# AI-Driven Road Management

- 5 Days
- Lecture and Hands-on Labs

## Course Overview

This course equips transportation professionals with the knowledge and skills to transform road asset management using artificial intelligence (AI) and computer vision (CV). Participants will explore how AI-driven systems enable predictive maintenance, optimize resource allocation, and support data-driven decisions for road networks. Through a blend of lectures, case studies, and hands-on labs, attendees will learn to define functional and non-functional requirements, select appropriate AI models, and craft specifications for AI-based road management solutions. The course is vendor-neutral, focusing on universal principles and technologies applicable to any DoT, ensuring participants can envision and implement AI solutions tailored to their organization's needs.

## Who Should Attend

- Project Managers
- Architects
- Developers
- Data Acquisition Specialists

## What You'll Learn

- Understand core AI and CV concepts for road inspection and asset management.
- Identify the roles of data, human oversight, and technology in AI-driven systems.
- Define essential functional and non-functional requirements for AI road management solutions.
- Establish meaningful performance metrics and data requirements to ensure system reliability.
- Develop a specification framework to describe and procure an AI-driven road management plan.
- Evaluate AI solutions for fairness, robustness, and integration with existing DoT systems.

## Outline

Welcome to Alta3 Research Labs!

- 💻 Lecture + Lab: Exploring Your Lab Environment
- 💻 Lecture + Lab: Meet VIRGIL: Your AI Lab Coach

Designing the Ultimate AI Road Management Plan

- 💬 Lecture: Course Overview

1. Introduction and Core Concepts

- 💬 Lecture: AI Revolution in Road Infrastructure
- 💻 Lecture + Lab: Discuss Local DoT Challenges

2. Essential Technologies for AI Road Management

- 💬 Lecture: Data Collection Methods and File Formats
- 💬 Lecture: AI Models and Computer Vision
- 💬 Lecture: Edge Computing and Geospatial Systems
- 💻 Lecture + Lab: Lab: Explore Sample GeoTIFF and GeoJSON Data

3. Case Studies and Technology Applications

- 💬 Lecture: AI Case Studies for Road Maintenance
- 💻 Lecture + Lab: Activity: Technology Analysis for Your DoT

4. Backend Systems and Data Processing

- 💬 Lecture: Backend Architectures and Data Pipelines
- 💬 Lecture: Leveraging Large Language Models (LLMs)
- 💻 Lecture + Lab: Lab: Simulate Data Pipeline
- 💻 Lecture + Lab: Activity: Draft Functional Requirements

5. Performance Requirements and Validation

- 💬 Lecture: KPIs and Validation Strategies
- 💻 Lecture + Lab: Lab: Calculate Performance Metrics
- 💻 Lecture + Lab: Activity: Draft Performance Targets

6. Advanced Data Requirements and Governance

- 💬 Lecture: Data Quality and Governance
- 💻 Lecture + Lab: Lab: Preprocess Imagery and Assign CRS
- 💻 Lecture + Lab: Activity: Define Data Ownership and Security

7. Non-Functional Requirements (NFRs)

- 💬 Lecture: Defining NFRs for AI Solutions
- 💻 Lecture + Lab: Activity: Prioritize and Draft NFRs

8. Ensuring Fair and Reliable AI

- 💬 Lecture: Fairness and Robustness in AI
- 💻 Lecture + Lab: Lab: Analyze AI Output Performance
- 💻 Lecture + Lab: Activity: Draft Fairness Requirements

9. Crafting Specifications and Workshop

- 💬 Lecture: Best Practices for Specification Documents
- 💻 Lecture + Lab: Workshop: Draft AI Road Management Specification
- 💻 Lecture + Lab: Activity: Identify Evaluation Criteria

10. Final Summary and Next Steps

- 💬 Lecture: Recap and Action Plan
- 💻 Lecture + Lab: Resources and Further Learning

## Prerequisites

- Basic Computer Proficiency ## Next Courses

AI-Leadership AI-Vision