Abstract

Generative Adversarial Network or briefly called as GAN is a machine learning model where two different networks play a fool game to generate more accurate predictions. GAN is used to generate images from scratch but this is applied in various domains like Image enhancement, Text-Image translation, Face Frontal view generation etc. There are number of applications of GAN apart from which there are different types of GANs such as DCGAN, Cycle GAN, Conditional GAN etc, each having its own specialization in particular domain of machine learning. Apart from other algorithms, GANs produce convincingly good results. With the onset of GAN into the machine leraning industry it has opened many paths or directions for prominent research in machine learning. In this paper we are proposing a method where we will be using a different type of GAN called the Cascade Pyramid GAN to enhance or in other words produce high-resolution neonatal thermal images.

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Chapter 1

Introduction

1.1 Section A

Infrared thermography is a straightforward method of transforming IR into visible images. The use of infrared technologies has evolved throughout time. The science of infrared energy, which is emitted by all things, is the basis for thermal imaging. The "heat signature" is the energy emitted by the things. Thermal cameras, also known as thermal imagers, are sophisticated devices that use a sensitive heat sensor to detect minute temperature variations. Thermal images are often grayscale, with white denoting heat and black indicating colder regions, with varying shades of grey suggesting temperature gradients between the two. Newer versions of thermal imaging cameras, on the other hand, colourize the images they produce to make it easier to distinguish between things. Thermal imaging has a wide range of uses. This can be employed in a variety of applications, including electrical maintenance, plumbing, mechanical and building construction, animal and pest management, transportation navigation, healthcare and medicine, and so on.

1.2 Section B

We will be working on the medical application of thermal imaging in this project. In order to use thermal images in the medical profession, they must be of excellent quality in order to properly assess the condition. In the case of newborns or neonates, constant temperature and respiratory rate monitoring is required to confirm continued health conditions. The procedures for determining the temperature and respiration rate, on the other hand, are highly invasive and interrupt the infants' sleeping patterns. Thermal imaging is used in this situation to identify them without physically violating the kid. As a result, we have a collection of neonatal thermal photographs. We'll use this to train a better model that can provide high-resolution thermal images for better assessment. For high-resolution thermal imaging, this can save money by avoiding the use of larger, more expensive detectors. For developing high resolution thermal images, there are several models in existence from which we have opted using GAN(Generative adversarial network). There are variable number of GAN networks, but we have opted for using Cascade Pyramid GAN since it has multiple discriminator and generator which generates more accurate images when compared to other GAN networks.

Chapter 3

Related Work

In this section we discuss about the existing models on generating High-resolution Thermal Infrared images.Generative Adversarial Network(GAN) and Deep neural networking(DNN) techniques are use to generate high-resolution thermal infrared images. First developed a multi-layer artificial neural network called LeNet-5 which could classify handwritten digits. Like other neural networks, LeNet-5 has multiple layers and can be trained with the back-propagation algorithm. Taking the famous LeNet-5 as an example, it consists of three types of layers, namely convolutional, pooling, and full connected layers. With the increasing challenges in computer vision and machine learning tasks, the models of deep neural networks get more and more complex. Meanwhile, the big training data also brings new challenges such as how to train the networks in a feasible amount of time. Pix2Pix is considered as a baseline because many popular GANs and mainstream generative adversarial networks are based on pix2pix. To discriminate the generated high-resolution images, they are re-scaled to different resolutions. CPGAN is composed of two parts: a cascade pyramid generator and a multi-scale discriminator. And the three branches of generator are connected in a cas-

cade manner. CPGAN uses a multi-scale discriminator to discriminate the generated images.

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