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HANOI UNIVERSITY OF SCIENCE AND TECHNOLOGY

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Energy and Emission Monitoring During AI Model Training

Module: Big Data Storage and Processing

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Agenda

1 Project Overview

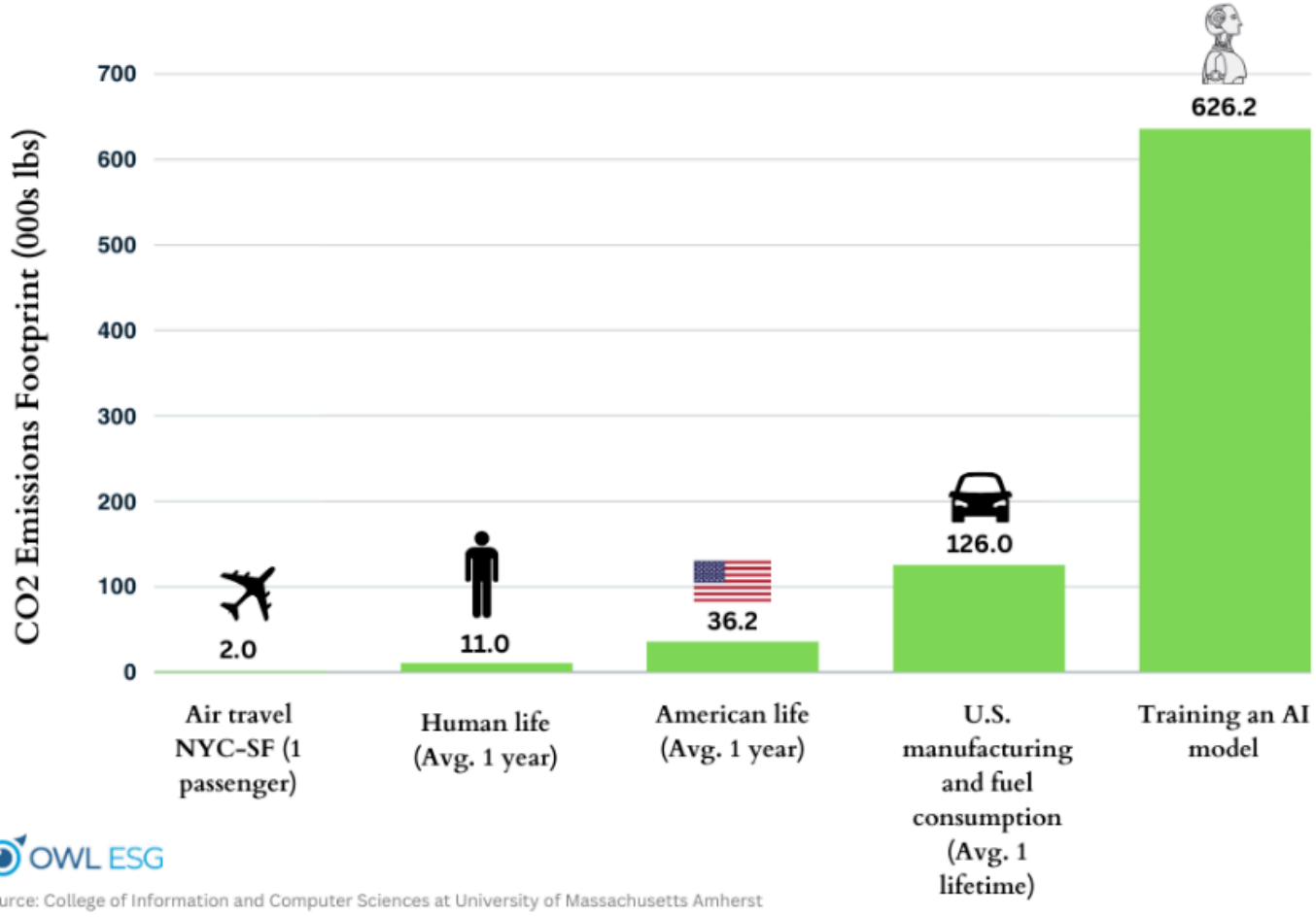
2 Data

3 Architecture

4 Conclusion & Outlook

1 Project overview

CO2 Emissions Benchmarks



OWL ESG

Source: College of Information and Computer Sciences at University of Massachusetts Amherst

1 Project Overview

Develop a streaming pipeline that tracks energy and CO_2 emissions during AI model training

Core Idea

- **Training processes continuously emit metrics**
- **Data is processed and aggregated in real time**
- **Results are stored and visualized for transparency and analysis**

Modern AI model training is computationally intensive
Energy consumption and emissions are often not visible to practitioners

And...

...Metrics are scattered across system monitors and dashboard

...No unified view per training run user or model

Challenge:

- Continuous, high-frequency data
- Long-running training jobs
- Need for real-time aggregation and analysis

2 Data

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Energy metrics: estimated energy consumption

Emission metrics: derived CO_2 equivalents

Training metrics: epoch, loss, accuracy

Metadata: run ID, user, model, environment, region

3 Architecture

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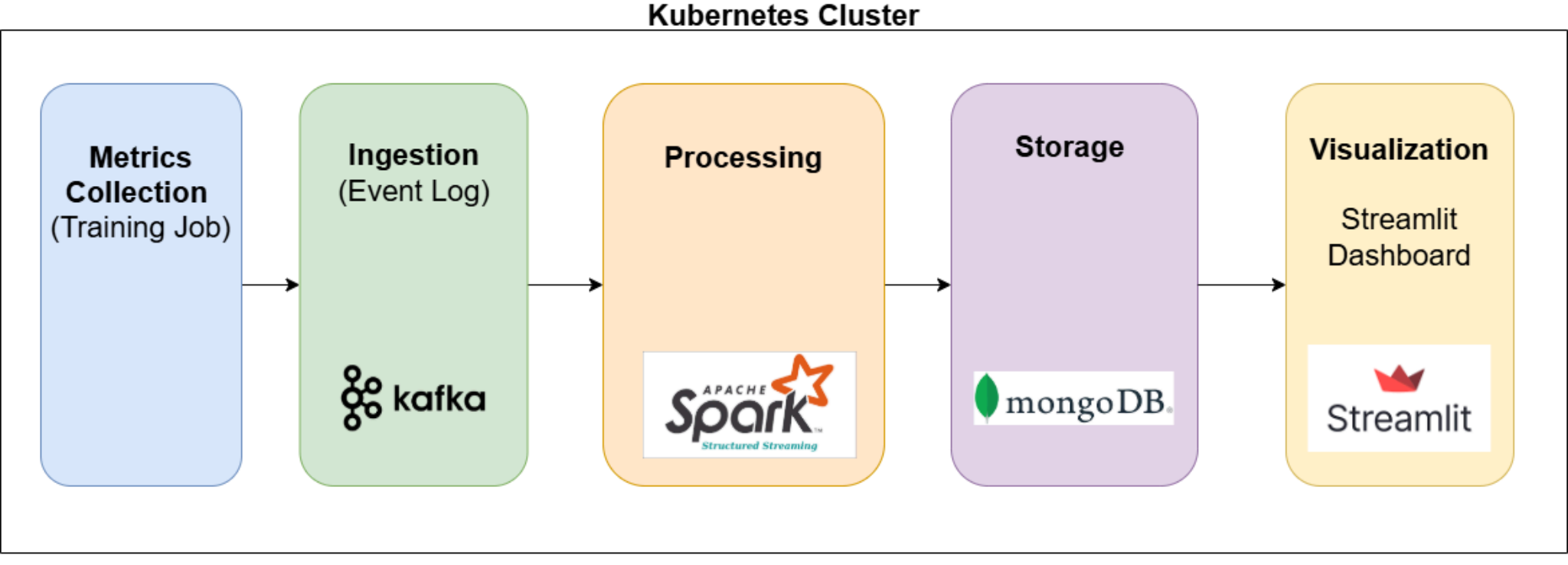

4 Conclusion & Outlook

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- A streaming-based pipeline enables real-time transparency of energy consumption and CO_2 emissions during AI model training
- Stream processing is well suited for continuous, high-frequency training metrics
- The Kappa Architecture simplifies design by using a single, unified streaming pipeline

Further steps...

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THANK YOU !