AN ALL-WEATHER AI FOR LANDSLIDE DETECTION

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GROUP MEMBERS

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Overview

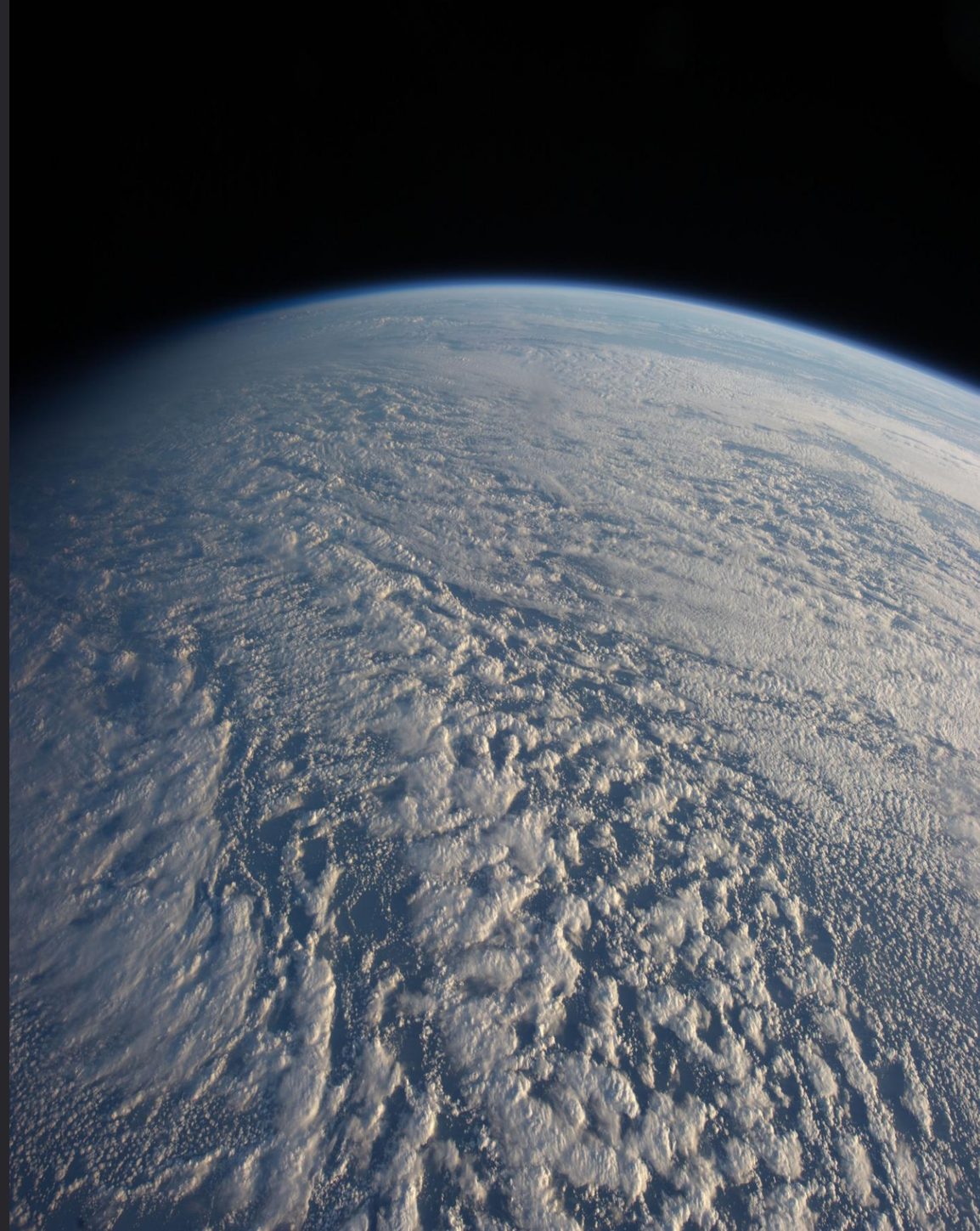
Landslides represent one of the most destructive moving natural hazards. They pose a significant threat to communities and infras

Our objective was to develop a robust, all-weather AI system to solve this. We achieved this by using visual optical data from Sent

PROBLEM STATEMENT

Cloud cover blinds the NDOC during a Crisis

- Heavy rain, a primary landslide trigger, creates cloud cover
- Traditional monitoring relying on optical satellites cannot see through clouds
- Result: **A critical information gap**. the National Disaster Operations Center, the very agency we rely on for disaster management can't assess damage or direct resources effectively.



Project Goals

1

Achieve Reliable Detection

Build a model that accurately identifies real landslides while minimizing false alarms, even during heavy cloud cover

2

Use the Right Data

Fuse standard optical imagery with cloud-penetrating radar to create a complete, all-weather view of the terrain.

3

Deliver Explainable Results

Pinpoint the key factors driving each prediction, to build trust in the system.

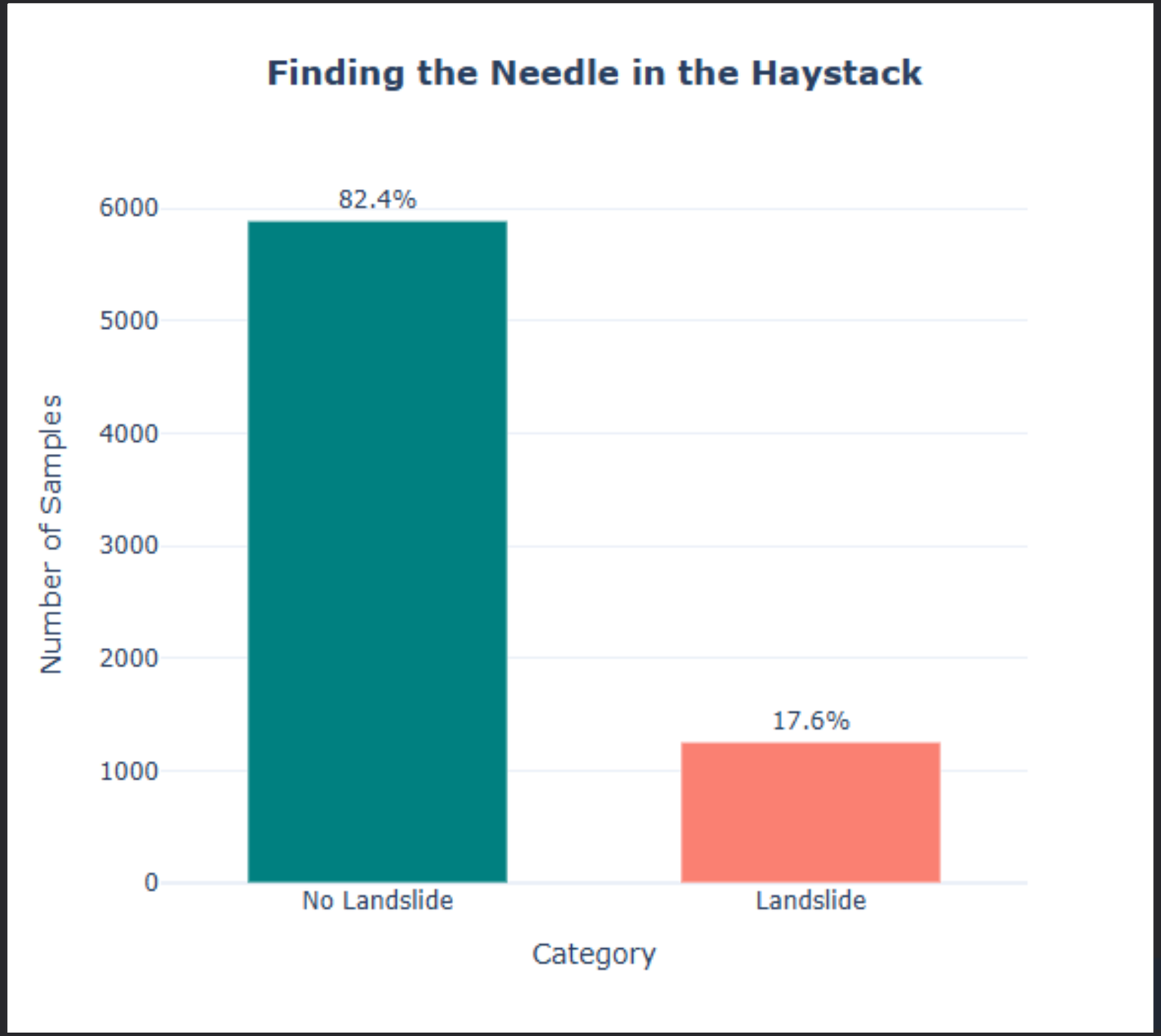
DATA OVERVIEW

Data input:

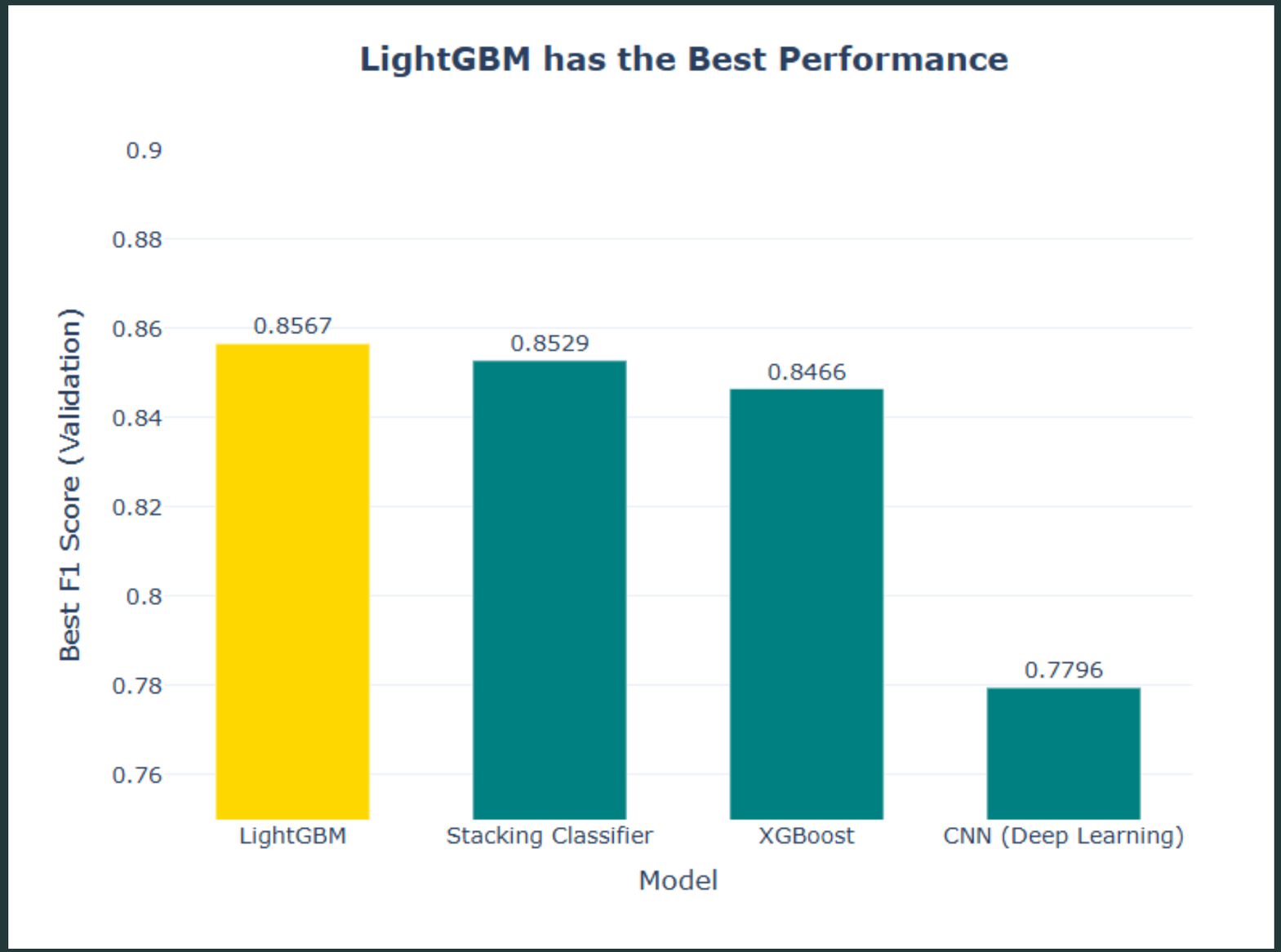
- **Sentinel-2 (Optical):**. Excellent for visual analysis but blinded by cloud cover
- **Sentinel-1 (Radar/SAR):** Sees through clouds by measuring ground texture and moisture

The Challenge: Class Imbalance
Landslides are a rare event making only 18% of our data. Model can easily cheat by guessing “no” and appear accurate.

Takeaway: Our success is measured by **high F1-score** which proves the model can find the rare class.

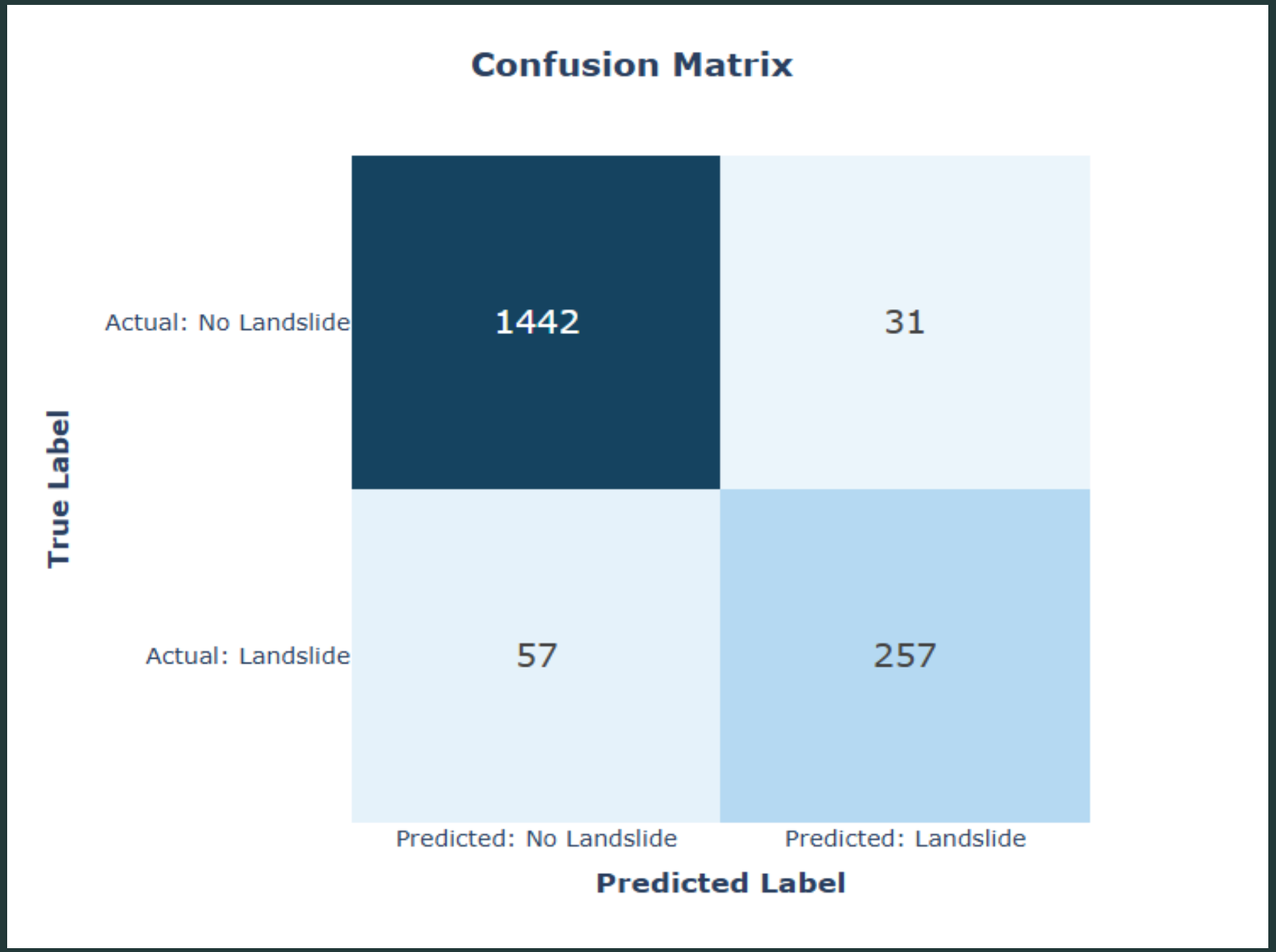


MODEL PERFORMANCE



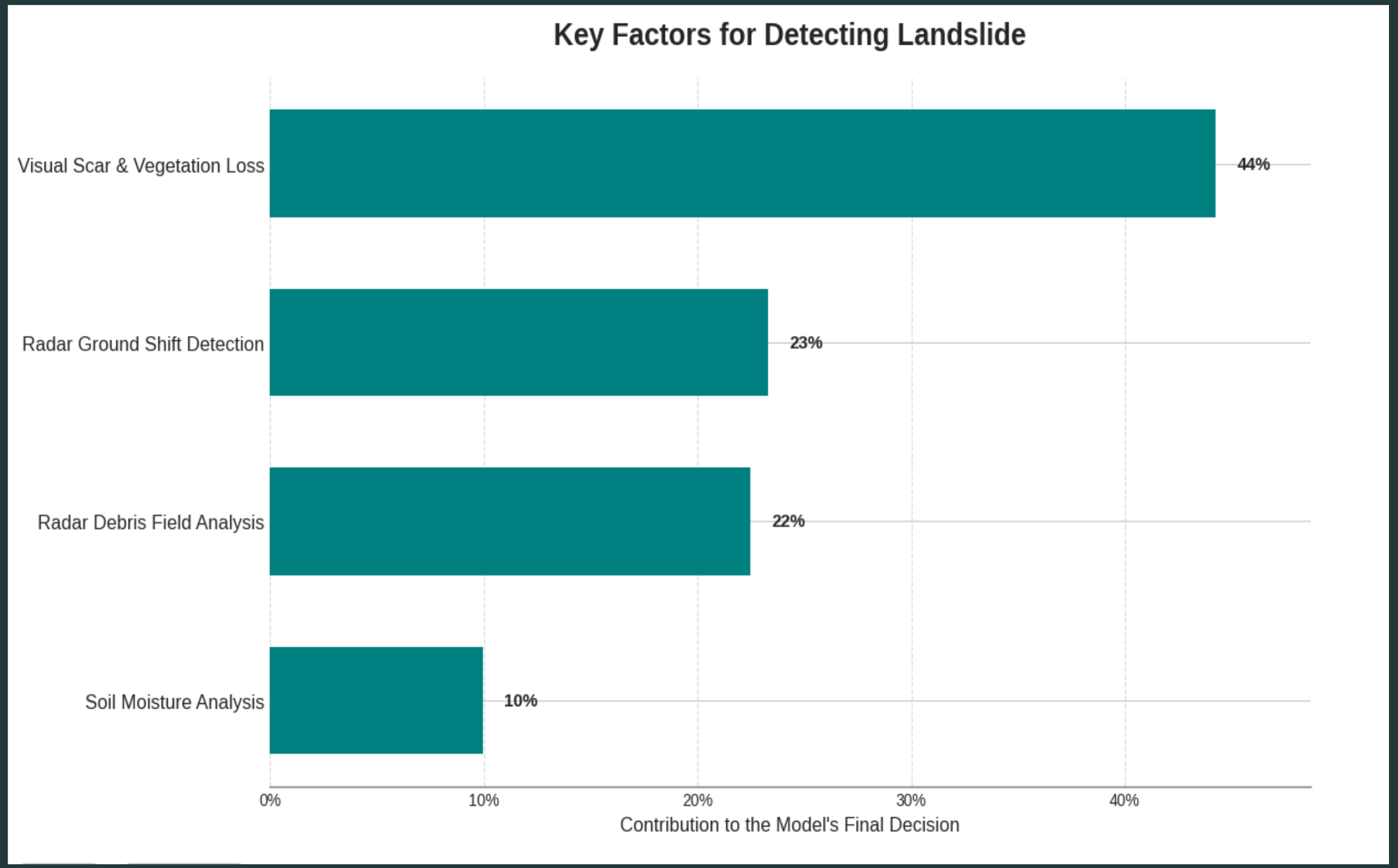
The LightGBM model delivered the best performance with an F1-Score of 0.86

MODEL PERFORMANCE FOR LIGHTGBM



Successfully identified 82% of landslides
While keeping false alarms slightly over 2%

Top Features LightGBM Used To Make Predictions



The model's all-weather capabilities are proven as it relies almost equally on visual evidence (44%) and cloud-penetrating radar (22% + 23%) to make predictions

BUSINESS RECOMMENDATION FOR NDOC

1

Automate Initial Screening

Use AI to filter out 80% of “No Landslide” data, freeing experts to focus only on high-risk cases.

2

Enable All-Weather Detection

Prioritize radar inputs for rapid landslide confirmation even when clouds block optical imagery.

3

Build a Historic Risk Database

Use AI to log recurring hotspots guiding NDOC’s focus on inspections and preventions

A New Era in Disaster Response

- We have proven that by combining optical and radar data, we can create a high-performing model (F1-Score: 0.8567) that solves the NDOC's critical information gap during cloud cover.
- This solution is about giving the NDOC a decisive edge when it matters most: saving lives, protecting infrastructure, and building a more resilient nation

THANK YOU & NEXT STEP

Discuss the Pilot Program

Let's plan the pilot program. We can walk through the timeline, goals, and next steps for the NDOC.

Technical Deep-Dive

Schedule a technical demo to walk your experts through the model and our working prototype.

Contact the Team

For all other inquiries, please reach out to us:

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