

# Machine Learning and Data Science

## AI/ML Case Study

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# 1.1

# Project Ideas

# AIML for Sustainability



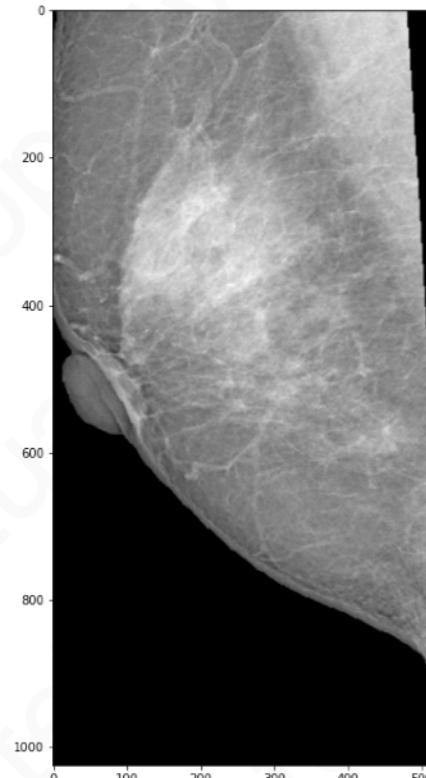
# AIML for Sustainability



# AIML for Sustainability

## Cancer Monitoring

The screenshot shows the Kaggle competition page for the RSNA Screening Mammography Breast Cancer Detection challenge. At the top left is a trophy icon labeled "Featured Code Competition". The main title is "RSNA Screening Mammography Breast Cancer Detection" with the subtitle "Find breast cancers in screening mammograms". Below the title is the RSNA logo and the text "Radiological Society of North America · 1,687 teams · a month ago". On the right side, there's a "\$50,000 Prize Money" badge. At the bottom, there are navigation links for "Overview" (which is underlined in blue), "Data", "Code", "Discussion", "Leaderboard", "Rules", "Late Submission" (in a dark button), and three dots for more options.



### Description:

- Monitor cancer from real patient data.
- Use AI/ML techniques for classification: {healthy vs. non-healthy}
- Kaggle: [rsna-breast-cancer-detection]

# AIML for Sustainability



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## Sign Language Recognition

Research Code Competition

### Google - Isolated Sign Language Recognition

Enhance PopSign's educational games for learning ASL

Google · 860 teams · a month to go (19 days to go until merger deadline)

Overview Data **Code** Discussion Leaderboard Rules New Notebook ...

HELLO      GOODBYE      NICE TO MEET YOU

YES      NO      PLEASE      THANKS

0. WRIST  
1. THUMB\_CMC  
2. THUMB\_MCP  
3. THUMB\_IP  
4. THUMB\_TIP  
5. INDEX\_FINGER\_MCP  
6. INDEX\_FINGER\_PIP  
7. INDEX\_FINGER\_DIP  
8. INDEX\_FINGER\_TIP  
9. MIDDLE\_FINGER\_MCP  
10. MIDDLE\_FINGER\_PIP  
11. MIDDLE\_FINGER\_DIP  
12. MIDDLE\_FINGER\_TIP  
13. RING\_FINGER\_MCP  
14. RING\_FINGER\_PIP  
15. RING\_FINGER\_DIP  
16. RING\_FINGER\_TIP  
17. PINKY\_MCP  
18. PINKY\_PIP  
19. PINKY\_DIP  
20. PINKY\_TIP

### Description:

- Recognise hand signs by using videos.
- Use AI/ML techniques for video classification.
- Kaggle: [asl-signs]

# AIML for Sustainability



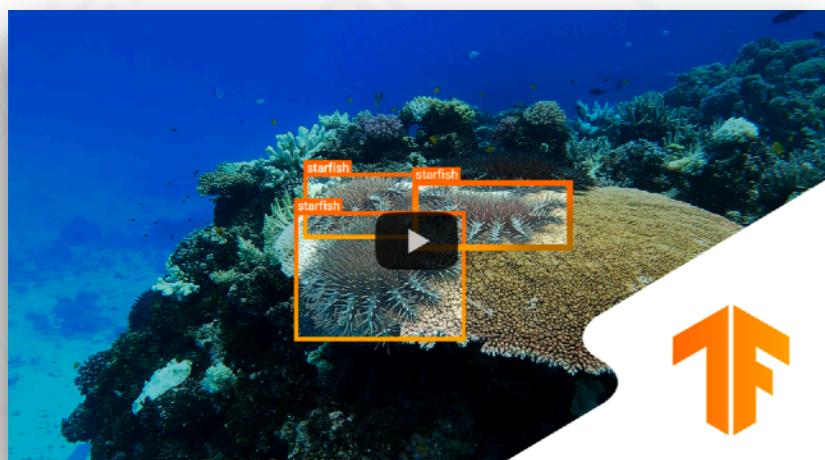
# AIML for Sustainability



# AIML for Sustainability

## Earth Monitoring

The screenshot shows a Kaggle competition page. At the top left is a 'Research Code Competition' icon. The main title is 'TensorFlow - Help Protect the Great Barrier Reef'. Below it is a subtitle 'Detect crown-of-thorns starfish in underwater image data'. To the right is a large image of a coral reef with several crown-of-thorns starfish. On the right side of the image, there is text '\$150,000 Prize Money'. At the bottom left, there are navigation links: 'Overview' (underlined), 'Data', 'Code', 'Discussion', 'Leaderboard', and 'Rules'. At the bottom right are buttons for 'Late Submission' and '...'. The TensorFlow logo is present on the left and bottom right.



### Description:

- Monitor the coral reefs by using images.
- Use AI/ML techniques for object detection.
- Kaggle: [tensorflow-great-barrier-reef], [fathomnet-out-of-sample-detection]

# AIML for Sustainability



# AIML for Sustainability

## Earth Monitoring

The screenshot shows a competition page for 'Planet: Understanding the Amazon from Space'. The title is 'Featured Prediction Competition' with a trophy icon. The main title is 'Planet: Understanding the Amazon from Space' with a subtitle 'Use satellite data to track the human footprint in the Amazon rainforest'. It features a background image of a dense green rainforest. On the right, it says '\$60,000 Prize Money'. Below the title, it shows 'Planet · 936 teams · 6 years ago'. At the bottom, there are navigation links: 'Overview' (underlined), 'Data', 'Code', 'Discussion', 'Leaderboard', 'Rules', 'Late Submission' (in a button), and '...'. There is also a circular image of satellite imagery showing agricultural fields and deforestation.

### Description:

- Monitor the amazon by using images.
- Use AI/ML techniques for image classification.
- Kaggle:  
[planet-understanding-the-amazon-from-space],  
[dstl-satellite-imagery-feature-detection]

# 1.2 Deliverables

# Project Deliverables

## Project Report

- **Content:** A formal document summarising the entire project.
- **Length:** 5 – 10 pages.
- **Sections:**
  - **Introduction:** Overview of the selected SDG and motivation.
  - **Problem Definition:** Describe the problem you're tackling.
  - **Data Overview:** Describe the data sources, pre-processing, etc.
  - **Methodology:** Detailed explanation of the AI techniques and how they were implemented/trained.
  - **Evaluations and Results:** Presentation of performance metrics and discussion of results compared to benchmarks/expectations.
  - **Challenges/Limitations:** Describe the difficulties encountered during the project and limitations of the solution
  - **Impact on SDG:** Discussion on how the AIML solution contributes to solve the SDG challenge.
  - **Conclusion:** Summarise key takeaways and possible future work.

# Project Deliverables

## Presentation

- **Content:** A slide presentation summarising the project's key points.
- **Length:** 10 –15 slides.
- **Sections:**
  - **Introduction:** A concise introduction to the project and the specific SGD challenge
  - **Problem Definition:** Explanation of the problem or challenge being addressed.
  - **Data Overview:** Describe the data used for the project.
  - **AI Solution & Methodology:** Present the AIML methods used in the project, e.g. architectures, etc.
  - **Results:** Summary of findings, insights, or key takeaways.
  - **Challenges/Limitations:** Discussion of the challenges and limitation faced during the project (e.g. data, computations).
  - **Impact on SDG:** Explain how the AI model contributes to the SDG.
  - **Conclusion:** Recap of the main points and suggested next steps.

# Project Deliverables

## GitHub Repository

- **Content:** A well-documented GitHub repository containing all the code for the project.
- **Content:**
  - Clear instructions on how to run the code (README file).
  - Relevant data files or links to the datasets.
  - The codebase structured for easy navigation.
  - A detailed explanation of how the AI models were implemented.

# 1.3 Project Evaluation

# Project Evaluation

## Evaluation Criteria

- **Problem Definition & Relevance (10%)**: Clear identification of the problem within the context of the selected SDG. Justification for the importance of addressing this problem using AI.
- **Data Preprocessing (10%)**: Quality/appropriateness of the data used.
- **Methodology & AI Techniques (30%)**: Appropriateness of the chosen AI models/techniques for solving the problem. Correctness and complexity of the implementation.
- **Evaluation & Results (20%)**: Use of appropriate metrics to evaluate the model's performance. Comparison with baselines or other models and a solid explanation of the results.

# Project Evaluation

## Evaluation Criteria

- **Report Quality (10%):** Clarity, structure, and organisation of the report. Depth of analysis and critical thinking demonstrated in the writing.
- **Presentation Quality (10%):** How well does the group communicate their findings and ideas? Organisation, clarity of writing or speaking, visual aids (if any), accessibility of information.
- **GitHub Repository (5%):** Proper organisation and documentation of the code. Completeness of the codebase, including any necessary scripts and datasets.
- **Self-Reflection (5%):** Has the group reflected on their own learnings and the broader implications of AI? Depth of engagement, critical reflection on the learning process and topic.

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