Problem Statements for SOFTWARE DATATHON

1. Crater Boulders Detection and Analysis

Planetary exploration relies heavily on identifying surface features, such as craters and boulders, to understand the geological history of celestial bodies. Accurate detection and classification of boulders within craters are critical for hazard assessment in landing missions, rover navigation, and scientific research.
The **Crater Boulders Dataset** provides high-resolution imagery and sensor data of planetary surfaces, capturing variations in boulder size, shape, and distribution within craters. However, manually analyzing these datasets is time-consuming and prone to inconsistencies.

- ### Objective:

  Develop an AI-driven solution for the automated detection, segmentation, and classification of boulders in crater imagery to enhance planetary exploration, hazard assessment, and scientific research.

- ### Challenge:

1. Identify and segment boulders from raw high-resolution planetary surface images.
2. Classify boulders based on size, shape, and other relevant geological features.
3. Analyze boulder distribution patterns to gain insights into crater formation and planetary surface processes.
4. Ensure efficiency and scalability in processing large and diverse datasets from different planetary surfaces.

- ### Dataset:

  https://universe.roboflow.com/ilyas-b/moon-craters-dataset

- ### Evaluation Criteria:

- **Accuracy:** Precision in detecting, segmenting, and classifying boulders.
- **Efficiency:** Computational performance in handling large datasets.
- **Scalability:** Adaptability to various planetary surfaces and imaging conditions.
- **Innovation:** Novel approaches in computer vision, deep learning, or machine learning models.

2. Nail Disease Detection

Nail health is a critical indicator of overall well-being, with various diseases such as fungal infections, psoriasis, and melanoma manifesting through visible changes in nail color, texture, and shape. Early and accurate detection of nail diseases can significantly improve treatment outcomes and prevent complications. However, manual diagnosis is often subjective, time-consuming, and requires expert dermatological knowledge.

- ### Objective:

  Develop an AI-powered solution for automated nail disease detection using images, enabling early diagnosis and improving treatment outcomes.

- ### Challenge:

1. Detects and classifies various nail diseases based on image features.
2. Differentiate between healthy and diseased nails with high accuracy.
3. Provide actionable insights for early diagnosis and potential treatment recommendations.
4. Ensure robustness across diverse skin tones, lighting conditions, and image variations.

- ### Dataset:

  https://www.kaggle.com/datasets/nikhilgurav21/nail-disease-detection-dataset/data

- ### Evaluation Criteria:

- **Accuracy:** High precision in detecting and classifying nail diseases.
- **Efficiency:** Fast and effective processing of diverse nail images.
- **Scalability:** Adaptability to various skin tones, lighting conditions, and nail types.
- **Innovation:** Novel techniques in computer vision and machine learning for disease detection.

3. Electric Vehicle Population

As the world transitions toward sustainable transportation, tracking and analyzing Electric Vehicle (EV) population data is crucial for optimizing infrastructure, policy-making, and accelerating EV adoption. Governments, urban planners, and businesses need data-driven insights to improve charging networks, reduce range anxiety, and enhance EV accessibility. However, the vast and fragmented nature of EV population data makes it challenging to derive actionable intelligence.

○ Objective:

Develop a data-driven solution that leverages Electric Vehicle (EV) population data to provide actionable insights for policymakers, businesses, and consumers, facilitating the growth of sustainable transportation.

○ Challenge:

1. Analyze EV adoption trends across different regions and demographics.
2. Predict future EV growth based on available data and market factors.
3. Identify gaps in charging infrastructure and suggest optimal locations for expansion.
4. Develop effective data visualizations to make insights accessible and actionable.

○ Dataset:

https://catalog.data.gov/dataset/electric-vehicle-population-data/resource/fa51be35-691f-45d2-9f3e-535877965e69

○ Evaluation Criteria:

- **Accuracy:** Precision in trend analysis and growth predictions.
- **Innovation:** Novel approaches in data modeling, visualization, and interpretation.
- **Scalability:** Applicability to diverse regions and datasets.
- **Impact:** Practical relevance for EV adoption, infrastructure planning, and policymaking.

4. Supreme Court Judgment Prediction

The **Supreme Court** is the ultimate arbiter of justice, shaping laws that impact millions. Understanding and predicting its decisions can provide valuable insights for lawyers, policymakers, and researchers. However, judicial rulings are complex, influenced by legal precedents, ideological leanings, and case-specific factors. **Can data science help anticipate Supreme Court judgments?**

- ## Objective:

  Develop a machine learning model to predict the outcome of Supreme Court cases based on historical data, helping lawyers, policymakers, and researchers gain insights into judicial decision-making.

- ## Challenge:

1. Analyze voting patterns of justices and their ideological shifts over time.
2. Predict case outcomes (e.g., affirm, reverse, split decision) based on case details, judge profiles, and legal precedents.
3. Develop interpretable models to enhance legal transparency and understanding.
4. Visualize key insights to make judicial predictions more accessible and actionable.

- ## Dataset:

  https://www.kaggle.com/datasets/deepcontractor/supreme-court-judgment-prediction

- ## Evaluation Criteria:

- **Accuracy:** Prediction of unseen cases and generalization to new legal contexts.
- **Feature Engineering:** Effective handling of legal text, precedents, and judicial behavior.
- **Interpretability:** Clarity in how the model reaches its decisions.
- **Innovation:** Novel approaches in machine learning, NLP, or legal analytics for
- better predictive performance.

DATATHON: Online Submission Guidelines

What to Submit?

- Your submission must align with the theme of the DataThon (**Human Action Recognition and Its Applications**).
- The project should address security risks and leverage the provided dataset for analysis.

- **Each team must submit:**
  1. A **demo video** that showcases the flow of your idea, key implementation phases, and project functionality.
  2. A **PowerPoint presentation (PPT)** covering:
     - **Project Overview** – Define the problem and your proposed solution.
     - **Approach & Methodology** – Describe frameworks, tools, and techniques used.
     - **Dataset Used** – Specify the dataset provided and how you processed it.
     - **Key Findings & Results** – Highlight insights derived from your analysis.
     - **Conclusion & Future Scope** – Discuss potential improvements and scalability.
     - **Team Details** – Names & email addresses of all members.

- **PPT Guidelines: Maximum 6 slides, including team details and conclusion.**

How to Submit?

- You need to upload your files to this Google Drive link.

  Drive Link: SOFTWARE TRACK
- Ensure your submission is uploaded **before the deadline (12th February, 2025 11:59 PM, Wednesday)** to be eligible.
- Follow this naming format for your files:
- **TeamName Folder:**
  - **Video:** *TeamName_ProjectName.mp4*
  - **PPT:** *TeamName_ProjectName.pptx*
- **Important:** All DataThon participants have to register for the Sampark event mandatorily.

Selection & Next Step:

- A panel of judges will evaluate all submissions.
- Evaluation of the submitted documents will be done by **14th of February, 2025**.
- Shortlisted teams will receive email notifications.
- Top-performing teams will advance to the next stage of the competition, where they will compete against other teams live on the day of the event at SCET.
- Final winners will be selected based on their live performance.

Need Help?

For any questions, reach out to:

- Aakash Jaiswal - 7041848454
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Analyze, Secure, Innovate – Compete for the top spot!