



University of New Haven

TAGLIATELA COLLEGE OF ENGINEERING

POWER
ON

PROJECT SHOWCASE

CSCE6007: TEAM 3

Explainable AI Framework for Bridge Inspection



Introduction

- Bridges are critical components of modern transportation infrastructure.
- Structural cracks can weaken bridge integrity and pose safety risks.
- Traditional bridge inspections rely on manual visual assessment — time-consuming and subjective.
- Recent **Deep Learning models** (CNN, ViT, CvT, RvT) achieve high-accuracy crack detection.
- However, these models function as “**black boxes**” with limited interpretability.
- **Explainable AI (XAI)** methods such as **Grad-CAM** and **LIME** enhance transparency and trust.
- This project aims to integrate **crack detection** and **XAI visualization** into a **dashboard** for scalable and interpretable bridge inspection.

Problem statement

Manual bridge inspections are **time-consuming** and **subjective**.

AI models detect cracks well, but their decision process is **not transparent**.

Lack of explainability limits trust and real-world adoption in infrastructure assessment.

Business Scenario

Bridge inspection is **essential but manual, subjective, and costly.**

AI vision models can automate defect detection but **lack transparency.**

Need for **trustworthy and explainable AI tools** to support inspectors and agencies.

Solution Overview

1

Integrate **XAI methods** (Grad-CAM, LIME) with **deep learning models** (CNN, ViT, RvT).

2

Provide **visual explanations** for defect localization and confidence.

3

Build a **scalable, reproducible data pipeline** for bridge image analysis.

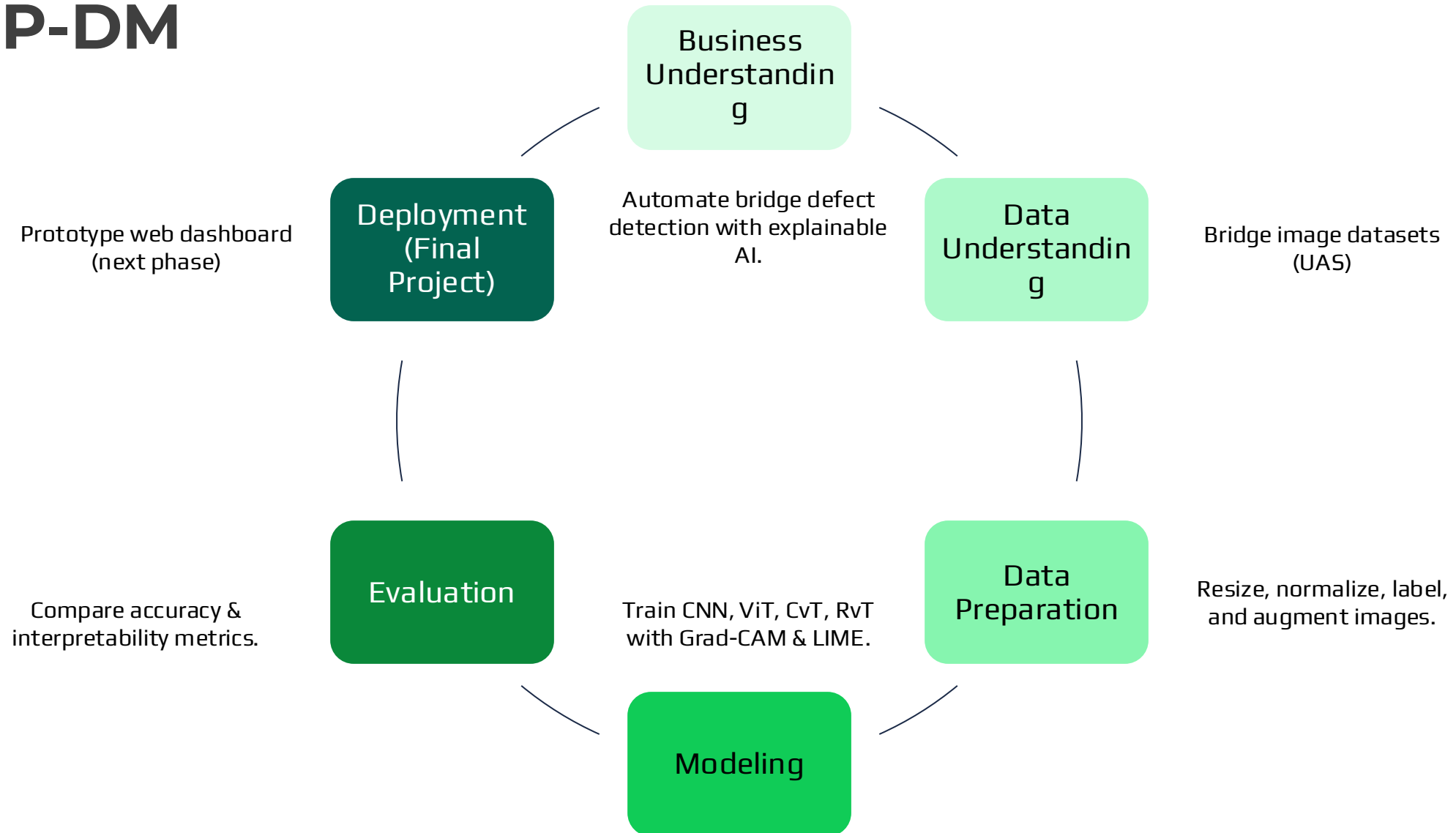
4

Evaluate models on both **accuracy** and **interpretability**.

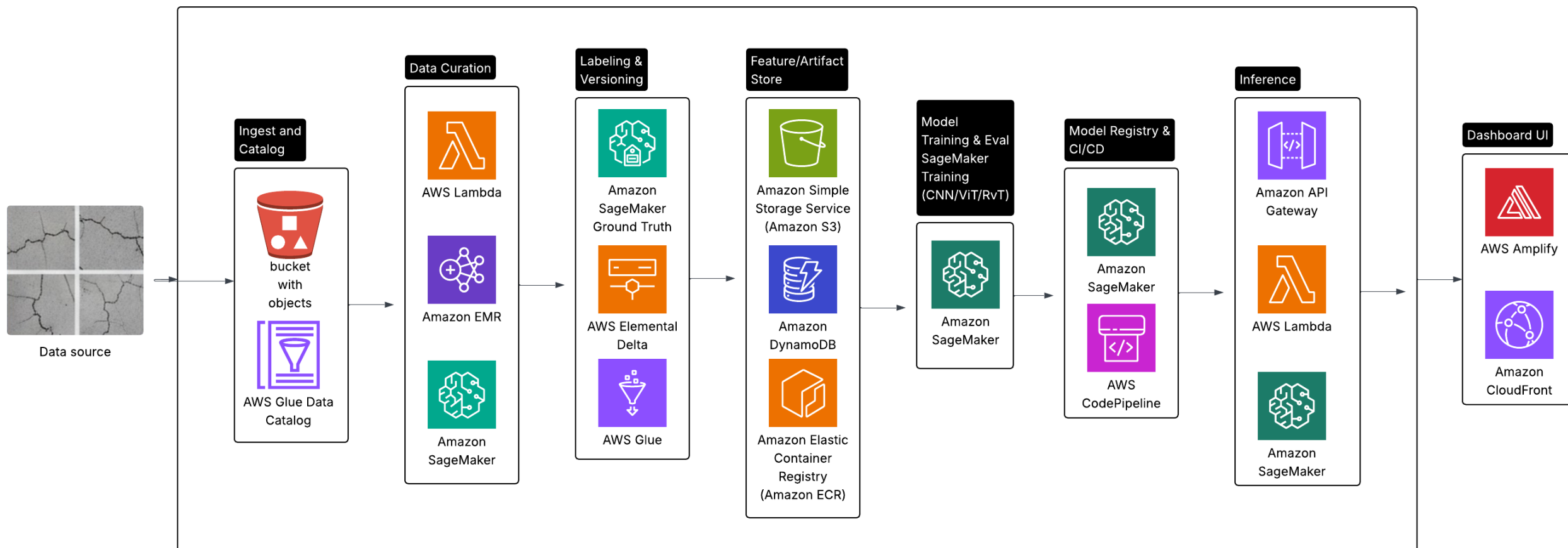
5

Deploy through a **lightweight dashboard** or **cloud platform**.

CRISP-DM



Solution Architecture



Conclusion



Combining **Deep Learning** with **XAI (Grad-CAM, LIME)** improves **trust, transparency, and adoption**.



The proposed **AWS-based scalable pipeline** ensures **efficient data processing and deployment**.



The interactive **dashboard** empowers engineers with **actionable, interpretable results** for decision-making.

Thank you!
Any questions?



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