Optical Character Recognition Technology for the Automation of Production Documentation

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Presenters Bio

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Agenda

- Problem Statement – Objective
- Introduction to OCR
- Introduction to AI/ ML
- Approach
- Technical Review
  - Architecture Overview
  - Process Overview
- Q & A

Problem Statement – Objective

- Unique part labels are tracked and documented within the Manufacturing Execution System (MES) from raw materials to finished product.

- Required documentation includes information such as serial numbers and part numbers. Current documentation practices include manual input of data onto MES.

- Objective this year was to enhance optical character recognition (OCR) system scanner to process all parts through each cost center in the Integrated Assembly Line (IAL).

- **In-house solution will:**
  - Eliminate user error through manual entry to MES
  - Automate the process of grabbing part label attributes such as a serial number automatically
  - Increase traceability and accountability
  - Increase productivity and save time for end users

Introduction to OCR

- Optical Character Recognition (OCR) is a technology that extracts data from printed or written text from an image or document.
- OCR converts the text from an image to a machine readable form that can be used for data processing.
- The system is expected to be reliable in order to adequately capture a variety of imaging conditions.
- OCR leverages preprocessing techniques such as:
  - Noise reduction/removal
  - Unwarping images/skew correction
  - Image Binarization
  - Adaptive Thresholding
  - Contrast
  - Sharpness
  - Blurring and/or Smoothing
    - Gaussian Blur
    - Median Blur
    - Bilateral Filtering

Introduction to AI/ ML OCR

- OCR tools lack the ability to understand the extracted text beyond just extracting it, and therefore require a system to process the extracted text and derive structure types from it.

- Machine Learning (ML) is used during image preprocessing so the system can handle more intricate data input. Artificial Intelligence (AI) is used for ML OCR to diminish some of the system's limitations.

- ML OCR uses a pre-trained model, encoding rules for determining the meaning of the data extracted. In this particular project, we use feature data sets containing various types of part labels to predict if a line in the text contains a serial number.

- A trained model will be refined as more data is collected and processed into the system. This system will be scalable and applicable across different use cases.

- Integrating machine learning into our OCR system required an initial effort to gather a dataset consisting of a broad variety of images and entity recognition models.

Approach

Requirements and Software Solutions

- Identify devices being used for this application (iPads/ iPhones)
- Identify solution for OCR tool (Paddle OCR, Tesseract, etc.)
- Define minimum acceptable range for program accuracy
- Define computational power needed

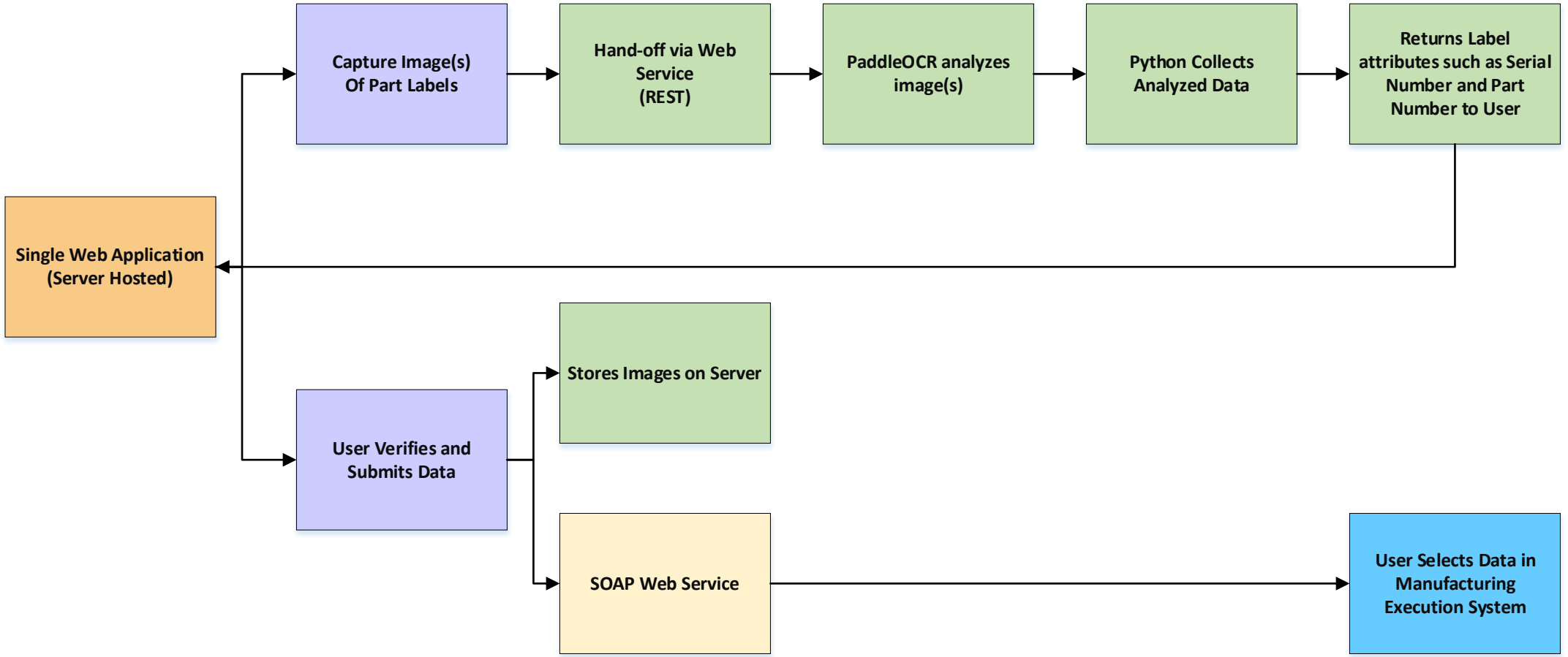
Optimization of UI/ UX

- Research mobile friendly designs for UI/ UX design
- Develop batch scan functionality for application
- Add user prompts and tool guides to enhance user experience

Optimize Machine Learning Models

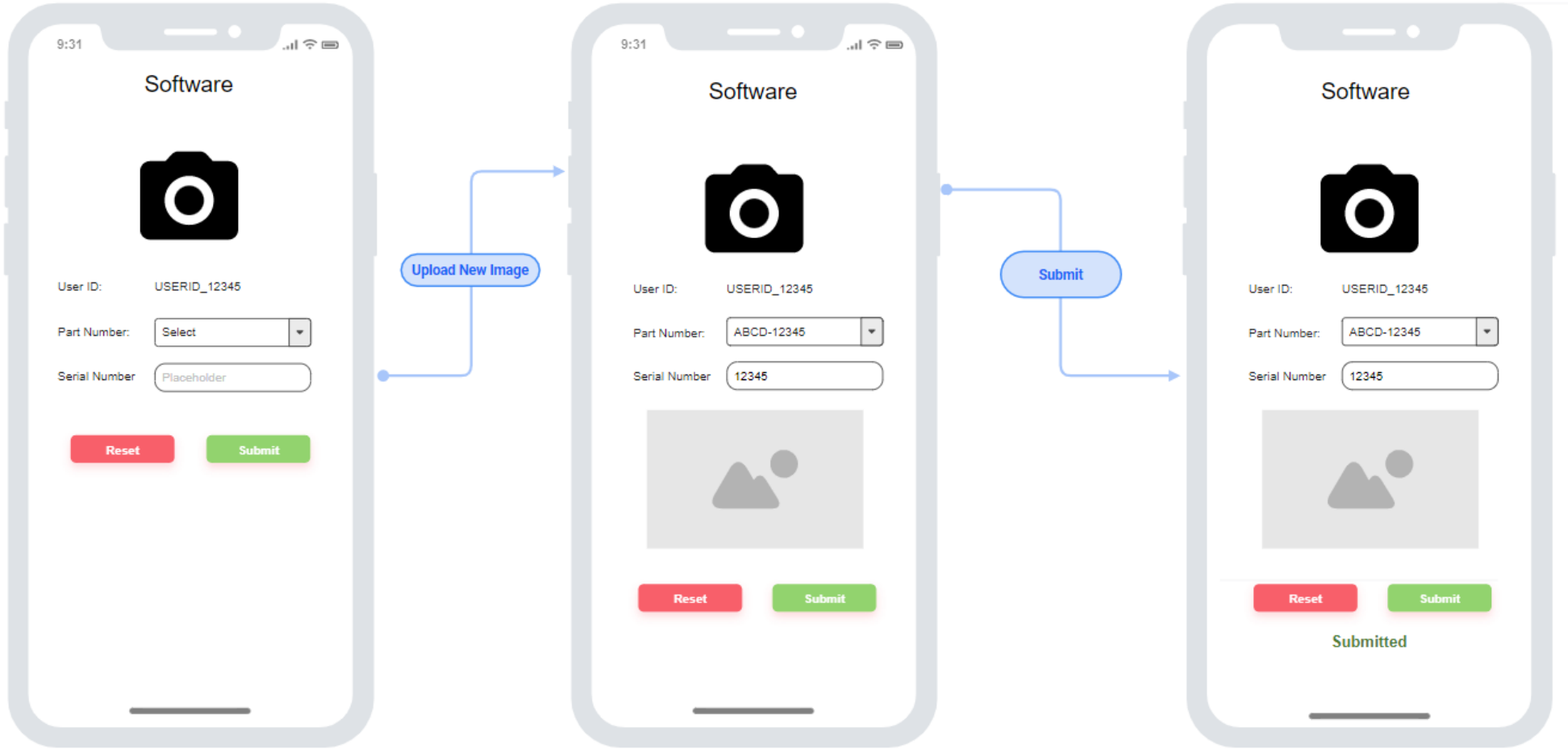
- Curate data set
- Create process for updating machine learning model and scoring
- Characterize accuracy improvement from training on new dataset

Technical Review: Architecture Overview



Technical Review: Process Overview

Mockup



THANK YOU!
QUESTIONS?