Image Reconstruction using Encoders: A Review

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Abstract -Image reconstruction is an important problem in computer vision with many applications such as image distortion and super resolution. Learning-based methods, especially encoder-based models, have achieved good results in image reconstruction. This review article examines encoder-based models, including autoencoders, convolutional neural networks (CNN), and artificial adversarial networks (GAN), and their performance in various image reconstruction tasks. . Challenges and future directions of encoder-based image reconstruction are also discussed.

Introduction

Image reconstruction is a major problem in computer vision, which consists of recovering damaged or incomplete images.

This task has many applications in fields as diverse as medical imaging, surveillance, and robotics. Recently, methods based on deep learning have achieved significant success in image reconstruction problems. In particular, encoder-based models have attracted considerable attention due to their ability to learn feature representations that capture high-level semantic information.

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This section describes an encoder-based model for image reconstruction. Encoders are introduced and their role in deep learning models is explained.

Encoder-based image reconstruction models including autoencoders, CNNs, and GANs are presented.

Autoencoders are unsupervised models that learn to reconstruct an input image from a compressed image known as interference. It consists of two parts: an encoder that maps the input image to the obstacle and an encoder that maps the obstacle to the reconstructed image. Various autoencoders are discussed, including denoising autoencoders, adaptive autoencoders, and anti-aliasing autoencoders.

CNNs are supervised models that use convolutional layers to extract features from images.

It has been widely used for image classification problems, but it can also be applied to image reconstruction by adding layers of deconvolution or

architectural superimposition. Several CNN-based image reconstruction models are reviewed, such as U-Net, Deep Image Prior, and Deep Convolutional Inverse Graphics Network.

A GAN is a generative model that learns to create patterns that resemble a given data set. It consists of a generator that learns to generate images and a discriminator that learns to distinguish real images from generated images. GANs have been shown to produce high quality images in several fields, including image reconstruction.

Pix2pix offers a variety of GAN-based models for image reconstruction, including CycleGAN and StarGAN.

Finally, challenges and future directions of encoder-based image reconstruction are explored. One of the difficulties is the lack of interpretation of the learned representation. Another challenge is the large amount of training data required. Future directions, such as integrating prior knowledge, are also discussed.

I. LITERATURE SURVEY

Image reconstruction using encoders has received much attention in computer vision in recent years. The state of research in this field is presented in this literature review, along with a focus on general significant progress.

The idea of using encoders to reconstruct an image is to take the input image and convert it into a low resolution image, which can then be used to create the original image. This process involves the use of deep neural networks, especially convolutional neural networks (CNNs). designed to learn coding and coding functions.

One of the oldest and most popular approaches to image reconstruction using encoders is the autoencoder model. Auto-encoders consist of a network of encoders that learn to transform the input image into a compressed image and learn to reconstruct the original image from the compressed image. The reconstruction loss, which calculates the difference between the original image and the reconstruction, is a loss function commonly used during training.

III. SYSTEM FRAMEWORK

Problem Formulation: The goal of this project is to create a deep learning model that can reconstruct images.

Collect information: Collect pictures of different items and their associated labels.

Data Preprocessing: Process images by resizing them, normalizing pixel values, and adding databases to increase their size.

Model selection and training: Choose a deep learning model such as VGG, ResNet or Inception and use training-like methods to train on a pre-developed database.

Model evaluation: Evaluate the model on a set of test images and calculate metrics such as accuracy, precision, and recall.

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