AI-Powered Defect Detection in Manufacturing

Using Computer Vision & Deep Learning

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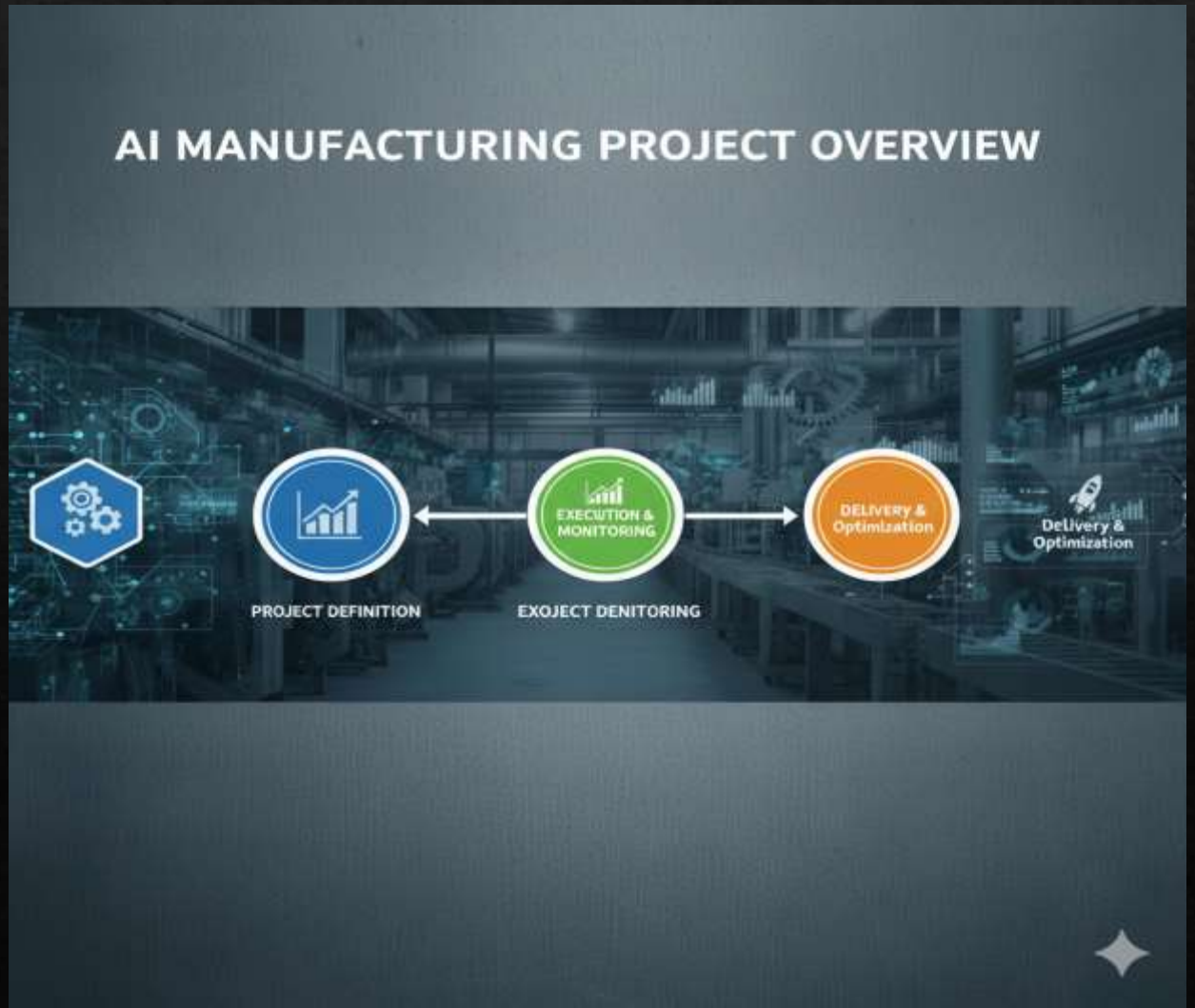
Project Overview

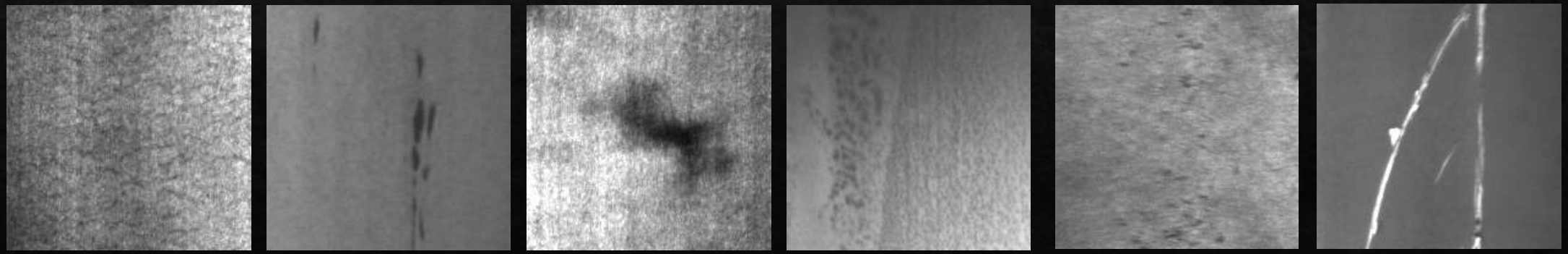
- Automates surface defect detection using CNN
- Improves quality control in industries like automotive, electronics, and steel
- Reduces manual inspection effort



Dataset

NEU Surface Defect Database (NEU-DET)

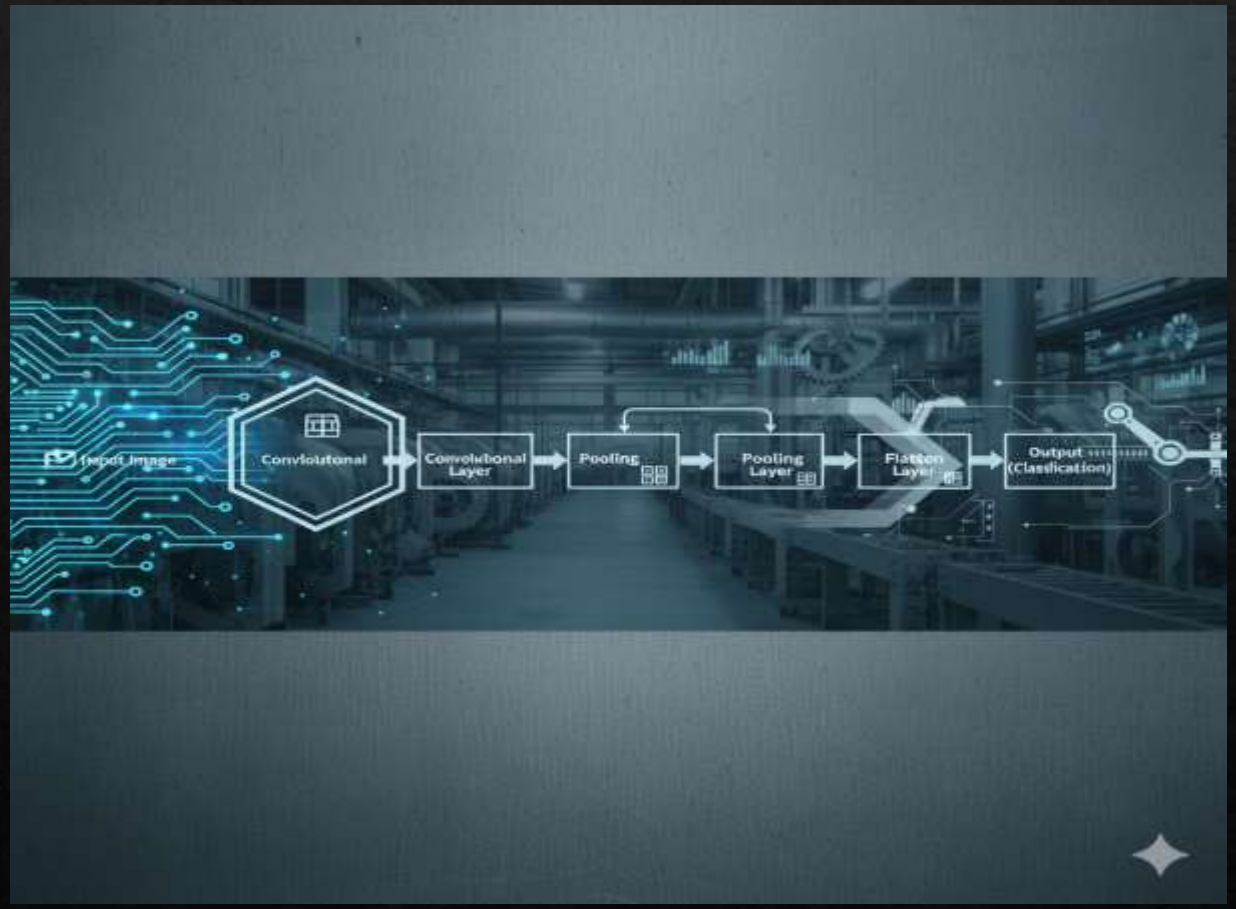
- 6 defect types: Crazing, Inclusion, Pitted Surface, Scratches, Rolled-in Scale, Patches
- High-resolution steel surface images



Model Architecture

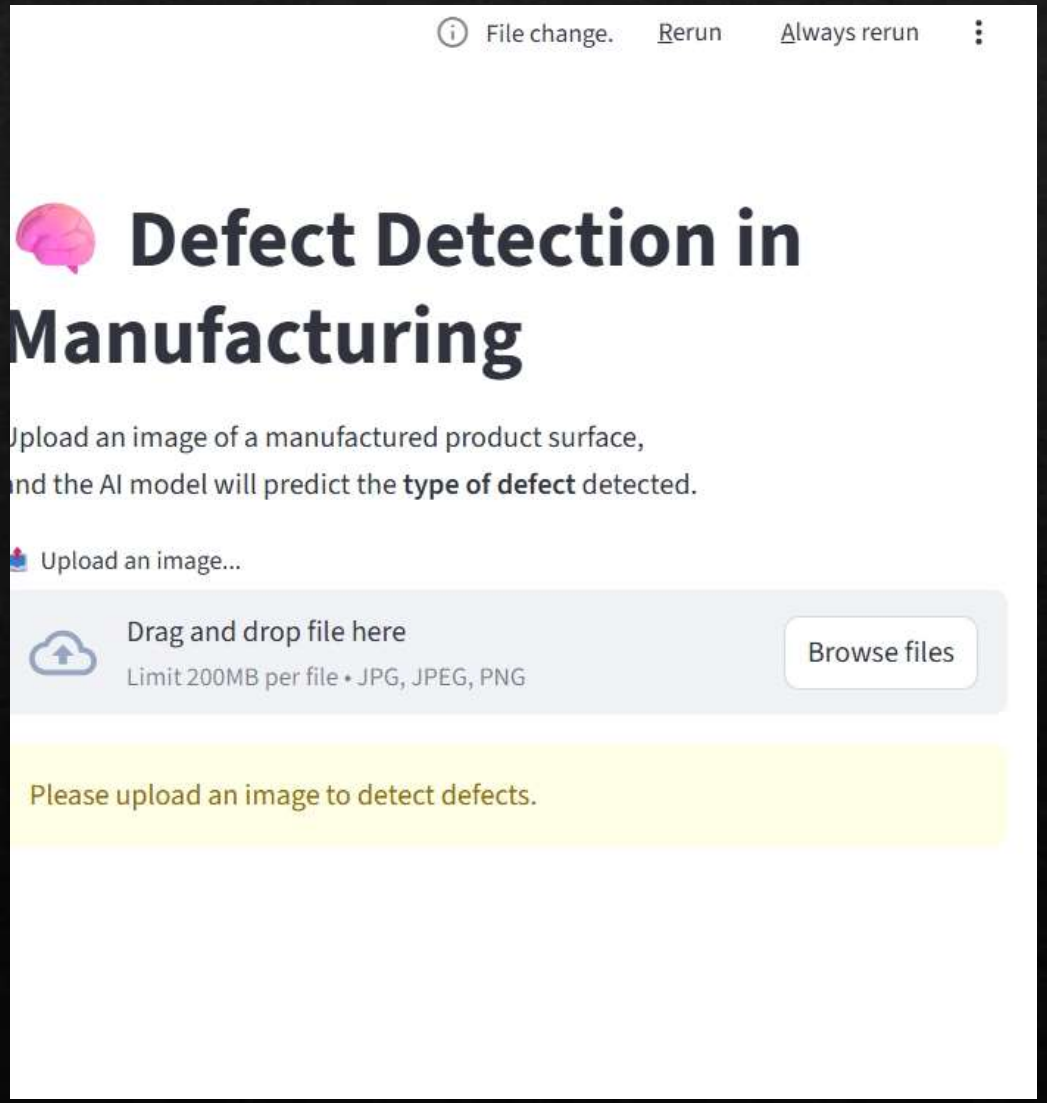
Convolutional Neural Network (CNN)

- Input: 128×128 images
- Output: 6 defect classes
- Optimizer: Adam
- Loss: Categorical Cross-Entropy
- Accuracy: ~94%



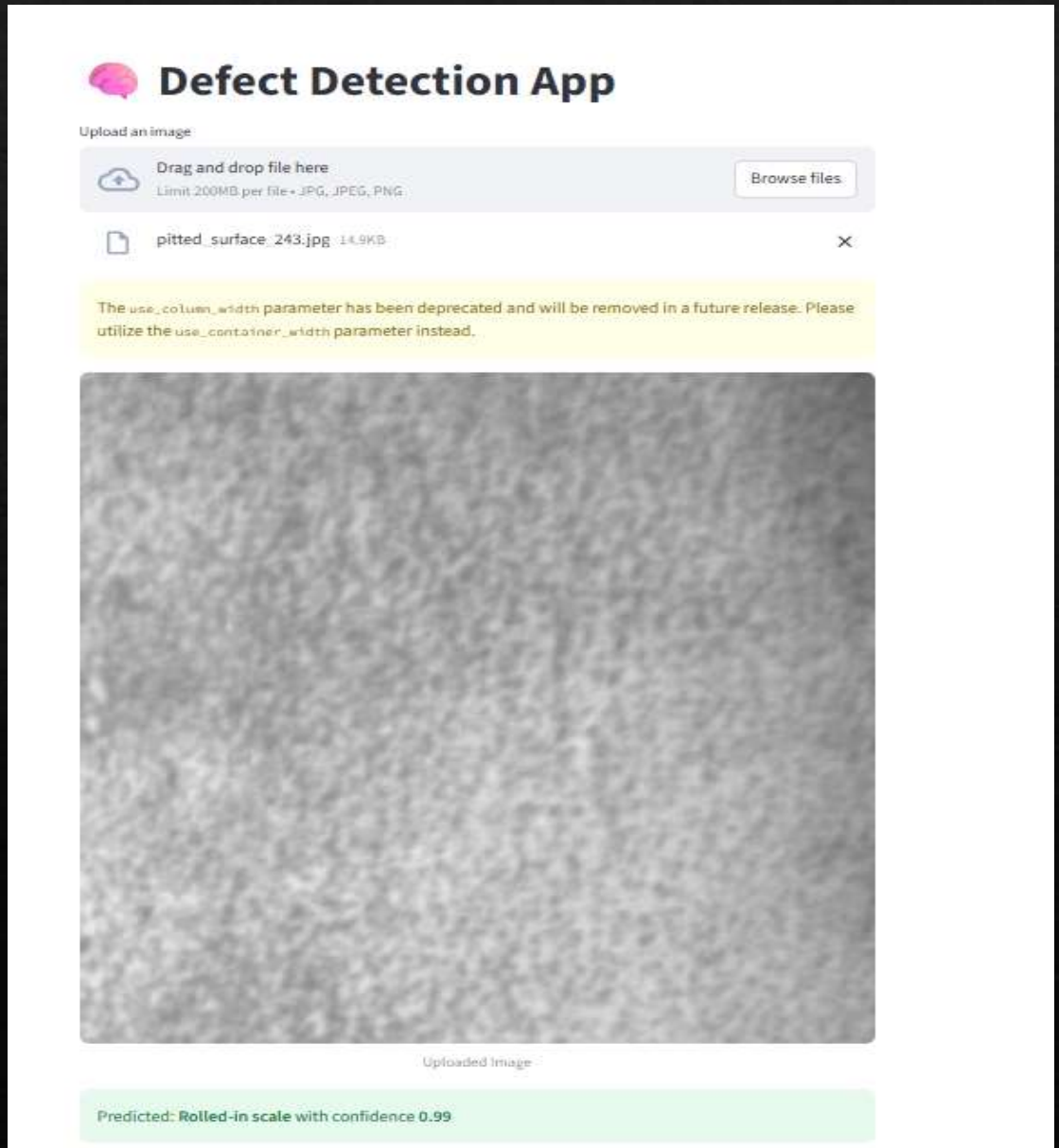
Streamlit App

- Upload interface for defect images
- Real-time prediction with confidence score
- Simple UI for non-technical users



Demo Output

- **Example Prediction:**
- Input: Steel surface image
- Output: Rolled-in-Scale(*Confidence: 0.99*)
- Fast and accurate results



Project Structure & Tech Stack

- Organized folders for data, models, notebooks, and app
- Key files: train_defect_detector.ipynb, app.py, defect_detection_model.h5

Languages & Libraries:

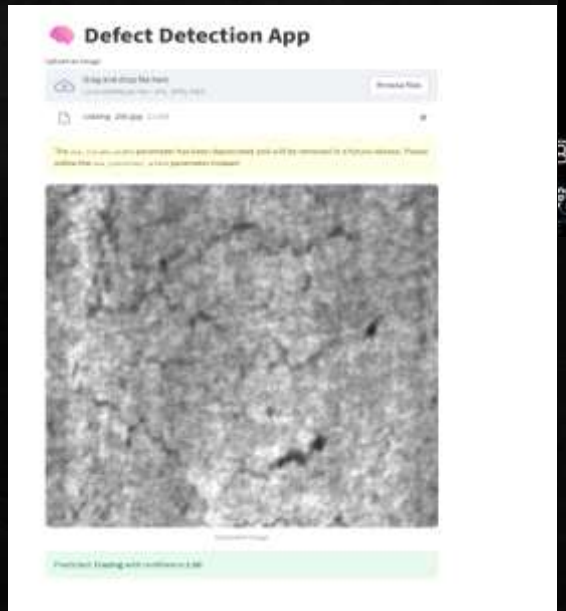
- Python, TensorFlow, Keras, NumPy, Pillow, Streamlit

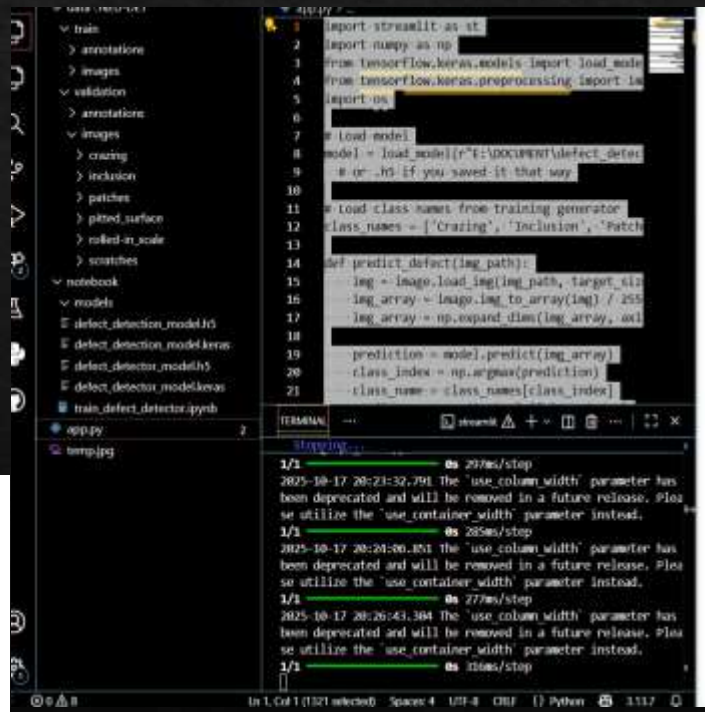
Tools:

- Jupyter Notebook, VS Code

Results & Use Cases

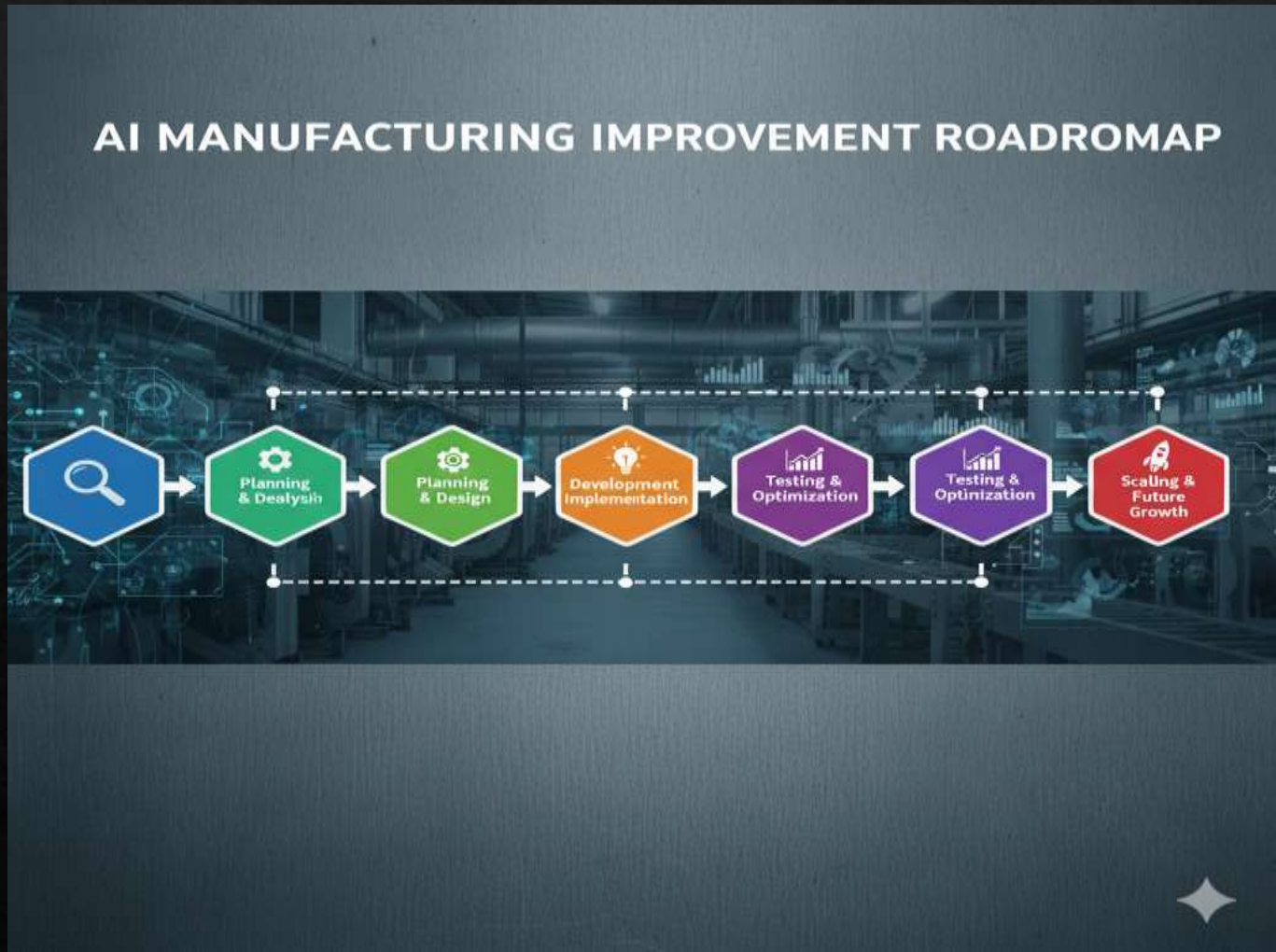
- High defect classification accuracy
- Useful for real-time industrial inspection
- Can be integrated with camera systems





Future Improvements

- Live camera input
- Cross-material defect detection
- Cloud deployment
- Feedback-based model retraining



Thank you