

IdeationPhase

Brainstorm & Idea Prioritization Template

| | |
|---------------|---|
| Date | 2 Jan 2025 |
| Team ID | LTVIP2025TMID40909 |
| Project Name | GrainPalette-A-Deep-Learning-Odyssey-In Rice-Type- - Through-Transfer-Learning Classification |
| Maximum Marks | 4 Marks |

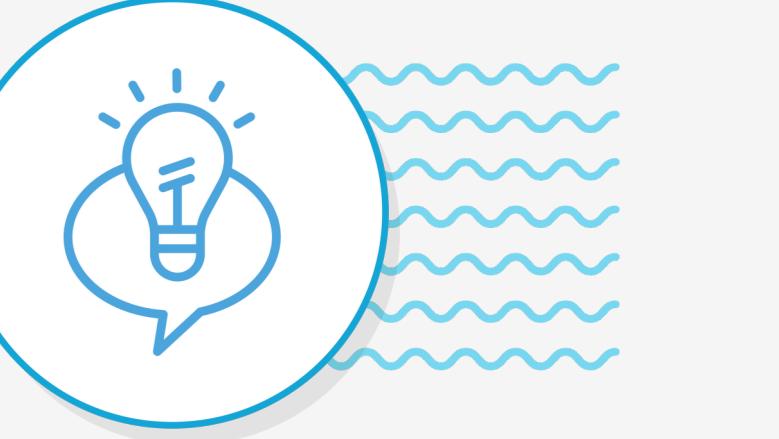
Brainstorm & Idea Prioritization Template: Brainstorming provides a free and open environment that encourages everyone within a team to participate in the creative thinking process that leads to problem solving. Prioritizing volume over value, out-of-the-box ideas are welcome and built upon, and all 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.

Reference: <https://www.mural.co/templates/brainstorm-and-idea-prioritization>

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

Step-2: Brainstorm, Idea Listing and Grouping

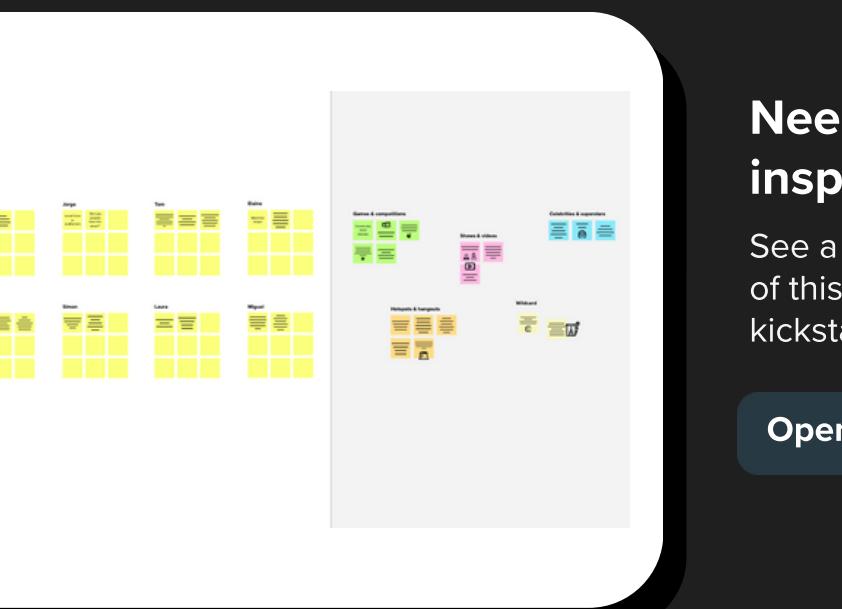
Step-3: Idea Prioritization



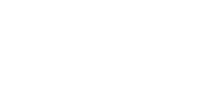
Brainstorm & idea prioritization

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



Need some inspiration?
See a finished version of this template to kickstart your work.
[Open example →](#)



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.



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



Brainstorm

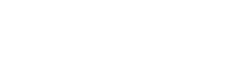
Write down any ideas that come to mind that address your problem statement.

⌚ 10 minutes



TIP

You can select a sticky note and hit the pencil [switch to sketch] icon to start drawing!



10 minutes



10 minutes



20 minutes



20 minutes



20 minutes



20 minutes



20 minutes



20 minutes



20 minutes



20 minutes



20 minutes



20 minutes



20 minutes



20 minutes



20 minutes



20 minutes



20 minutes



20 minutes



20 minutes

<p

Ideation Phase

Define the Problem Statements

| | |
|---------------|--|
| Date | 14 jan 2025 |
| Team ID | LTVIP2025TMID40909 |
| Project Name | Grain Palette-A-Deep-Learning-Odyssey-In Rice-Type- -Through-Transfer-Learning Classification |
| 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 |

Reference: <https://miro.com/templates/customer-problem-statement/>

Example:



| Problem Statement (P.S) | I am (Customer) | I'm trying to | But | Because | Which makes me feel |
|-------------------------|---|--|--|---|---|
| P-S-1 | <div style="display: flex; justify-content: space-around;"> <div>I am a quality control analyst</div> <div>I am a agricultural researcher</div> <div>I am a rice producer.</div> <div>I am a food scientist.</div> <div>quality assurance manager</div> <div>food industry executive.</div> <div>supply chain manager.</div> <div>rice exporter.</div> </div> | <div style="display: flex; justify-content: space-around;"> <div>classify different rice types accurately and efficiently.</div> <div>develop better rice classification techniques</div> <div>identify the quality of my rice quickly and accurately</div> <div>ensure rice meets industry and safety standards</div> <div>ensure that our rice classification meets industry standards</div> <div>implement technology that improves rice classification efficiency.</div> <div>ensure accurate classification for smooth distribution and pricing</div> <div>ensure that my rice meets international quality standards</div> </div> | <div style="display: flex; justify-content: space-around;"> <div>manual classification is slow and inconsistent,</div> <div>traditional methods are inefficient and difficult to scale</div> <div>current classification methods are time-consuming and costly</div> <div>inconsistent classification affects quality control</div> <div>manual classification leads to inconsistencies and delays</div> <div>current processes are slow and not scalable</div> <div>inconsistencies in rice classification disrupt logistics</div> <div>manual classification methods are prone to error and slow the process.</div> </div> | <div style="display: flex; justify-content: space-around;"> <div>it relies on subjective human judgment.</div> <div>they require extensive manual effort and lack automation</div> <div>they require expert knowledge and manual sorting</div> <div>manual inspection varies from person to person</div> <div>it depends on human expertise and subjective judgment</div> <div>they depend on manual inspection and lack automation</div> <div>quality variations lead to disputes and inefficiencies</div> <div>they rely on human perception and outdated techniques</div> </div> | <div style="display: flex; justify-content: space-around;"> <div>concerned and concerned about maintaining quality standards.</div> <div>limited in my ability to innovate and improve agricultural research.</div> <div>worried about delays and financial losses.</div> <div>concerned about food safety and regulatory compliance.</div> <div>concerned about maintaining product quality and meeting complex requirements.</div> <div>pressured to find innovative solutions that reduce costs and increase accuracy.</div> <div>frustrated by operational inefficiencies and the risk of financial loss.</div> <div>worried about meeting export regulations and losing market opportunities.</div> </div> |

IdeationPhase

Empathize&Discover

| | |
|---------------|---|
| Date | 31 January 2025 |
| Team ID | LTVIP2025TMID40909 |
| Project Name | GrainPalette-A-Deep-Learning-Odyssey-In Rice-Type- - Through-Transfer-Learning Classification |
| Maximum Marks | 4 Marks |

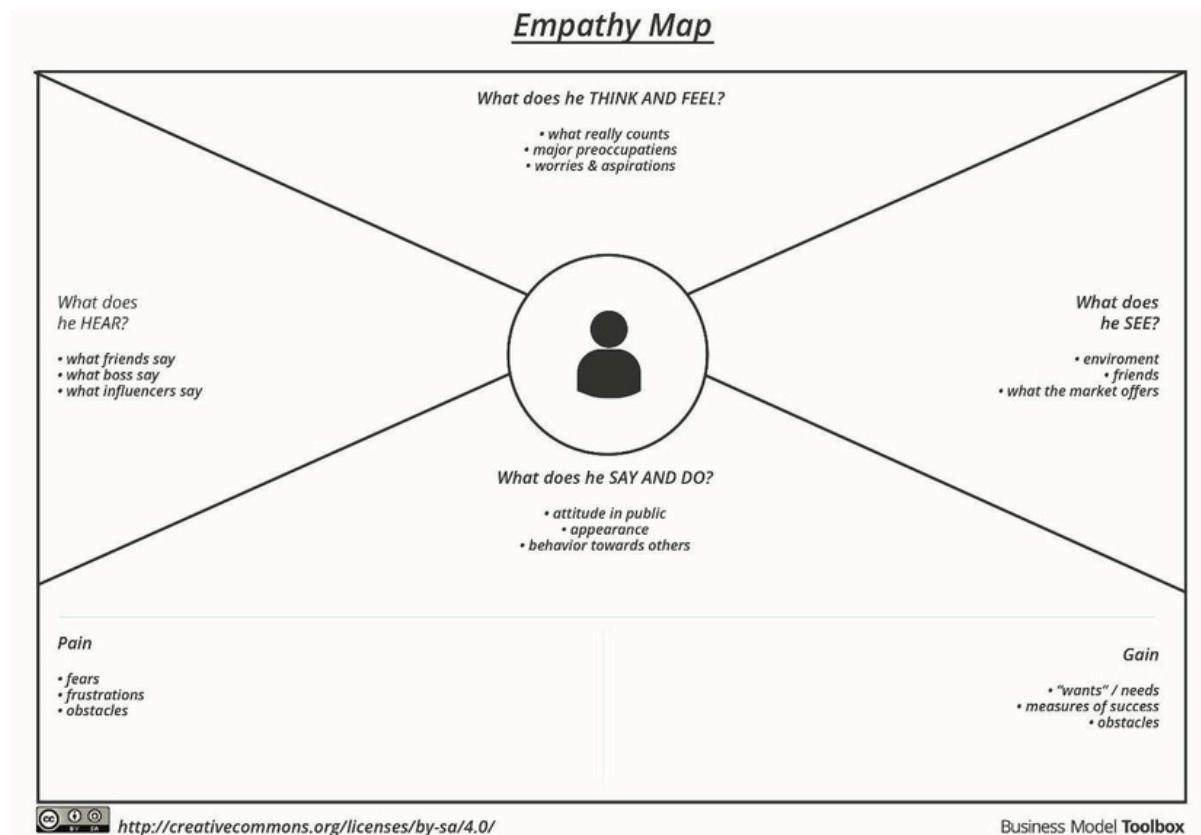
Empathy Map Canvas:

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

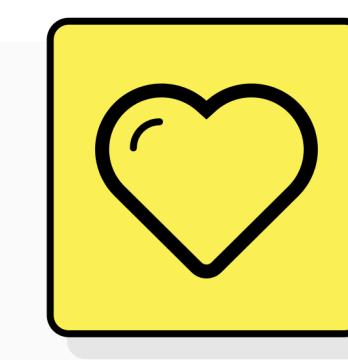
It is a useful tool to helps teams better understand their users.

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:



Reference: <https://www.mural.co/templates/empathy-map-canvas>



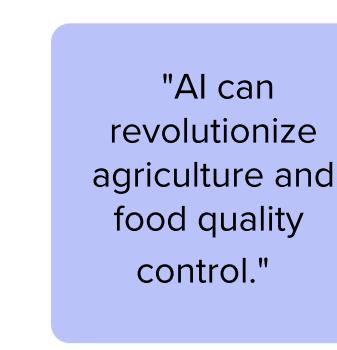
WHO are we empathizing with?

Who is the person we want to understand?
What is the situation they are in?
What is their role in the situation?

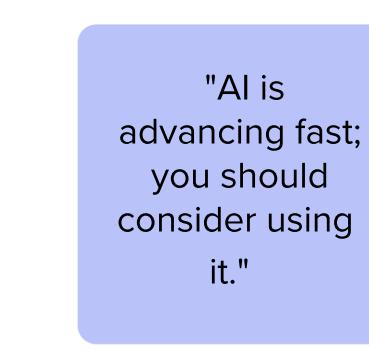


What do they HEAR?

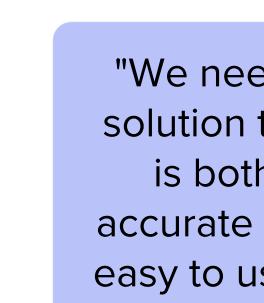
What are they hearing others say?
What are they hearing from friends?
What are they hearing from colleagues?
What are they hearing second-hand?



"AI can revolutionize agriculture and food quality control."



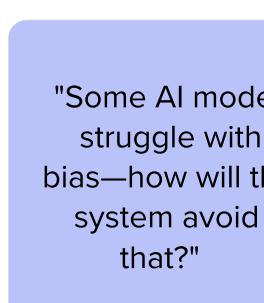
"AI is advancing fast; you should consider using it."



"We need a solution that is both accurate and easy to use."



"Big companies are already adopting AI for food quality control."



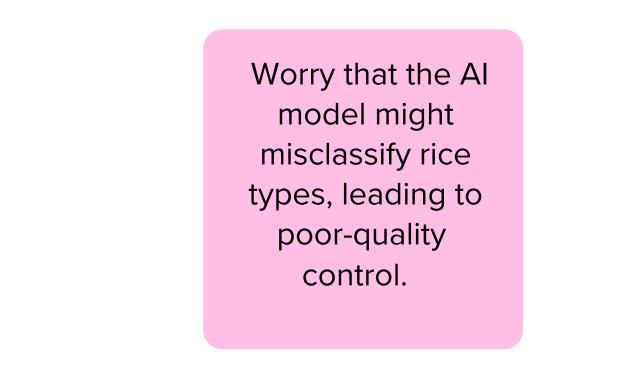
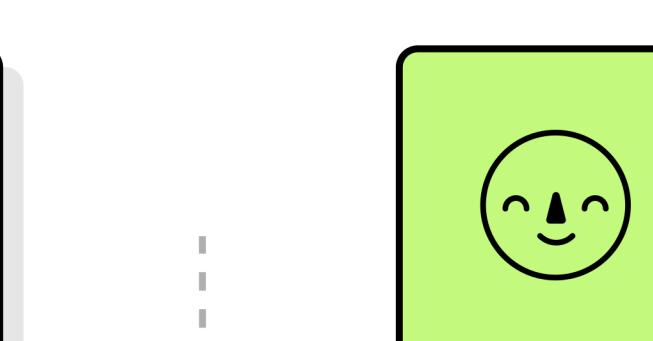
"Some AI models struggle with bias—how will this system avoid that?"

GOAL

What do they THINK and FEEL?

PAINS

What are their fears, frustrations, and anxieties?



They struggle with manual rice classification, which is time-consuming, prone to human error, and less reliable. They need a faster, more reliable AI-driven solution.



We are empathizing with quality control analysts, agricultural researchers, food scientists, and rice processors who need an efficient way to classify rice types accurately.



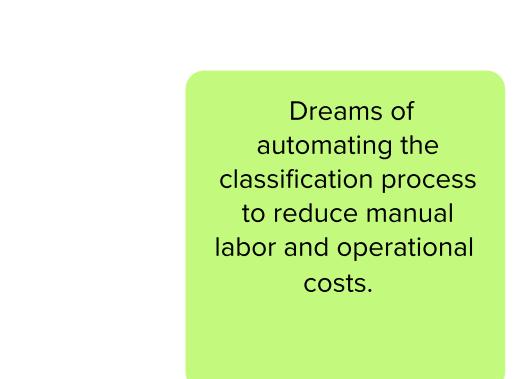
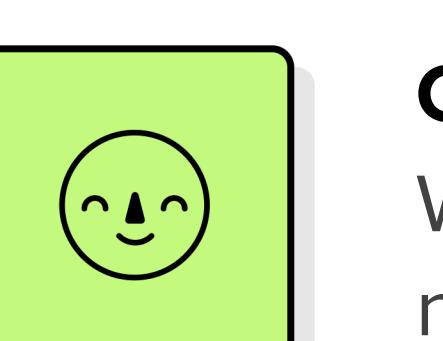
Their job is to analyze and verify rice quality to ensure that the correct classification is made. This requires high competency. Their main concern is creating classification models for accuracy and reliability.



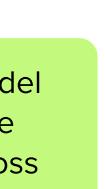
A quality control analyst working in a rice processing company responsible for ensuring rice quality and maintaining strict quality control standards.

GAINS

What are their wants, needs, hopes, and dreams?



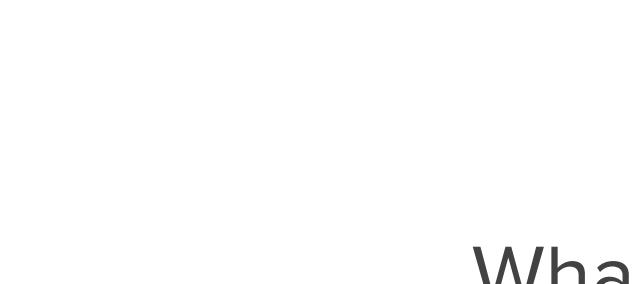
Dreams of automating the classification process to reduce manual labor and operational costs.



Want a model that can be easily adopted across different regions and rice varieties.



Concern about the availability and quality of clean image datasets for training the model.



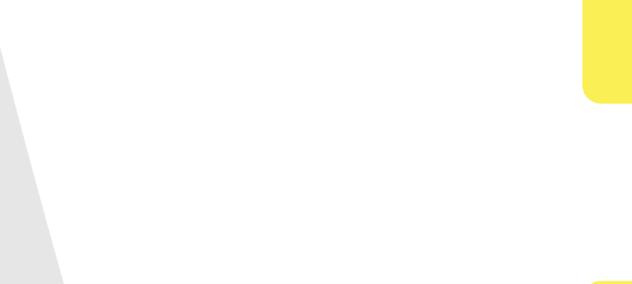
Worry that the AI model might misclassify rice types, leading to poor-quality control.



Concern about the availability and quality of clean image datasets for training the model.



Users may hesitate to fully trust an AI-driven system for quality control as they have relied on traditional manual classification for years.



They may want a customizable model that can be fine-tuned for different rice types or quality standards in different regions.



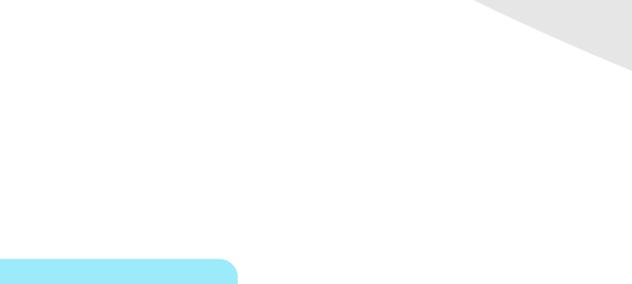
They might question the transparency of the AI-driven decision-making process and whether they can verify its accuracy.



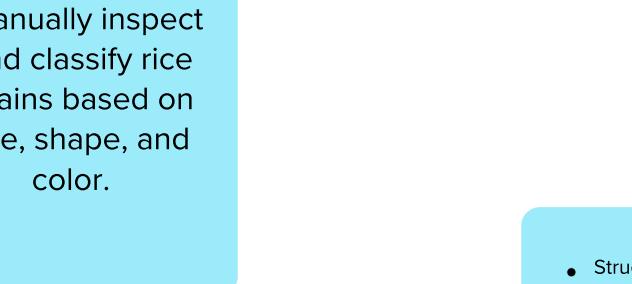
Expect an easy integration of AI models into existing agricultural workflows.



Manually inspect and classify rice grains based on size, shape, and color.



- Slowing growth in the time-consuming nature of manual classification.
- Showcasing automation as a potential solution due to technological advancements.



- Using an AI-powered solution to automate classification and reduce manual labor.
- Training software to detect specific rice types based on visual features.
- Comparing results with manual inspection to test the tool.

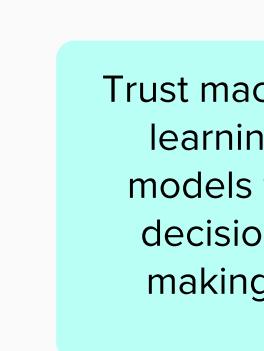
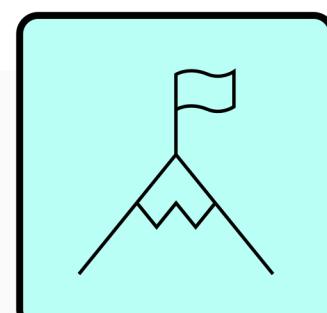
What do they need to DO?

What do they need to do differently?

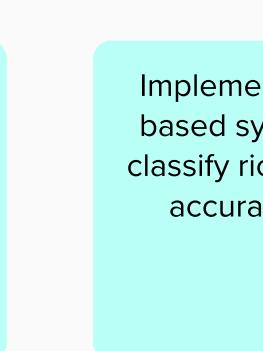
What job(s) do they want or need to get done?

What decision(s) do they need to make?

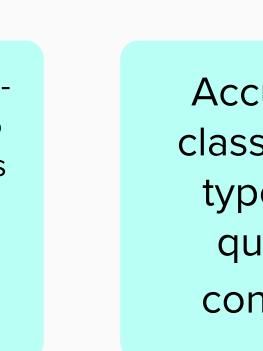
How will we know they were successful?



Trust machine learning models for decision-making.



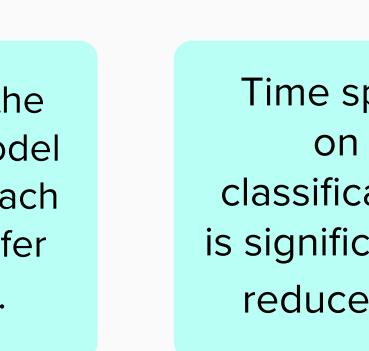
Implement an AI-based system to classify rice types accurately.



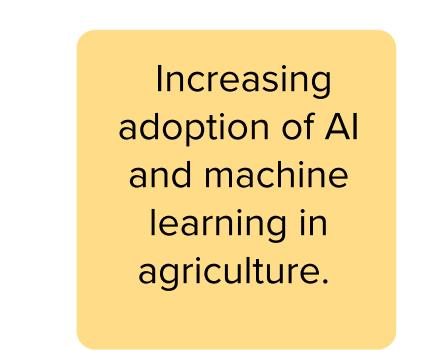
Accurately classify rice types for quality control.



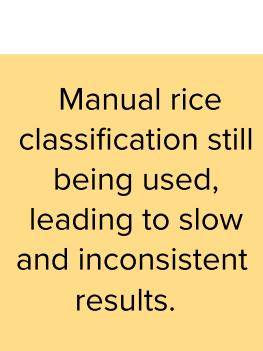
Choose the right AI model and approach (e.g., transfer learning).



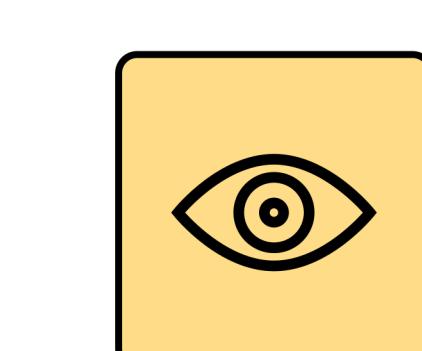
Time spent on classification is significantly reduced.



Increasing adoption of AI and machine learning in agriculture.



Manual rice classification still being used, leading to slow and inconsistent results.



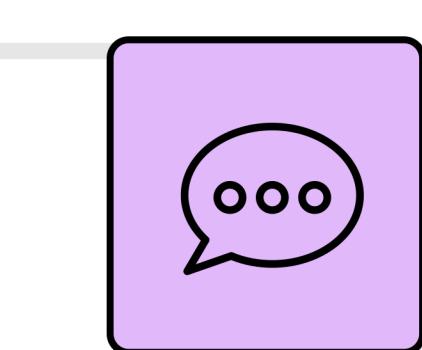
What do they SEE?

What do they see in the marketplace?

What do they see in their immediate environment?

What do they see others saying and doing?

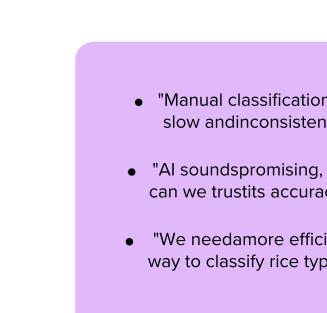
What are they watching and reading?



What do they SAY?

What have we heard them say?

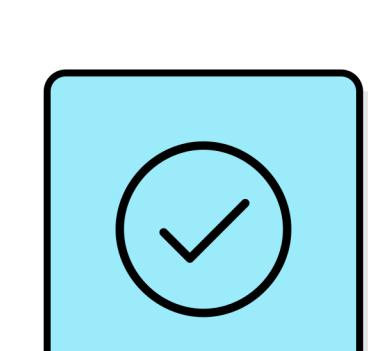
What can we imagine them saying?



- "Manual classification is becoming increasingly difficult."
- "AI is advancing fast, but can we trust accuracy?"
- "We need a solution that is both accurate and easy to use."

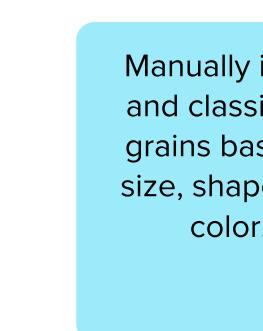


- "This AI system sounds promising."
- "We need an AI system that can handle different rice varieties."
- "More transparency in AI models would be great."
- "It's unique technology that can solve our current challenges."

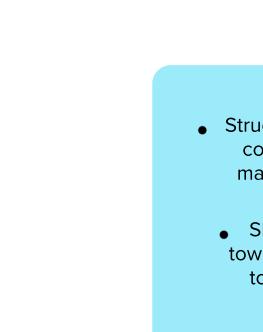


What do they DO?

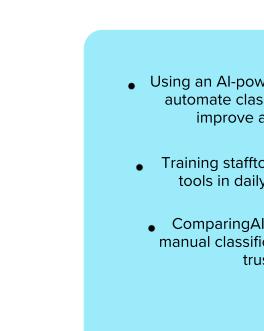
What do they do today?
What behavior have we observed?
What can we imagine them doing?



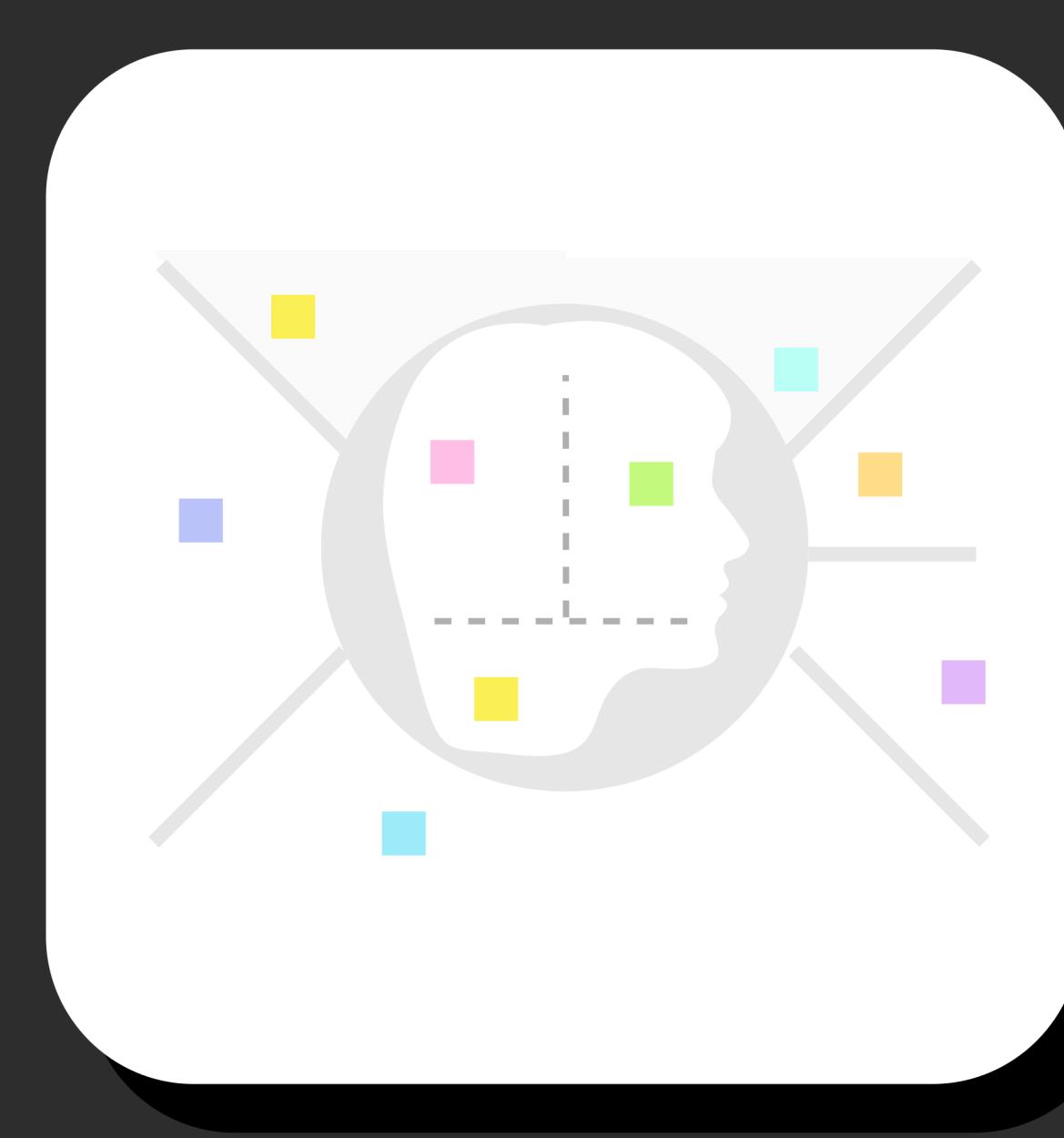
Manually inspect and classify rice grains based on size, shape, and color.



- Slowing growth in the time-consuming nature of manual classification.
- Showcasing automation as a potential solution due to technological advancements.



- Using an AI-powered solution to automate classification and reduce manual labor.
- Training software to detect specific rice types based on visual features.
- Comparing results with manual inspection to test the tool.

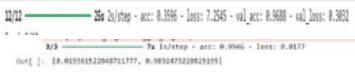


Project Development Phase
Model Performance Test

| | |
|---------------|--|
| Date | 10 February 2025 |
| Team ID | LTVIP2025TMID40909 |
| Project Name | Grain Palette-A-Deep-Learning-Odyssey-In-Rice-Type- -Through-Transfer-Learning Classification |
| Maximum Marks | 4 Mrks |

Model Performance Testing:

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

| S. No. | Parameter | Values | Screenshot |
|--------|------------------------------|--|--|
| 1. | Model Summary | - |  Model: "sequential" Layer (Type) Output Shape Param Input (None) [None, 60000] 0 dense (Dense) [None, 10] 60000 dense_1 (Dense) [None, 10] 60000 Total params: 2,007,400 (7.05 MB) Trainable params: 2,007,400 (7.05 MB) Non-trainable params: 0 (0.00 KB) |
| 2. | Accuracy | Training Accuracy -0.9688 Validation Accuracy -0.9892 |  10/10 25/25 train - acc: 0.9688 - loss: 7.2545 - val_acc: 0.9892 - loss: 0.3672 - 10/10 25/25 train - acc: 0.9946 - loss: 0.8177 Out[1]: {0: 0.9359152204871177, 0.9892475288025395} |
| 3. | Fine Tuning Result (if done) | Validation Accuracy - | - |

Project Design Phase

Problem – Solution Fit Template

| | |
|---------------|--|
| Date | 15 February 2025 |
| Team ID | LTVIP2025TMID40909 |
| Project Name | GrainPalette-A-Deep-Learning-Odyssey-In-Rice-Type-Classification-Through-Transfer-Learning |
| Maximum Marks | 2 Marks |

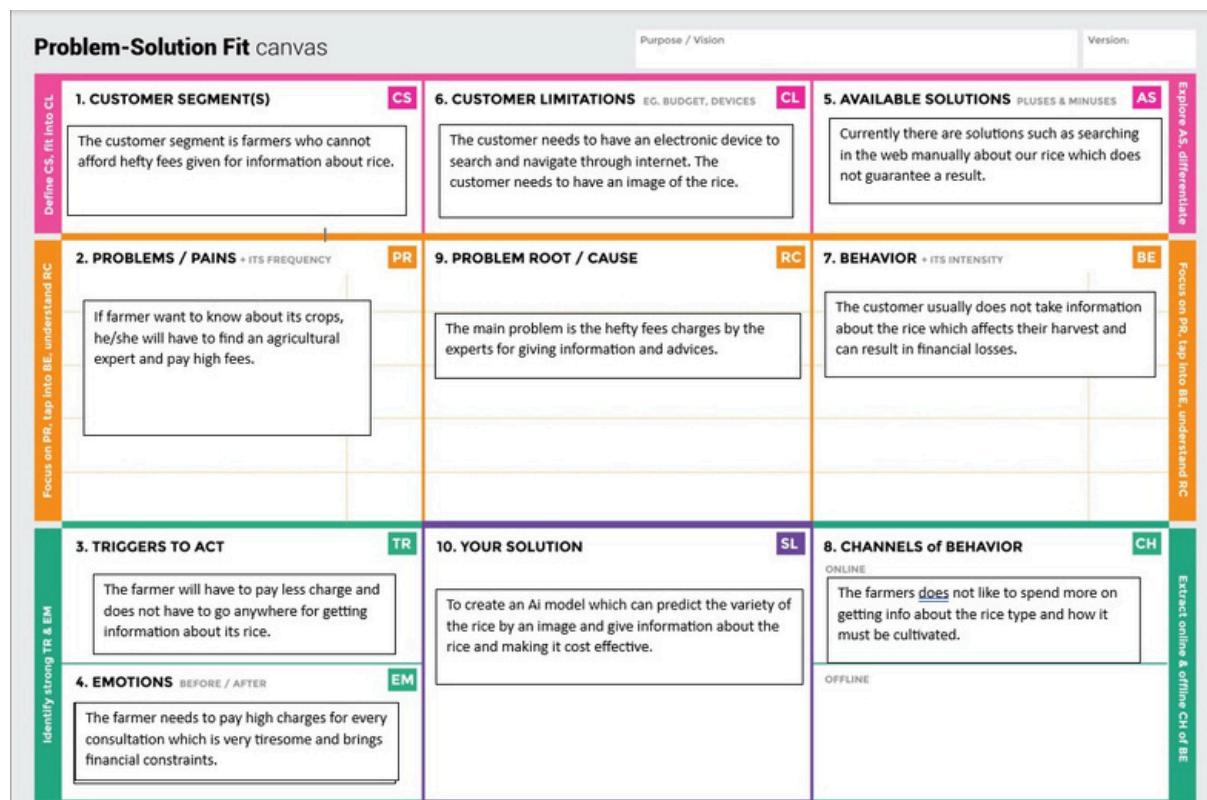
Problem – Solution Fit Template:

The Problem-Solution Fit simply means that you have found a problem with your customer and that the solution you have realized for it actually solves the customer's problem. It helps entrepreneurs, marketers and corporate innovators identify behavioral patterns and recognize what would work and why.

Purpose:

- Solve complex problems in a way that fits the state of your customers.
- Succeed faster and increase your solution adoption by tapping into existing mediums and channels of behavior.
- Sharpen your communication and marketing strategy with the right triggers and messaging.
- Increase touch-points with your company by finding the right problem-behavior fit and building trust by solving frequent annoyances, or urgent or costly problems.
- Understand the existing situation in order to improve it for your target group.**

Template:



Project Design Phase
Proposed Solution Template

| | |
|---------------|--|
| Date | 15 February 2025 |
| Team ID | LTVIP2025TMID40909 |
| Project Name | Grain Palette-A-Deep-Learning-Odyssey-In-Rice-Type-Classification-Through-Transfer-Learning 2 Marks |
| Maximum Marks | Learning 2 Marks |

Proposed Solution Template:

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

| S. No. | Parameter | Description |
|--------|--|---|
| 1. | Problem Statement (Problem to be solved) | It is not possible for the farmers to pay the agriculture experts hefty fees every time they have a new produce. We have to come up with a solution to this problem |
| 2. | Idea / Solution description | Train an AI model which can be used by farmers to check the type of rice. The users need to upload image of a rice grain and click on the submit button. |
| 3. | Novelty / Uniqueness | The prediction will be done automatically without any human intervention using a machine learning model. |
| 4. | Social Impact / Customer Satisfaction | The model can predict the rice in very less time and provide services to a very large customer base. |
| 5. | Business Model (Revenue Model) | We can charge amount per prediction which can generate a good profit. |
| 6. | Scalability of the Solution | The model can be scalable by training the model on various different types of rice. |

Project Design Phase Solution Architecture

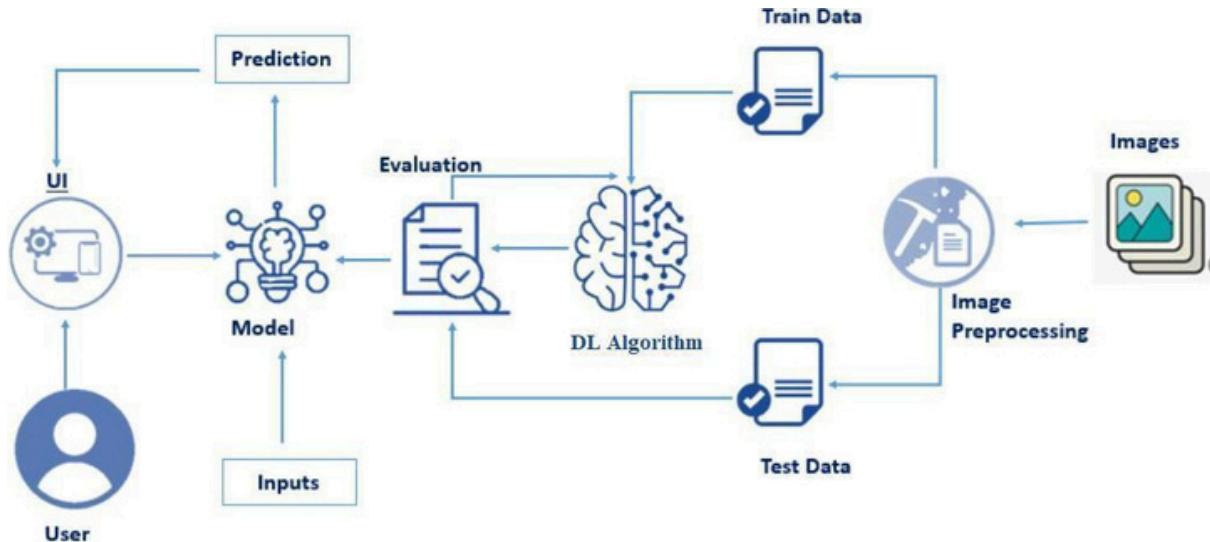
| | |
|---------------|---|
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| Maximum Marks | 4 Marks |

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, behaviour, 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:



Key Components of the solution:

1. User Interface (Frontend)

Provides an interface for users to upload rice images and view classification results. Uses HTML, JavaScript, or React to send images to the backend and display predictions.

2. Backend Logic (Flask API)

Handles image preprocessing, runs inference using MobileNetV2, and returns classification results as JSON. Built with Flask/ Fast API for easy deployment.

3. MobileNetV2 (Deep Learning Model)

A lightweight CNN optimized for mobile/web, trained to classify different rice types. Uses depth wise separable convolutions for efficiency and is fine-tuned for accuracy.

4. Output (Rice Classification Result)

Returns a predicted rice category (e.g., Basmati, Jasmine) as JSON, which is displayed on the frontend. Can be integrated into web or mobile apps for real-time use.

Features and Deployment phases:

Features:

User-Friendly UI: Simple interface for image upload and displaying results.

Efficient Backend: Uses Flask/Fast API to handle requests and process images.

Accurate Predictions: MobileNetV2 ensures fast and reliable rice classification.

Deployment phases:

Model Training & Saving: Train MobileNetV2, fine-tune it, and save as .h5.

Backend & API Setup: Develop a Flask API for model inference and JSON response.

Hosting & Deployment: Deploy on Render, AWS, or Google Cloud for public access.

Solution Requirements:

1.Techical requirements:

Frameworks & Libraries: TensorFlow/ Keras for model training, Flask/Fast API for API, and React/HTML for frontend.

Infrastructure: A cloud server (AWS, GCP) or containerized deployment (Docker, Kubernetes).

Storage & Processing: GPU support for training, cloud or local storage for model files and images.

2.Functional requirements:

Image Upload & Processing: Users can upload rice images for classification.

Model Inference & Prediction: Backend processes images and returns the rice type.

Result Display & API Integration: Predictions are displayed in the UI with real-time responses.

Project Planning Logic

| | |
|---------------|--|
| Date | 15 February 2025 |
| Team ID | LTVIP2025TMID40909 |
| Project Name | GrainPalette-A-Deep-Learning-Odyssey In-Rice-Type- -Through-Transfer Learning Classification - |
| Maximum Marks | |

A **Sprint** fixed period or duration in which a team works to complete a set of tasks

An **Epic** is a **big task or project** that is too large to complete in one sprint. It is broken down into **smaller tasks (stories)** that can be completed over multiple sprints.

A **Story** is a small task. It is part of an **Epic**.

A **Story Point** is a number that represents how much effort a story takes to complete.
(usually in form of Fibonacci series)

- 1- Very Easy task
- 2- Easy task
- 3- Moderate task
- 5- Difficult task

Sprint 1: (2 Days)

Data Collection

Collection of Data 2

Loading Data 1

Sprint 2: (3 Days)

Data Preprocessing

Handling Missing Values 3

Handling Categorical values 2

Sprint 3: (5 Days)

Model Building

Model Building 5

Testing Model 3

Sprint 4: (3 Days)

Deployment

Working HTML Pages **3**

Flask deployment **5**

Sprint 3 (5 days) Total Story Points Sprint 1 = 3 Sprint 2 = 5

Sprint 3 = 8 Sprint 4 = 8 Velocity= Total Story Points

Completed/ Number of Sprints Total story Points= $3+5+8+8$

= 24 No of Sprints= 4 **Velocity** = $24/4=6$ 6 (Story Points per

Sprint) **Your team's velocity is 6 Story Points per Sprint.**

Project Planning Phase

Project Planning Template(ProductBacklog,SprintPlanning, Stories, Story points)

| | |
|---------------|---|
| Date | 15 February 2025 |
| Team ID | LTVIP2025TMID40909 |
| Project Name | GrainPalette-A-Deep-Learning-Odyssey-In-Rice-Type-Classification-Through-Transfer-Learning |
| Maximum Marks | 5 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 | Visiting website | USN-1 | As a user, I can visit the site simply using website URL. To use the model for prediction, I need to go to | 2 | High | Kabir |
| Sprint-2 | Accessing upload page | USN-2 | image upload page. In the Image upload page, I can simply upload the image from my device files. | 1 | High | Kushagra Singh |
| Sprint-3 | Image uploading | USN-3 | After uploading the image, I get the rice type prediction and addition information related to farming of that particular rice variety. | 2 | Low | Rishi Pal |
| Sprint-4 | Rice type prediction | USN-4 | | 2 | Medium | Kishan Kumar Sharma |

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) |
|----------|--------------------|----------|-------------------|---------------------------|---|------------------------------|
| | 20 20 20 20 | | | 26 Feb 2025 01 | | 10 Mar 2025 10 Mar |
| Sprint-1 | | 2 Days | 25 Mar 2025 | Mar 2025 06 Mar | 20 20 20 20 | 2025 10 Mar 2025 10 |
| Sprint-2 | | 3 Days | 27 Mar 2025 | 2025 09 Mar | | Mar 2025 |
| Sprint-3 | | 5 Days | 02 Apr 2025 | 2025 | | |
| Sprint-4 | | 3 Days | 07 Apr 2025 | | | |

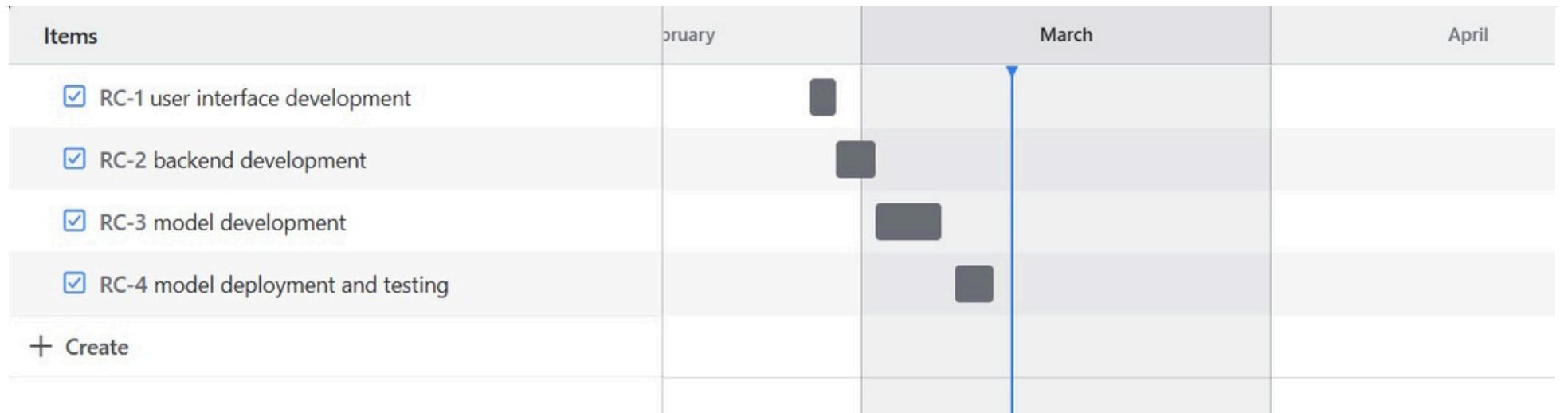
Velocity:

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)

$$AV = (\text{sprint duration}) / \text{Velocity} = 13 / 6 = 2.16$$

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.



<https://www.visual-paradigm.com/scrum/scrum-burndown-chart/>

<https://www.atlassian.com/agile/tutorials/burndown-charts>

Reference:

<https://www.atlassian.com/agile/project-management>

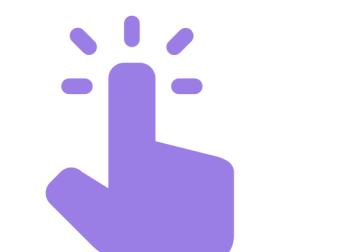
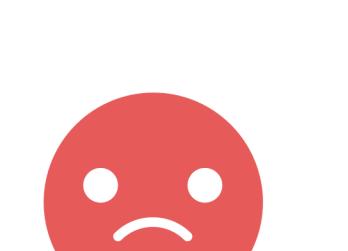
<https://www.atlassian.com/agile/tutorials/how-to-do-scrum-with-jira-software>

<https://www.atlassian.com/agile/tutorials/epics>

<https://www.atlassian.com/agile/tutorials/sprints>

<https://www.atlassian.com/agile/project-management/estimation>

<https://www.atlassian.com/agile/tutorials/burndown-charts>

| Scenario: Upload image of any type of rice, processing and see results of what type of rice it is. | ! Entice How does someone become aware of this service? | → Enter What do people experience as they begin the process? | ⟳ Engage In the core moments in the process, what happens? | ➡ Exit What do people typically experience as the process finishes? | 🕒 Extend What happens after the experience is over? |
|---|--|---|--|---|--|
|  Experience steps What does the person (or people) at the center of this scenario typically experience in each step? |  Potential users discover GrainPalette through social media ads, agricultural forums, and industry conferences. Positive reviews and testimonials from farmers and agricultural experts build curiosity. A compelling value proposition, such as "Accurate Rice Classification in Seconds," grabs attention. | Users are welcomed with a simple onboarding process explaining the app's purpose. A guided tutorial demonstrates how to upload rice grain images for classification. | Users upload images of rice grains through the app's camera or file upload feature. The deep learning model quickly processes the images and provides classification results. The app suggests insights such as grain quality, type, and potential market value. Real-time feedback allows users to refine their inputs for better accuracy. User satisfaction grows as the app's high accuracy saves time and effort. | The app displays a summary report of the classification results. Users receive recommendations for improving rice quality and market positioning. | Users receive periodic updates and new features via notifications. Feedback channels allow users to report issues and suggest improvements. Data from past classifications helps improve future accuracy through machine learning. |
|  Interactions What interactions do they have at each step along the way? ■ People: Who do they see or talk to? ■ Places: Where are they? ■ Things: What digital touchpoints or physical objects do they use? | Users may see promotional content from social media influencers, agricultural experts, or industry leaders. They encounter GrainPalette through online ads, agricultural fairs, and farming seminars. They interact with social media platforms (e.g., Facebook, Instagram), the GrainPalette website, and online video demos. | Users interact with customer support through chat or FAQs during onboarding. They are usually at home, on the farm, or in agricultural offices while setting up the app. | Users may seek guidance from customer support or other farmers when using the app. They are typically in rice fields, warehouses, or grain processing centers during use. They use smartphone cameras to capture rice images and the app's interface to process them. Some users might consult experts or team members to validate results. Real-time feedback through the app's dashboard enhances user interaction. | Users may share their results with agricultural experts or other farmers. They are usually back at home or in their office while reviewing reports. | Users receive follow-ups from the GrainPalette team through emails or notifications. They might discuss app performance and results with industry peers at events or meetings. Push notifications inform users about app updates and new features. |
|  Goals & motivations At each step, what is a person's primary goal or motivation? ("Help me..." or "Help me avoid...") | "Help me find a reliable solution for rice classification." "Help me improve the efficiency of sorting rice grains." "Help me reduce errors in rice type identification." | "Help me understand how to use the app quickly and easily." "Help me avoid confusion during the onboarding process." | "Help me classify rice types accurately and quickly." "Help me understand the differences between rice varieties." "Help me make informed decisions based on classification results." "Help me avoid misclassifications that could affect quality and pricing." "Help me improve efficiency and reduce labor costs." | "Help me understand the classification report clearly." "Help me apply the insights to improve rice quality and sales." | "Help me stay updated with app improvements and new features." "Help me track classification accuracy over time." "Help me compare past and present classification trends." |
|  Positive moments What steps does a typical person find enjoyable, productive, fun, motivating, delightful, or exciting? | Discovering that GrainPalette can automate and simplify rice classification is exciting. Positive testimonials and high ratings build motivation to try the app. Seeing a demo of quick and accurate rice classification feels impressive and promising. | A smooth and quick onboarding process feels easy and welcoming. Successfully uploading the first image without issues creates confidence. | Getting fast and accurate results from the deep learning model feels satisfying. Seeing detailed insights about rice quality and type boosts confidence. Real-time feedback and improvement suggestions feel empowering. High accuracy rates make the process feel productive and rewarding. The ability to compare different rice types side-by-side adds an element of curiosity and learning. | Viewing a detailed and well-organized classification report feels informative and useful. Being able to share or export the results with one click feels seamless. | Receiving helpful tips and updates through notifications feels engaging. Tracking classification history and trends over time builds a sense of progress. Seeing improvements in classification accuracy over repeated use feels rewarding. |
|  Negative moments What steps does a typical person find frustrating, confusing, angering, costly, or time-consuming? | Difficulty finding reliable information about the app online creates frustration. Confusing or inconsistent marketing messages reduce trust and interest. Lack of clear pricing or hidden costs can make users feel hesitant. | A complicated or lengthy onboarding process can discourage users. Poor internet connectivity causing delays during setup creates annoyance. | Inaccurate classification results can frustrate and discourage users. Slow processing times during image analysis can waste time. Poor camera integration or image quality issues may lead to failed classification. Lack of detailed insights or explanations about the classification process may confuse users. Receiving inconsistent results from similar images reduces confidence in the app's accuracy. | Confusing report formats make it hard to understand the results. Difficulties in exporting or sharing results can create frustration. | Frequent or irrelevant push notifications may feel intrusive. Poor customer support when seeking clarification reduces trust. Data loss or unavailability of previous reports can anger users. |
|  Areas of opportunity How might we make each step better? What ideas do we have? What have others suggested? | Improve visibility by partnering with agricultural organizations and influencers. Create targeted social media campaigns to reach farmers and agribusinesses directly. Develop a series of short, clear demo videos to explain the app's benefits. | Introduce a step-by-step onboarding wizard to simplify the setup process. Improve UI/UX design for better navigation and faster understanding of features. | Enhance the image recognition model to improve accuracy and reduce processing time. Introduce a progress bar to show how long the classification will take. Provide detailed insights about classification criteria to increase user understanding. Allow users to compare classification results side-by-side for better decision-making. Offer an offline mode for areas with poor internet connectivity. | Provide a clear summary of classification results with actionable insights. Improve report formatting to make data easier to interpret and share. | Send personalized notifications about app updates and new features. Allow users to track classification history and trends over time. Use machine learning to improve classification accuracy based on user feedback. |

Project Design Phase-II

Data Flow Diagram & User Stories

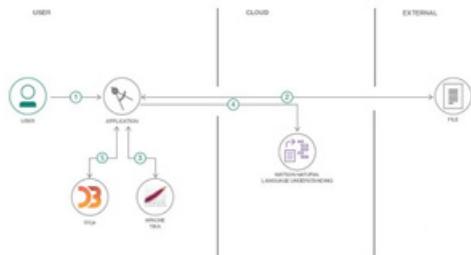
| | |
|---------------|--|
| Date | 28 June 2025 |
| Team ID | LTVIP2025TMID40909 |
| Project Name | GrainPalette-A-Deep-Learning-Odyssey-In-Rice Type-Through-Transfer-Learning Classification |
| Maximum Marks | 4 Marks |

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.

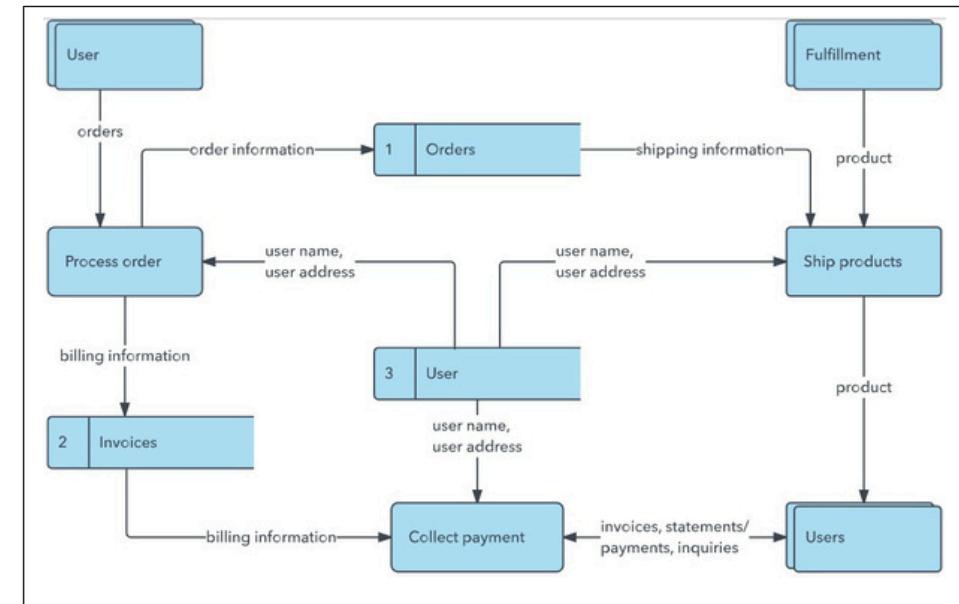
Example: (Simplified)

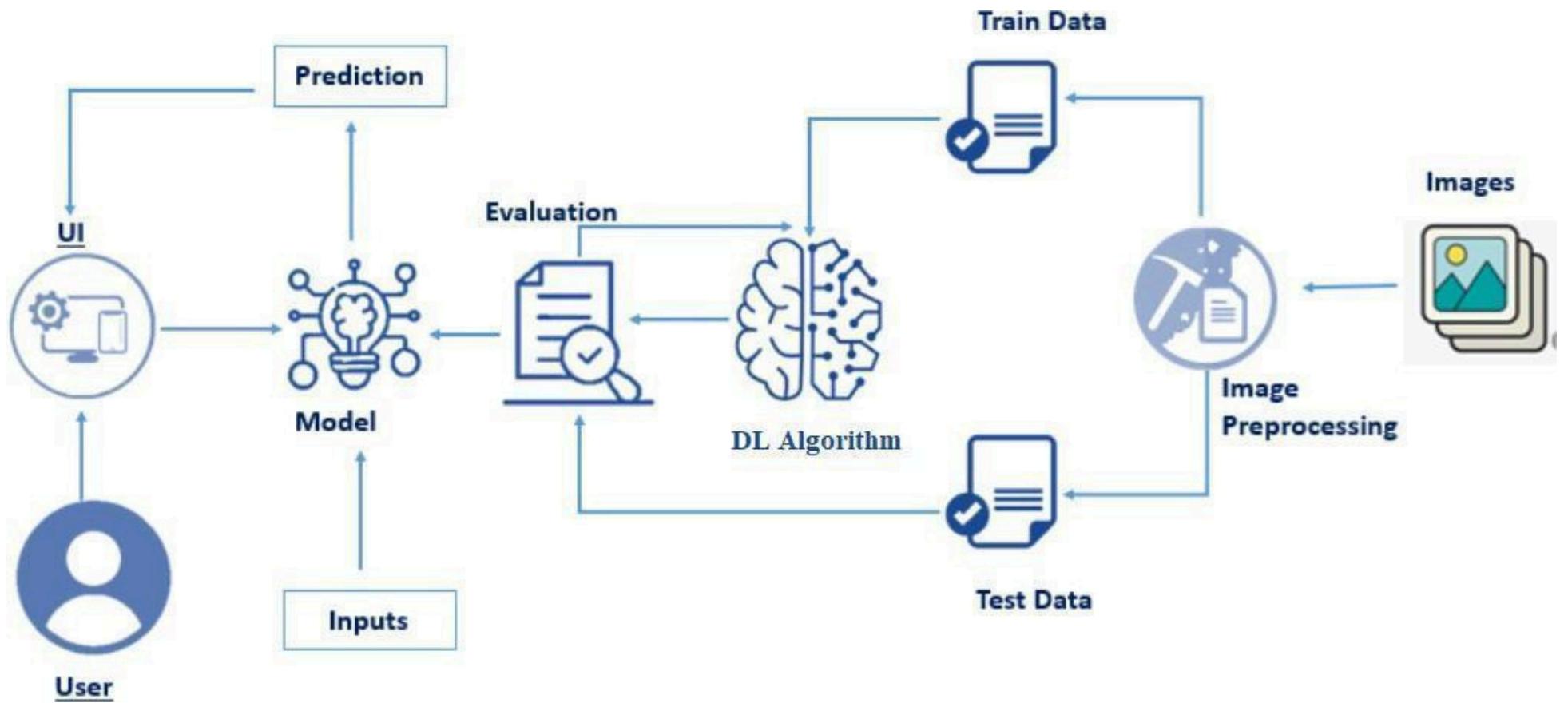
Flow



1. User configures credentials for the Watson Natural Language Understanding service and starts the app.
2. User selects data file to process and load.
3. Apache Tika extracts text from the data file.
4. Extracted text is passed to Watson NLU for enrichment.
5. Enriched data is visualized in the UI using the D3.js library.

Example: DFD Level 0 (Industry Standard)





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 | Release |
|---------------------|-------------------------------|-------------------|---|---|----------|----------|
| Customer (Web user) | Browsing | USN-1 | As a user, I first need to browse through the url to go to the website. | I can use any browsing platform to go to through the url. | High | Sprint-1 |

| User Type | Functional Requirement (Epic) | User Story Number | User Story / Task | Acceptance criteria | Priority | Release |
|-----------|-------------------------------|-------------------|--|--|----------|----------|
| | upload | USN-2 | As a user, I will have to upload the image for the model to predict. | Image must be uploaded in the correct place. | Medium | Sprint-2 |
| | Processing and prediction | USN-3 | After uploading the image, the model processes the image and give result based on the image. | The model gives prediction based on the image. | Medium | Sprint-3 |
| | results | USN-4 | As a user, I can review the related information with the uploaded rice type image. | The result must be displayed. | High | Sprint-4 |

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

| | |
|---------------|---|
| Date | 28 June 2025 |
| Team ID | LTVIP2025TMID40909 |
| Project Name | GrainPalette-A-Deep-Learning-Odyssey-In-Rice-Type-Classification-Through-Transfer-Learning |
| Maximum Marks | 4 Marks |

Functional Requirements:

Following are the functional requirements of the proposed solution.

| FR No. | Functional Requirement (Epic) | Sub Requirement (Story / Sub-Task) |
|--------|-------------------------------|--------------------------------------|
| FR-1 | Browsing through URL | website link |
| FR-2 | Get Image | Upload the image |
| FR-3 | Prediction | Machine learning model |
| FR-4 | Details | View the details based on prediction |

Non-functional Requirements:

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

| FR No. | Non-Functional Requirement | Description |
|--------|----------------------------|---|
| NFR-1 | Usability | The system should have an intuitive, user-friendly interface with clear instructions. |
| NFR-2 | Reliability | The prediction must be correct and accurate. |
| NFR-3 | Performance | The model must not take much time to predict. |
| NFR-4 | Availability | The availability to everyone must be maintained. |
| NFR-5 | Scalability | It must be scalable for predicting other types of rice too. |

Project Design Phase-II

Technology Stack (Architecture & Stack)

| | |
|---------------|---|
| Date | 28 june 2025 |
| Team ID | LTVIP2025TMID40909 |
| Project Name | Grain Palette-A-Deep-Learning-Odyssey-In-Rice-Type- -Through-Transfer-Learning Classification |
| Maximum Marks | 4 Marks |

Technical Architecture:

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

Rice Type Classification:

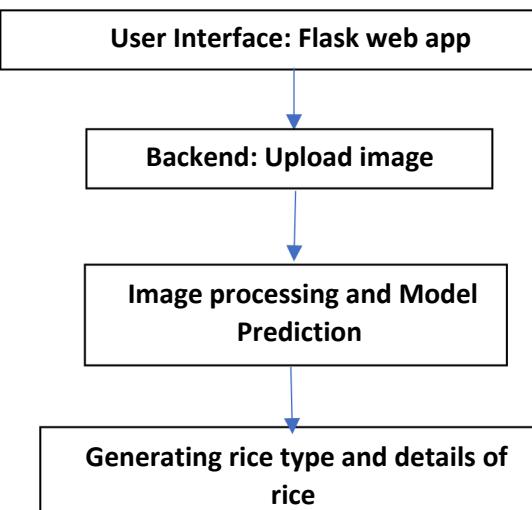


Table-1: Components & Technologies:

| S. No | Component | Description | Technology |
|-------|---------------------------------|---|-----------------------|
| 1. | User Interface Application | The user interacts with the application via a web interface. | Flask, HTML, CSS |
| 2. | Logic-1 Application Logic-2 | Handles user input and processes it for Image prediction. Predicts the Image | Python |
| 3. | Database | If data storage is required | MobilenetV2, python |
| 4. | File Storage | Use internal storage to upload the image | MySQL |
| 5. | External API-1 | Purpose of External API used in the application | Flask |
| 6. | Machine Learning Model | Predicts the Image | IBM Weather API, etc. |
| 7. | Infrastructure (Server / Cloud) | Application Deployment on Local System | Image classification |
| 8. | | | Flask |

Table-2: Application Characteristics:

| S. No | Characteristics | Description | Technology |
|-------|------------------------|---|-----------------------------------|
| 1. | Open-Source Frameworks | List the open-source frameworks used | MobilenetV2, Flask, Python |
| 2. | Scalable Architecture | Justify the scalability of architecture (3 – tier, Micro-services) | Parallel processing (if required) |
| 3. | Availability | Justify the availability of application (e.g. use of load balancers, distributed servers etc.) | Flask |
| 4. | Performance | Design consideration for the performance of the application (number of requests per sec, use of Cache, use of CDN's) etc. | MobilenetV2 |

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>