Vehicle Make and Model Recognition System

A Presentation by

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Abstract

- Vehicle monitoring and identification is an important part in area of traffic control and monitoring.
- We need large databases and domain specific features with machine learning.
- In this proposed system we used CNN with transfer learning on relatively small database.

Problem Statement

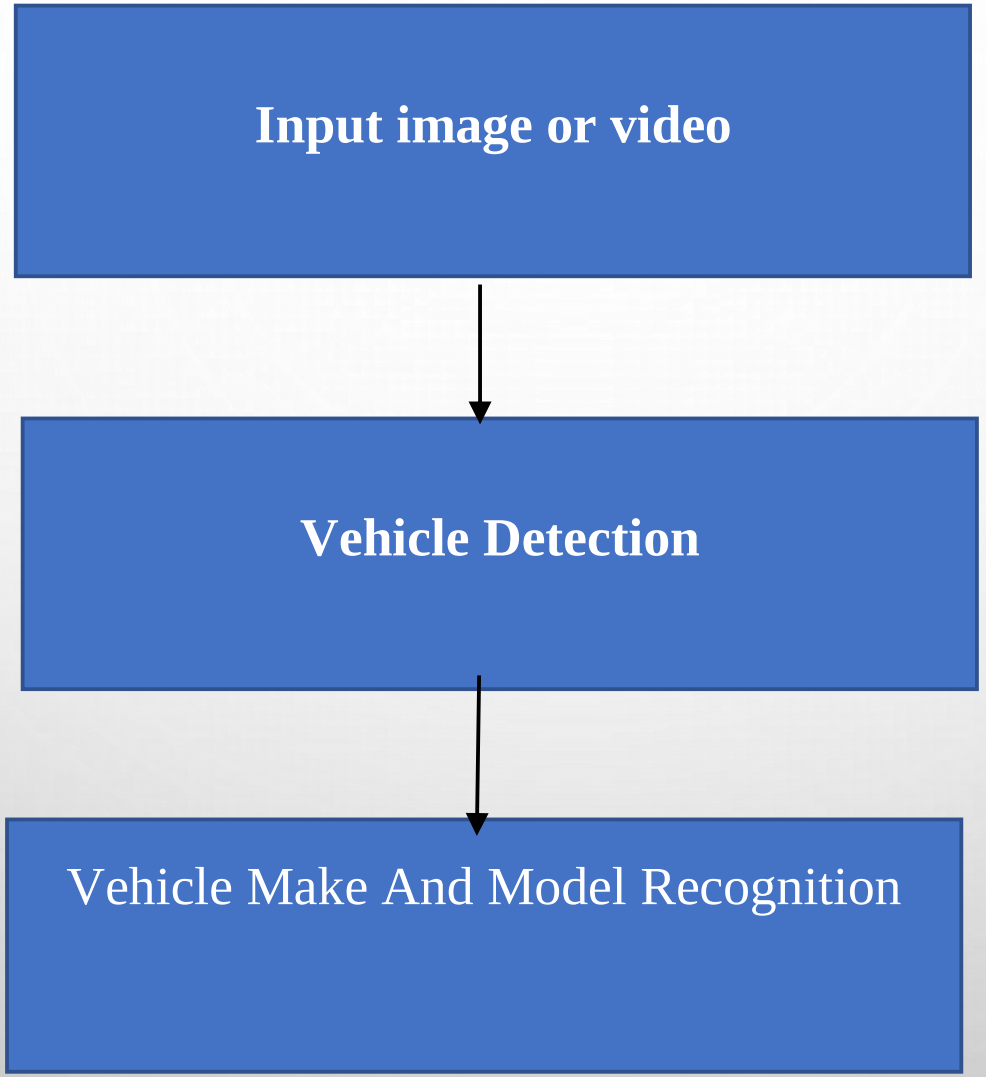
The main goal of this project is to predict the make and model of a vehicle with the help of models made from convolution neural networks with the help of transfer learning.

Existing Models

- Automatic Number Plate Recognition
- Works using Machine learning feature Extractors.

Proposed System

To use CNN with transfer learning to attain a high accuracy with small dataset.


Input image or video
Vehicle Detection
Vehicle Make And Model Recognition

Dataset

- We gathered dataset based on most stolen cars in India
- Hyundai Creta (98)
- Hyundai Santro(100)
- Hyundai Venue(92)
- Kia Seltos(97)
- Mahindra Bolero(82)
- Mahindra Scorpio(85)
- Maruti Suziki Vitara Brezza(94)
- MG Hector(79)
- With variances ¾,Front,Back,Side views

Reasons for Deep Learning

- Very helpful in solving problems such includes computer vision, speech recognition etc.
- With is we can avoid ‘reverse engineering’ required by traditional ML algorithms.
- Neural networks adjust and adapt to every new piece of data.

Pre-process the dataset

- Fetch and visually inspect a dataset
- Image Pre-processing
  - Address Imbalanced Dataset Problem
  - dataset into training, validation and testing groups
  - Augment training data
    - Limit overlap between training and testing data
    - Sufficient testing and validation datasets

Pre-processing & Augmentation

PREPROCESSING

- **Removes inconsistencies and incompleteness in the raw data and cleans it up for model consumption**
- **Techniques:**
  - Black background
  - Rescaling, gray scaling
  - Sample wise centering, standard normalization
  - Feature wise centering, standard normalization
  - RGB → BGR

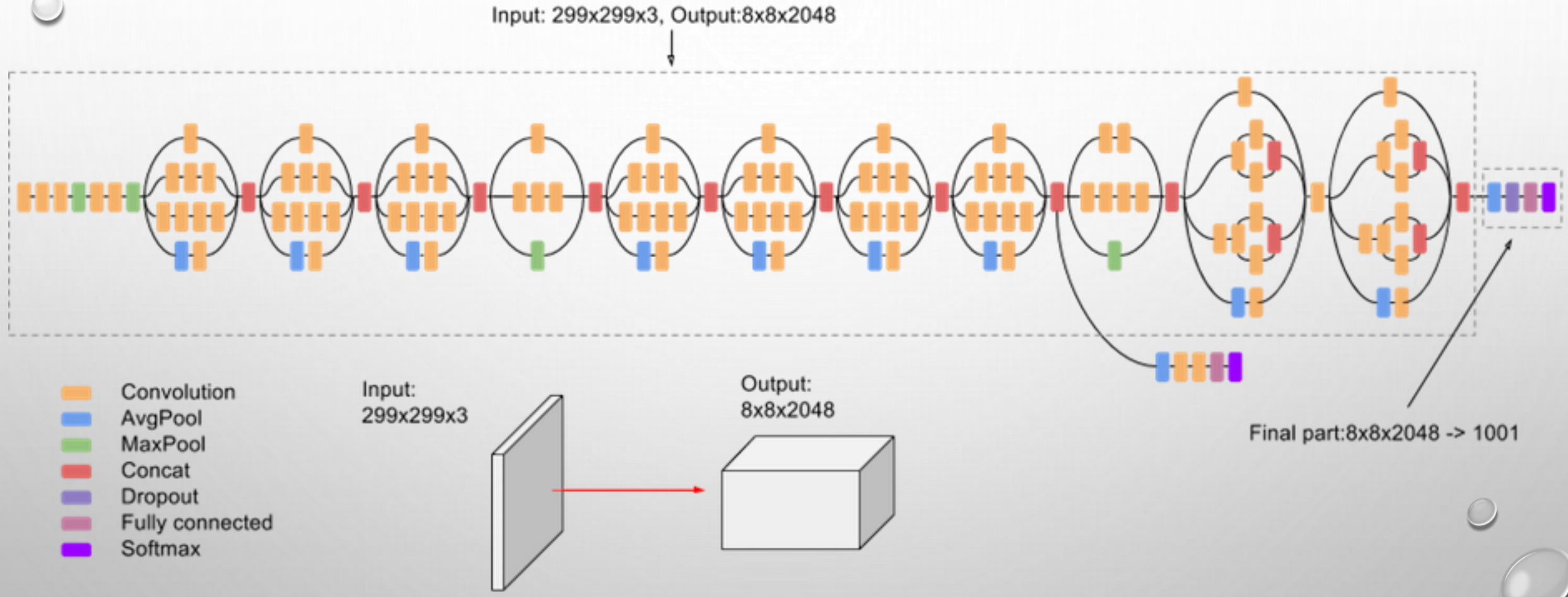
DATA AUGMENTATION

- **Improves the quantity and quality of the dataset**
- **Helpful when dataset is small or some classes have less data than others**
- **Techniques:**
  - Rotation
  - Horizontal & Vertical Shift, Flip
  - Zooming & Shearing

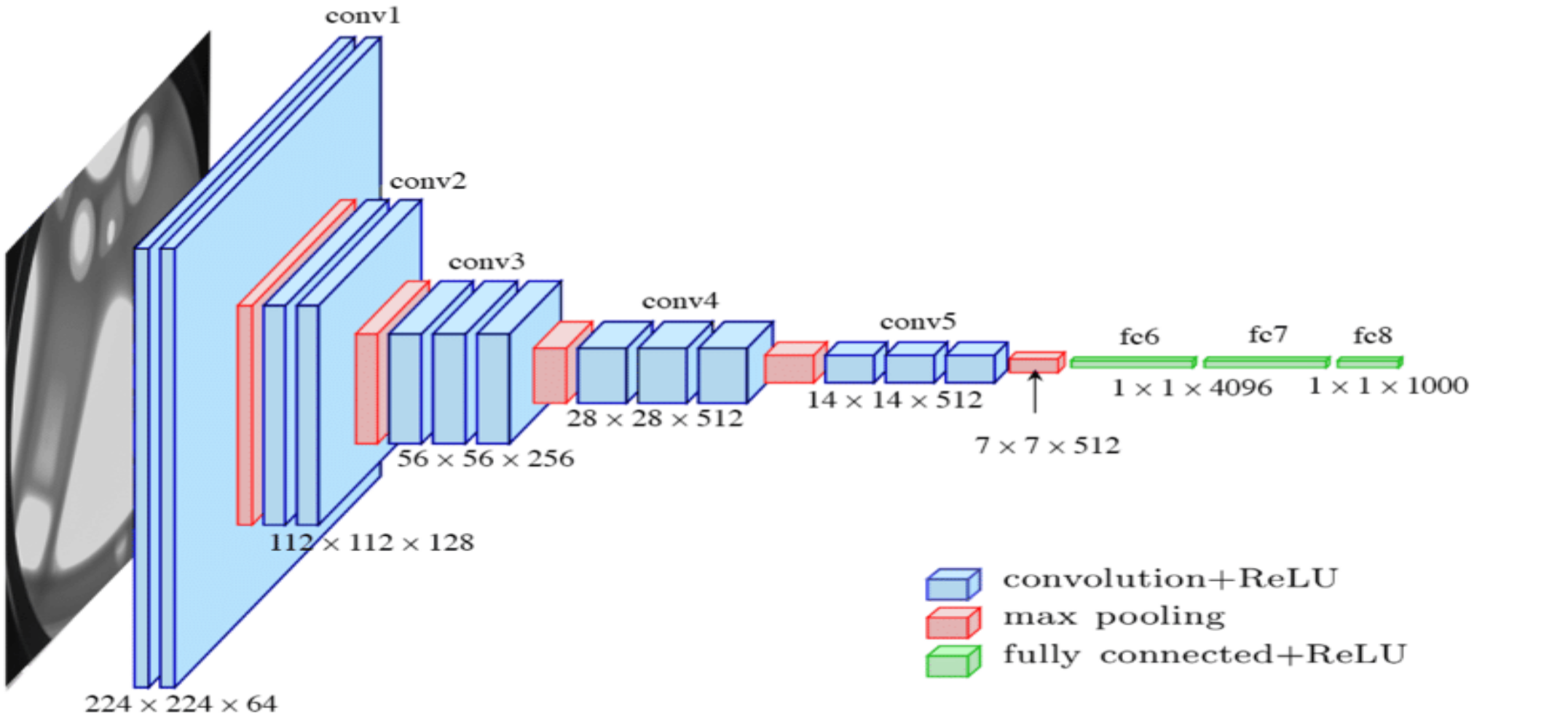
Training

Framework : TensorFlow
Networks : Inception v3 and VGG16

Inception v3



VGG16


conv1
conv2
conv3
conv4
conv5
fc6
fc7
fc8
224 × 224 × 64
112 × 112 × 128
56 × 56 × 256
28 × 28 × 512
14 × 14 × 512
7 × 7 × 512
1 × 1 × 4096
1 × 1 × 1000
convolution+ReLU
max pooling
fully connected+ReLU

Model Evaluation and Results

MODEL	ACCURACY	SIZE
Inception-V3	82%	118 MB
VGG-16	88%	312 MB

Conclusion

- Based on our requirements the choice of topology and framework will differ.
- In addition to work with small image dataset there is still more room for progress

Thank You