**ACNet-based MobileNet for image classification**

**Abstract**

In this paper, we propose a novel ACNet-based MobileNet(Adaptively Connected Neural Networks based MobileNet) for image classification. Google's MobileNet gets a significant achievement in image classification on the mobile device platform in recent years. However, MobileNet has fewer model parameters, making its accuracy still not comparable to other large-scale network models. Previously, ACNet proposed to improve the traditional convolutional neural networks (CNNs), can flexibly change the global and local reasoning in the internal feature performance, and it also enhances classification accuracy. We believe that ACNet can adequately compensate for the above-mentioned MobileNet problems. Therefore, our ACNet – based MobileNet have benefited is that while retaining the inverted residual architecture of the MobileNet model, the model parameters are small enough. It also could improve the accuracy of image classification and reduce training time.

**Introduction**

Google's MobileNet(Howard et al.,2017 ) significantly reduces the parameters of the model by using depthwise separable convolutions(DWS), which makes a meaningful contribution to porting to mobile devices. Even though mobileNetV3 has been improved by 3.2% in accuracy compared with the mobileNetV2 in ImageNet classification through the inverted residual with linear bottleneck and squeeze and excitation structure, the accuracy is still not comparable to other large-scale network models, such as ResNet and VGG16. How to improve the accuracy of MobileNet under the premise that the model volume is small enough has become the key to the successful application of deep learning in the field of mobile devices.

Simultaneously, more and more models use CNN as a vital part of the model with the large-scale application of deep learning in image classification and target detection. However, the limitations of CNN itself have also been continuously confirmed. Due to CNN only extracts information from local neighboring pixels, each layer in the convolutional network does not have an excellent global overturning ability. Therefore, the convolution operation cannot distinguish two similar objects well. ACNet - Adaptively Connected Neural Networks (Wang et al., 2019) can effectively solve this problem. The author holds that the optimization and reconstruction of DWS in MobileNet by ACNet can effectively avoid CNN pays too much attention to the local reasoning phenomenon, to improve the accuracy. Wang et al. also proposed that using ACNet has the function of reducing the model training cycle. The training period of ACNet-based MobileNet after optimization in this article will raise more efficiency compared to mobileNetV3. And the new model will be more friendly to deploy in the mobile terminal field.

**Background and Literature review**

~~956年夏，麦卡锡、明斯基等科学家在美国达特茅斯学院开会研讨“如何用机器模拟人的智能”，首次提出“人工智能（Artificial Intelligence，简称AI）”这一概念，标志着人工智能学科的诞生。人工智能被广泛关注的则是如何让智能机器会看，即图片识别。~~20世纪 90年代，LeCun et al. [1,2]等人发表论文，确立了CNN的现代结构。同时大规模训练数据，与计算机的计算能力的不断提升，深度CNN不断应用到图像分类中。最著名的是Krizhevsky et al.提出了一个经典的CNN结构，并在图像识别任务上取得了重大突破。其方法的整体框架叫做 AlexNet，AlexNet大获成功，掀起了卷积神经网络的研究热潮。在这之后，研究人员又提出了其他的改善方法，xxx 在AlexNet模型基础上提出了层数更多、更深的模VGGNet 模型用于解决图片分类问题，并且获得更高的准确度。 GoogLeNet采用了模块化的结构（Inception结构）的思想进而丰富了模型的多样性。ResNet 率先提出了残差网络的概念，有效的抑制了模型的过拟合。在此期间CNN发展的一个方向就是层数变得更多，ILSVRC 2015冠军 ResNet是 AlexNet的20多倍，是 VGGNet的8倍多。通过增加深度，网络便能够利用增加的非线性得出目标函数的近似结构，同时得出更好的特性表征。但是，这样做同时也增加了网络的整体复杂程度，使得模型参数巨大，无法应用于实际生活中。

为此，如何将深度学习模型应用于实际生活越来越受到广泛关注。 20xx google 团队提出的mobilenet 采用倒残差网络和DWS等技术大大缩小了模型参数。该模型虽然可以应用到移动设备，但缩小模型参数也带来了精度的下滑副作用。与此同时， CNN所具有的又一缺陷也在mobilenet上体现了出来：CNN只是局部相邻像素中提取信息，所以卷积网络内部各层不具备很好地全局推倒能力。因此，卷积操作就不能很好地区分出两个相似的物体。而在移动设备上能够基准的区分两个相似物体是深度学习应用的又一重大瓶颈。

而本文研究的主要目的是如何构建一种参数模型足够小、且精度足够的深度学习模型。我们针对CNN的不足，通过ACNet 具有灵活的参数保存方式来学习转换一般数据的局部和全局推理的能力，提出了ACNet-based MobileNet的网络模型。从而获得一种全新的、对移动端友好、且精度足够高的图片分类模型。

Methodology

1. 数据预处理

本文采用cifar100 的数据集。数据预处理阶段将数据图片统一227\*227的尺寸。

Possible conclusions

References (no more than 2 pages, not account to the 5 pages of the proposal)