DEEP LEARNING-BASED OBJECT DETECTION IN LOW-LIGHTING CONDITIONS SYSTEM

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OBJECTIVES

- Introduction
- Literature survey
- Comparison with existing idea and Proposed idea
- Proposed system model
- Design diagram hardware & Software
- Flowchart
- Algorithm
- Results
- Discussion
- Reference

INTRODUCTION

- Low light image enhancement is an important and challenging task in computer vision which aims to improve the visibility and restore corruptions hidden in the image.
- Low lighting conditions issues challenge not only human visual perception but also other vision tasks like nighttime object detection.
- And to correct this problem we propose our system which enhances and also detects the objects present in an image which has been corrupted by low lighting condition.

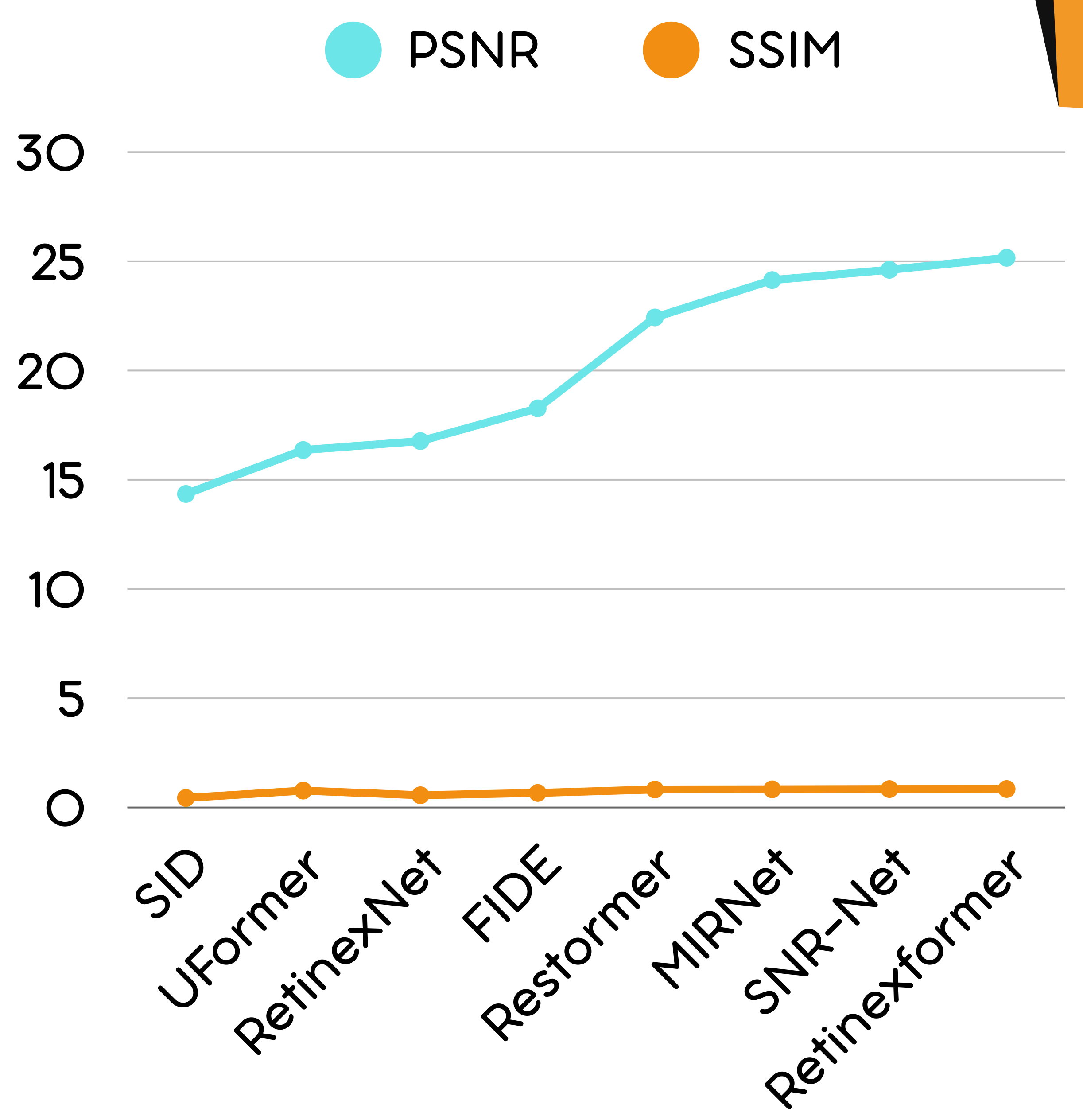
LOW LIGHT IMAGE

ENHANCED IMAGE

LITERATURE SURVEY

Image enhancement:-

- For image enhancement, histogram equalization is the most commonly used approach. However, it frequently produces under or over-enhanced images.
- Recently several deep learning models have applied retinex thoery [1] for image enhancement which have achieved state-of-the-art results.
- Also, CNNs have been successfully applied to low-light, image enhancement problems [2]. Notable works employ encoder-decoder networks [3,4], and GANs[5,6].

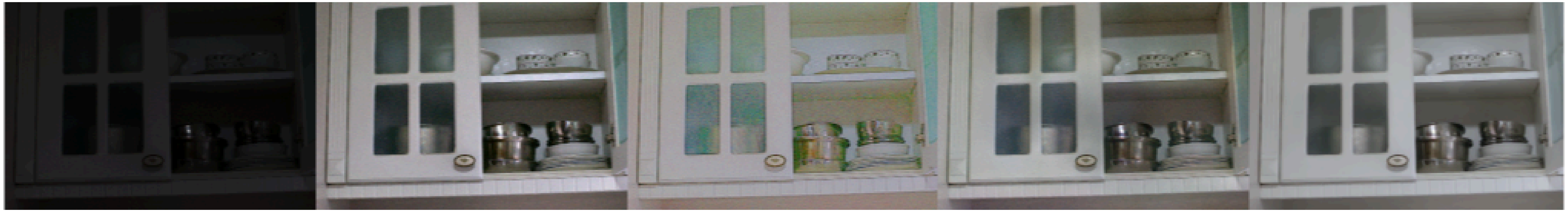


LITERATURE SURVEY

Object detection:-

- Key methods like the Viola-Jones framework (face detection)[7] and HOG (Histogram of Oriented Gradients) introduced by McConnell (1986) laid the foundation.
- Viola-Jones used Integral Images, Adaboost, and a Classifier Cascade, while HOG extracts pixel-based histograms as features, classified effectively using SVM by Dalal and Triggs[8].
- Overfeat (2013) utilized spatial convolutional features for detection. Due to the complexity and resource demands of two-stage methods, researchers now focus on single-stage detectors like YOLO.

COMPARISON WITH EXISTING METHODS



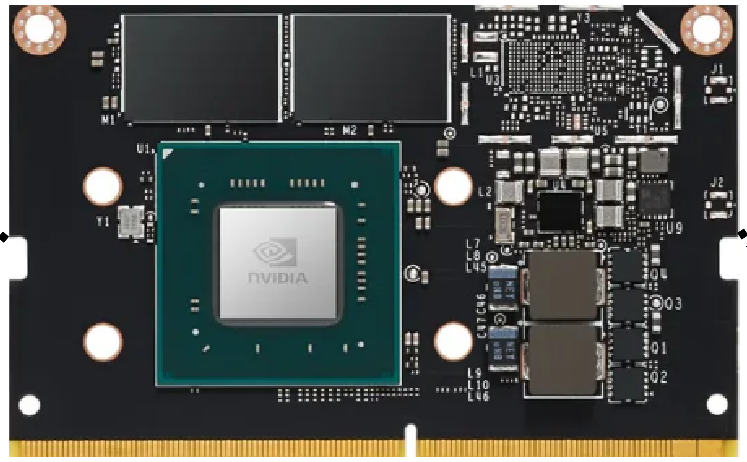
a) Input b) LIME c) Retinex Net d) EnlightenGAN e)DRBN

f) Kind++ g) Kind h) Zero-DCE i) Retinex former j) Reference

Figure: Visual comparison with state-of-the-art low-light image enhancement methods on LOL dataset.

DESIGN FLOW

LOW LIGHT INPUT IMAGE



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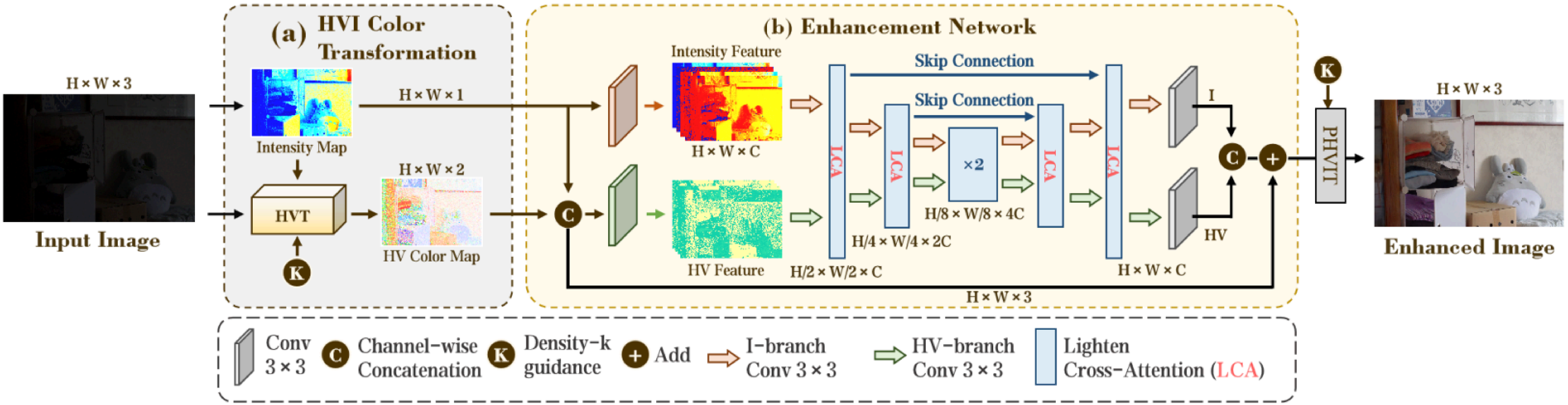
DEEP LEARNING BASED MODULES

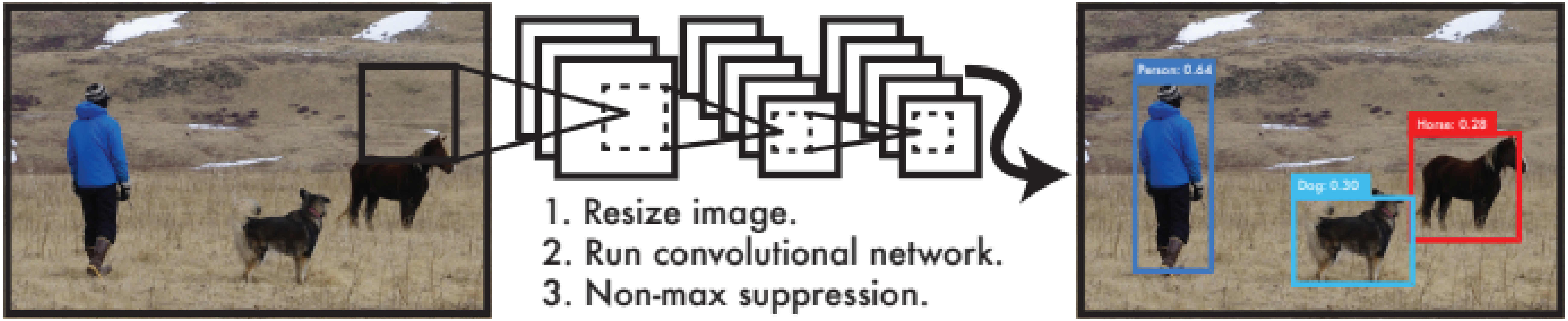
Object Detector Model ← Image Enhancer Model ← INPUT LOW LIGHT

OUTPUT DETECTED OBJECTS

IMAGE ENHANCEMENT MODEL



OBJECT DETECTION MODEL



INPUT ENHANCED IMAGE

OUTPUT DETECTED OBJECTS

RESULTS

FIG. ENHANCEMENT ON EXDARK DATASET

FIG. LOW LIGHT ENHANCEMENT WITH REAL TIME OBJECT DETECTION

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THANK YOU