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Vehicle Damage Detection

The ML Way

Introduction

Problem Statement

- Claims Leakage
- Visual Inspection
  - Delays in Claims Processing
  - Manual Intervention

Idea

- Automated System for Car Damage Assessment
  - Deep Learning Model
- Faster Claims Processing
- Eliminate Manual Intervention

What is Artificial Intelligence

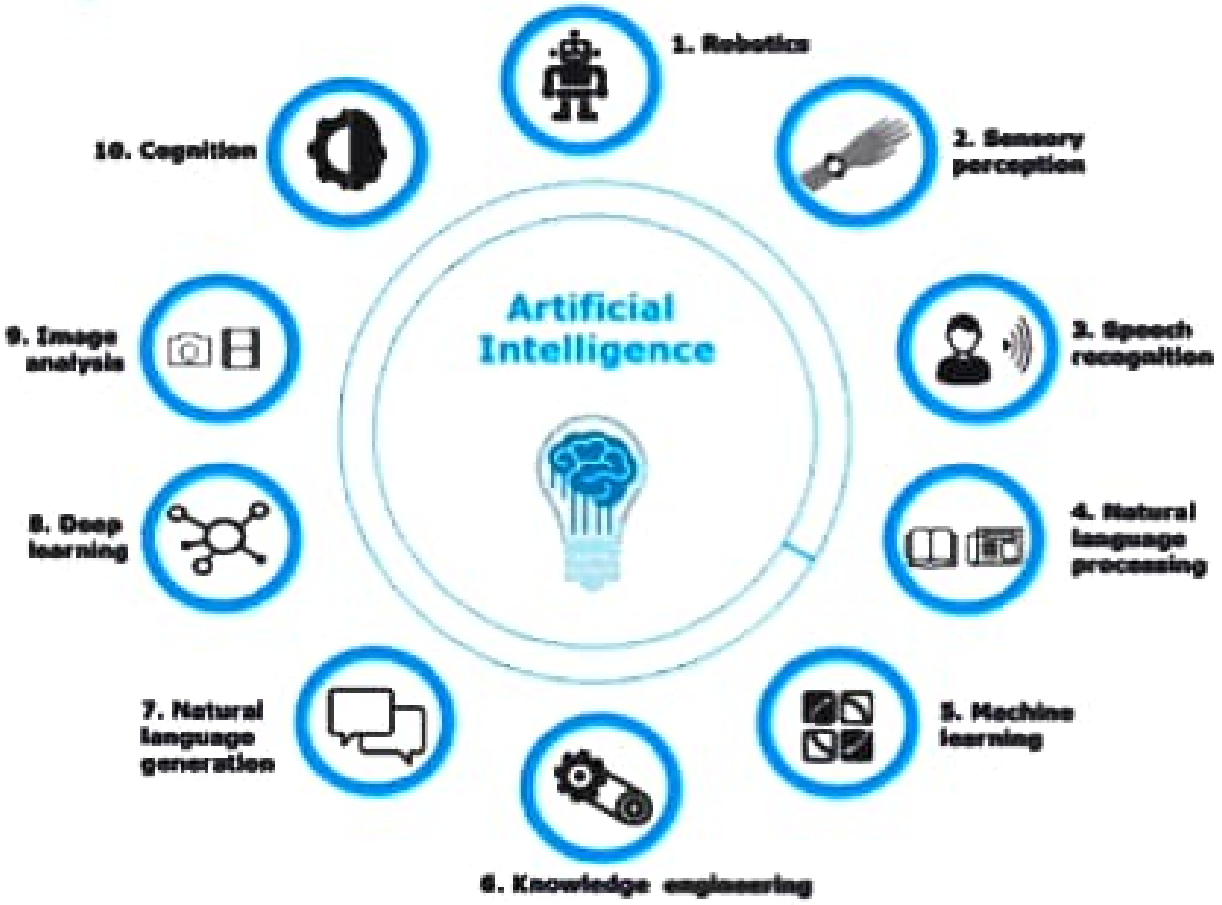
What

Artificial Intelligence
It is a way of making a computer, a computer-controlled robot, or a software think intelligently, the way intelligent humans think.

Benefits

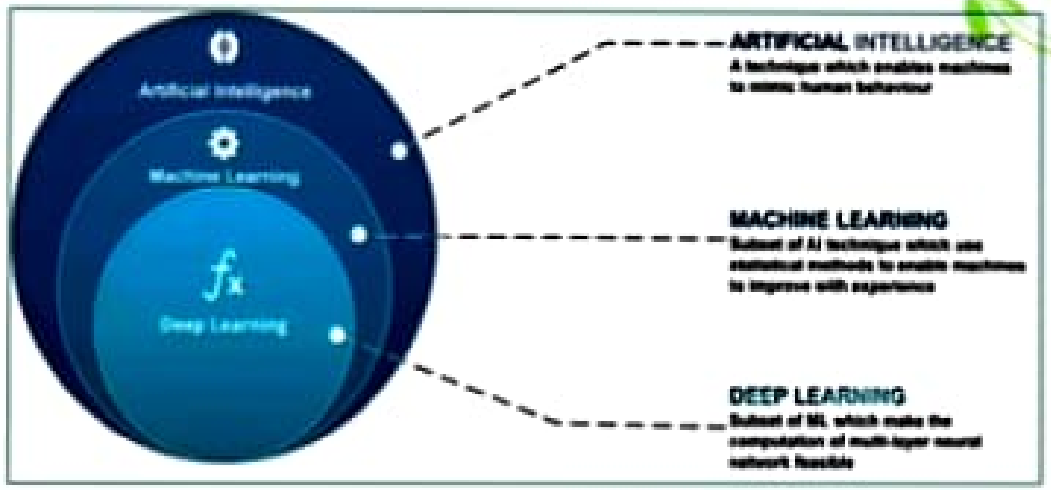
- Increase productivity and operational efficiencies
- Provide cost savings in products.

Categories



Key Terms

- Artificial Intelligence: is a technique which allows the machines to act like humans by replicating their behavior and nature.
- Machine Learning is a major field in artificial intelligence (AI) that provides systems the ability to learn to perform tasks from experience (i.e. training data) without being explicitly programmed. Machine learning focuses on the development of computer programs that can access data and use it to learn for themselves.
- Deep learning is a type of machine learning that deals with algorithms inspired by the structure and function of the human brain. Deep learning systems are similar to how our nervous system is structured, where neurons are connected to each other and pass impulse or information.



Abstract

- Replace the traditional methods of vehicle damage inspection (for car insurance) with a Machine Learning based automated solution.
- Deep Learning based models – car damage and its type/severity.
- Model is iteratively fine-tuned to achieve satisfactory accuracy scores.
- Opens doors for future collaborations on
  - Image recognition projects
  - Car insurance field - assess customer vehicle damage
  - Expedite claims settlement.

Solution Architecture

WHAT IS HAPPENING NOW?

- Claims Leakage
- Visual Inspection
  - Delays in Claims Processing
  - Manual Intervention

WHAT SHOULD WE DO?

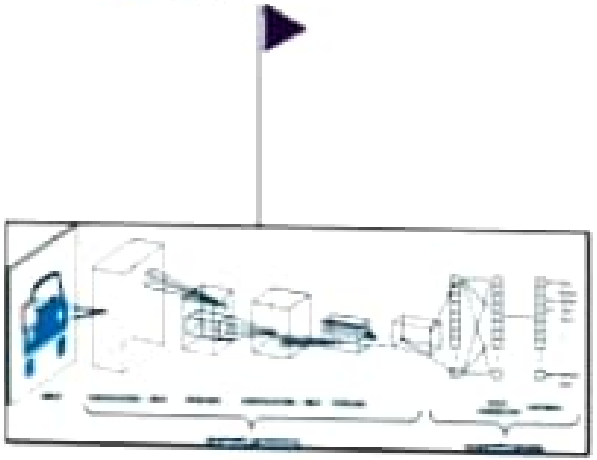
- Eliminate Manual Intervention
- Faster Claims Processing

WHAT IS GOING TO HAPPEN?

- Automated System for Car Damage Assessment
  - Deep Learning Model
- Fair Assessment of the Car Damage Replacement

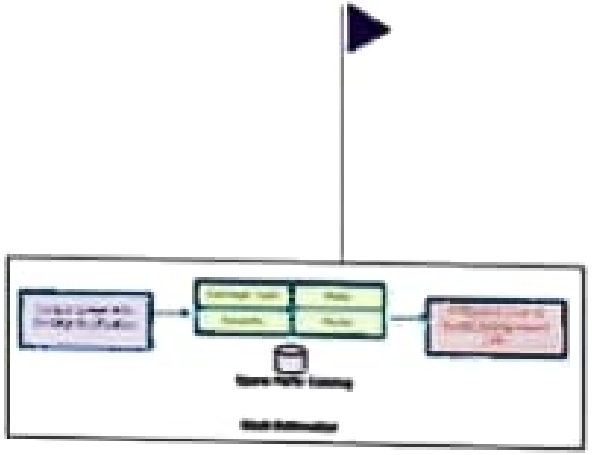
Convolutional Neural Network

- Deep Learning Model
- Classifies image
  - Damage Type
  - Severity

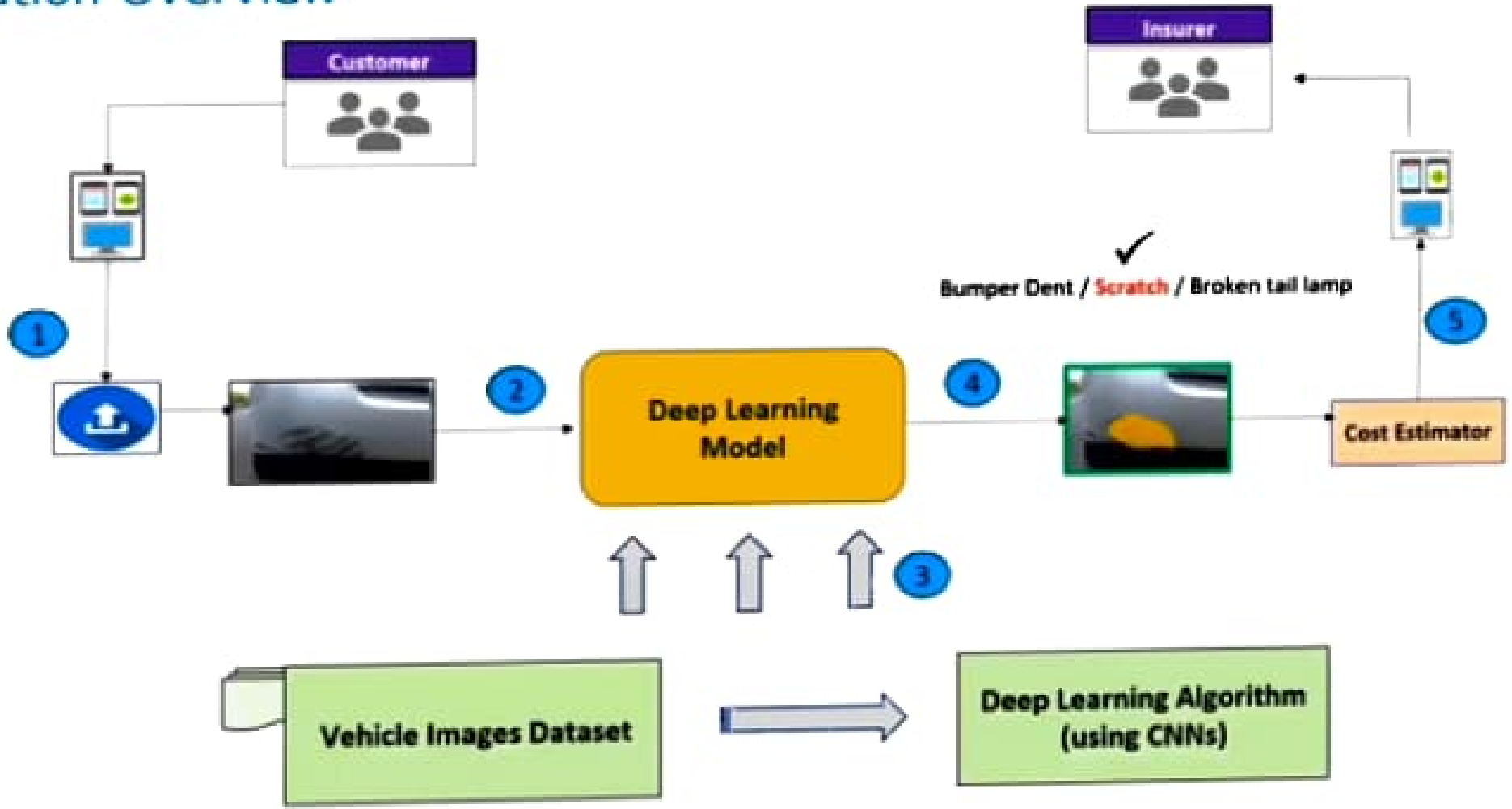


Cost Estimator

- Fair Assessment of the Car Part Service/ Replacement



Solution Overview



Solution Overview

1. Customer uploads the damaged vehicle image

2. AI/deep learning-based model classifies damage as one or more of the following types :
   - Bumper dent
   - Glass shatter
   - Broken head lamp
   - Miscellaneous scratch
   - Smash

3. The deep learning model is built on
   - Convolutional Neural Networks
   - A training dataset

4. Analyzes the input images from step 2 and labels the damage.

5. Cost Estimator provides a fair estimate of the damage - based on the damage type and severity (to be paid by the insurance company)

Solution Details

The solution comprises of two main components:

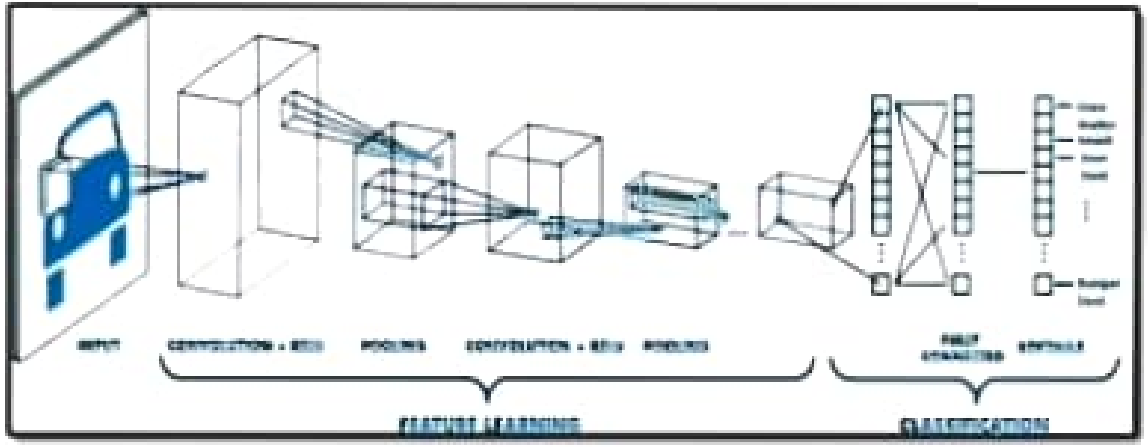
- Deep learning model
- Cost Estimator

Building the Dataset

The critical step in building any Deep learning model is the input data. It consists of thousands of labelled images that comprise of primarily three datasets:

- **Images without cars**: Dataset of different image categories, other than cars, by collecting sample images from the web.
- **Images with undamaged cars**: This consists of building a large dataset of different car models.
- **Images with damaged cars (and types of damages)**: This dataset consists of images of cars damaged with different types and severities. The final output of this step is a labelled collection of images of damaged cars as:
  - **Type**: Dent, Glass, Hail, Scratch
  - **Location**: Front, Rear, Side, Top
  - **Severity**: High, Medium, Low

Deep Learning Model



Sample Output

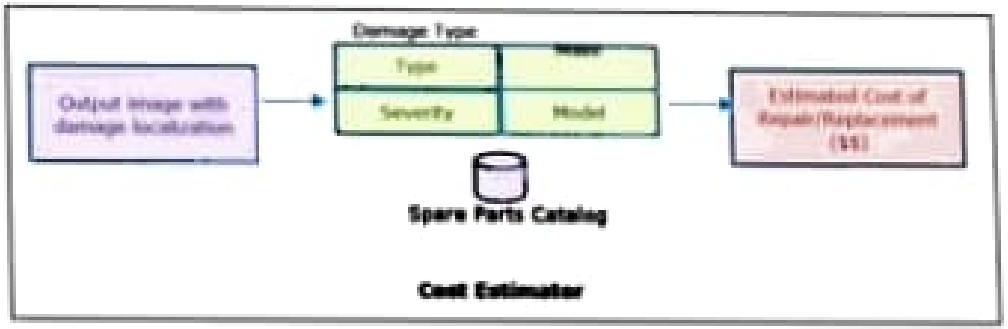
Once our Deep Learning model is trained, built, tested and deployed, it is ready to be "applied" on the input image(s) uploaded by the user.

With the deep learning model in action, we can classify or map the damage to specific body parts of the car, and even localize it.

A sample output of this step would be

- Damaged Part(s) identified,
- Scale of damage (whether requires Repair or Replacement) for each damaged part

Cost Estimator



The output of Deep Learning model can then be passed to a cost estimator (API).
The cost estimator API is a service that connects to the Vehicle parts inventory database, and queries the Spare Parts and Services Catalogues (db/nosql tables) of different make and model to return a total cost estimate for the parts to be serviced/repaired or replaced.

BENEFITS

- Fair **Assessment**
  for quantification or calculation of damage to a vehicle.

- Saving **Time**
  in claims processing from (~2 to 3 weeks) to ~(1-2 hours)

- Saving **cost**
  Eliminate manual intervention (in majority scenarios) to inspect the vehicles and validate the damages

- Better Customer Experience - Simplified Process

Conclusion

- An automated system - developed/proposed for quantification or calculation of damage to a vehicle.
- Enables insurers to provide instant disbursal of insurance money related to vehicle damage/repairs,
- Acts as a key differentiator for a potential buyer for selecting an insurance provider.