

Ideation Phase

Brainstorm & Idea Prioritization Template

Date	06 May 2023
Team ID	NM2023TMID12828
Project Name	Drowsiness detection and alerting system
Maximum Marks	4 Marks


Brainstorm & Idea Prioritization Template:

Brainstorming provides a free and open environment that encourages everyone within a team to participate in the creative thinking process that leads to problem solving. Prioritizing volume over value, out-of-the-box ideas are welcome and built upon, and all participants are encouraged to collaborate, helping each other develop a rich amount of creative solutions.

Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.

Step-1: Team Gathering, Collaboration and Select the Problem Statement

Template



Brainstorm & idea prioritization

Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.

⌚ 10 minutes to prepare
🕒 1 hour to collaborate
👥 2-8 people recommended

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Before you collaborate

A little bit of preparation goes a long way with this session. Here's what you need to do to get going.

⌚ 10 minutes

- A** Team gathering
Define who should participate in the session and send an invite. Share relevant information or pre-work ahead.
- B** Set the goal
Think about the problem you'll be focusing on solving in the brainstorming session.
- C** Learn how to use the facilitation tools
Use the Facilitation Superpowers to run a happy and productive session.

[Open article](#) →

1

Define your problem statement

What problem are you trying to solve? Frame your problem as a How Might We statement. This will be the focus of your brainstorm.

⌚ 5 minutes

PROBLEM

Driver drowsiness detection and alerting system is a car safety technology which helps prevent accidents caused by the driver getting drowsy

Key rules of brainstorming
To run a smooth and productive session

- 🗨️ Stay in topic.
- 💡 Encourage wild ideas.
- 👂 Defer judgment.
- 👂 Listen to others.
- 🗨️ Go for volume.
- 👁️ If possible, be visual.

Step-2: Brainstorm, Idea Listing and Grouping

2 Brainstorm

Write down any ideas that come to mind that address your problem statement.

10 minutes

Key themes

Eye Tracking and Blink Detection: Use a camera or specialized eye-tracking device to monitor the user's eyes and detect patterns such as slow blinking or prolonged eye closure, indicating drowsiness.

Facial Expression Analysis: Analyze the user's facial expressions using computer vision techniques to identify signs of fatigue or drowsiness, such as drooping eyelids or yawning.

EEG Monitoring: Measure brainwaves in real-time using an electroencephalogram (EEG) to detect changes associated with drowsiness, such as an increase in alpha waves or a decrease in beta waves.

Heart Rate and Pulse Monitoring: Monitor the user's heart rate and pulse using sensors or wearable devices. A significant decrease in heart rate or irregular patterns may indicate drowsiness.

Head Position and Movement Tracking: Track the user's head position and movement to detect signs of drowsiness, such as head nodding or sudden changes in head orientation.

IoT Integration: Connect the monitoring system to an IoT platform or cloud service to enable real-time data processing and analysis. This integration allows for remote monitoring and alerting.

Volley

Drowsiness Detection: Implement a drowsiness detection system that monitors the user's eye movements, facial expressions, and heart rate. The system can trigger alerts or interventions when drowsiness is detected, such as sending notifications to a connected mobile device.

IoT Integration: Connect the monitoring system to an IoT platform or cloud service to enable real-time data processing and analysis. This integration allows for remote monitoring and alerting.

MSribaby

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IoT Integration: Connect the monitoring system to an IoT platform or cloud service to enable real-time data processing and analysis. This integration allows for remote monitoring and alerting.

Smart Wearable Device: Develop a wearable device equipped with sensors such as an accelerometer and heart rate monitor to detect signs of drowsiness in the wearer. The device can continuously monitor the wearer's vital signs and movement patterns to identify drowsiness. When drowsiness is detected, the device can send an alert to a connected smartphone or IoT platform.

Computer Vision-based System: Build a computer vision system using a camera to monitor a person's facial features and eye movements. Utilize machine learning algorithms to detect signs of drowsiness, such as eye closure or slow blinking. When drowsiness is detected, the system can trigger an alert through IoT devices like a smartwatch or smart home assistants.

IoT-enabled Vehicle Safety: Create a system that integrates with vehicles to monitor the driver's drowsiness level. The system can utilize a sensor within the vehicle, such as a steering wheel sensor or seat occupancy sensor, to detect driver behavior indicative of drowsiness. Alerts can be sent to the driver, other passengers, or a centralized monitoring system.

Cloud-based Drowsiness Detection: Develop a cloud-based drowsiness detection system that receives data from multiple sources, such as wearable devices or cameras installed in various locations. The system can analyze the data using machine learning algorithms to detect patterns of drowsiness across different individuals and provide real-time alerts or generate reports for further analysis.

Environmental Monitoring: Implement an IoT system that monitors environmental factors known to affect drowsiness, such as temperature, humidity, and CO2 levels. By integrating these sensors with a drowsiness detection algorithm, the system can identify conditions that may contribute to drowsiness and send alerts to individuals or adjust the environment automatically.

3 Group ideas

Take turns sharing your ideas while clustering similar or related notes as you go. Once all sticky notes have been grouped, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try and see if you can break it up into smaller sub-groups.

10 minutes

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Step-3: Idea Prioritization

4 Prioritize

Your team should all be on the same page about what's important moving forward. Place your ideas on this grid to determine which ideas are important and which are feasible.

20 minutes

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After you collaborate

You can export the mural as an image or pdf to share with members of your company who might find it helpful.

Quick add-ons

Share the mural
Share a live link to the mural with stakeholders to keep them in the loop about the outcomes of the session.

Export the mural
Export a copy of the mural as a PNG or PDF to attach to emails, include in slides, or save in your drive.

Keep moving forward

Strategy Blueprint
Define the components of a new idea or strategy.
[Open the template](#)

Customer experience journey map
Understand customer needs, motivations, and obstacles for an experience.
[Open the template](#)

Strengths, weaknesses, opportunities & threats
Identify strengths, weaknesses, opportunities, and threats (SWOT) to develop a plan.
[Open the template](#)

[Share template feedback](#)

Ideation Phase

Define the Problem Statements

Date	06 May 2023
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Project Name	Drowsiness detection and alerting system
Maximum Marks	2 Marks

Customer Problem Statement Template:

Create a problem statement to understand your customer's point of view. The Customer Problem Statement template helps you focus on what matters to create experiences people will love.

A well-articulated customer problem statement allows you and your team to find the ideal solution for the challenges your customers face. Throughout the process, you'll also be able to empathize with your customers, which helps you better understand how they perceive your product or service.

I am	Describe customer with 3-4 key characteristics - who are they?	Describe the customer and their attributes here
I'm trying to	List their outcome or "job" the care about - what are they trying to achieve?	List the thing they are trying to achieve here
but	Describe what problems or barriers stand in the way - what bothers them most?	Describe the problems or barriers that get in the way here
because	Enter the "root cause" of why the problem or barrier exists - what needs to be solved?	Describe the reason the problems or barriers exist
which makes me feel	Describe the emotions from the customer's point of view - how does it impact them emotionally?	Describe the emotions the result from experiencing the problems or barriers

Example:

I am	I'm trying to	But	Because	Which makes me feel
Engineer	To Build Drowsiness detection and alerting system	Driver's inattention might be the result of a lack of alertness when driving due to driver drowsiness and distraction	Designing algorithms or techniques to accurately detect and recognize drowsiness-related indicators or patterns in real-time, such as rapid movements, yawning, head drooping or changes in facial expressions.	Analyze facial expressions using facial landmark detection and recognition algorithms to identify yawning, changes in muscle activity or head drooping.

Problem Statement (PS)	I am (Customer)	I'm trying to	But	Because	Which makes me feel
PS-1	Engineer	To Build Drowsiness detection and alerting system	Driver's inattention might be the result of a lack of alertness when driving due to driver drowsiness and distraction	: Designing algorithms or techniques to accurately detect and recognize drowsiness-related indicators or patterns in real-time, such as eyelid movements, yawning, head drooping, or changes in facial expressions.	Analyze facial expressions using facial landmark detection and recognition algorithms to identify yawning, changes in muscle activity, or head drooping.

Ideation Phase

Empathize & Discover

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Maximum Marks	4 Marks

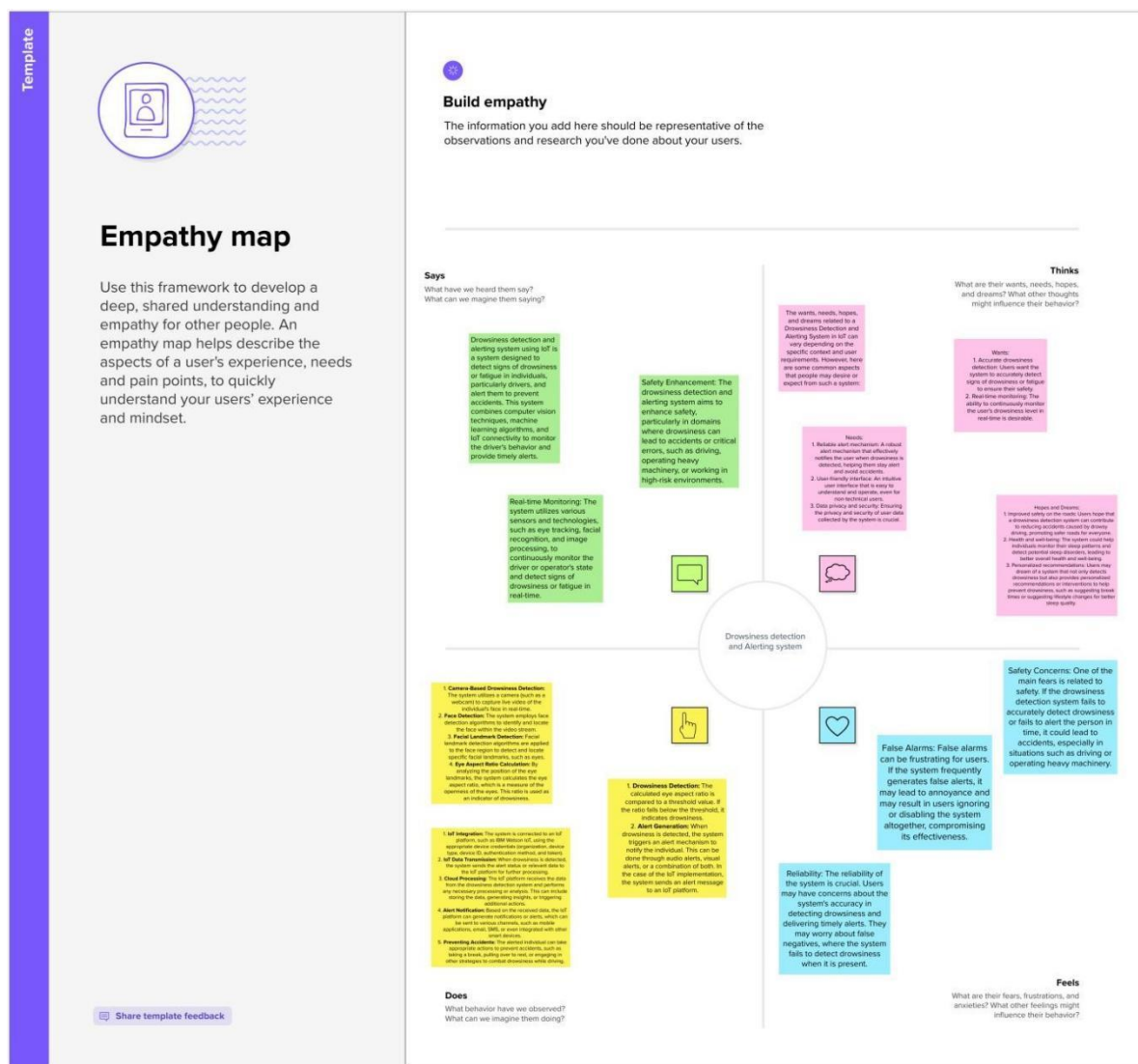
Empathy Map Canvas:

An empathy map is a simple, easy-to-digest visual that captures knowledge about a user's behaviours and attitudes.

It is a useful tool to help teams better understand their users.

Creating an effective solution requires understanding the true problem and the person who is experiencing it. The exercise of creating the map helps participants consider things from the user's perspective along with his or her goals and challenges.

Example:



Project Design Phase-I
Proposed Solution Template

Date	06 May 2023
Team ID	NM2023TMID12828
Project Name	Drowsiness detection and alerting system

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 to be solved is the development of a drowsiness detection and alerting system that can accurately and timely identify drowsiness-related indicators in real-time, such as eyelid movements, yawning, head drooping, or changes in facial expressions. The system should provide timely alerts to individuals, such as drivers, to prevent accidents and promote safety.
2.	Idea / Solution description	the drowsiness detection and alerting system aims to enhance safety, particularly in scenarios like driving, where drowsy driving can lead to accidents with severe consequences.
3.	Novelty / Uniqueness	you can enhance the accuracy, adaptability, and user experience of the drowsiness detection and alerting system, setting it apart from traditional systems and addressing specific challenges associated with drowsiness detection.
4.	Social Impact / Customer Satisfaction	a robust drowsiness detection and alerting system can positively impact society by reducing accidents, enhancing safety in various settings, promoting well-being, and improving customer satisfaction through personalized and user-friendly experiences.
5.	Business Model (Revenue Model)	It's important to consider the target market, competition, and customer preferences when selecting a revenue model. A combination of revenue models may also be viable depending on the specific business goals and market dynamics.
6.	Scalability of the Solution	scalability considerations, the drowsiness detection solution can accommodate growing user bases, expanding sensor networks, and increasing data volumes, ensuring its effectiveness and usability as it scales.

Project Design Phase-I Solution Architecture

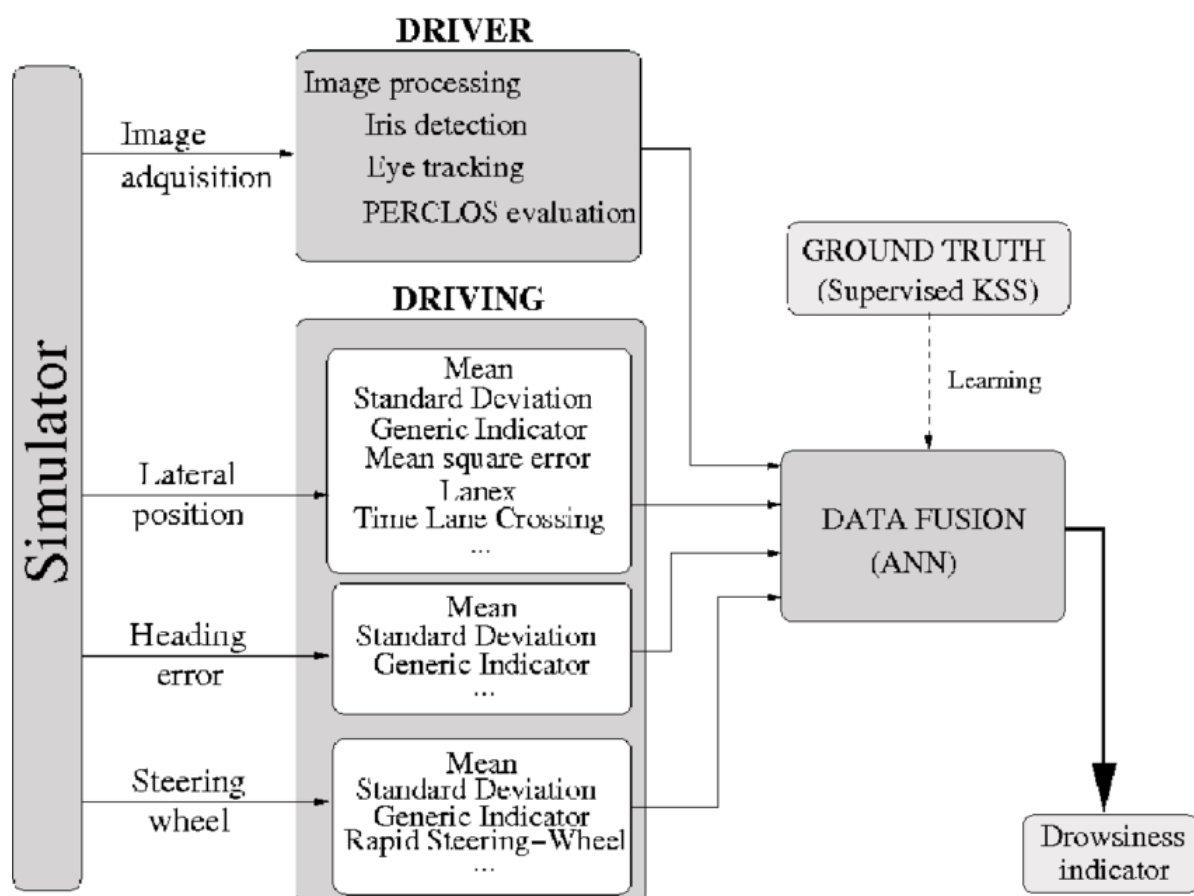
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Solution Architecture:

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.

Solution Architecture Diagram:



Project Design Phase-II Data Flow Diagram & User Stories

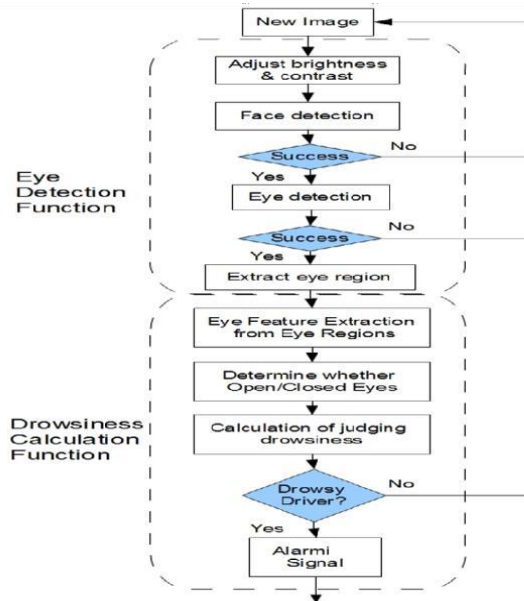
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Data Flow Diagrams:

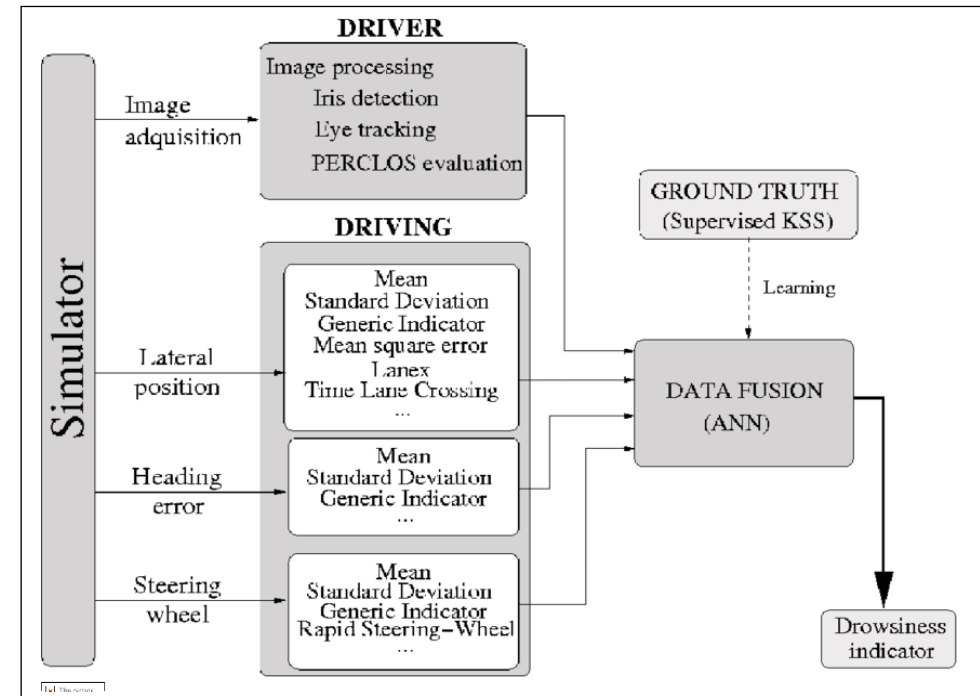
A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.

+

Example: [\(Simplified\)](#)



Example: Drowsiness detection and alerting system



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	K.Tejavarma
		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	M.Sribathy
		USN-3	As a user, I can register for the application through Gmail	I can register & access the dashboard with Facebook Login	Low	B.Kishore
		USN-4	As a user, I can register for the application through Gmail		Medium	L.R.Suriyava rshan
	Login	USN-5	As a user, I can log into the application by entering email & password		High	V.Vijay
	Dashboard					
Customer (Web user)						
Customer Care Executive						
Administrator						

Project Design Phase-II
Solution Requirements (Functional & Non-functional)

Date	06 May 2023
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Functional Requirements:

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	Real-Time Monitoring	The system should continuously monitor the user's physiological or behavioral parameters to determine their drowsiness level in real-time.
FR-2	Data Acquisition	The system should acquire relevant data from sensors or devices, such as electroencephalography (EEG), electrooculography (EOG), heart rate monitors, or video cameras.
FR-3	Drowsiness Detection Algorithms	The system needs to employ algorithms capable of analyzing the acquired data to detect signs of drowsiness accurately. These algorithms may include machine learning techniques, signal processing methods, or a combination of both.
FR-4	Drowsiness Indicators	The system should provide indicators or metrics that represent the level of drowsiness detected, such as a drowsiness score or a categorical alert level.
FR-5	Alerting Mechanism	When the system detects significant drowsiness, it should generate appropriate alerts to inform the user. Alerts can be in the form of visual cues, auditory signals, haptic feedback, or a combination of these, depending on the user's preferences and the context of use.
FR-6	User Interface	The system should provide a user-friendly interface, allowing users to interact with the system, view drowsiness-related information, and configure settings if needed.

Non-functional Requirements:

Following are the non-functional requirements of the proposed solution.

FR No.	Non-Functional Requirement	Description
NFR-1	Usability	the drowsiness detection and alert system can ensure that users can easily interact with the system, understand their drowsiness status, and

		respond appropriately to prevent accidents or mitigate the effects of drowsiness.
NFR-2	Security	security considerations, the drowsiness detection and alert system can maintain the confidentiality, integrity, and availability of user data, and provide users with the assurance that their information is protected.
NFR-3	Reliability	reliability considerations, the drowsiness detection and alert system can provide consistent and accurate performance, ensuring user confidence and enhancing the overall effectiveness of the system.
NFR-4	Performance	Performance metrics and conduct rigorous evaluation of the system's performance. Measure and analyze metrics such as detection accuracy, false positive rates, and response times to identify areas for improvement and validate the system's performance against established benchmarks.
NFR-5	Availability	the drowsiness detection and alert system can ensure uninterrupted operation, providing users with reliable access to the system and timely alerts to prevent drowsiness-related incidents.
NFR-6	Scalability	Ensure that the system can handle increasing data volumes and accommodate a growing user base without sacrificing performance. Design the system to scale horizontally by distributing the processing load across multiple servers or devices. Leverage cloud-based services or distributed computing architectures for scalability.

Project Design Phase-II

Technology Stack (Architecture & Stack)

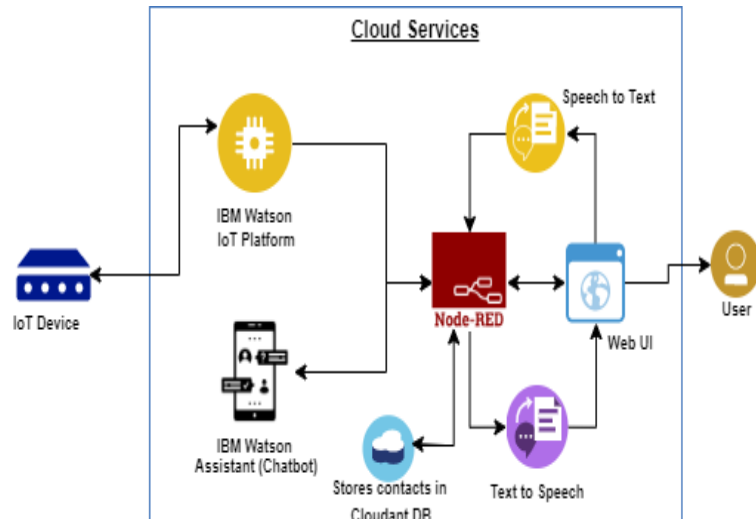
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Technical Architecture:

The Deliverable shall include the architectural diagram as below and the information as per the table1 & table 2

Example: Order processing during pandemics for offline mode

Reference: <https://developer.ibm.com/patterns/ai-powered-backend-system-for-order-processing-during-pandemics/>



Guidelines:

- Include all the processes (As an application logic / Technology Block)
- Provide infrastructural demarcation (Local / Cloud)
- Indicate external interfaces (third party API's etc.)
- Indicate Data Storage components / services
- Indicate interface to machine learning models (if applicable)

Table-1 : Components & Technologies:

S.No	Component	Description	Technology
1.	Sensors	Various sensors are utilized to monitor physiological or behavioral parameters that indicate drowsiness.	HTML, CSS, JavaScript / Angular Js / React Js etc.
2.	Data Processing and Analysis	Machine Learning Algorithms: Utilize techniques like deep learning, neural networks, or statistical models to analyze sensor data and extract drowsiness patterns. Signal Processing Techniques: Apply filters, feature extraction, or statistical analysis methods to process and interpret sensor signals for drowsiness detection.	Python
3.	Drowsiness Detection Algorithms	Algorithms are developed based on the analysis of sensor data to determine the level of drowsiness. These algorithms may employ various techniques, such as pattern recognition, feature extraction, or classification algorithms.	IBM Watson STT service
4.	Alerting Mechanisms	Visual Alerts: Use visual cues, such as LED lights or graphical displays, to notify users about their drowsy state. Auditory Alerts: Emit sound signals or alarms to grab the user's attention. Haptic Feedback: Provide vibrational or tactile feedback through wearable devices or seats to alert users.	IBM Watson Assistant
5.	Integration	Vehicle Integration: Some drowsiness detection systems can integrate with existing vehicle safety systems, such as lane departure warning systems or adaptive cruise control, to enhance safety measures. Wearable Devices: Utilize wearable devices, such as smartwatches or headsets, to monitor drowsiness and provide alerts.	MySQL, NoSQL, etc.

		Mobile Applications: Integrate with mobile apps to provide drowsiness monitoring and alerts on smartphones or tablets.	
6.	User Interface	Display Interface: Present drowsiness-related information, alert notifications, and user settings on a display screen or interface. User Input: Enable users to interact with the system, configure settings, or acknowledge alerts using buttons, touchscreens, or voice commands.	IBM DB2, IBM Cloudant etc.
7.	Data Logging and Analysis	Data Storage: Store sensor data for later analysis, tracking drowsiness patterns, or generating reports. Data Analytics: Perform data analysis to identify trends, patterns, or anomalies related to drowsiness and provide insights for the user.	IBM Block Storage or Other Storage Service or Local Filesystem
8.	Connectivity	Enable data transmission and communication between different system components, such as sensors, processing units, and alerting devices.	IBM Weather API, etc.

Table-2: Application Characteristics:

S.No	Characteristics	Description	Technology
1.	Context of Use	The system's intended context of use is crucial to understand the environmental conditions and user requirements. For example, a drowsiness detection system for long-haul truck drivers may have different requirements compared to a system designed for office workers.	Technology of Opensource framework
2.	User Characteristics	Consider the characteristics of the target users, such as age, physical abilities, and potential medical conditions. User-specific factors can influence the system's design, interface, and customization options.	e.g. SHA-256, Encryptions, IAM Controls, OWASP etc.

S.No	Characteristics	Description	Technology
3.	Application Domain	Identify the specific domain or industry where the system will be deployed. Drowsiness detection systems can be used in various domains, including transportation (e.g., automotive, aviation, railway), healthcare, industrial safety, and more. Understanding the requirements and constraints of the domain helps tailor the system accordingly.	Technology used
4.	Scalability and Flexibility	Determine whether the system should be scalable to accommodate different deployment scales, from individual users to large-scale implementations across an organization or industry. Flexibility allows the system to adapt to evolving needs and technological advancements.	Technology used
5.	Performance	The performance of a drowsiness detection and alerting system should be evaluated through rigorous testing, validation, and continuous improvement to ensure its effectiveness and reliability in real-world scenarios.	Technology used

References:

<https://c4model.com/>

<https://developer.ibm.com/patterns/online-order-processing-system-during-pandemic/>

<https://www.ibm.com/cloud/architecture>

<https://aws.amazon.com/architecture>


<https://medium.com/the-internal-startup/how-to-draw-useful-technical-architecture-diagrams-2d20c9fda90d>

Project Development Phase Performance Test

Date	06 May 2023
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Model Performance Testing:

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

Parameter	Values	Screenshot
Metrics	Wowki Execution time and Output screenshot Or Python accuracy of prediction and output screenshot	

Project Demo Video Link :

https://drive.google.com/file/d/19cLOsj2dytuCji4h0YD0Eav68_6Oszes/view?usp=share_link