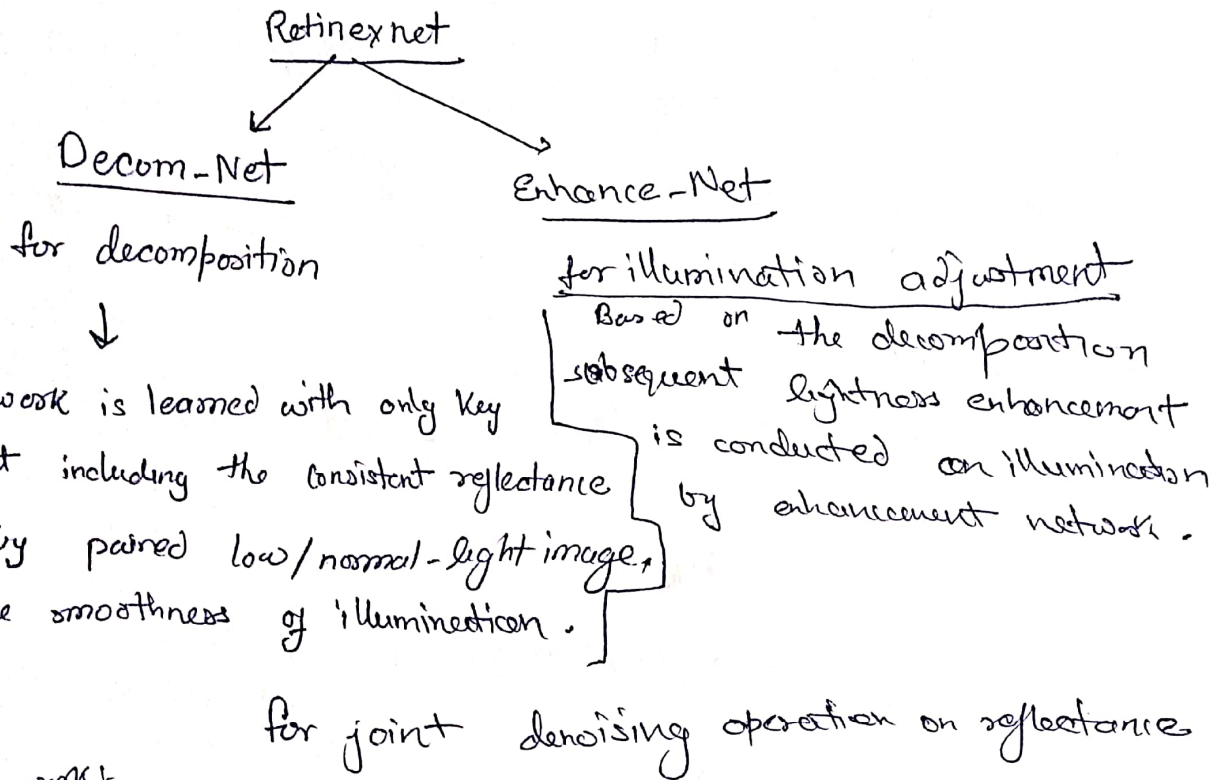


Retinexnet

Dataset :- Low-light dataset (LOL)

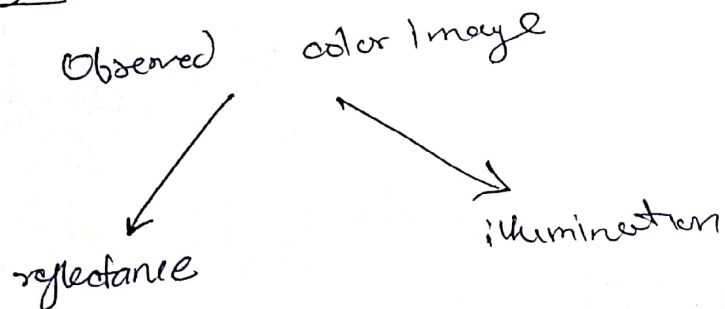
low/normal-light image pairs



Previous work

De-hazing based method :- Utilizes the inverse connection between the image with insufficient and those in hazy environment.

Low-light enhancement based on Retinex theory



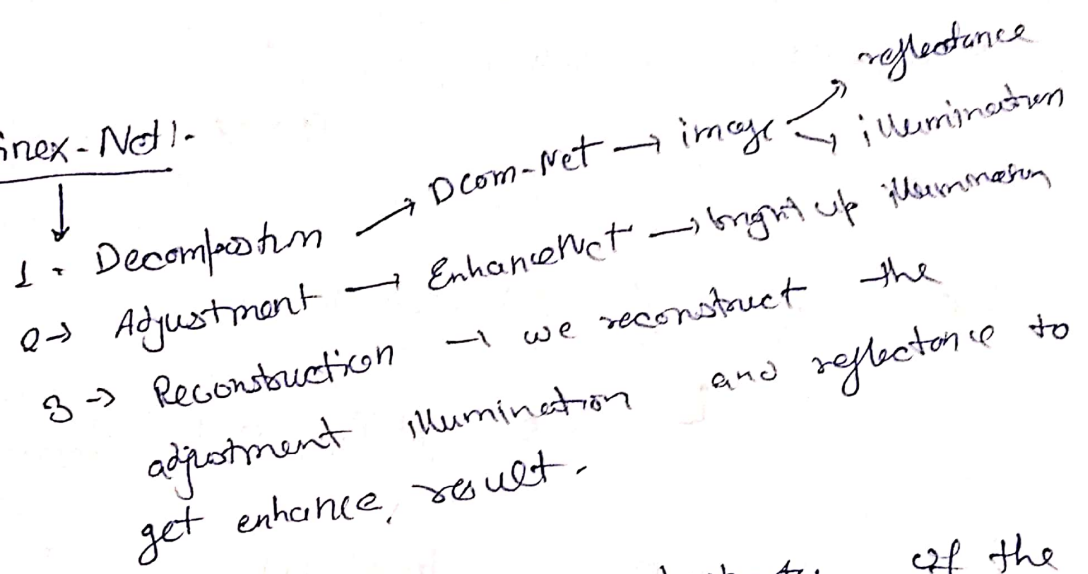
Single Scale Retinex (SSR) :- smooth by gaussian filter
Multi-scale Retinex (MSR) - multi-scale gaussian filter and color restoration.

SRI :- Estimate reflectance and illumination simultaneously using weighted variation model.

LIME :- Only estimate illumination with structure prior and use reflection as final enhanced result.

LLNet :-

Retinex-Net :-



→ Reflectance describe the intrinsic property of the captured objects, which is considered to be consistent under any lightness conditions.

→ Illumination represents the various lightness on objects. On low-light images, it usually suffer from darkness and unbalanced illumination distributions.

→ It is not easy to design a proper function adaptive to various scenes.

Loss :-

$$L = L_{recons} + \lambda_{ir} L_{ir} + \lambda_{is} L_{is}$$

• Based on the assumption

$$L_{recons} = \sum_{i \in \text{low, normal}} \sum_{j \in \text{low, normal}} \lambda_{ij} \|R_i \odot I_j - S_j\|_L$$

Invariable reflectance loss, L_{ir}

$$L_{ir} = \|R_{low} - R_{normal}\|_1$$

Illumination smoothness loss, L_s

$$L_{is} = \sum_{i=low, normal} \|\nabla I_i \odot \exp(-\lambda_g \nabla R_i)\|$$

Loss-fun of Enhance-Net

$$L_{recons} = \|R_{low} \odot \hat{I} - S_{normal}\|_1$$

L_{is} is same as previous.

Structure-Aware Smoothness Loss:-

Total variation minimization, which minimize the gradient of whole image, is often used as smoothness prior for various image restoration tasks.

$$L_{is} = \sum_{i=low, normal} \|\nabla I_i \odot \exp(-\lambda_g \nabla R_i)\|$$

∇ denotes the gradient including ∇_h (horizontal) and ∇_v (vertical) and λ_g denote the coefficient balancing the strength of structure awareness.