TNSDC – NAAN MUDHALVAN AU – NIRAL THIRUVIZHA (HACKATHON)

HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY (AUTONOMOUS) COIMBATORE – 641 032

PROJECT PROPOSAL

1. **MAJOR AREA**

   Agritech & Food Technology

2. **PROBLEM STATEMENT**

   How might we create s system that leverage satellite imagery and machine learning to detect vegetation height beneath transmission lines, anticipate growth patterns and generate alerts for timely trimming when needed

3. **TOTAL COST**

   1. Development and Customization: Rs. 20,000 (approx.)
   2. Cloud Service: Rs. 10,000 (approx.)
   3. Testing and Marketing: Rs. 7,000 (approx.)

   Total Estimated Cost: Rs. 37,000 (approx.)

4. **COLLEGE CODE:** 7207

   COLLEGE NAME: HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY, COIMBATORE.

5. **GUIDE NAME**: Mr. K. KARTHIKEYAN

   DESIGNATION: ASSISTANT PROFESSOR

   MOBILE NO: 9597252491

   EMAIL ID: karthiyeyan.cse@hicet.ac.in

6. **STUDENT TEAM DETAILS :**

Sl. No	Student Reg. No	Name of the Student	Branch	Mobile No.	Email Id
1	20115046	SANJAY.R	AIML	7306067805	201150@46hicet.ac.in
2	20115057	SRIVATHSAN P S	AIML	7395823595	20115057@hicet.ac.in
3	20115802	SANTHOSHSHIVAN B	AIML	7550396877	20115802@hicet.ac.in
4	20115059	VASEEKARAN D	AIML	9843347088	20115059@hicet.ac.in

7. PROJECT SUMMARY:

The project aims to develop an innovative system leveraging satellite imagery and machine learning to address the challenge of vegetation interference beneath transmission lines. Current methods for monitoring and managing vegetation growth along power transmission corridors are often reactive and resource-intensive, leading to potential risks of outages and infrastructure damage.

8. PROPOSED SOLUTION WITH METHODOLOGY

PROPOSED SOLUTION:

The envisioned project aims to address the challenge of managing vegetation interference beneath transmission lines through the development of an innovative satellite imagery and machine learning system. By leveraging advanced technologies, the system will detect vegetation height, anticipate growth patterns, and generate alerts for timely trimming, thereby enhancing the reliability and efficiency of power transmission infrastructure.

METHODOLOGY:

The methodology adopted for the development of the satellite imagery system for pruning vegetation interference in power transmission lines is structured into distinct phases to ensure a systematic and efficient approach:

1. **Requirement gathering and analysis:**
    - Facilitate communication between stakeholders and the project development team to gather requirements comprehensively.
    - Analyze gathered requirements to understand the project's scope, objectives, and key functionalities.
    - Document the analyzed requirements in a detailed Software Requirement Specification (SRS) document.
2. **Design:**
    - Convert the requirements outlined in the SRS document into a structured design format suitable for implementation.
    - Develop high-level and detailed design specifications, encompassing software architecture, user interface design, and system components.
    - Create a Software Design Document (SDD) to document the design decisions and provide guidance for development.
3. **Implementation:**

- Code the software modules based on the design specifications outlined in the SDD.
- Implement machine learning algorithms for analyzing satellite imagery and detecting vegetation height and growth patterns.
- Conduct unit testing to ensure the functionality and correctness of each software component.

4. **Integration and System testing:**
   - Integrate the individual software modules incrementally, following a planned integration strategy.
   - Conduct comprehensive system testing to verify the integrated system's functionality, reliability, and performance.
   - Perform various types of testing activities, including functional testing, performance testing, and security testing.
5. **Deployment:**
   - Once the software has been thoroughly tested and approved, deploy it to the production environment.
   - Ensure seamless deployment processes and provide necessary support during the transition to production.
6. **Maintenance:**
   - Initiate the maintenance phase to address any issues or bugs identified post-deployment.
   - Allocate resources for ongoing maintenance and support, ensuring that the software remains operational and meets evolving requirements.
   - Prioritize maintenance activities to optimize software performance and reliability over time.

1. WORKPLAN/ TIME SCHEDULE INDICATING THE PROJECT MILE STONE

Sl. No	Duration of Work	Task Plan
1	1st – 2nd week of February 2024	Project Initiation and Research
2	3rd – 4th week of February 2024	Design and Prototyping
3	1st – 2nd week of March 2024	Development- Phase 1
4	3rd – 4th week of March 2024	Development- Phase 2
7	1st week of April 2024	Testing and Refinement
8	2nd week of April 2024	Final Evaluation and Documentation

2. PLAN ACTION OF IMPLEMENTATION

Phase 1: PROJECT INITIATION AND PLANNING (Feb 1-21)

- Align project goals and define objectives.
- Conduct initial research on traditional products and artisan communities.
- Compile a list of features based on research insights.
- Develop wireframes and prototypes, gathering feedback from stakeholders.

Phase 2: CORE DEVELOPMENT (Feb 22 - Mar 7)

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- In Phase 2 of the agricultural project development, the focus is on laying the foundation for the core features essential for effective vegetation monitoring and management. This phase encompasses setting up the development environment, implementing version control, and coding the fundamental components of the system.

Phase 3: FEATURE ENHANCEMENT (Mar 8-14)

1. In Phase 3, the focus shifts towards enhancing the features of the satellite imagery system for pruning vegetation interference in power transmission lines. This phase involves the integration of additional functionalities, collaboration with domain experts, and initial testing of core features.

Tasks:

1. **Develop Cultural Heritage Section:**
    - Integrate a cultural heritage section into the system, enriching user experience with multimedia content related to vegetation management practices and environmental conservation.
    - Collaborate with cultural experts to curate accurate and engaging content, ensuring alignment with the project's objectives.
2. **AI Recommendation Algorithms:**
    - Begin coding AI recommendation algorithms to personalize user experiences based on their interaction history, preferences, and geographical context.
    - Lay the groundwork for advanced recommendation features to enhance user engagement and satisfaction.
3. **Initial Testing:**

- Conduct initial testing of core features and the newly integrated cultural heritage section to identify any usability issues or technical glitches.
- Gather feedback from test users and stakeholders to inform refinements and improvements.

Phase 4: ADVANCED DEVELOPMENT (Mar 15-28)

- Phase 4 focuses on advancing the capabilities of the satellite imagery system, fine-tuning machine learning algorithms, and integrating social and community engagement features.

Tasks:

1. **Fine-Tune Machine Learning Algorithms:**
   - Refine machine learning algorithms based on user feedback and performance metrics, optimizing accuracy and efficiency in vegetation height detection and growth pattern prediction.
2. **Advanced Recommendation Features:**
   - Implement advanced recommendation features to provide users with personalized insights and suggestions for vegetation management strategies.
   - Enhance user engagement and satisfaction through tailored recommendations aligned with individual preferences and environmental factors.
3. **Integrate Social Features:**
   - Integrate social features and community engagement functionalities to foster collaboration, knowledge sharing, and collective action among users.
   - Enable users to share insights, experiences, and best practices related to vegetation management and environmental stewardship.
4. **Comprehensive Testing:**
   - Conduct comprehensive testing of the entire application, including newly implemented features and enhancements.
   - Ensure robustness, reliability, and compatibility across different devices and platforms through rigorous testing procedures.

Phase 5: LAUNCH AND POST-LAUNCH (Mar 29 - Apr 11)

- In Phase 5, the focus shifts towards preparing for the official launch of the satellite imagery system, including security audits, documentation, marketing strategies, and stakeholder coordination.

3. LIST OF FACILITIES AVAILABLE IN THE COLLEGE TO DEVELOP THE PROTOTYPE OF THE PROJECT

1. **Access to Satellite Imagery Databases:**

   - Utilize satellite imagery databases for acquiring high-resolution images of transmission line corridors and surrounding vegetation.

2. **Machine Learning Frameworks and Tools:**
   - Access machine learning frameworks such as TensorFlow, PyTorch, and scikit-learn for developing algorithms to analyze satellite imagery and predict vegetation growth patterns.

3. **High-Performance Computing Resources:**

   - Leverage dedicated servers and cloud computing resources for processing large volumes of satellite imagery data and running complex machine learning algorithms.

4. **Software Development Tools and IDEs:**

   - Access to software development tools and integrated development environments (IDEs) for coding and testing the satellite imagery system.

   Testing and Validation Environments:

   - Establish testing and validation environments to assess the accuracy and effectiveness of the developed system in detecting vegetation height and anticipating growth patterns.

5. **Collaboration Spaces and Meeting Rooms:**

   - Utilize collaboration spaces and meeting rooms for team meetings, brainstorming sessions, and project discussions.

6. **Internet Connectivity:**

   - High-speed internet connectivity for accessing online resources, collaborating with team members, and downloading satellite imagery data.

7. **Audio-Visual Facilities:**
   - Access to audio-visual facilities for presentations, training sessions, and knowledge sharing activities related to the project.

8. **NATURE OF INDUSTRY SUPPORT FOR THE PROJECT:**

   Financial Backing and Grants:
   - Seek financial support from industry-related organizations, government agencies, and research institutions to cover project expenses, including data acquisition, software development, and hardware resources.

9. **Expert Guidance and Mentorship:**
   - Establish connections with industry experts in satellite imagery analysis, machine learning, and power transmission infrastructure to receive valuable insights and mentorship throughout the project.

10. Collaboration Opportunities with Industry Partners:

- Explore collaboration possibilities with power utilities, environmental organizations, and technology companies to leverage their expertise, resources, and networks for the development and implementation of the satellite imagery system.

11. Market Validation and User Testing:

- Engage industry support for market validation activities to ensure that the developed system meets the needs and requirements of power transmission companies and environmental agencies.
- Organize user testing sessions with potential stakeholders to gather feedback and insights for further refinement and improvement of the system.

12. Networking and Promotion:

- Utilize industry connections for networking opportunities, promoting the project through industry channels, and showcasing it at relevant conferences, workshops, and events to attract collaborators, users, and investors.

4. DETAILS OF FINANCIAL ASSISTANCE REQUIRED

S. No	Hardware and Software Components Required For The Project	Cost in Rupees
1	Server to host by using cloud services like AWS, Azure, etc.	₹11000
2	Development and Testing Environments	₹8000
3	User Interface Design Tools	₹4000
4	Continuous Integration and Deployment (CI/CD) Tools	₹4000
5	Security and Encryption Tools	₹3000
6	Collaboration and Communication Tools	₹4000
7	Miscellaneous (licenses, subscriptions, etc.)	₹3000
	Total Amount	₹37000

5.EXPECTED OUTCOMES/ RESULTS

1. Accuracy and Timeliness of Vegetation Detection:

- Discuss the accuracy rate of vegetation detection beneath transmission lines using satellite imagery and machine learning algorithms.
- Highlight the system's ability to anticipate growth patterns and generate alerts for timely trimming when needed.

2. Reduction in Vegetation-Related Interference:

- Present data on the reduction of vegetation-related interference in power transmission lines due to proactive trimming and maintenance.

- Discuss how the system contributes to minimizing power outages and safety hazards caused by overgrown vegetation.

3. **Efficiency and Cost Savings:**

   - Evaluate the efficiency gains and cost savings achieved through the automated detection and alert system.
   - Compare the system's performance to traditional manual inspection methods and highlight the benefits of automation.

4. **Environmental Impact and Sustainability:**

   - Assess the environmental impact of vegetation management practices facilitated by the system.
   - Discuss how proactive trimming reduces habitat disturbance and minimizes the need for reactive interventions.

5 **Integration with Power Transmission Operations:**

- Outline the integration of the satellite imagery system into existing power transmission operations.
- Highlight any improvements in workflow efficiency and decision-making processes resulting from the system's implementation.

6 **Data Insights and Decision Support:**

a. Present data analytics on vegetation height trends, growth patterns, and trimming frequency.
b. Discuss how data insights inform strategic decision-making and resource allocation for vegetation management.

7 **Stakeholder Engagement and Collaboration:**

- Discuss stakeholder engagement initiatives involving power transmission authorities, environmental agencies, and local communities.
- Highlight collaborations aimed at optimizing vegetation management practices and promoting sustainable infrastructure development.

8 **Continuous Improvement and Innovation:**

- Outline plans for ongoing system optimization, including algorithm refinements and feature enhancements.
- Discuss opportunities for innovation in satellite imagery analysis and machine learning techniques to further improve vegetation management efficiency.

9. **Regulatory Compliance and Safety Standards:**

   - Ensure compliance with regulatory requirements and safety standards related to vegetation management in power transmission systems.

- Highlight any certifications or accreditations attained to demonstrate adherence to industry best practices.

10. Long-Term Impact and Scalability:

- Assess the long-term impact of the satellite imagery system on power transmission infrastructure resilience and reliability.
- Discuss scalability considerations for expanding the system's coverage and functionality to additional transmission corridors.

UNDERTAKING

1. The college will provide the basic infrastructure and other required facilities to the students for timely completion of their projects.

2. The college assumes to undertake the financial and other management responsibilities of the project.

3. The college will ensure that the funds provided are utilized only for the purpose provided and any remaining amount will be returned back to the University after the time of completion of the project.

Signature of the Mentor   Signature of the HoD   Signature and seal of the Principal