PROOF OF CONCEPT (POC)

Title: Development of automated vision based quality inspection system to detect faulty casting.

Background:

A friend from Pune based manufacturing company facing problem which is discussed below.

Problem Statement:

A Pune based company producing different aluminum casting part required for vehicle engine assembly. After casting and machining operation the parts are going through powder coating operation then baking operation. The company is facing rejection issue due to improper powder coating on casting part. This is computer vision project and can be solved using deep learning.

Objective:

Build automated quality inspection system to detect faulty powder coated casting parts & analysis dashboard.

Solution:

From AI stack, to process images we can use computer vision deep learning model with neural network architecture to perform fault detection & classification approach to separate the part from assembly line. Using Python programming language and frameworks such as Numpy, Pandas, Scikit-learn, TensorFlow, Keras, to build the whole model.

Technology:

Frontend	HTML/CSS
Backend	Python
Database	MongoDB
Framework	Flask
Deployment	AWS

Steps:

Step 1:

- Perform understanding of problem & constraints
- Requirement gathering for model training & testing

Step 2:

- Development of frontend using HTML/CSS for interaction
- Development of backend ie deep learning model
- Integration of frontend with backend

Step 3:

- Dashboard creation for statistical & graphical analysis of detection.

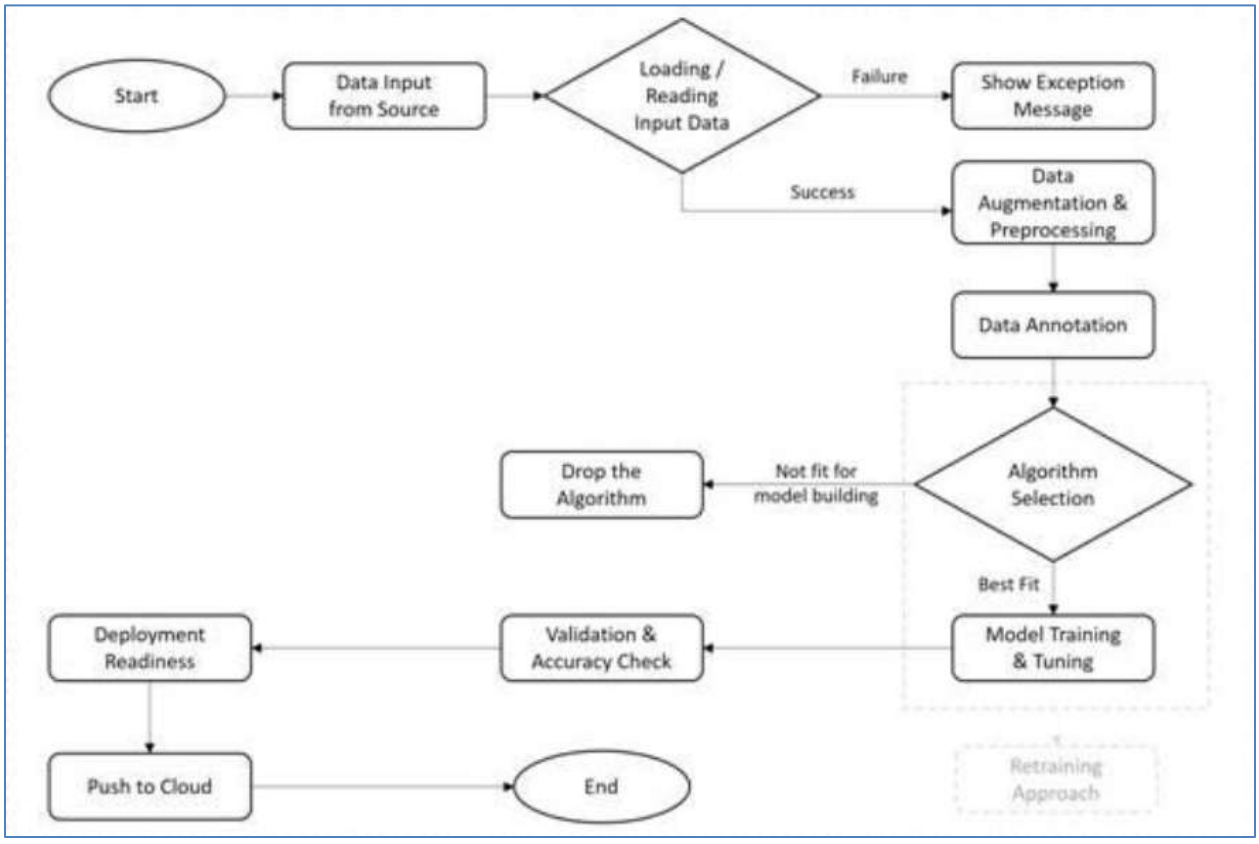
Step 4:

- Development of test cases
- Testing with sample images

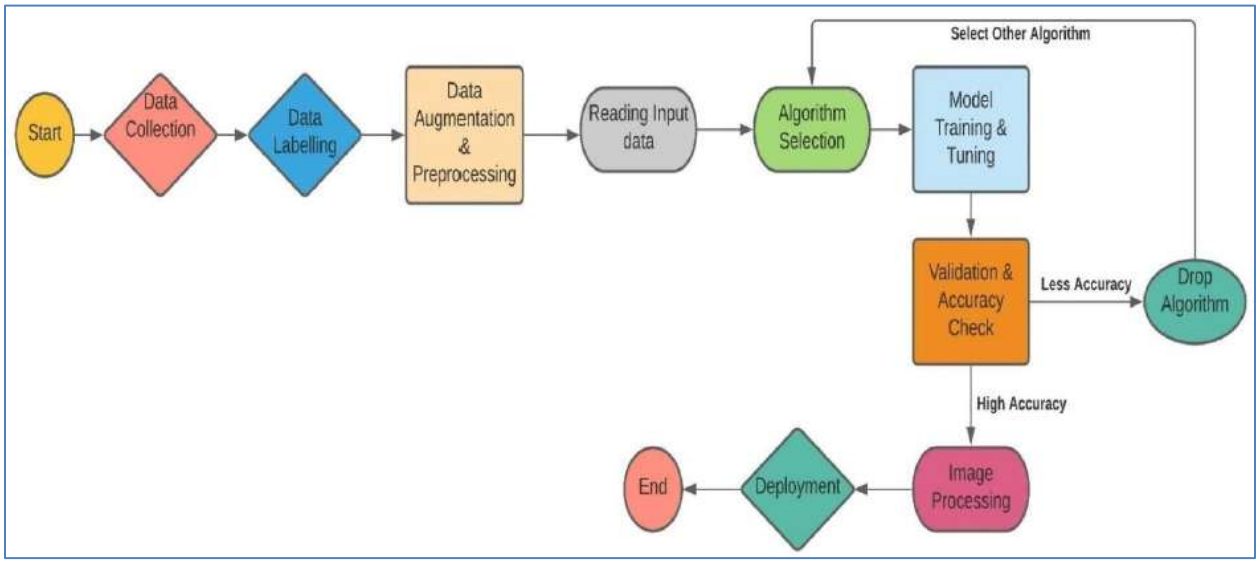
Step 5:

- Deployment to cloud platform if required

Model training/validation workflow:



Probable Functional Architecture:



Architecture Explanation:-

1. Data Collection - It is the process of collecting images from multiple sources like through camera, Google's Open image dataset, Kaggle, Shutterstock.

2. Data Labelling - It is the process of annotating the objects present in the image so we can train our model accordingly.

3. Data Augmentation & Pre-processing - It is the process of applying some augmentation and pre-processing techniques like rotation, cropping, saturation and others which makes the images more generalized and provide more variations in images.

4. Model Training and Tuning – It is the process of training input images on different object detection algorithms and tuning the parameters of algorithm for getting better result.

5. Validation & Accuracy Check – In this process accuracy of the model obtained is checked and validated on validation images.

6. Image Processing – In this process after getting high accuracy on validation images, image processing is applied on images and videos for using it in different use cases.

7. Deployment – Deployment of the model means integration of model into production environment which will take input and provide us output that can be used in real-time scenarios.