Ideation and Planning for Capstone Project

INSTRUCTOR NAME: DATE:

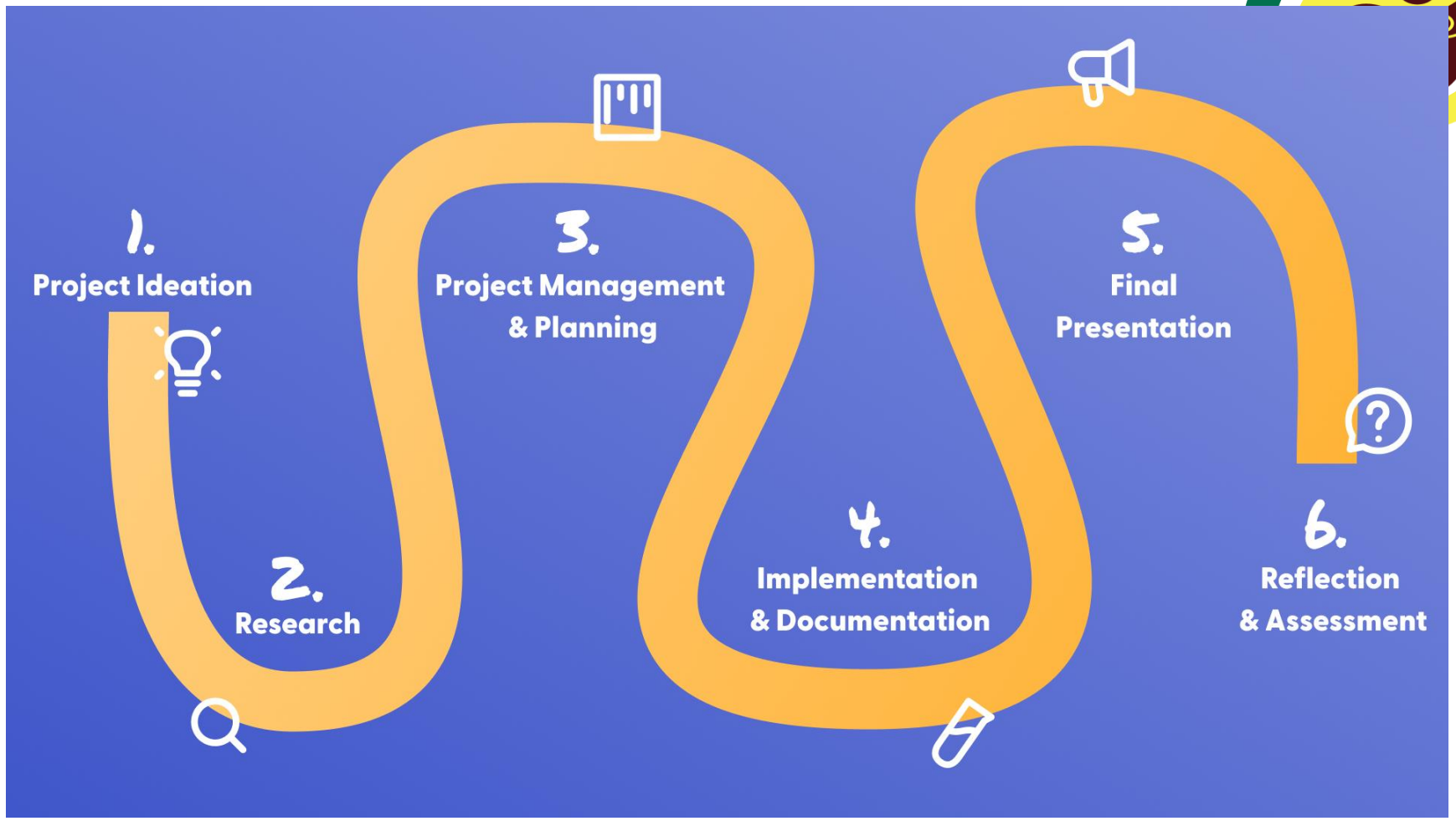
DAY NO. 17

SECTION: B1M7L17T1

Contents

- How to implement capstone projects
- Techniques for Ideation and idea validation.
- Group discussions to refine project ideas.
- Presentation of ideas and feedback.
- Finalising Capstone Project proposals.

How to implement capstone projects



Source: https://www.unrulr.com/post/what-are-high-school-capstone-projects

• Ideation: Techniques for idea generation

Some of the Techniques include:

- Brainstorming
- Brainwriting
- Brainwalk
- 6-3-5 method
- Sketching, etc.

• Ideation: Techniques for idea generation

Brainstorming:

- All members participate in the judgment-free process and freely express their ideas for the chosen topic and possible solutions.
- Write your ideas and possible solutions.
- Each member presents their ideas and others listen to them without criticism.
- Next Members generate new ideas based on the ideas presented.
- List out best idea and possible solution based on Majority or any other approach.

• Ideation: Techniques for idea generation

Brainwriting:

- A version of brainstorming that works well for more introverted participants.
- Each person has a piece of paper and five minutes to write down as many solutions to the problem your team wants to solve.
- At the end of that time, they will then pass their piece of paper to another participant, who will build upon the ideas they had written down.
- You will repeat this process until everyone has contributed, then a facilitator collects all of the papers and displays them.
- Once displayed, everyone will discuss each idea and determine which ones best solve your needs.

- Ideation: Techniques for idea generation

Brainwalk:

- Brainwalk is similar to Brainwriting.
- Instead of passing around the paper, the participants walk around in the room and continuously find new “ideation stations” where they can elaborate on other participants’ ideas.

• Ideation: Techniques for idea generation

6-3-5 method:

- The idea behind 6-3-5 Brainwriting is to have 6 participants write down 3 ideas on a worksheet in a 5 minute timebox.
- After each participant takes a turn jotting down the 3 ideas, they pass on to either contribute to the existing idea, or start anew.
- After 6 rounds, 108 ideas are generated in 30 minutes.
- The steps following involve deleting duplications, clustering, and identifying the top chosen solution of the group (example, perhaps by dot-voting.).

• Ideation: Techniques for idea generation

Sketching:

- It enables to convey ideas visually rather than verbally, and it can help your team think about more abstract concepts.
- There is no pressure to create a perfect or final image of your product, as these should be rough drafts or simple sketches that illustrate your ideas.
- Collaborative or group sketching is similar to brainwriting, but each participant draws ideas instead of writing them.
- These drawings are then passed around and built upon by other participants, and finally presented to everyone and discussed.
- During this discussion, you may find connections between the drawings that will help you create the most optimal design solution.

Some idea examples

- **Healthcare:**
  - *Predictive Diagnostics:* Developing algorithms to predict diseases or conditions based on patient data like medical history, symptoms, and genetic markers.
  - *Personalized Treatment Plans:* Creating ML models that recommend customized treatment plans based on patient-specific factors.
- **Finance:**
  - *Fraud Detection:* Implementing ML algorithms to detect fraudulent transactions or activities in banking systems.
  - *Algorithmic Trading:* Building models for predicting stock market trends and optimizing trading strategies.
- **Natural Language Processing (NLP):**
  - *Sentiment Analysis:* Analyzing sentiments from social media posts, reviews, or customer feedback to gauge public opinion.
  - *Language Translation:* Developing advanced translation models to accurately translate between languages.

Some idea examples

- **Image and Video Analysis:**
  - *Object Detection and Recognition:* Building systems that can identify and label objects within images or videos.
  - *Medical Image Analysis:* Using ML to interpret medical images like X-rays or MRIs for diagnosis and detection of abnormalities.
- **Autonomous Vehicles:**
  - *Self-Driving Cars:* Implementing ML models for object detection, path planning, and decision-making in autonomous vehicles.
  - *Traffic Prediction:* Creating models to predict traffic patterns and optimize navigation in real-time.
- **Recommendation Systems:**
  - *Personalized Content Recommendations:* Developing algorithms for suggesting movies, music, or products based on user preferences and behavior.
  - *E-commerce Product Recommendations:* Building systems to suggest products to customers based on their browsing and purchasing history.
- **Environmental Applications:**
  - *Climate Modeling:* Using ML to predict climate patterns or analyze environmental data for conservation efforts.
  - *Energy Optimization:* Developing models to optimize energy consumption in buildings or industries.

Some idea examples

- **Education:**
  - *Personalized Learning:* Creating adaptive learning platforms that customize educational content based on students' learning styles and progress.
  - *Student Performance Prediction:* Predicting student performance based on various factors to provide early intervention.

- **Image and Video Analysis:**
  - *Object Detection and Recognition:* Building systems that can identify and label objects within images or videos.
  - *Medical Image Analysis:* Using ML to interpret medical images like X-rays or MRIs for diagnosis and detection of abnormalities.
- **Autonomous Vehicles:**
  - *Self-Driving Cars:* Implementing ML models for object detection, path planning, and decision-making in autonomous vehicles.
  - *Traffic Prediction:* Creating models to predict traffic patterns and optimize navigation in real-time.
- **Recommendation Systems:**
  - *Personalized Content Recommendations:* Developing algorithms for suggesting movies, music, or products based on user preferences and behavior.
  - *E-commerce Product Recommendations:* Building systems to suggest products to customers based on their browsing and purchasing history.

Idea Validation methods

- **Feedback from Potential Users/Stakeholders:**
  - **Description:** Gather feedback from potential users or stakeholders about the proposed ML solution to understand its relevance and usability.
  - **Application:** Conducting surveys or interviews with students and teachers to gather feedback on a proposed adaptive learning platform.
- **Literature Review and Research Validation:**
  - **Description:** Validate the feasibility of the ML approach by reviewing existing research papers or case studies.
  - **Application:** Researching published papers on similar ML applications (e.g., sentiment analysis, fraud detection) to understand their methodologies and success rates.
- **Feasibility Analysis:**
  - **Description:** Assess the technical feasibility, computational requirements, and available resources needed to implement the proposed ML solution.
  - **Example:** Determining whether the computational infrastructure is sufficient for deploying a complex deep learning model for image recognition.

Idea Validation methods

- **Expert Consultation and Feedback:**
  - **Description:** Consult with domain experts, data scientists, or individuals experienced in ML to gather feedback on the viability and potential challenges of the proposed idea.
  - **Example:** Discussing a proposed healthcare predictive model with medical professionals to ensure its relevance and accuracy in diagnosing specific conditions.
- **Data Availability Assessment:**
  - **Description:** Evaluate the availability and quality of data required to train the ML model for the proposed idea. Insufficient or poor-quality data can hinder the success of an ML project.
  - **Example:** Analyzing the accessibility and volume of historical financial data for training a stock market prediction model.

Activity

- Students are required to form teams of 5 members.
- Use one of the Ideation methods to generate ideas for the topic chosen for Project.
- Apply the idea validation methods.
- Select the best idea for the topic.
- Write a brief description about the project

Instructions for Capstone Project Proposal

- **Title Page:** Includes the project title, student's name, program, and date.
- **Introduction:** Contextualizes the project, states its problem or research question, and outlines objectives.
- **Literature Review:** Summarizes existing research relevant to the project's topic, highlighting gaps.
- **Methodology:** Describes the methods and approaches to be used in conducting the project.

Instructions for Capstone Project Proposal

- **Project Plan and Timeline:** Details the tasks, milestones, and deadlines for completing the project.
- **Resources and Budget:** Lists necessary resources and estimates the budget required.
- **Expected Outcomes:** Anticipates project results and its potential impact or contributions.
- **Conclusion:** Summarizes the proposal, emphasizing its significance.
- **References:** Lists all cited sources following a specific citation style (e.g., APA, MLA).

Project Guidelines

Sl. No.	Task	Date/Time
1	Formation of Teams: Student teams are created with 5 members. Ideation to generate project ideas; Finalize project proposal preparation	Day 17
2	Discussion on Project Development Methodology Milestone1: Data Collection	Day 18
3	Discussion on Project presentation template Milestone2: Data preprocessing	Day 19
4.	Milestone3: Selection of ML algorithms and Model Development	Day 20, <Week1>
5	Milestone4: Model Evaluation and Comparison with other models	<Week2>
6	Project presentations: Duration of presentation: 15mts for each team; Monday to Friday: 4 teams per day	<Week3>

Project Evaluation Criteria

Sl. No.	Criteria	Weightage (%)
1	Objectives of the project	15%
2	Project Planning (Draw Gantt Chart (Time-activity chart)	5%
3	Development and Testing of ML models	50%
4.	Result analysis and Interpretation	20%
5	Novelty of the work	10%
	Total Marks	100

Sample Projects

- **Comparing Classifiers for Building Classification Models**

https://colab.research.google.com/drive/1N5l89Gs5qVC9IB1pzc2vJSdPeF-PPaWY

- **Comparison of 5 differnet classifiers on 3 datasets**

https://colab.research.google.com/github/TannerGilbert/Tutorials/blob/master/Scikit-Learn-Tutorial/5.%20Classification%20Algorithms.ipynb

Sample Project List

1. Sentiment Analysis for Social Media Using Machine Learning
2. Agricultural Crop Yield Prediction
3. Classification of Lung Disease With Recommendation Using Deep Learning
4. Anomaly Detection in Heart Rate Data
5. Stock Predictions using Machine Learning
6. Predicting Student Grades
7. Bank Customer Churn Prediction
8. Credit card fraud detection
9. House Price Prediction
10. Image Classification
11. Predicting Diabetes Onset
12. Disease Prediction from Medical Records
13. Drug Discovery
14. Fake News Detection
15. Rainfall prediction

ML Project Developmnet:: Data Repositories

- UCI Machine learning Repository (600+ Datasets):https://archive.ics.uci.edu/datasets
- Kaggle Data sets (10K+ Datasets):
  - https://www.kaggle.com/datasets?tags=12107-Computer+Science
- Knowledge Extraction Evolutionary Learning (KEEL) Data sets (600+ Datasets)
  - https://sci2s.ugr.es/keel/datasets.php
- Other Resources:https://towardsdatascience.com/top-sources-for-machine-learning-datasets-bb6d0dc3378b

References

1. https://medium.com/agileinsider/what-lies-beneath-the-world-of-product-ideation-da2e8bc9da23
2. https://www.indeed.com/career-advice/career-development/brainstorming-techniques
3. https://datascience.duke.edu/academics/capstone-projects/instructions-for-capstone-project-proposal/
4. https://www.unrulr.com/post/what-are-high-school-capstone-projects
5. https://www.indeed.com/career-advice/career-development/ideation-techniques
6. https://www.interaction-design.org/literature/article/introduction-to-the-essential-ideation-techniques-which-are-the-heart-of-design-thinking
7. https://rightinformation.com/blog/ideation-workshop-top-10-practical-tools-and-techniques/

Home work

Submit a detailed Capstone Project proposal, outlining the problem statement, AI techniques to be used, and expected outcomes (Deliverables), etc. as detailed.
Page limit: Upto 4 pages with font size 12, Times New Roman

THANKS