CELEBAL TECHNOLOGIES

Protective Equipment Detection

Microsoft Solutions Partner

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

Celebal Specialization and Strength

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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

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

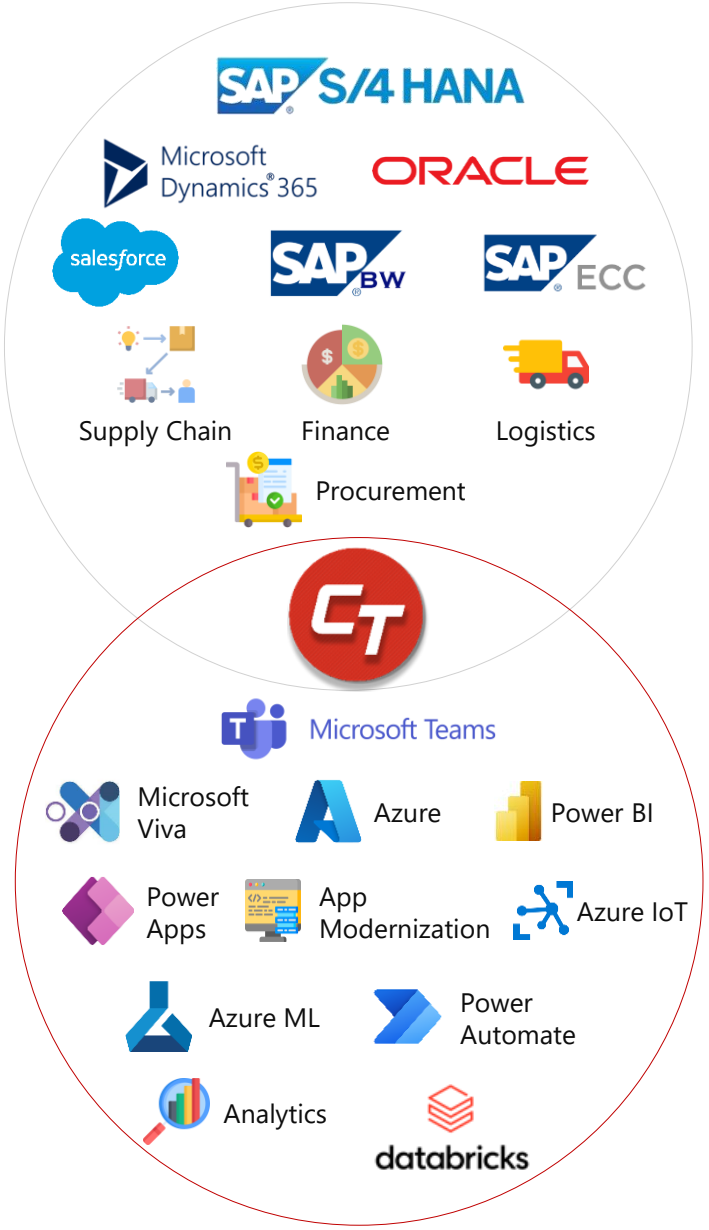
800+ AI experienced professionals

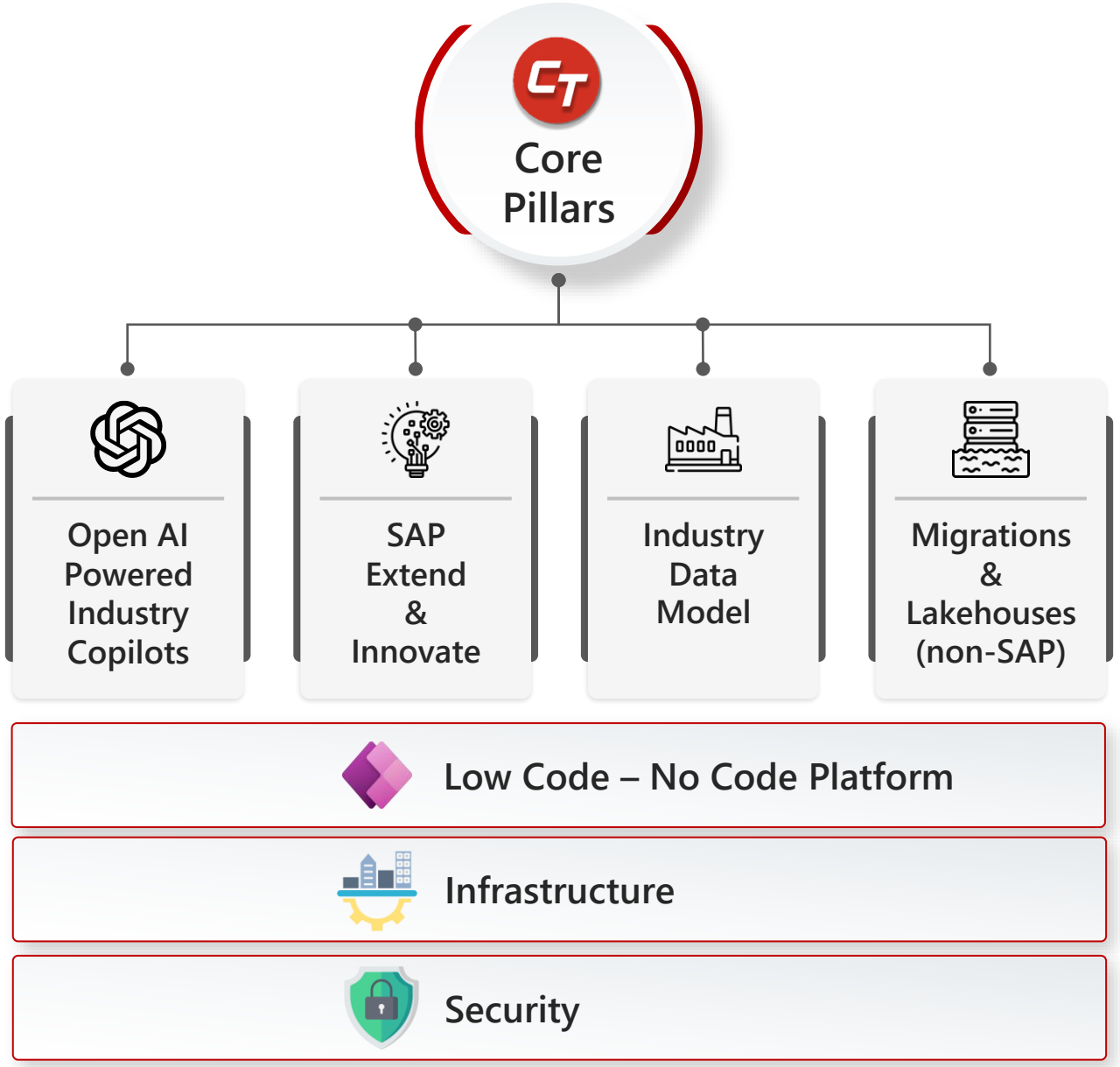
500+ AI Certifications

Industries We Serve

- Manufacturing
- Retail & CPG
- Financial Services
- Energy & Sustainability
- Healthcare & Life Sciences
- Media & Entertainment

Celebal Core Pillars





Protective Equipment Detection

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1. Brief Description of the Solution:

Our advanced Protective Equipment Detection solution enhances safety in the energy sector by enforcing PPE compliance and minimizing injury risks. Built on Azure Machine Learning, Azure Container Registry, Azure Kubernetes Service, Azure Cosmos DB, and Azure Blob Storage, it detects and alerts when individuals are missing or improperly wearing PPE like helmets, gloves, and safety glasses. Traditional methods lack real-time monitoring and scalability, leading to safety violations. This solution bridges that gap with automated, continuous checks and instant alerts. It uses Azure Custom Vision, Segment Anything Model (SAM) for pixel-level segmentation, and OpenAI CLIP (Contrastive Language-Image Pre-training) for zero-shot learning of unfamiliar PPE types.

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:

- AI and Deep Learning Algorithms: Sophisticated AI and deep learning models, trained on extensive image and video datasets, process real-time video streams to detect PPE compliance accurately across dynamic environments.
- Flexible Integration: Compatible with existing surveillance infrastructure, including fixed cameras, drones, and helmet-mounted cameras, or can operate through dedicated AI-enabled devices installed in high-risk operational zones.
- Instant Alerts and Notifications: The system automatically issues real-time alerts when critical safety equipment is missing or improperly worn, enabling supervisors to respond promptly and reduce exposure to hazards.
- Historical Data Insights: Review and analyze historical footage to uncover recurring PPE compliance issues. These insights support focused training initiatives and informed safety planning to improve overall adherence.

Few shot Image Segmentation (SAM + CLIP)

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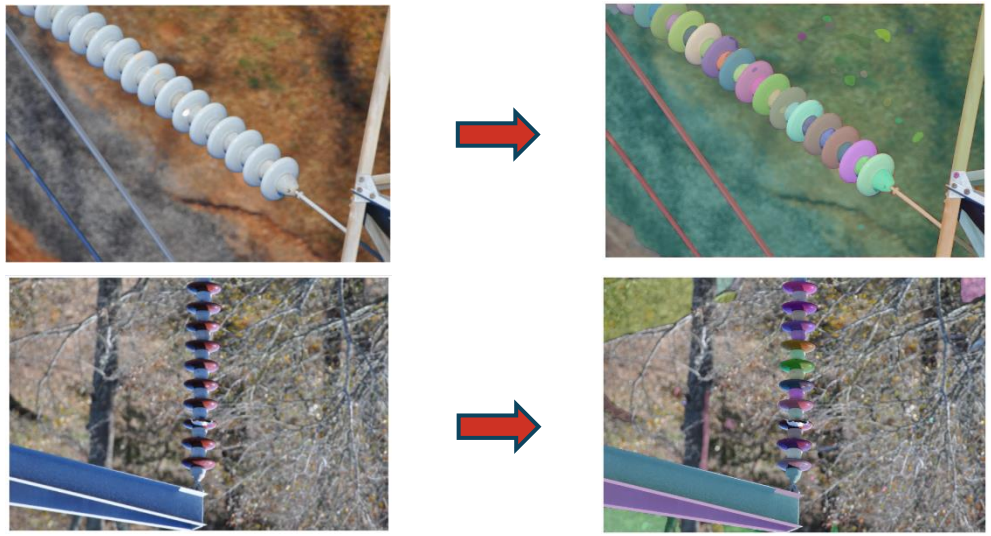
Overview

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

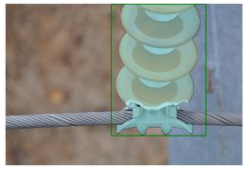
Results

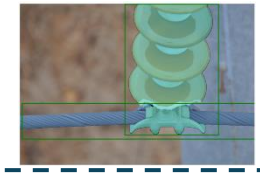
Inputs
Image + prompts

['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.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Thank You