CELEBAL
TECHNOLOGIES

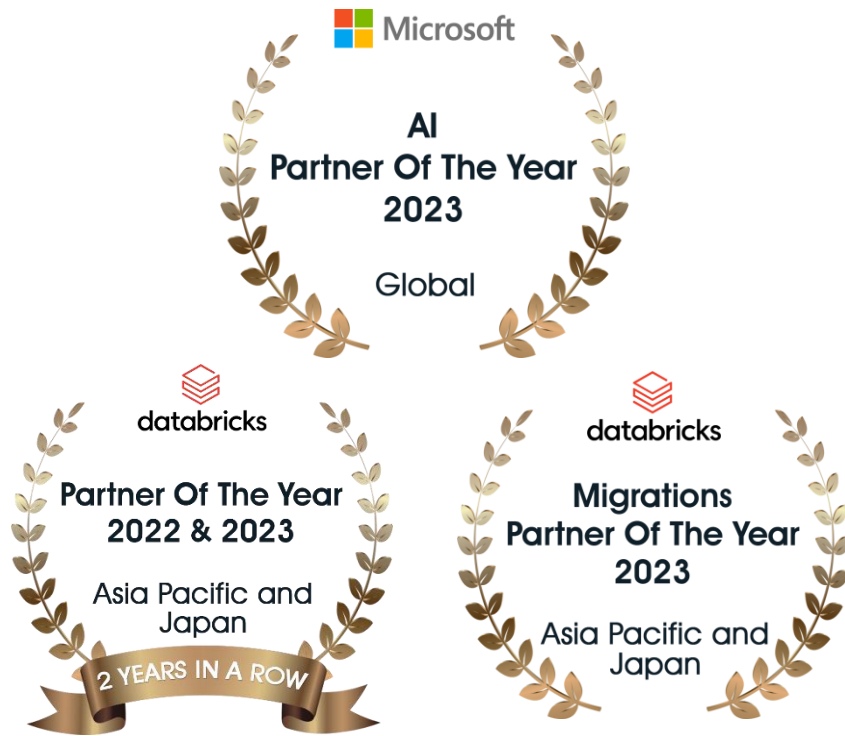# Vegetation Encroachment Detection

Microsoft
Solutions Partner

Infrastructure (Azure)
Data & AI (Azure)
Digital & App Innovation (Azure)
Security
Biz Applications

Celebal Specialization and Strength

CELEBAL TECHNOLOGIES

Microsoft
AI
Partner Of The Year
2023
Global

databricks
Partner Of The Year
2022 & 2023
Asia Pacific and Japan
2 YEARS IN A ROW

databricks
Migrations
Partner Of The Year
2023
Asia Pacific and Japan

databricks — Partner of the Year 2022 — Asia Pacific and Japan
databricks — TOP CONSUMPTION PARTNER — Asia Pacific and Japan
databricks — REGIONAL SYSTEM INTEGRATION PARTNER — India — 2 YEARS IN A ROW

Microsoft — Singapore Partner — 2023
Microsoft — MALAYSIA PARTNER AWARDS 2022 — Azure Data & AI Partner of the Year
Microsoft — COUNTRY PARTNER OF THE YEAR India — 2 YEARS IN A ROW — 2021 AND 2022

Partnerships

Microsoft Solutions Partner

databricks Elite Partner

SAP Silver Partner

Red Hat — Ready — Business Partner

Advanced Specialization

- AI & Machine Learning
- Analytics
- Infra and Database Migration
- Kubernetes
- Cloud Security
- Low Code No Code
- Intelligent Automation

INDIA | USA | CANADA | APJ | MIDDLE EAST | AUS

2800+ Employees

800+ AI experienced professionals

500+ AI Certifications

Industries We Serve

Manufacturing

Retail & CPG
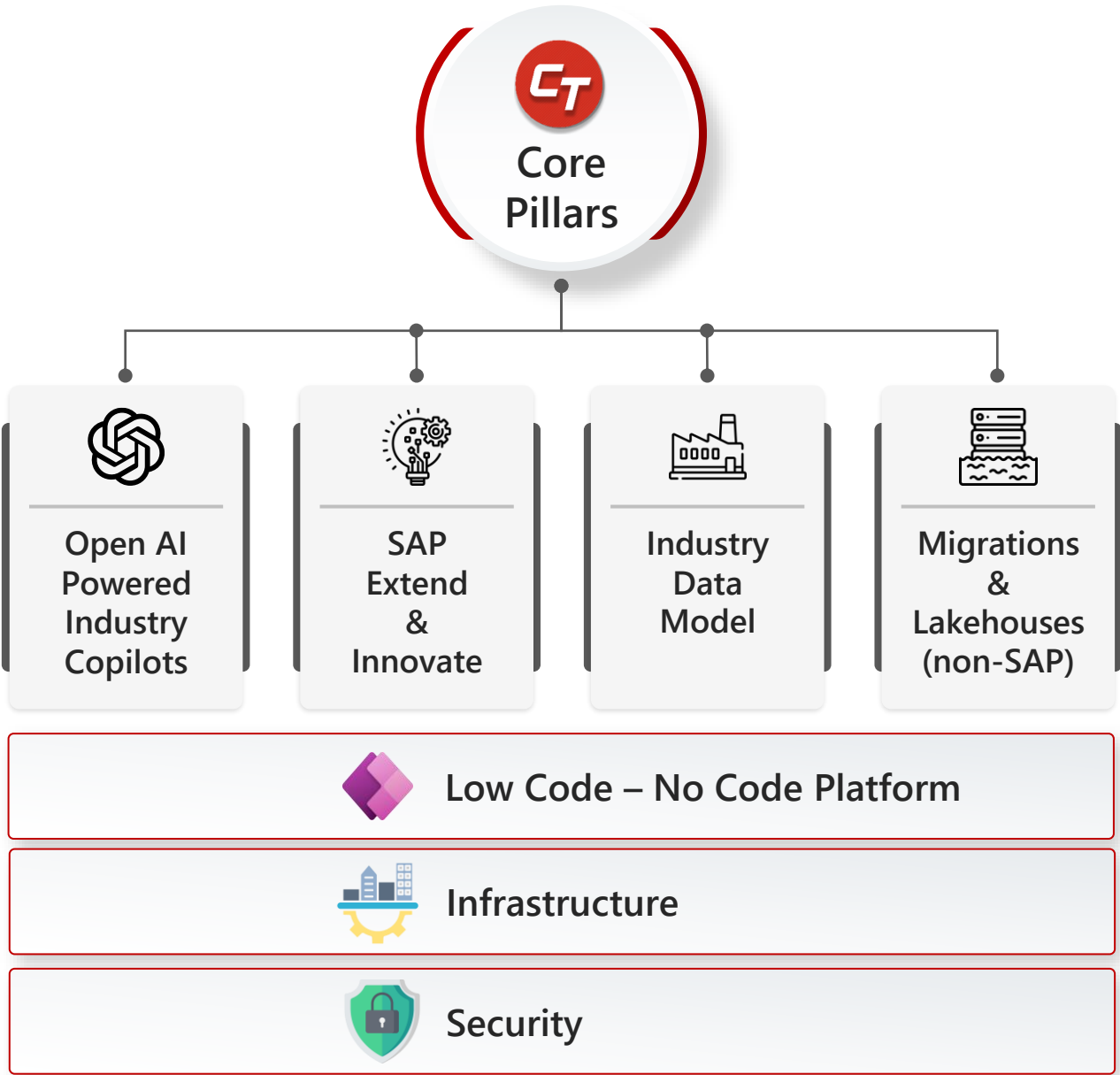
Financial Services

Energy & Sustainability

Healthcare & Life Sciences

Media & Entertainment

Celebal Core Pillars

1. Brief Description of the Solution:

Our Vegetation Encroachment Detection solution safeguards energy infrastructure by precisely identifying overgrown vegetation near power lines, enabling timely and preventive action. It delivers real-time monitoring, actionable alerts, and geospatial insights to reduce outage risks and support efficient maintenance. Built on Azure Machine Learning, Azure Container Registry, Azure Kubernetes Service, Azure Cosmos DB, and Azure Blob Storage, the system ensures scalability, performance, and secure data handling. It uses Azure Custom Vision for fast model training, Segment Anything Model (SAM) for pixel-level segmentation, and OpenAI CLIP (Contrastive Language-Image Pre-training) for advanced contextual image interpretation. With few-shot learning, it rapidly adapts to new or evolving patterns using minimal annotated data, empowering utility enterprises to manage grid reliability with confidence and precision.

2. Business Problem It Solves:
Energy infrastructure operators face significant challenges in maintaining the integrity, safety, and operational efficiency of their assets. Traditional methods of inspection and monitoring are often labor-intensive, reactive, and prone to human error. These limitations can lead to safety incidents, service disruptions, regulatory non-compliance, and increased maintenance costs. The solution addresses these challenges by automating detection processes, providing continuous monitoring, and delivering timely alerts and insights for proactive maintenance and risk mitigation.
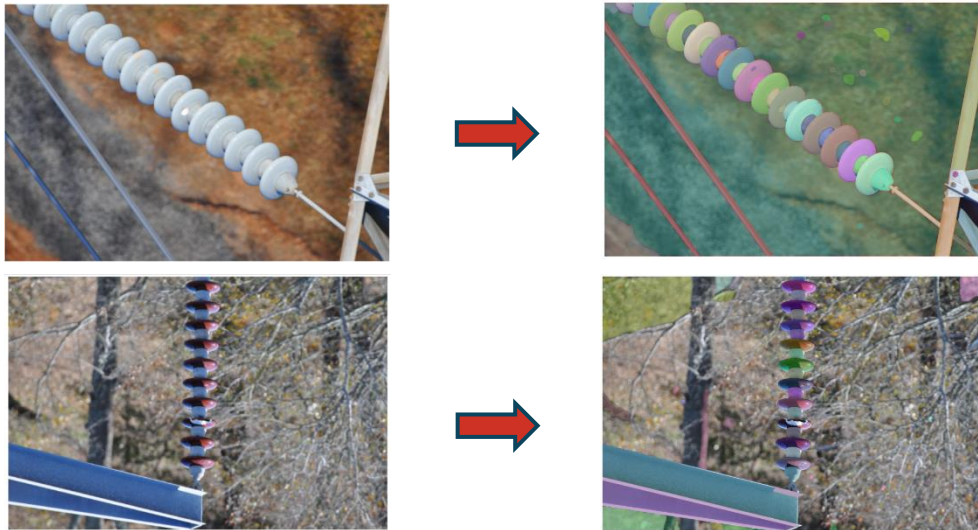
3. Value Add for Customer:
*   **Precision Vegetation Mapping:** Advanced AI and computer vision algorithms deliver pixel-level accuracy in detecting encroaching vegetation around transmission and distribution lines.
*   **Intelligent Reporting:** Delivers clear visualizations and data-driven insights to support effective vegetation management decisions.
*   **Predictive Maintenance Alerts:** Identifies potential threats before they impact infrastructure, enabling data-driven scheduling of vegetation removal to prevent outages.
*   **Continuous Compliance Monitoring:** Automates surveillance of right-of-way corridors to support adherence to regulatory vegetation clearance mandates and safety protocols.
*   **Scalable, Utility-Ready Architecture:** Built on Azure for high availability, the solution adapts to grid-wide deployments and integrates smoothly with existing asset management platforms.
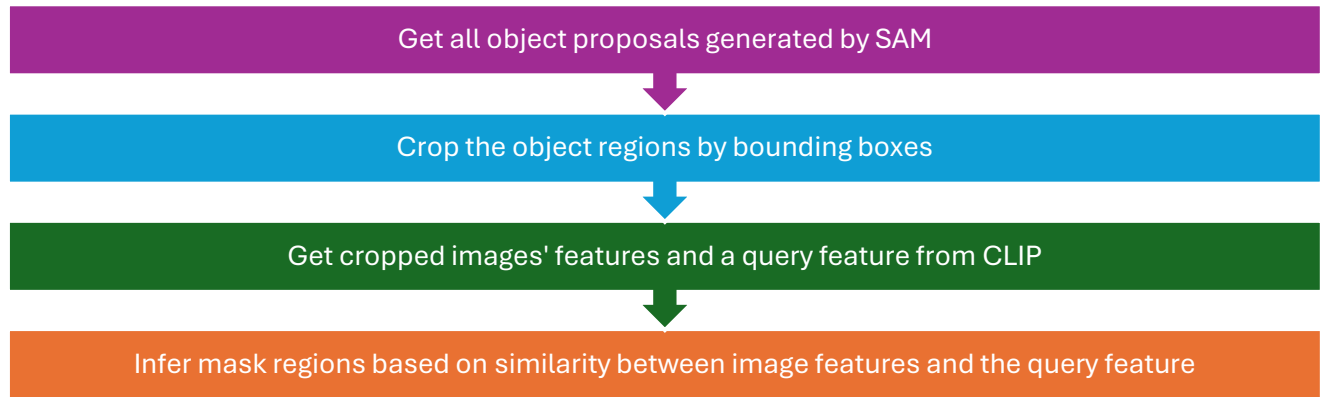
Few shot Image Segmentation (SAM + CLIP)

Overview

This approach uses zero-shot learning with FAIR's SAM model for image segmentation with minimal labeled data. CLIP model is used to filter segmented regions based on natural language prompts, enabling rapid development of image segmentation applications with little to no training data.

Object proposals generated by SAM (Zero Shot)

Approach

Get all object proposals generated by SAM

Crop the object regions by bounding boxes

Get cropped images' features and a query feature from CLIP

Infer mask regions based on similarity between image features and the query feature

Results
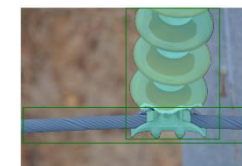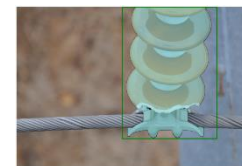
Inputs
Image + prompts

['an insulator']'

['a insulator', 'a metal wire']

Preds
Segmented images

Conclusion

Hence by cropping object regions and extracting visual features with CLIP, we can efficiently perform instance segmentation selectively using natural language prompts by matching images and textual contexts. This approach has a significant impact on applications such as image retrieval and segmentation of various region of interests, where accurate and efficient collection of data is critical for user experience and productivity.