Image Classification

# Overview and Application

## Model Introduction

Image classification is the process of using computers to classify objects in images or provide a probability of what the object could be. A class is essentially a label ie. cat, dog, car, building.

## Use Cases

Image Classifiation is used for things such as social media facial detection, identification of substances in rock samples for oil mining, identification of anomalies in xrays in radiology.

## When and Why to use

# Mathematical Foundations

## Theory

## Algorithms

## Probabilistic Framework

# Model Architecture and Components

## Model Structure

## Parameters and Hyperparameters

# Assumptions and Limitations

## Assumptions of the Data and Problem

## Understanding Limitations and Pitfalls

Change in viewport

Change of illumination

Deformation

Occlusion

Background noise and clutter

# Model Building and Training

## Data Preparation

Normally an image is represented as a series of 3 matrices of mn dimensions, RGB, representeing the intensity value for each pixel and each colour.

## Training Techniques

# Model Evaluation

## Evaluation Metrics

## Validation Techniques

# Model Diagnostics and Refinement

## Overfitting vs. Underfitting

## Interpretability

# Advanced Topics and Extensions

## Ensemble Methods

## Transfer Learning

## Regularization

# Ethical Considerations

## Bias and Fairness

## Transparency and Accountability

# Continuous Learning

## Research

## Community