Center for Research in Computer Vision

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Abstract

Person reidentification is a form of person tracking that focuses specifically on identifying and labeling an individual in two separate cameras. Initially, when an individual moves into view of a camera the computer asses the figure to identify it as a person. Then, the individual is analyzed further by the computer to pick up on the person's distinct features and they are given a label. When the person walks out of view of the initial camera, and into the view of a different one, the computer uses this information to determine if this person has previously been observed. The challenge in this process lies in the fact that computers do not posses the ability to view images in the same way people do; nor can they reason in the same manner. This issue is combated through the implementation of deep learning.

Introduction

Computers do not have ability to see or recognize images the way that humans do. Each image is identified as 3 matrices of pixels. The pixels have values that range from 0 to 255. Seeing an image as an array of numbers would make it more difficult to have computers to identify figures. Another challenge faced is occlusion, this occurs when computer attempts to reidentify the person with an impediment such as a wall or another individual blocking them. Deep learning is implemented to train the computer to identify a person with a given dataset. The reidentification problem is being solved by attribute classification. A person is categorized by the program using attributes such as gender, color of clothing, and presence of accesories such as bags. The more categories there are the more distinctly an individual can be identified.

Methods

In order to get an overall understanding on this specific model, we were initially introduced to the broader topics of machine an deep learning. This was done by watching lectures on selected topics such as neural networks, clustering, statistical models, programming platforms, etc. We were also given a broad overview of what deep learning is and exposed to its many applications. We also participated in various experiments so we see what the process entails. Lastly, we were exposed to the process of research by watching various presentations given by both graduate and undergraduate students participating in research in the fields of machine and deep learning.

For the topic of person reidentification specifically, during training the classification layer is removed and a dropout layer is added followed by multiple Softmax functions (one per attribute and one to predict the correct pedestrian id).The optimizer that is used thus far is SGD. The loss function which is being use is Categorical Cross Entropy. Durng the testing phase, features are extracted for each pedestrian image. The Euclidean distance is computed between each query image and the gallery images. In an effective model distances between the same person will be small, and distances between different people will be larger.

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Results





Attribute	Label
gender	2
top	1
backpack	2
bag	1
handbag	1
boots	2
shoes	1
handbag	1
upblack	2
downblue	2

The results of the implementation of this technoloy can be seen in the DukeMTMC. The effectiveness of models using attribute classification is increased. This is because it has been shown in previous work that re-identification and attribute prediction are mutually benificial. Thus, both attribute prediction and re-identification are improved by using a single deep learning model which is trained at the same time.

Conclusion

Programming computers how to be able to identify objects on their own is challenging process because of the way that computers interpret visual data. It requires understanding of both computers and human processing. Issues such as occlusion further complicate the task. However, computers do have the ability to process, store, and interpret information quickly. Thus, they would be able to secure an area more effectively than a person would. Training computers to be able to identify and label individuals on one camera, later identifying that this is the same individual on another camera would revolutionize the world of security.