# Automated Product Quality Inspection

Submitted by

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# Agenda

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2. Current pain areas
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4. Drawback: Conventional Approach
5. Our Approach
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# Introduction

- Even in this machine era, manual inspection of products (products like sea food, grains, products at end of line etc.) in processing industries is widely practiced
- Large variance in appearance within a class and small inter class variance make the automation of visual quality inspection complex, thereby demanding manual inspection
- Some of the consequences that the industries face in case of compromised quality inspection are :
    - Negative impact on the brand value which leads to loss of business
    - Incur high costs in case of product recall which are delivered to market

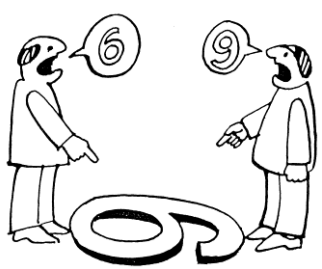
# Current Pain Areas

Replacing a skilled inspector has implications on the cost and quality of inspection

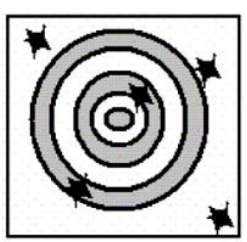
Huge effort & time involved during manual inspection

Current pain areas

Accuracy and repeatability of manual inspection is very less due to fatigue and boredom



Manual quality inspection of products is subjective in nature



# Conventional Approach

- For automation of quality inspection, manual analysis of the subject to be inspected will be performed to understand what are the key features that need to be extracted - colour, texture, frequency etc.,- for efficient representation of characteristics of the subject
- The selected features must represent information that is key for solving the business case
- The selected features should not have high correlation
- Once the features are finalized, suitable pre-configured thresholds are applied on the extracted features for making decision on the quality
- In some approaches a Machine Learning (ML) classifier/model will be trained on the features extracted from the labelled training dataset

# Drawback: Conventional Approach

- For a complex inspection task, selection of suitable features is an exhaustive process which may take up weeks or months of design and development effort
- Resulting features will be in the order of hundreds, making it virtually impossible to have pre-configured thresholds
- For a new Inspection requirement feature extraction process may require rework

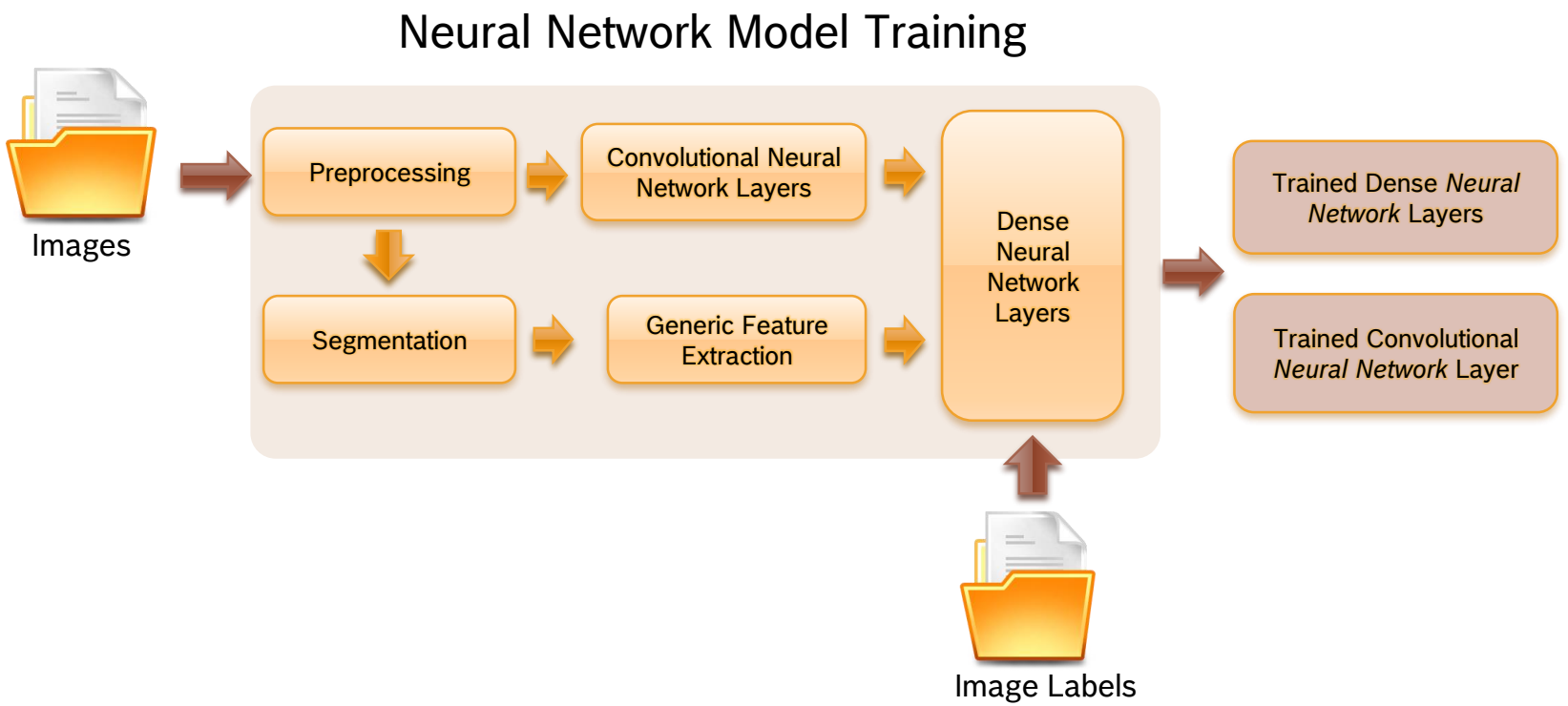
# Our Approach

- To overcome the drawbacks of conventional approach Neural Network based Machine Learning is well suited
- State of the art, Convolutional Neural Networks (CNNs) are a special form of neural networks designed to exploit local correlation present in data such as images, speech data, sensors data or any time series data
- The task of feature extraction can be automated in CNNs with multiple hidden convolutional layers. In other words, CNNs can be trained on raw data without any feature extraction
- Rich feature extraction is performed by the neurons in the hidden convolutional layers of CNN
- Convolutional neural networks with large number of neurons/parameters can learn/model complex functions

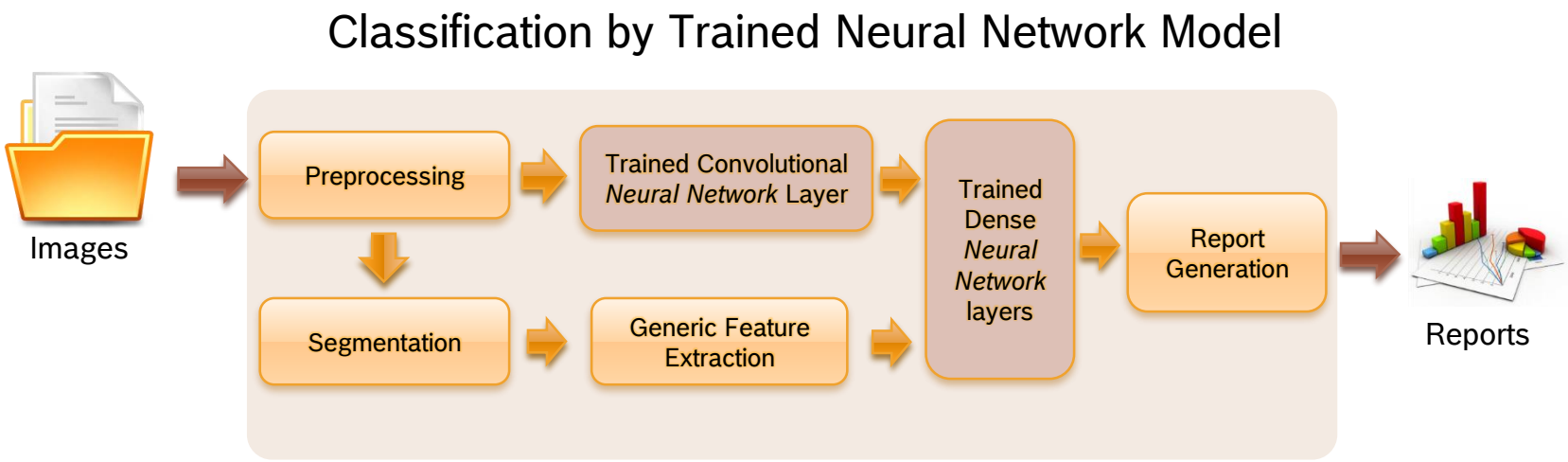
# Our Approach[contd…]

- As the defect can vary in appearance, we employ convolutional layer for surface analysis
- For extraction of dimensional data we segment the object and extract the features like length, width, etc
- With deep architectures and sufficient amount of training data CNNs generalize well for the given application; resulting in increased accuracy for unseen samples

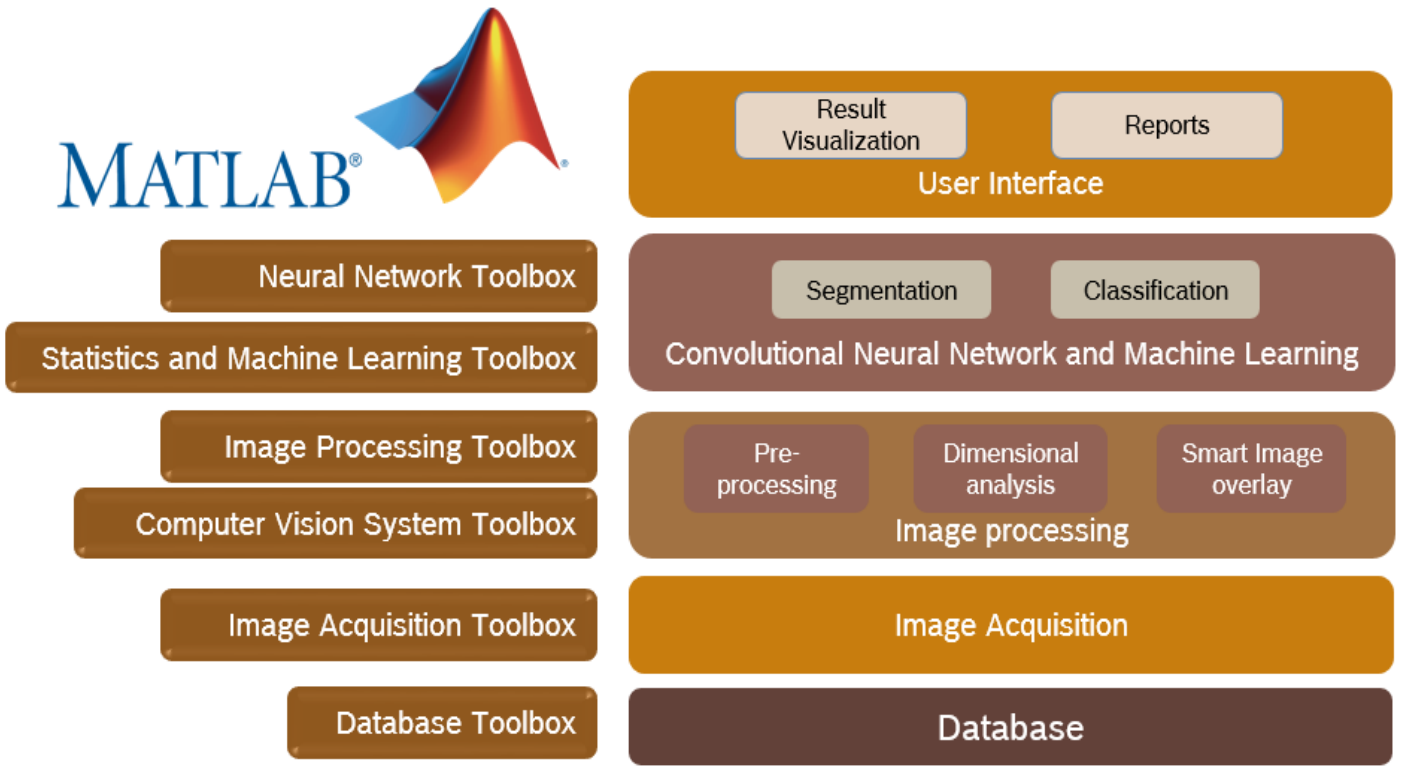
# Proposed solution



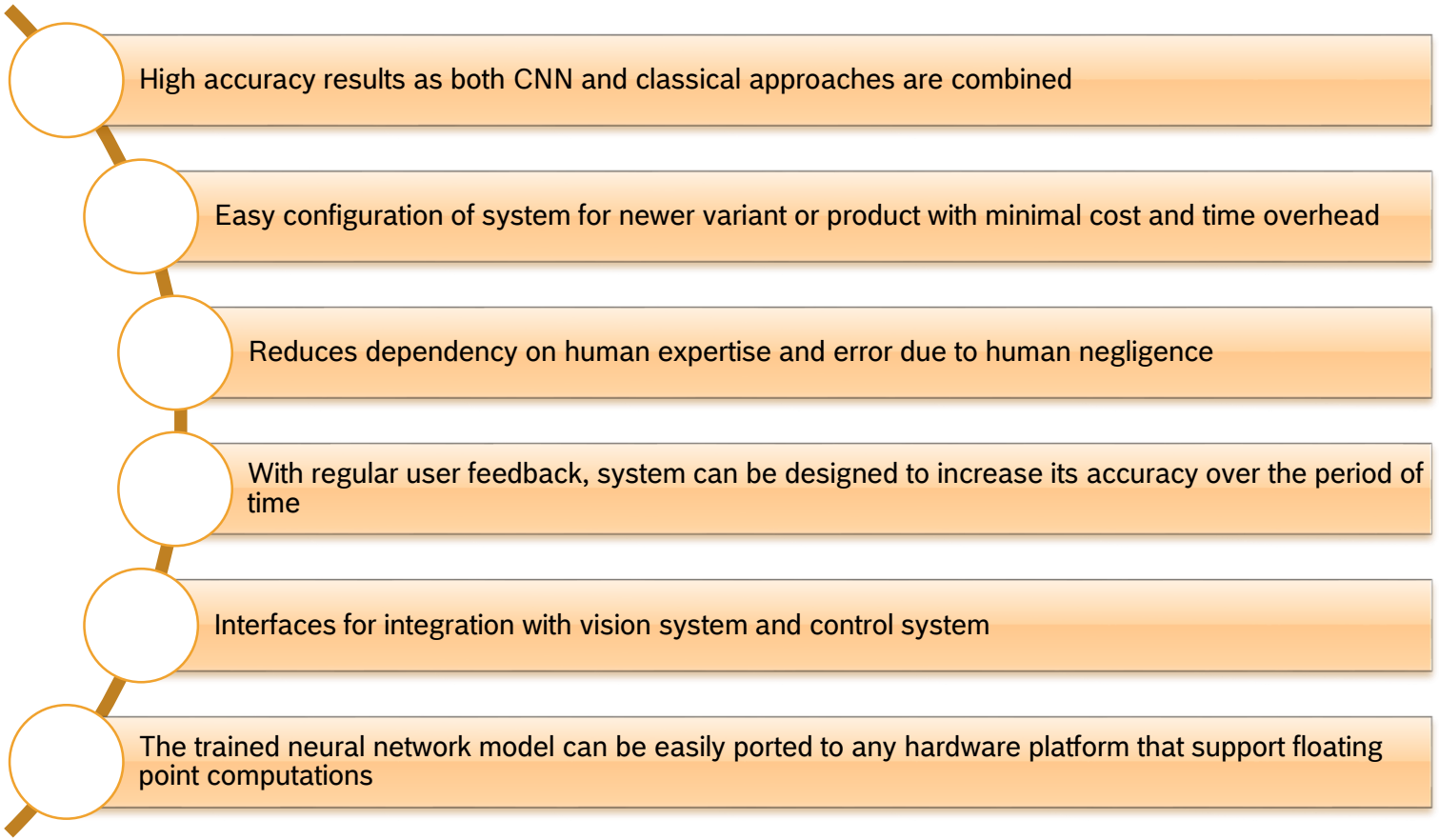
# Proposed solution[contd..]



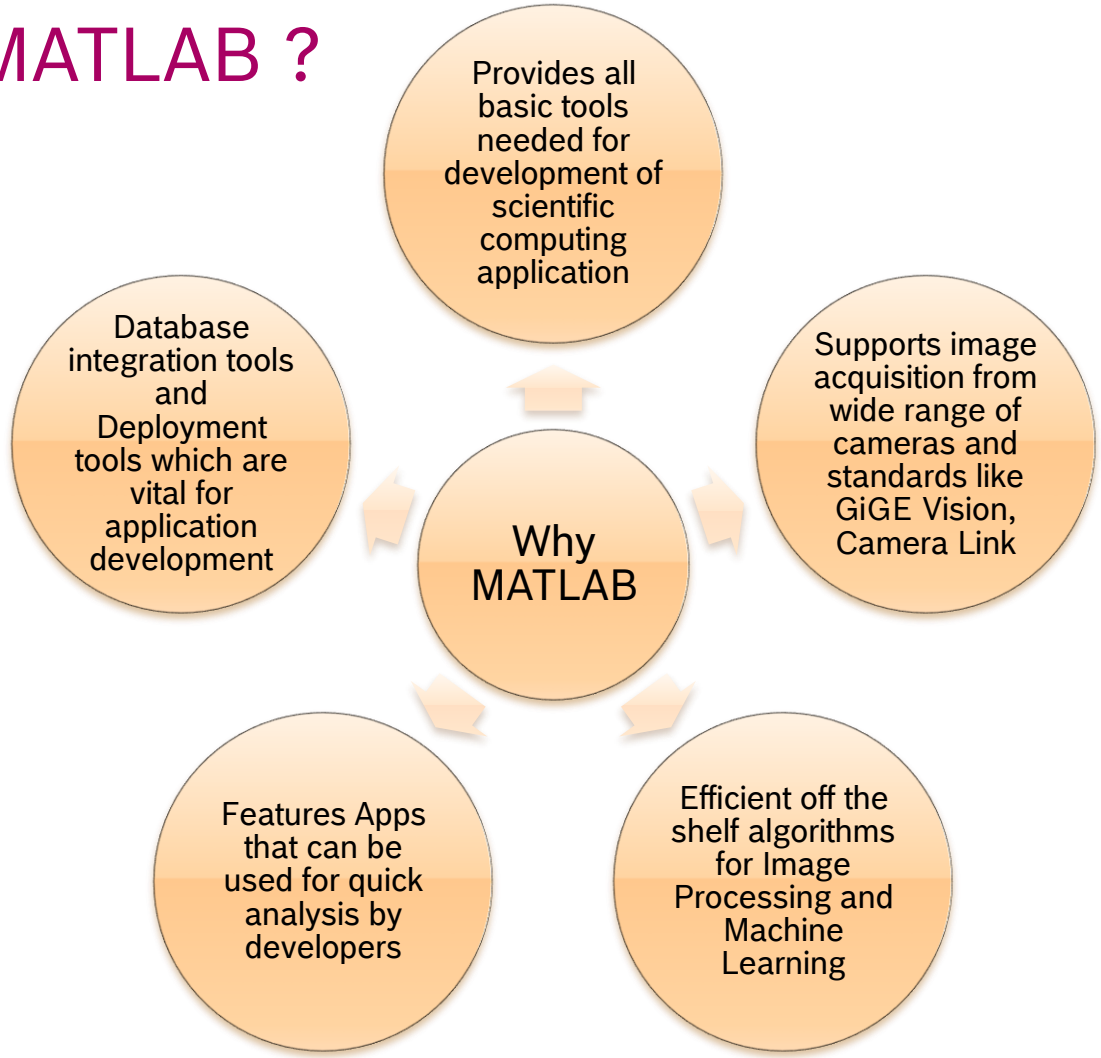
# Application architecture and technology stack



# Key features & Benefits



# Why MATLAB ?

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