Ideation Phase
Brainstorm & Idea Prioritization Template

Date	18 October 2023
Team ID	PNT2022TMID592348
Project Name	Project - AI-Driven Optimization of 5G Resource Allocation for Network Efficiency
Maximum Marks	4 Marks

Brainstorm & Idea Prioritization Template:

The brainstorming map provided below outlines the structured approach and key steps for a project focused on AI-Driven 5G Resource Allocation. This map serves as a visual guide, helping to organize and plan the project effectively. It covers various essential phases, from data collection and preprocessing to model building and deployment, as well as user interface development and integration. The map assists in clarifying the project's objectives, activities, and potential challenges while maintaining a clear sequence of actions. It ensures that all critical aspects, from data analysis to user feedback and future enhancements, are considered in a well-structured and systematic manner.

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

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.

Open article →

1 problem statement

In the context of 5G network deployment in India, there exists a pressing challenge in optimizing resource allocation for enhanced network efficiency and quality of service. The problem revolves around determining the most effective allocation of resources based on Application Type, Signal Strength, Latency, Required Bandwidth, and Allocated Bandwidth within the spectrum of low-band, mid-band, and high-band (mm Wave) frequencies. The objective is to maximize network performance, throughput, and user experience while considering the trade-offs posed by varying frequency bands.

PROBLEM

How might we [your problem statement]?

Key rules of brainstorming

To run an smooth and productive session

- Stay in topic.
- Defer judgment.
- Go for volume.
- Encourage wild ideas.
- Listen to others.
- 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

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

Vishnu

- Import Python libraries like Pandas, NumPy, Matplotlib, Seaborn, Scikit-Learn for data analysis and machine learning.
- Transform or encode categorical variables as needed.
- Normalize or scale numerical features
- Decision Tree Regressor
- Evaluate model performance using metrics like Mean Squared Error (MSE) or Root Mean Squared Error (RMSE).
- Select the best-performing model for resource allocation prediction
- Use Matplotlib, Seaborn, or other visualization libraries.
- Choose a web framework (Flask or Streamlit) for creating a user interface.
- Design a user-friendly interface for resource allocation predictions
- Deploy the model and user interface

Isha

- Gather data related to 5G network parameters, application types, signal strength, latency, and bandwidth requirements
- Handle missing data if any.
- Implement strategies like removing outliers or transforming data
- Split data into training and testing sets
- Logistic Regression
- Train and fine-tune models using hyperparameter optimization techniques
- Also analyse the cross tab for more detailed information on each and every model built
- Create visualizations to understand the relationships between input features and resource allocation
- Investigate model bias, variance, and accuracy
- Invite users to interact with the interface and provide feedback
- Create documentation detailing the project, data sources, methodologies, and user interface usage

Adithya

- Acquire datasets for low-band, mid-band, and high-band (mm Wave) frequencies
- Create relevant features based on network parameters, such as signal strength, latency, and bandwidth
- Identify and handle outliers in the dataset
- Linear Regression
- Random Forest Regressor
- Assess the model's performance on test data
- Prepare the selected model for deployment
- Implement input fields for application type, signal strength, latency, and required bandwidth
- Continuously monitor the system's performance
- Use user feedback to make improvements and updates to the system
- Perform a final round of testing to ensure the system's stability and accuracy

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 and break it up into smaller sub-groups.

20 minutes

TIP
Add customizable tags to sticky notes to make it easier to find, browse, organize, and categorize important ideas as themes within your mural.

Data Collection

- Gather data related to 5G network parameters, application types, signal strength, latency, and bandwidth requirements.
- Acquire datasets for low-band, mid-band, and high-band (mm Wave) frequencies.

Feature Engineering

- Create relevant features based on network parameters, such as signal strength, latency, and bandwidth.
- Transform or encode categorical variables as needed.
- Handle missing data if any, using techniques like imputation

Importing Necessary Libraries

- Import Python libraries like Pandas, NumPy, Matplotlib, Seaborn, Scikit-Learn for data analysis and machine learning.

Outlier Detection and Treatment

- Identify and handle outliersIdentify and handle outliers in the dataset. You can use techniques like the Z-score or IQR method for outlier detection.ris in the dataset.
- Implement strategies like removing outliers or transforming data.

Data Preprocessing

- Normalize or scale numerical features.
- Split data into training and testing sets.

Performance Testing

- Assess the model's performance on test data. Investigate model bias, variance, and accuracy.
- Analyze the model's predictions and compare them to the actual resource allocations.

Model Building

- Explore various machine learning regression algorithms as mentioned (Linear Regression, Decision Tree Regressor, Random Forest Regressor).
- Train and fine-tune models using hyperparameter optimization techniques. (e.g., GridSearchCV or RandomizedSearchCV).

Best Model Selection

- Evaluate model performance using metrics like Mean Squared Error (MSE) or Root Mean Squared Error (RMSE).
- analyse the cross tab for more detailed information on each and every model built.
- Select the best-performing model for resource allocation prediction.

Data Visualization

- Create visualizations to understand the relationships between input features and resource allocation.
- Use Matplotlib, Seaborn, or other visualization libraries.

Model Deployment

- Prepare the selected model for deployment by saving the model and its necessary preprocessing steps (e.g., scalers, encoders).

Integration of Flask or streamlit

- Choose a web framework like Flask or Streamlit for creating a user interface.

Creating User Interface

- Design a user-friendly interface for resource allocation predictions, replacement input fields for application type, signal strength, latency, and required bandwidth in your chosen framework.

User Testing

- Invite users to interact with the interface and provide feedback.

Deployment and Monitoring

- Deploy the model and user interface to a web server or cloud platform.
- Continuously monitor the system's performance and resource utilization.

Feedback Iteration

- Use user feedback to make improvements and updates to the system, both in terms of the model and the user interface.

Documentation

- Create documentation detailing the project, data sources, methodologies, and user interface usage.

Final Testing

- Perform a final round of testing to ensure the system's stability and accuracy.

Step-3: Idea Prioritization

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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

TIP

Participants can use their cursors to point at where sticky notes should go on the grid. The facilitator can confirm the spot by using the laser pointer holding the **H key** on the keyboard.