OBJECT RECOGNITION USING CNN

INTRODUCTION

- Impact of AI/ML on Industry

a) Manufacturing : AI/ML will provide more productive results with fewer errors and higher quality.

b) Healthcare : Computer vision promises to pinpoint the diseases over X-rays; Natural language processing (NLP) promises in drug safety.

c) Retail : Retailers are expected to adopt the augmented and virtual reality functionality in their advertising.

- What is Object Classification & Its Significance

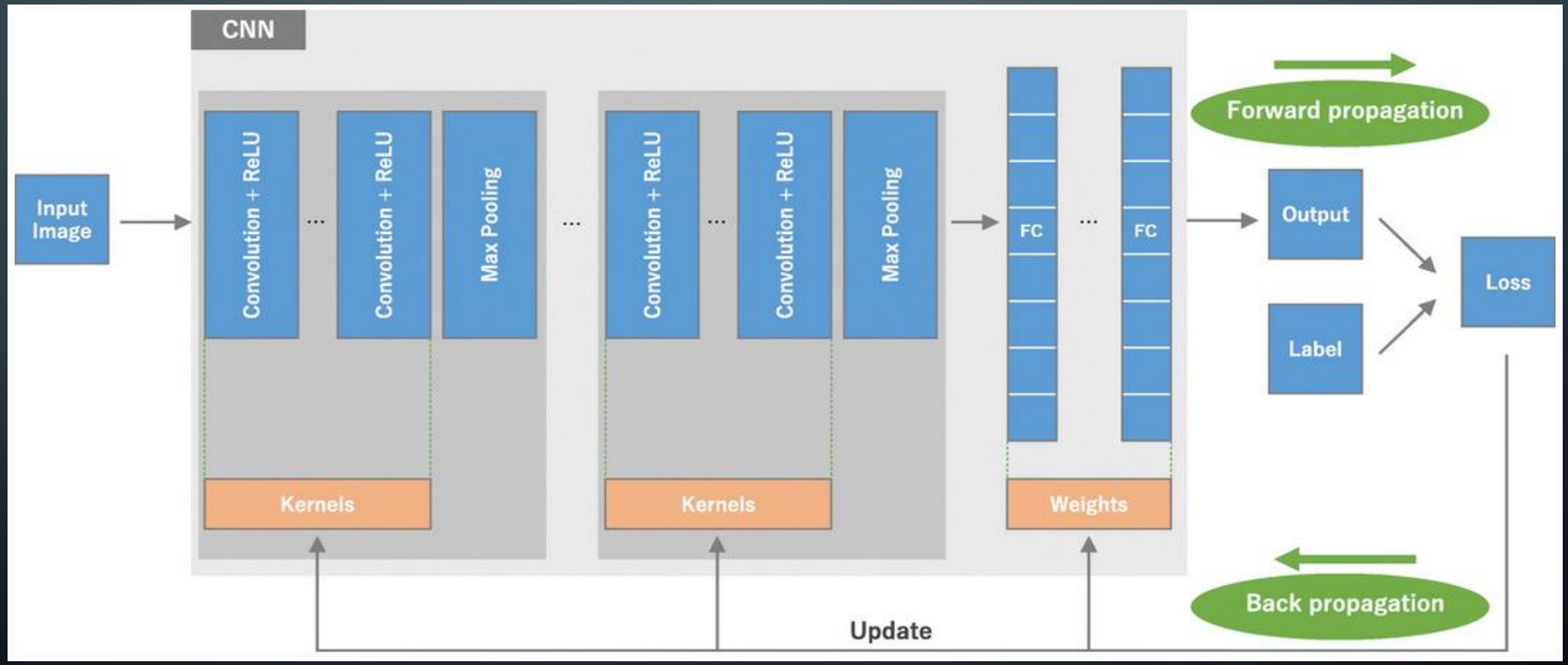
  - It is the task of classifying objects from different object categories.
  - An object classification algorithm takes images as input and output what objects it contains.
  - In Image Processing , Image classification refers to the labelling of images into one of a number of predefined categories.

PROBLEM STATEMENT

- Problem faced during object Recognition using Traditional Methods.
  - Dual priorities: object classification and localization
  - Speed for real-time detection
  - Limited data
- Why CNN is used for Image Classification ?
  - Because of its high accuracy.
  - Able to learn relevant features from an image /video .

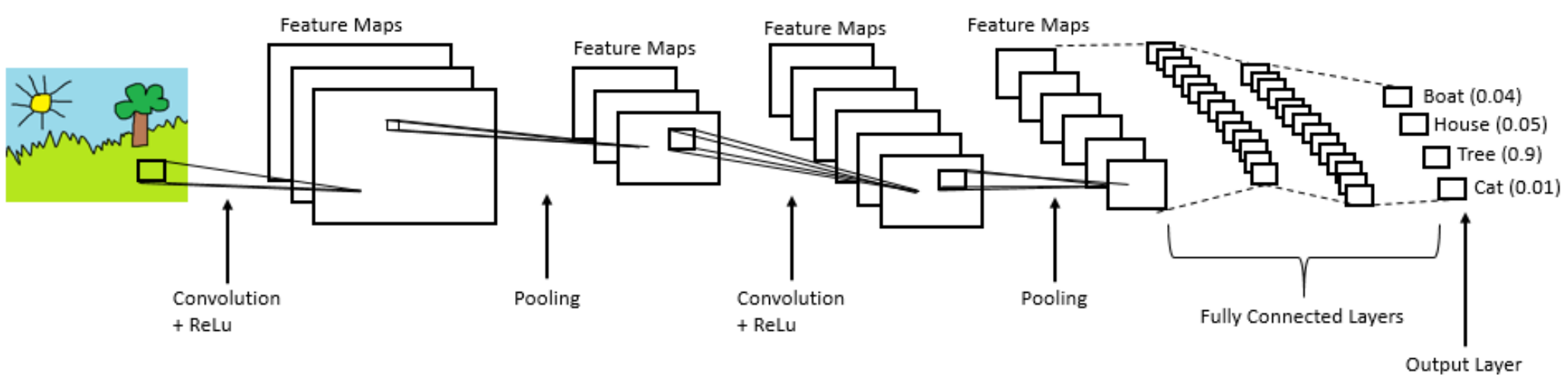
- Why Caltech 101 is used as Dataset ?
  - Pictures of objects belonging to 101 categories.
  - About 40 to 800 images per category.
  - Uniform size and presentation
  - Low level of clutter/occlusion
  - Detailed annotations

ARCHITECTURAL FLOW



CNN (CONVOLUTIONAL NEURAL NETWORK)

- Is a Deep Learning algorithm.
- Take in an input image, assign importance to various objects.
- IT is able to differentiate one from the other.



TECHNOLOGY USED

1. TensorFlow
    - It is an open source AI library, using data flow graphs to build model
    - Used for: Classification, Perception, Understanding, Discovering, Prediction and Creation.
2. Keras
    - Keras follows best practices for reducing cognitive load.
    - It offers consistent & simple APIs,
    - It provides clear and actionable feedback upon user error

3. OpenCV
    - It is library used for Image Processing.
    - Used to do all the operation related to Images.
4. Jupyter Notebook
    - Open source web application.
    - Use to create and share documents that contain live code, equations, visualizations and text.
5. Python-Tkinter
    - It is Python's de-facto standard GUI (Graphical User Interface) package.
    - Provides a powerful object-oriented interface to the Tk GUI toolkit.

OPERATIONAL CHALLENGES

- Limited Images of Particular Categories.
- Overfitting :

  Occurs when a statistical model or machine learning algorithm captures the noise of the data.

- Hyper-Parameter Tuning :

  Problem of choosing a set of optimal hyperparameters for a learning algorithm.

  A hyperparameter is a parameter whose value is used to control the learning process.

SOLUTIONS IMPLEMENTATION

- Data Augmentation for limited Images :

  It is a technique to artificially create new training data from existing training data.

- Regularization to tackle problem of Overfitting.
- Hyper- Parameter Tuning using Trial & Error.

SWOT ANALYSIS

- Strength :
  - Using image-objects as basic units reduces computational classifier load.
  - Image-objects exhibit useful features (e.g. shape, texture, context relations with other objects)
- Weakness :
  - Under the guise of ‘flexibility’ provides overly complicated options.
  - There are numerous challenges involved in processing very large datasets.

❖ Opportunities :

- Concepts and methods have been successfully applied to many different problems.
- There are new IT tools (e.g. wikis) that may accelerate consensus and cohesion.
- Methods may build upon to tackle problems related to the analysis of large datasets.

❖ Threats :

- Trying to make distinct from other concepts and Methods.
- The visual appeal of image-objects