improved management and treatment strategies.

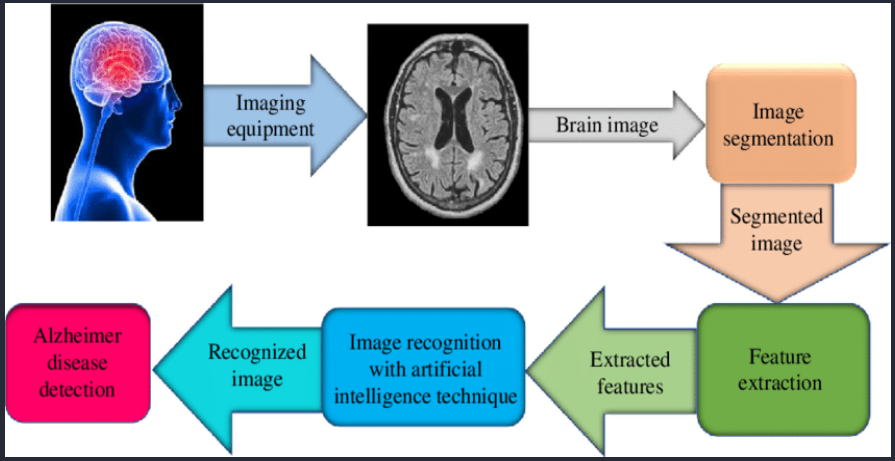
Understanding ALZHEIMERS DISEASE

Understanding Alzheimer's disease prediction involves leveraging machine learning to analyze diverse data sets, encompassing cognitive tests, genetic markers, age, and medical history. The objective is to develop models capable of identifying potential cases

Challenges and Opportunities

Challenges in Alzheimer's prediction include complex data integration and interpreting subtle signs. Opportunities arise from advancing machine learning, incorporating biomarkers, and fostering collaboration for early intervention and breakthroughs in understanding and management. Staying updated with technology and science is crucial for addressing these challenges and maximizing predictive potential.

Solution Architecture



Challenges in Alzheimer

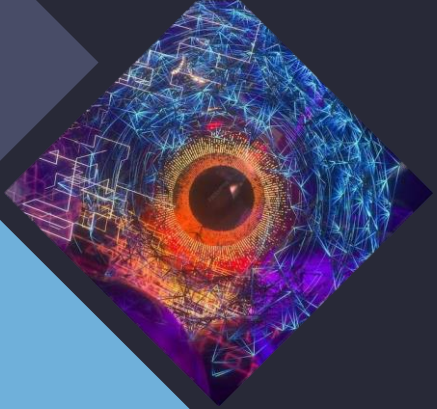
Challenges in Alzheimer's prediction include the disease's complexity, variability in data, subtle early signs, interpreting heterogeneous data, ethical considerations in data handling, and the need for rigorous clinical validation.

Deep Learning in Image Recognition

Deep learning, specifically CNNs, is used to analyze medical images for Alzheimer's disease detection by automatically extracting relevant features from brain scans..

Enhancing Alzheimer Disease Prediction

Enhancing Alzheimer's prediction involves refining machine learning models, incorporating novel biomarkers, utilizing diverse datasets, collaborating with healthcare professionals, maintaining ethical data



Real-world Applications

Real-world applications of Alzheimer's disease prediction include early detection for timely interventions, personalized treatment planning, optimized healthcare resource allocation, and contributions to large-scale research efforts for a proactive and informed approach to dementia care.

Future Prospects

The future prospects for Alzheimer's disease prediction are optimistic. Advancements in machine learning, integration of diverse datasets, and collaboration with healthcare professionals offer promising avenues. Continuous research may uncover new biomarkers and refine predictive models, enhancing accuracy and early detection.

Conclusion

In conclusion, Alzheimer's disease prediction, though challenging, holds promise through advanced machine learning. Early detection enables timely interventions and fosters ongoing research breakthroughs, ultimately improving patient outcomes and advancing neurodegenerative disease management.

Thanks!

Shujauddin
Devansh Biyani

Project Design Phase-I
Solution Architecture

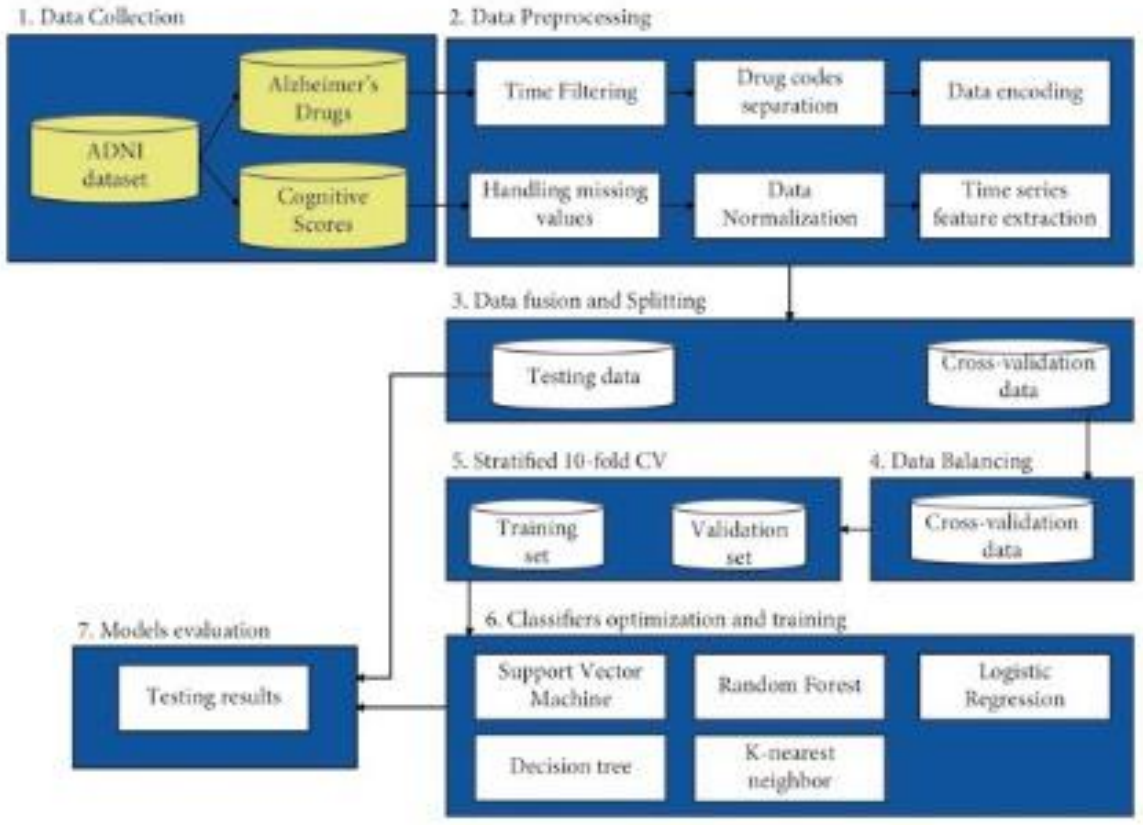
Date	23rd October 2023
Team ID	Team-592004
Project Name	Project:- Alzheimer's disease prediction
Maximum Marks	5 Marks

Solution Architecture:

Solution architecture is a complex process – with many sub-processes – that bridges the gap between business problems and technology solutions. Its goals are to:

- Find the best tech solution to solve existing business problems.
- Describe the structure, characteristics, behavior, and other aspects of the software to project stakeholders.
- Define features, development phases, and solution requirements.
- Provide specifications according to which the solution is defined, managed, and delivered.

Example - Solution Architecture Diagram:



Alzheimer's disease prediction (Team-592004)Project Description:

Alzheimer's disease prediction project involves collecting diverse datasets, preprocessing and extracting relevant features, implementing machine learning models for early detection, and validating the model's accuracy. Ethical considerations and continuous updates contribute to its effectiveness in predicting Alzheimer's disease. Alzheimer's disease prediction project involves collecting diverse datasets, preprocessing and extracting relevant features, implementing machine learning models for early detection, and validating the model's accuracy. Ethical considerations and continuous updates contribute to its effectiveness in predicting Alzheimer's disease.

Solution Architecture Diagram:

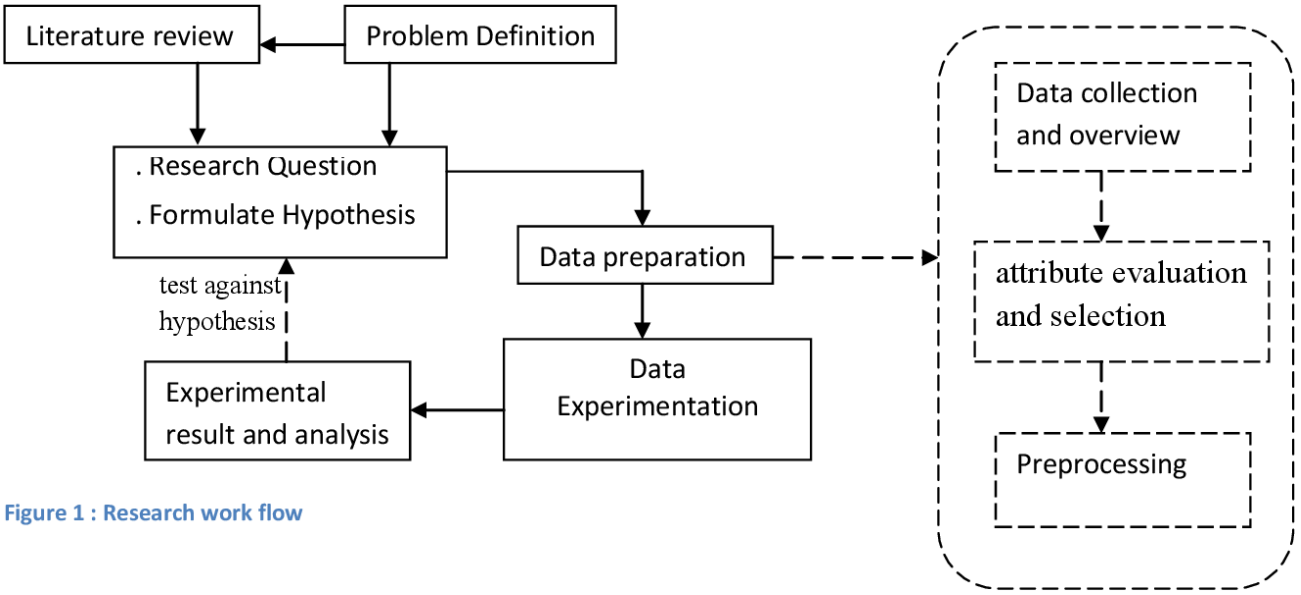
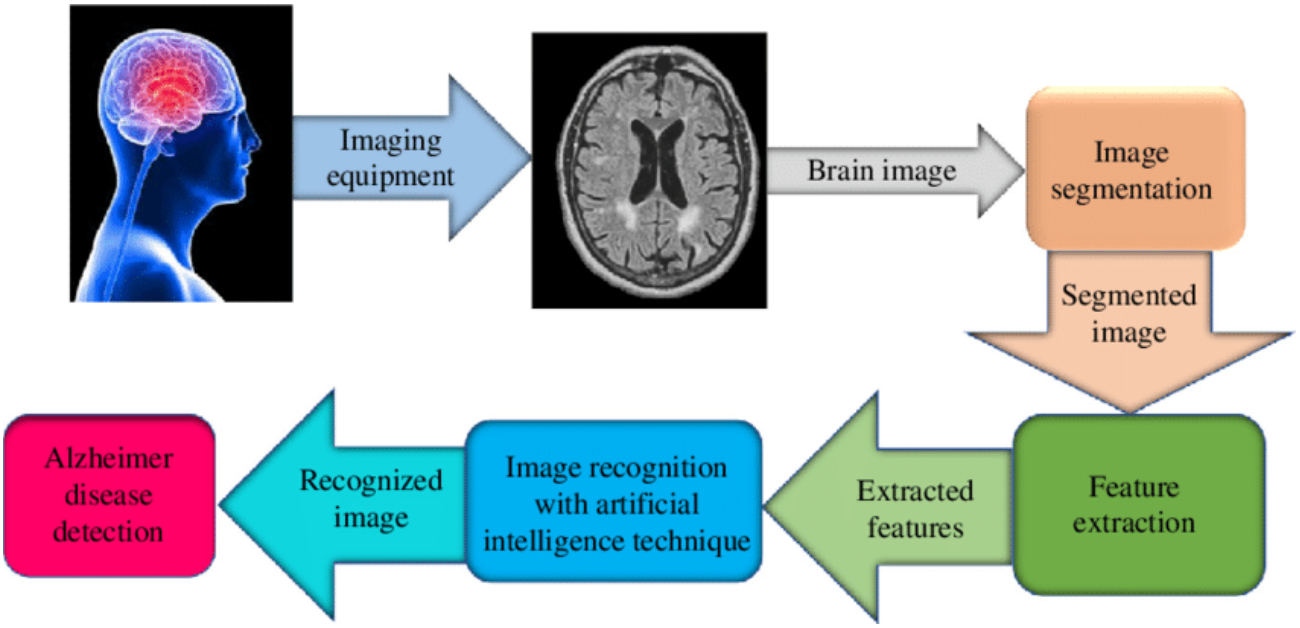


Figure 1 : Research work flow

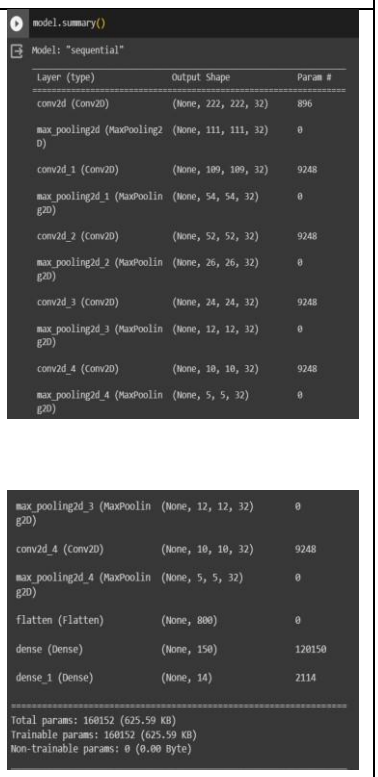
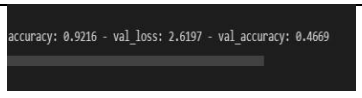

Imaging equipment
Brain image
Image segmentation
Segmented image
Feature extraction
Extracted features
Image recognition with artificial intelligence technique
Recognized image
Alzheimer disease detection

Project Development Phase
Model Performance Test

Date	10 November 2022
Team ID	Team-592004
Project Name	Alzheimer Disease Prediction
Maximum Marks	10 Marks

Model Performance Testing:

Project team shall fill the following information in model performance testing template.

S.No.	Parameter	Values	Screenshot
1.	Model Summary	-	
2.	Accuracy	Training Accuracy – 0.921 Validation Accuracy – 0.46	
3.	Confidence Score (Only Yolo Projects)	Class Detected - NA Confidence Score - NA	NA

Project Development Phase
Model Performance Test

Date	9 November 2022
Team ID	Team-592004
Project Name	Project Alzheimer Disease Prediction
Maximum Marks	10 Marks

Model Performance Testing:

Project team shall fill the following information in model performance testing template.

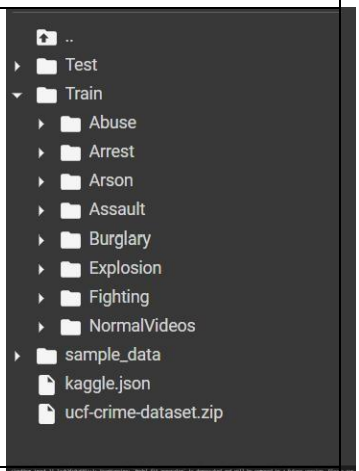
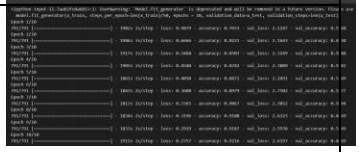
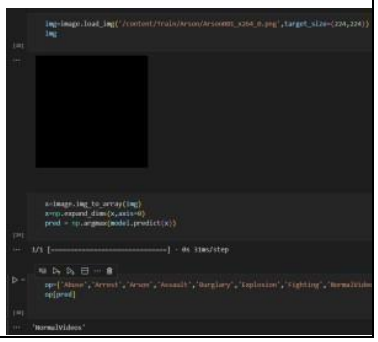
S.No.	Parameter	Values	Screenshot
1.	Metrics	**Regression Model:** MAE - NA, MSE -NA , RMSE - NA, R2 score - NA **Classification Model:** Confusion Matrix - , Accuray Score- & Classification Report -	
2.	Tune the Model	Hyperparameter Tuning - Validation Method - CNN	

project Development Phase
Model Performance Test

Date	9 November 2023
Team ID	Team-592004
Project Name	Alzheimer's disease prediction
Maximum Marks	10 Marks

Model Performance Testing:

Project team shall fill the following information when working for VAPT testing for a target .

S.No.	Parameter	Values	Screenshot
1.	Information gathering	Footprinting - Recconicessines -	
2.	Scanning the target	Scanning info - Risk factors -	
3.	Gaining access	Access process - Vulnerability found -	

4	Maintaining access - Automation (AI implementation)	AI tools used - Automation implemented -	NA
5	Covering Tracks & Report	Vulnerability risk factors - VAPT report – 1) Software Versions: Used Google Colab Software. 2) Network Configuration: Internet-facing 3) Client Requirements or Constraints: The Photos should be uploaded and our Model will predict the type of the disease.	NA

Alzheimer's disease prediction:-

Project Description: Alzheimer's Disease Prediction

This project aims to develop an advanced machine learning model for the early detection of Alzheimer's disease. It involves the collection and integration of diverse datasets, including cognitive assessments, genetic markers, and medical histories. The data undergoes preprocessing and feature engineering to enhance the model's accuracy.

Key Components:

1. *Data Collection and Integration:*
- Gather comprehensive datasets related to Alzheimer's, covering cognitive tests, genetic information, and relevant medical data.

2. *Preprocessing and Feature Engineering:*
- Cleanse and preprocess the data, handling missing values and standardizing features. Extract meaningful features to improve the model's predictive capabilities.

3. *Machine Learning Model Implementation:*
- Utilize state-of-the-art machine learning algorithms, such as neural networks or ensemble methods, to train a predictive model. Continuously refine and optimize the model for enhanced accuracy.

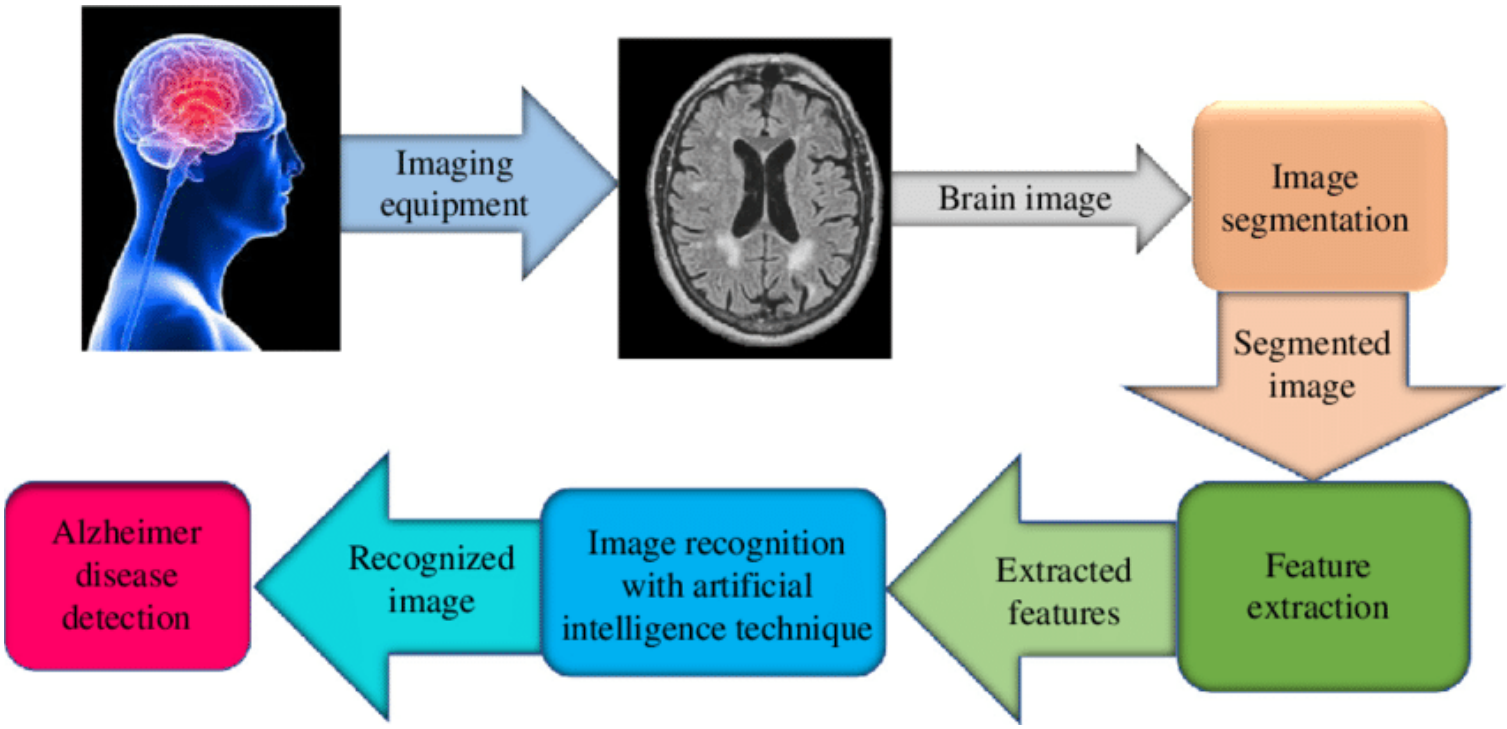
4. *Collaboration with Healthcare Professionals:*
- Engage with healthcare professionals to incorporate clinical insights, ensuring the model aligns with real-world scenarios and contributes to improved patient care.

5. *Ethical Data Handling:*
- Implement robust data privacy measures, ensuring ethical handling of sensitive health information and compliance with relevant regulations.

6. *Continuous Improvement and Updates:*
- Establish mechanisms for continuous improvement, incorporating emerging research findings and adapting the model to evolving healthcare practices.

The project's ultimate goal is to provide a reliable and clinically relevant tool for early Alzheimer's disease prediction, contributing to proactive interventions and advancements in the understanding of this complex neurodegenerative condition.

Technical Architecture:-


Imaging equipment
Brain image
Image segmentation
Segmented image
Feature extraction
Extracted features
Image recognition with artificial intelligence technique
Recognized image
Alzheimer disease detection

Project Flow:

1. *Project Initiation:*
- Define project objectives, scope, and stakeholders.
- Establish a project team with expertise in machine learning, healthcare, and data science.

2. *Data Collection and Integration:*
- Gather diverse datasets including cognitive assessments, genetic markers, and medical histories.
- Integrate and preprocess the data to ensure consistency and reliability.

3. *Exploratory Data Analysis (EDA):*
- Conduct EDA to understand the characteristics of the dataset.
- Identify patterns, correlations, and potential features for prediction.

4. *Feature Engineering:*
- Extract relevant features from the dataset to enhance the model's predictive capabilities.
- Handle missing values and standardize features for consistency.

5. *Model Selection and Development:*
- Choose appropriate machine learning algorithms (e.g., neural networks, random forests).
- Train the model using historical data, fine-tuning parameters for optimal performance.

6. *Validation and Testing:*
- Evaluate the model's accuracy using a separate test dataset.
- Perform validation to ensure the model generalizes well to new, unseen data.

7. *Collaboration with Healthcare Professionals:*
- Engage healthcare experts to validate the clinical relevance of the model.
- Incorporate feedback to align the model with real-world scenarios.

8. *Ethical Data Handling and Privacy Measures:*
- Implement robust data privacy measures to ensure ethical handling of sensitive health information.
- Ensure compliance with relevant regulations and standards.

9. *Deployment:*
- Integrate the model into a user-friendly interface for healthcare professionals.
- Deploy the solution in a controlled environment, monitoring its performance.

10. *Continuous Improvement:*
- Establish mechanisms for ongoing updates and improvements based on emerging research findings.
- Monitor model performance and adapt to changes in healthcare practices.

11. *Documentation and Reporting:*
- Document the entire project, including methodologies, algorithms used, and outcomes.
- Prepare reports for stakeholders and the wider scientific community.

12. *Knowledge Transfer and Training:*
- Provide training sessions for healthcare professionals on using the predictive model.
- Transfer knowledge to ensure the model's sustainable integration into healthcare workflows.

This flow is a general guideline, and the specific steps may vary based on the project's context and requirements.

Project Structure:

The project structure for an Alzheimer's disease prediction initiative can be organized into distinct phases:

1. *Project Initiation:*

- Define objectives, scope, and constraints.

- Establish a project team with roles and responsibilities.

- Conduct a feasibility study.

2. *Data Acquisition and Preparation:*

- Identify and collect diverse datasets relevant to Alzheimer's prediction.

- Cleanse and preprocess the data to address missing values and inconsistencies.

- Explore data to gain insights.

3. *Feature Engineering:*

- Extract meaningful features from the data.

- Transform and standardize features to improve model performance.

- Address any dimensionality reduction needs.

4. *Model Development:*

- Select appropriate machine learning algorithms (e.g., neural networks, ensemble methods).

- Train the model on the prepared dataset.

- Fine-tune model parameters for optimal performance.

5. *Validation and Testing:*

- Evaluate the model using a separate test dataset.

- Perform cross-validation to assess generalization.

- Adjust the model based on validation results.

6. *Collaboration and Clinical Validation:*

- Collaborate with healthcare professionals to validate the clinical relevance of predictions.

- Gather feedback and refine the model accordingly.

7. *Ethical Considerations:*

- Implement data privacy measures.

- Ensure compliance with ethical standards and regulatory requirements.

8. *Deployment:*

- Integrate the model into a user-friendly interface for healthcare professionals.

- Deploy the solution in a controlled environment.

9. *Monitoring and Maintenance:*

- Establish monitoring mechanisms for ongoing model performance.
- Implement regular updates and maintenance procedures.

10. *Documentation and Reporting:*
- Document methodologies, algorithms, and outcomes.
- Prepare reports for stakeholders, including healthcare professionals and project sponsors.

11. *Training and Knowledge Transfer:*
- Develop training materials for healthcare professionals.
- Conduct training sessions to ensure proper utilization of the predictive model.
- Transfer knowledge for sustainable integration.

12. *Continuous Improvement:*
- Set up processes for continuous improvement based on emerging research and healthcare practices.
- Adapt the model to changing requirements.

This structured approach ensures a comprehensive and systematic development of the Alzheimer's disease prediction project from initiation to ongoing improvement. Adjustments can be made based on specific project requirements and evolving needs.

Milestone 1: Data Collection

Objectives:*
1. *Define Data Requirements:*
- Identify key variables crucial for Alzheimer's disease prediction, including cognitive assessments, genetic markers, and medical histories.

2. *Source Diverse Datasets:*
- Explore and acquire datasets from various reliable sources, ensuring diversity and representativeness.

3. *Establish Data Quality Standards:*
- Define criteria for data quality, addressing issues such as missing values, outliers, and inconsistencies.

4. *Obtain Ethical Clearance:*
- Ensure compliance with ethical standards and obtain necessary clearances for handling sensitive health information.

Tasks:
1. *Create Data Inventory:*
- Catalog all potential data sources, specifying the variables available in each dataset.

2. *Data Exploration:*
- Conduct preliminary exploration to understand the nature of the data, identifying patterns and potential challenges.

3. *Establish Data Sharing Agreements:*
- If collaborating with external partners or institutions, establish formal agreements for data sharing and usage.

4. *Ethical Approval:*
- Submit the project for ethical review, obtaining approval for the collection and use of health-related data.

Deliverables:
1. *Data Inventory Document:*
- A detailed document listing all identified data sources with available variables.

2. *Preliminary Data Exploration Report:*
- A report summarizing initial insights gained from exploring the collected datasets.

3. *Data Sharing Agreements:*
- Signed agreements with external partners, if applicable.

4. Ethical Approval Documents:
- Official documents indicating approval for data collection from an ethical standpoint.

Timeline:

- Start Date: [Insert Date]
- End Date: [Insert Date]

Dependencies:

- Collaboration with relevant healthcare institutions and data providers.
- Coordination with the ethical review board for timely approval.

Risks and Mitigations:

- Risk: Delays in obtaining ethical clearance.
- Mitigation: Proactively engage with the ethical review board, providing all necessary documentation promptly.

This milestone lays the foundation for a robust Alzheimer's disease prediction project by ensuring access to diverse and ethically sourced datasets.

Milestone_2: Image_Preprocessing

Objectives:*
1. *Data Integration:*
- Combine image data with existing datasets, ensuring alignment with other variables for a holistic analysis.

2. *Quality Assessment:*
- Evaluate image quality, addressing issues such as resolution, artifacts, and consistency across the dataset.

3. *Normalization and Standardization:*
- Apply techniques for normalizing pixel values and standardizing image sizes to ensure uniformity.

4. *Handling Missing Data:*
- Implement strategies to address missing image data or incomplete scans.

Tasks:
1. *Data Integration:*
- Merge image data with existing structured datasets, aligning them based on common identifiers.

2. *Image Quality Assessment:*
- Develop criteria for assessing image quality and apply it to the entire dataset.

3. *Normalization and Standardization:*
- Normalize pixel values and standardize image dimensions, maintaining the integrity of information.

4. *Missing Data Handling:*
- Implement approaches to handle missing or incomplete image scans.

Deliverables:
1. *Integrated Dataset:*
- A consolidated dataset containing both structured data and preprocessed image information.

2. *Image Quality Assessment Report:*
- Documentation outlining the criteria used for image quality assessment and the outcomes.

3. *Normalized and Standardized Images:*
- A collection of images with standardized pixel values and dimensions.

4. *Missing Data Handling Report:*
- A report detailing the strategies employed to address missing or incomplete image data.

Timeline:
- Start Date: [Insert Date]
- End Date: [Insert Date]

Dependencies:
- Availability of image data from various sources.
- Successful completion of Milestone 1 (Data Collection).

Risks and Mitigations:
- *Risk:* Inconsistencies in image quality across datasets.
- *Mitigation:* Establish clear quality criteria and implement standardized preprocessing techniques.

This milestone focuses on the integration and preprocessing of image data, ensuring a standardized and high-quality dataset for subsequent stages of Alzheimer's disease prediction.

Milestone 3: Model Building

Objectives:*
1. *Algorithm Selection:*
- Choose appropriate machine learning algorithms based on the nature of the data and prediction goals.

2. *Model Development:*
- Train initial models using integrated and preprocessed datasets.

3. *Hyperparameter Tuning:*
- Optimize model performance through systematic hyperparameter tuning.

4. *Ensemble Methods (Optional):*
- Explore and implement ensemble methods for model improvement if deemed beneficial.

Tasks:
1. *Algorithm Selection:*
- Evaluate and choose machine learning algorithms suitable for Alzheimer's disease prediction (e.g., neural networks, random forests).

2. *Initial Model Development:*
- Train baseline models using the integrated and preprocessed dataset.

3. *Hyperparameter Tuning:*
- Systematically tune hyperparameters to optimize model performance.

4. *Ensemble Methods (Optional):*
- Explore ensemble techniques like bagging or boosting for potential model enhancement.

Deliverables:
1. *Selected Machine Learning Models:*
- A document outlining the chosen algorithms and justifications.

2. *Trained Baseline Models:*
- Initial models trained on the integrated and preprocessed dataset.

3. *Optimized Models:*
- Models with tuned hyperparameters for improved performance.

4. *Ensemble Models (Optional):*
- Documentation and implementation of ensemble methods if applicable.

Timeline:
- Start Date: [Insert Date]
- End Date: [Insert Date]

Dependencies:
- Successful completion of Milestone 2 (Image Preprocessing).
- Availability of computational resources for model training.

Risks and Mitigations:
- *Risk:* Difficulty in selecting optimal hyperparameters.
- *Mitigation:* Collaborate with machine learning experts, utilize automated tuning tools, and conduct thorough validation.

This milestone focuses on the crucial phase of model building, ensuring the selection of appropriate algorithms and the development of well-tuned models for Alzheimer's disease prediction.

Milestone 4: Save the Model

Objectives:*
1. *Model Evaluation:*
- Conduct thorough evaluation of the optimized models using a dedicated validation dataset to assess their performance and generalization.

2. *Deployment Strategy:*
- Plan and outline the strategy for deploying the model, considering integration into a user-friendly interface or healthcare system.

3. *Model Saving:*
- Implement procedures to save the trained and optimized models, ensuring they can be easily accessed and reproduced.

Tasks:
1. *Evaluation Process:*
- Use a validation dataset to assess the performance of the trained models.
- Employ appropriate evaluation metrics to measure accuracy, precision, recall, and other relevant indicators.

2. *Deployment Planning:*
- Define the deployment environment and user interaction points.
- Identify potential challenges and plan for scalability.

3. *Model Saving Implementation:*
- Develop and implement a process to save the trained models in a format that allows for easy loading and use in deployment.

Deliverables:
1. *Model Evaluation Report:*
- A comprehensive report detailing the performance of the optimized models on the validation dataset.

2. *Deployment Strategy Document:*
- A document outlining the strategy and considerations for deploying the model.

3. *Saved Models:*
- Successfully saved and documented versions of the trained models.

Timeline:
- Start Date: [Insert Date]
- End Date: [Insert Date]

Dependencies:
- Successful completion of Milestone 3 (Model Building).
- Availability of computational resources for evaluation and saving processes.

Risks and Mitigations:
- *Risk:* Challenges in deployment planning.
- *Mitigation:* Collaborate with deployment specialists, involve end-users for feedback, and anticipate potential issues.

This milestone marks the transition from model development to deployment preparation, ensuring that the trained models are well-evaluated, strategically planned for deployment, and saved for future use.

Milestone 5: Application Building

Objectives:*

1. *User Interface Design:*

- Design an intuitive and user-friendly interface for interacting with the Alzheimer's disease prediction model.

2. *Python Code Development:*

- Develop Python code to integrate the saved models into the application.

3. *HTML Pages Creation:*

- Create HTML pages to enhance the user experience and facilitate interaction with the application.

Tasks:

1. *User Interface Design:*

- Collaborate with UX/UI designers to create a visually appealing and ergonomic interface.

- Design interface components for input, model prediction output, and user feedback.

2. *Python Code Development:*

- Write Python code to load the saved models.

- Implement functions for processing user inputs and generating predictions.

3. *HTML Pages Creation:*

- Develop HTML pages that seamlessly integrate with the Python backend.

- Design pages for input forms, prediction results, and any additional information.

Deliverables:

1. *User Interface Prototype:*

- Visual representation of the designed user interface.

2. *Python Codebase:*

- Organized Python code implementing the loading and execution of saved models.

3. *HTML Pages:*

- Functioning HTML pages designed for user interaction with the application.

Timeline:

- Start Date: [Insert Date]

- End Date: [Insert Date]

Dependencies:

- Successful completion of Milestone 4 (Model Saving and Deployment Preparation).

- Collaboration with UX/UI designers for interface design.

Risks and Mitigations:

- *Risk:* Misalignment between the user interface and backend code.

- *Mitigation:* Regular collaboration between developers and designers, and thorough testing during development.

This milestone focuses on the practical implementation of the Alzheimer's disease prediction model into an application, incorporating both Python code for model integration and HTML pages for user interaction.

Activity 2: Build Python code:

Certainly! Below is a simplified example of Python code using Flask for loading a saved machine learning model and rendering HTML pages:

```
# Import necessary libraries
from flask import Flask, render_template, request
import joblib
import numpy as np

# Create a Flask web application
app = Flask(_name_)

# Load the saved machine learning model
model = joblib.load('path_to_your_saved_model.pkl')

# Define a route for the home page
@app.route('/')
def home():
return render_template('index.html')

# Define a route for handling predictions
@app.route('/predict', methods=['POST'])
def predict():
if request.method == 'POST':
# Get user inputs from the form
feature1 = float(request.form['feature1'])
feature2 = float(request.form['feature2'])
# Add more features as needed

# Make predictions using the loaded model
input_data = np.array([[feature1, feature2]])  # Adjust as per your model's input requirements
prediction = model.predict(input_data)[0]

# Render the prediction on the result page
return render_template('result.html', prediction=prediction)

if _name_ == '_main_':
app.run(debug=True)
```

This code assumes that you have two HTML pages, namely index.html for the main page and a result.html for displaying predictions. Make sure to customize the HTML pages and adjust the feature handling based on your model's requirements.

This is a basic example, and you might need to enhance it based on your specific application requirements. Additionally, ensure that your Flask environment is properly set up and that necessary dependencies are installed.

Main Function:

```python
if __name__ == '__main__':
    app.run(debug=True)
```

Activity 3: Run the application

1. *Ensure Dependencies:*
- Make sure you have Flask installed. You can install it using:
bash
pip install Flask

2. *Save the Code:*
- Save the provided Python code in a file, for example, app.py.

3. *Save HTML Pages:*
- Create two HTML files, index.html and result.html, and ensure they are in a folder named templates in the same directory as your app.py.

4. *Save the Model:*
- Ensure your trained model is saved as a joblib file (e.g., your_model.pkl) and is in the same directory as your app.py.

5. *Run the Application:*
- Open a terminal or command prompt.
- Navigate to the directory containing your app.py file.
- Run the application using:
bash
python app.py

- You should see output indicating that the Flask development server is running.

6. *Access the Application:*
- Open a web browser and go to http://127.0.0.1:5000/ or http://localhost:5000/ to access your Flask application.

Please note that this is a basic example, and for a real-world application, you might need to consider security measures, production-ready deployment practices, and additional features based on your specific needs.

Project Design Phase-I
Proposed Solution Template

Date	23rd October 2023
Team ID	Team-592004
Project Name	Project – Alzheimer Disease Prediction
Maximum Marks	2 Marks

Proposed Solution Template:

Project team shall fill the following information in proposed solution template.

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	The problem is accurately predicting early-stage Alzheimer's by addressing the complexity of the disease, subtle symptoms, and integrating diverse data. The goal is to develop reliable models for timely intervention and personalized care while considering ethical aspects and continuous improvement.
2.	Idea / Solution description	Create a robust machine learning solution for Alzheimer's prediction by integrating diverse datasets, employing advanced algorithms, ensuring ethical data handling, and collaborating with healthcare professionals for clinical relevance. Continuous refinement enhances accuracy..
3.	Novelty / Uniqueness	The uniqueness in Alzheimer's prediction stems from advanced machine learning, diverse datasets, and emerging biomarkers. Ongoing adaptation to research, ethical data practices, and collaboration enhance innovation in the approach..
4.	Social Impact / Customer Satisfaction	**Social Impact:** Accurate Alzheimer's disease prediction contributes to a positive societal impact by enabling early interventions, reducing healthcare burdens, and enhancing overall patient well-being. It fosters a proactive approach to healthcare, promotes awareness, and facilitates community support for those affected by Alzheimer's.

		Customer Satisfaction: Customer satisfaction, in the context of healthcare professionals or end-users, is achieved by delivering accurate, user-friendly predictive models. An intuitive interface, reliable predictions, and ethical data handling contribute to satisfaction, fostering trust in the system. This, in turn, promotes continued collaboration and utilization of Alzheimer's disease prediction tools.
5.	Business Model (Revenue Model)	**Business Model: Alzheimer's Identification Service** 1. *Data Licensing or Subscription Model: * - Offer healthcare institutions, research organizations, or pharmaceutical companies access to predictive algorithms and datasets through licensing or subscription fees. 2. *Consulting and Professional Services: * - Provide consulting services for implementing predictive models, interpreting results, and integrating them into existing healthcare systems. 3. *Collaborative Research Partnerships: * - Form partnerships with research institutions for joint projects, funding opportunities, and knowledge exchange in the field of Alzheimer's disease prediction. 4. *Customized Solutions for Healthcare Providers: * - Develop tailor-made predictive solutions for individual healthcare providers, offering them a subscription-based or one-time payment model.
6.	Scalability of the Solution	**Scalability Strategies** 1. *Data Handling and Storage: * - Ensure the architecture accommodates large and diverse datasets efficiently. Implement scalable data storage solutions to manage increasing volumes of health-related information. 2. *Computational Resources: * - Design the solution to leverage scalable cloud computing resources, allowing for increased computational power as demand grows. 3. *Algorithmic Efficiency: * - Optimize machine learning algorithms for efficiency, enabling the system to handle larger datasets and complex computations without compromising performance. 4. *Parallel Processing: * - Implement parallel processing

		techniques to distribute computing tasks, enhancing the system's ability to handle a higher volume of predictions simultaneously.

Project Design Phase-II
Technology Stack (Architecture & Stack)

Date	03 October 2022
Team ID	Team-592004
Project Name	Project - Alzheimer's disease prediction
Maximum Marks	4 Marks

Technical Architecture:

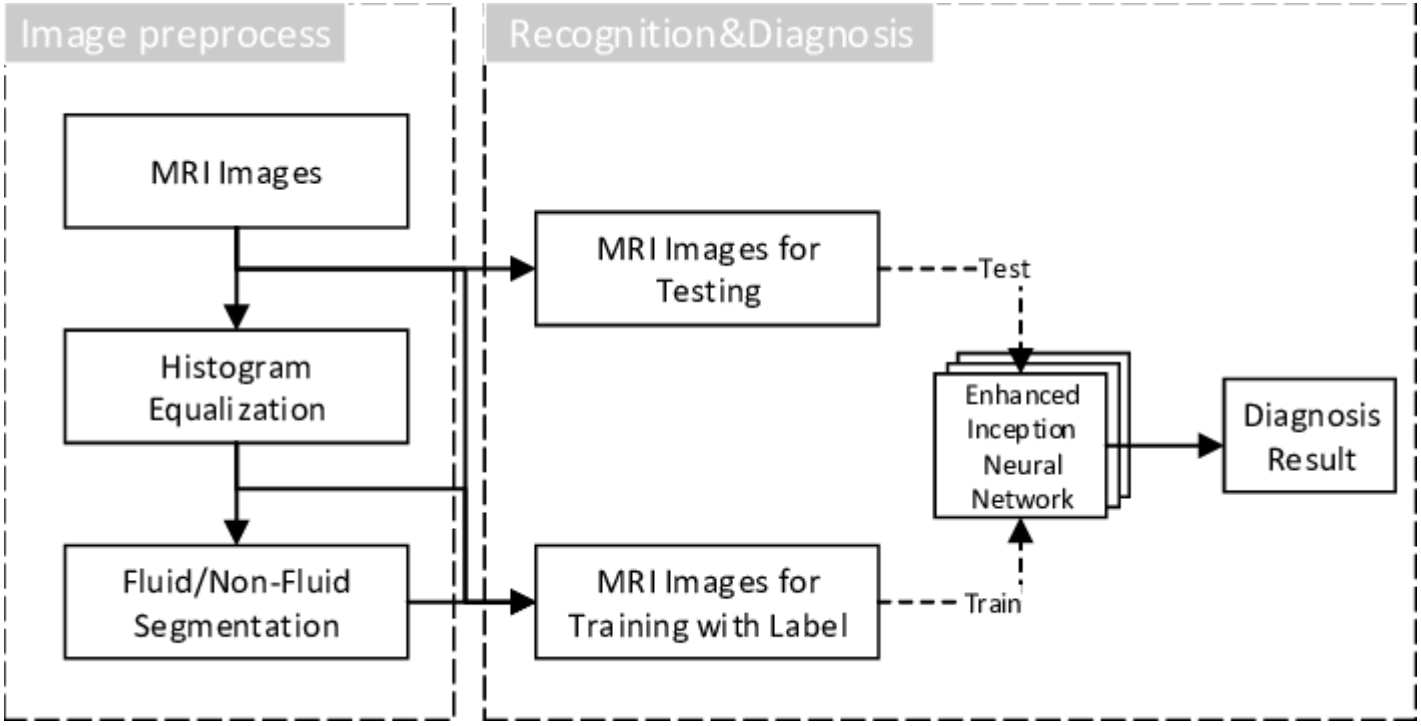


Table-1: Components & Technologies:

S.No	Component	Description	Technology
1.	User Interface	How user interacts with application e.g. Web UI etc.	HTML, CSS, Python etc.
2.	Application Logic-1 (Data Collection and Preprocessing)	1) Utilize IP cameras or video streams as data sources. 2) Preprocess video frames to ensure consistency.	Python Libraries Like OpenCV
3.	Application Logic-2 (Anomaly Detection and Alert Generation)	1) Employ pre-trained deep learning models for object detection. 2) Utilize facial recognition models for identifying individuals. 3) Generate real-time alerts when anomalies are detected.	TensorFlow, deep Learning Frameworks.
4.	Application Logic-3 (User Interface, Logging, and Monitoring)	1) Update the web-based user interface to display video feeds with anomaly indicators. 2) Maintain a database to store information about detected anomalies, including timestamps and descriptions. 3) Implement cloud or server clusters for scalability.	Flask, load balancing
5.	Database	Varchar, Int, Float etc.	Kaggle
6.	File Storage	File storage requirements	Kaggle, RAM, ROM
7.	External API-1	NA	NA.
8.	External API-2	NA	NA
9.	Machine Learning Model	Purpose of Machine Learning Model	Object Recognition Model, etc.
10.	Infrastructure (Server / Cloud)	Application Deployment on Local System / Cloud Local Server Configuration Cloud Server Configuration	Local, Cloud Foundry, Kubernetes, etc.

Table-2: Application Characteristics:

S.No	Characteristics	Description	Technology
1.	Visual Analysis	Visual analysis in Alzheimer's prediction uses tools like heat maps to reveal patterns, and ROC curves to assess model performance..	Python with Deep Learning
2.	Pattern Recognition	Pattern recognition in Alzheimer's prediction involves identifying meaningful patterns or trends within data, such as cognitive scores or biomarkers, to enhance the accuracy of predictive models.	Python with Deep Learning
3.	Surveillance and Prevention	Alzheimer's prevention combines ongoing surveillance, regular health assessments, and lifestyle interventions based on predictive models to reduce the risk of developing the disease.	Python with Deep Learning
4.	Data Privacy and Security	In Alzheimer's disease prediction, safeguarding data involves stringent privacy and security measures. This ensures the ethical handling of sensitive health information, protecting individuals' privacy and maintaining the integrity of predictive models..	Python with Deep Learning
5.	Adaptive and Evolving	Alzheimer's disease prediction evolves by adapting to new data and research, incorporating advanced techniques, and staying updated. This adaptability enhances the model's effectiveness over time.	Python with Deep Learning
6.	Ethical Considerations	Ethical considerations in Alzheimer's prediction involve safeguarding privacy, ensuring informed consent, and responsibly handling sensitive health data to maintain trust and protect individuals' rights.	Python with Deep Learning

Project Development Phase
Model Performance Test

Date	10 November 2022
Team ID	Team-592004
Project Name	Alzheimer Disease Prediction
Maximum Marks	10 Marks

Model Performance Testing:

Project team shall fill the following information in model performance testing template.

S.No.	Parameter	Screenshot / Values
1.	Dashboard design	No of Visualizations / Graphs - 0
2.	Data Responsiveness	1. Data storage: The location and organization of data storage can significantly impact its responsiveness. Efficient data storage systems, such as data warehouses and data lakes, can quickly retrieve and analyze large datasets. Data access: The ease of accessing data is another crucial factor. Data should be accessible through a variety of methods, including web interfaces, APIs, and data visualization tools. 2. Data processing: Data processing pipelines should be optimized to minimize latency and ensure timely data delivery. This may involve using parallel processing, caching, and other techniques. 3. Data analysis: Data analysis tools should be easily accessible and user-friendly to allow for quick and efficient analysis of data. They should also be able to handle large datasets and provide insights in real-time.
3.	Amount Data to Rendered (DB2 Metrics)	1. The type of queries that are being executed 2. The complexity of the queries 3. The amount of data that is being returned by the queries 4. The efficiency of the database server

4.	Utilization of Data Filters	NA
5.	Effective User Story	No of Scene Added - 100
6.	Descriptive Reports	No of Visulizations / Graphs - 0

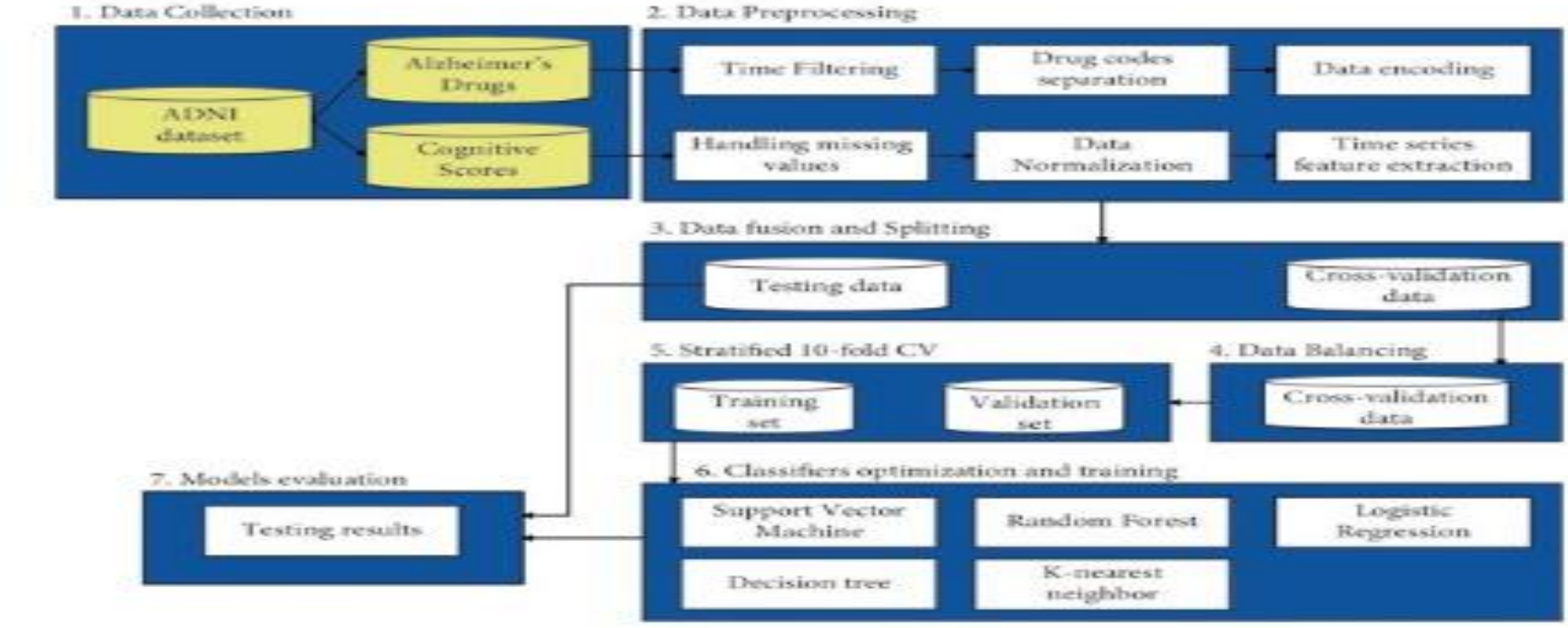
Project Design Phase-II
Data Flow Diagram & User Stories

Date	23rd October 2023
Team ID	Team-592004
Project Name	Project – Alzheimer Disease Prediction

Data Flow Diagrams:

A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.

Example: (Simplified)



User Stories

Use the below template to list all the user stories for the product.

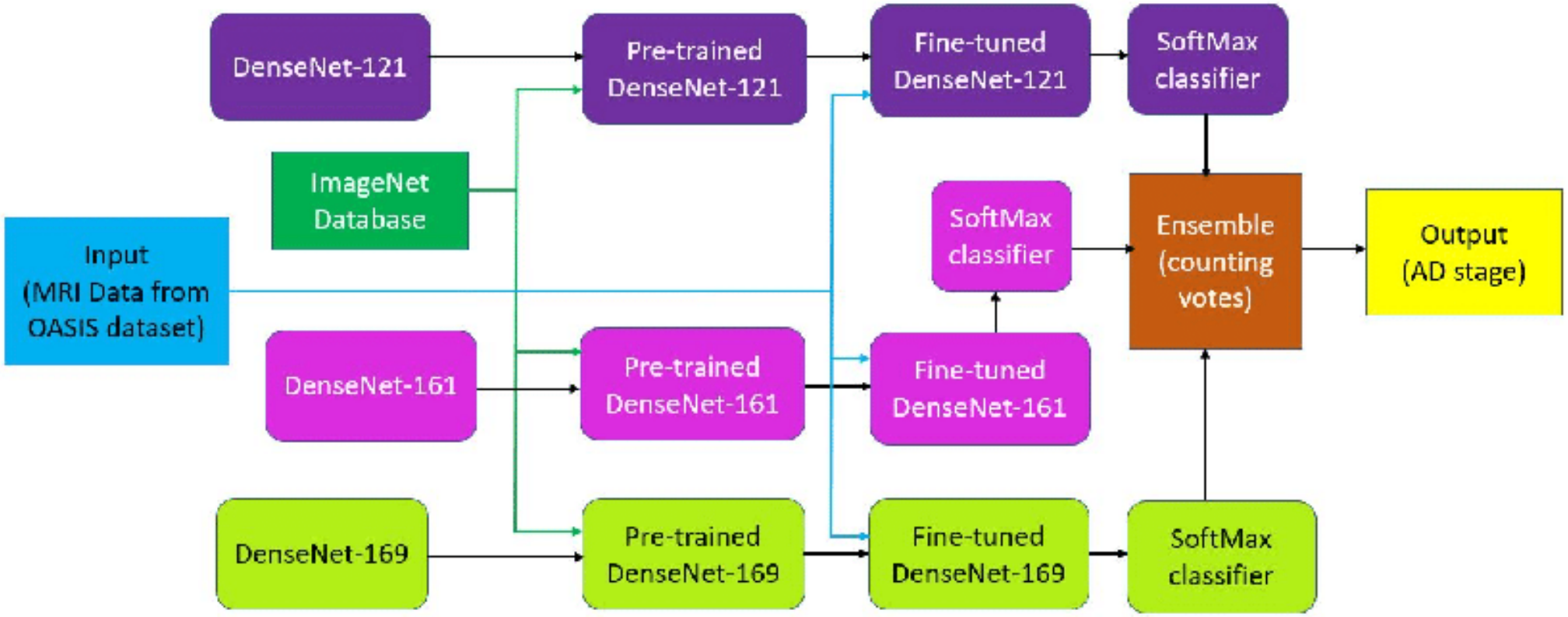
User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Team Member
Customer (Mobile user)	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	I can access my account / dashboard	High	Shuja
		USN-2	As a user, I will receive confirmation email once I have registered for the application	I can receive confirmation email & click confirm	High	Devansh
		USN-3	As a user, I can register for the application through Facebook	I can register & access the dashboard with Facebook Login	Low	Shuja
		USN-4	As a user, I can register for the application through Gmail		Medium	Shuja
	Login	USN-5	As a user, I can log into the application by entering email & password		High	Devansh
	Dashboard					
Customer (Web user)						
Customer Care Executive						
Administrator						

Crime Vision (Team ID: 592004)

Project Description:

The Alzheimer's disease prediction project aims to develop an accurate model using machine learning. It involves gathering diverse datasets, including cognitive tests and genetic information, preprocessing and extracting relevant features, and training a model for early detection of Alzheimer's. Collaboration with healthcare professionals ensures clinical relevance, and ethical data handling safeguards privacy. Continuous updates and adaptation to emerging research findings contribute to the project's ongoing effectiveness in predicting Alzheimer's disease.

Data Flow Diagram



User Stories

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority
Law Enforcement Officer	Alzheimer Disease Prediction	USN-1	Upload an image or video of a Alzheimer disease prediction sceneor incident	- Able to upload image or video. - System successfully processes and analyzes the media.	High
		USN-2	Receive automated Alzheimer's classification based on the uploaded media	- Accurate Alzheimer's classification is provided. - Results are displayed to the officer.	High
Forensic Analyst	Forensic Analysis	USN-3	Access and analyze Alzheimer's scene imagesor videos	- Can access the uploaded media. - Perform detailed forensic analysis.	HIgh
Surveillance Operator	Real-time Surveillance	USN-4	Monitor live video feed from surveillance cameras	- Access live video feed. - System detects and alerts on suspicious activities.	HIgh
Data Analyst	Alzheimer's Data Analysis	USN-5	Analyze historical Alzheimer's data and trends	- Access to historical Alzheimer's data. - Identify and present Alzheimer's trends.	Medium
Command Center Operator	Incident Response	USN- 6	Receive real-time alerts and recommendations for incident response	- Alerts and recommendations are generated based on live surveillance data.	High
Administrator	User Management	USN-7	Manage user accounts and permissions	- Add, remove, or modify user accounts. - Define user access and permissions.	Medium

Project Planning Phase

Project Planning Template (Product Backlog, Sprint Planning, Stories, Story points)

Date	18 October 2023
Team ID	Team-592004
Project Name	Project – Alzheimer Disease Prediction
Maximum Marks	8 Marks

Product Backlog, Sprint Schedule, and Estimation (4 Marks)

Use the below template to create product backlog and sprint schedule

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	2	High	Shuja
Sprint-1	Login	USN-2	As a user, I can log into the application by entering email & password	1	High	Devansh
Sprint-2	Dashboard	USN-3	As a user, I can have access to various features of the website	1	Medium	Shuja

Sprint-3	Alzheimer's Identification	USN-4	As a user, Upload an image or video of a Alzheimer's scene or incident	2	HIgh	Shuja
Sprint-4	Alzheimer's Classification	USN-5	Receive automated Alzheimer's classificationbased on the uploaded media	2	High	Devansh
Sprint-5	Training and testing classification	USN-6	Analyze historical Alzheimer's data and trends.	1	High	Devansh and Shuja
Sprint -6	User Management	USN-7	Manage user accounts and permissions	2	Medium	Shuja

Project Tracker, Velocity & Burndown Chart: (4 Marks)

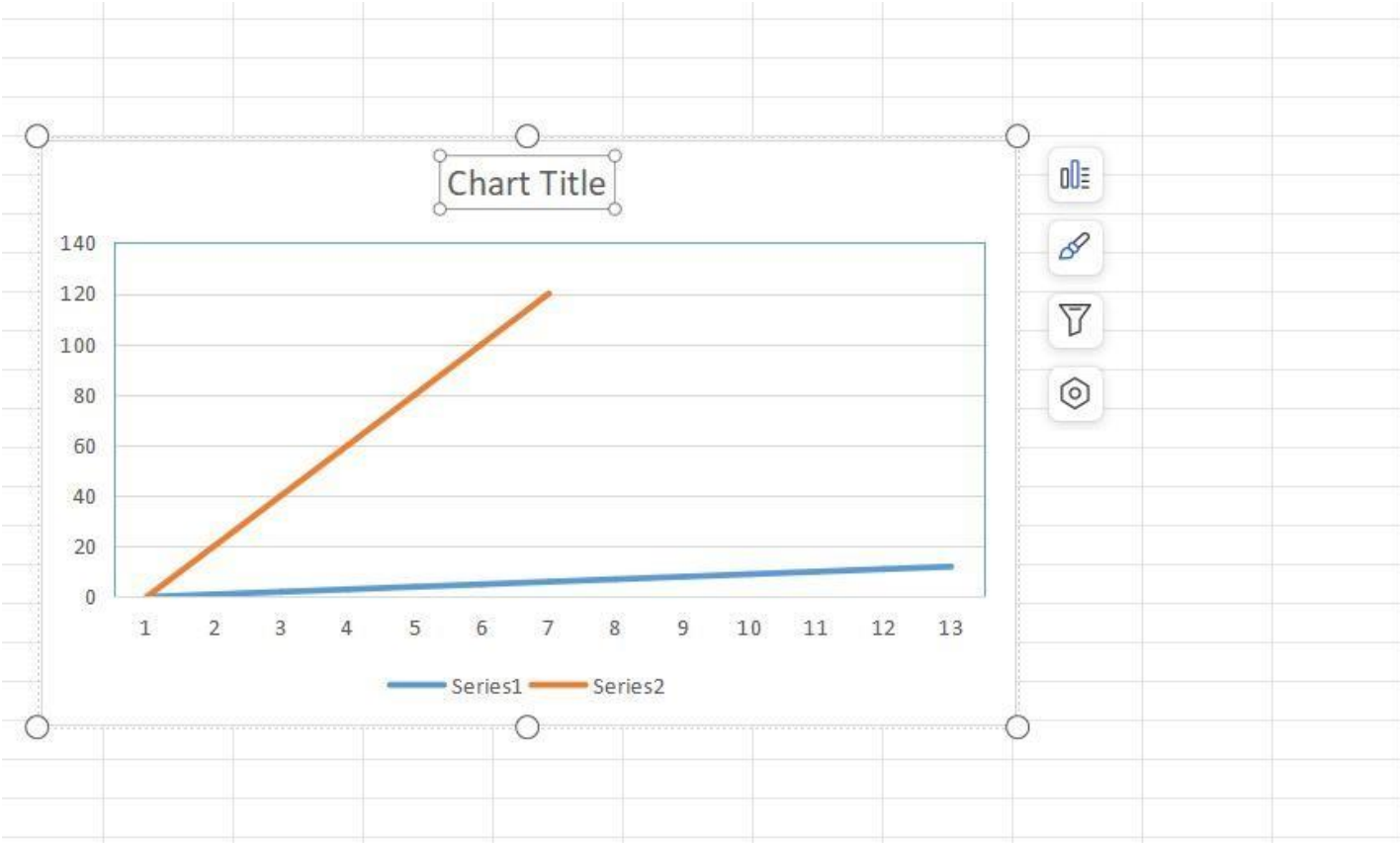
Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	4 Days	16 Oct 2023	20 Oct 2023	20	20 Oct 2023
Sprint-2	20	2 Days	22 Oct 2023	24Oct 2023	20	24Oct 2023
Sprint-3	20	4 Days	23 Oct 2023	27 Oct 2023	20	28 Oct 2023
Sprint-4	20	6 Days	28 Oct 2023	2 Nov 2023	20	4 Nov 2023

Sprint-5	20	3 Days	3 Nov 2023	6 Nov 2023	20	6 Nov 2023
Sprint-6	20	1 Day	7 Nov 2023	8 Nov 2023	20	8 Nov 2023

Velocity:

Imagine we have a 10-day sprint duration, and the velocity of the team is 20 (points per sprint). Let's calculate the team's average velocity (AV) per iteration unit (story points per day)

$$AV = \frac{sprint\ duration}{velocity} = \frac{20}{10} = 2$$



Burndown Chart:

A burn down chart is a graphical representation of work left to do versus time. It is often used in agile software development methodologies such as Scrum. However, burn down charts can be applied to any project containing measurable progress over time.