Fabric Defects Detection Based on Faster R-CNN

defectNet: An Efficient Defects Detection Model

defectNet: Towards Efficient Defects Detection

defectNet: Towards Efficient Objects Detection for Defects

**Abstract. pass**

**Keywords:**

**Pass**

# Introduction

（背景：）近几年来，深度卷积神经网络在物体检测领域取得了巨大的成功，涌现出了一大批的优秀的检测框架，例如，多阶段的基于区域推荐的（Faster R-CNN）、单阶段直接SSD等，他们大都集中于建立一个统一通用的物体检测框架，并且有着较高的准确率和效率，他们虽然能满足大多数物体检测领域的需要，（抛出问题：）但是，在小部分物体检测领域，尤其是在工厂瑕疵检测中，例如，纺织品瑕疵检测，我们不仅仅只关注于一张图像中某个对象的识别和定位，同时我们还需要对该图像是否包含瑕疵对象进行判决，即图像分类问题，甚至有时候对瑕疵进行判决比对物体检测更加重要，因为更高的对瑕疵的判决能力意味着更小的计算成本和更低的错误率，这能降低大量的经济成本。虽然我们也能够利用（state-of-the-art）业界前沿的检测框架解决这些问题，但是他们并不完美，他们对瑕疵的判决能力仍然取决于某个阈值，而这往往会容易受到主观方面的影响，这种情况下他们产生错误的概率仍然很高，所以我们还有可以改进和提升的空间。从另一方面讲，当然，我们可以先训练一个图像分类网络，先对图像是否包含瑕疵进行判决，然后再训练一个目标检测网络，再检测出图像中的瑕疵对象，但是这样太繁琐了，会带来更多的时间和计算成本，因此（hence），我们希望有一个框架能一次性解决上述问题。

在这篇文章中，我们建议了一个新的瑕疵检测框架，名字为defectNet，它将一个图像分类的结构插入到目前（state-of-the-art）的目标检测框架中，以便一次性的实现对是否包含瑕疵进行判决和对瑕疵对象进行物体检测。首先，它先对图像进行分类，根据分类的结果再决定是否再对图像进行物体检测。实验结果表明我们的defectNet对瑕疵的检验能力（acc）比Faster R-CNN高出了？%，比SSD高出了？%，mAP比SSD高出了%，但是和Faster R-CNN几乎一样，速度和Faster R-CNN和SSD保持一致，我们的defectNet acc比直接进行图像分类低了？%，但是速度比它快了？倍。~~除此之外，我们还建议了一个新的生成先验框的方法，该方法~~。我们的方法的目的不是为了取代和超越现今的物体检测框架，而是为了弥补它们在某些细分的物体检测领域方面的不足。我们的贡献也许很微小，但是它促进了深度卷积网络在目标检测领域更加系统和完善。

我们总结我们的贡献如下：

我们建议了一个defectNet，一个瑕疵检测框架，该框架能够插入到现有的物体检测框架中，并且它对瑕疵的检验能力超过了现有物体检测方法，弥补了他们在瑕疵检测领域方面的不完美；

我们在Fabric Detects Dataset、PASCAL VOC、COCO对我们的模型进行了实验和分析，并且和现今的物体检测框架做了比较。实验结果表明我们的框架具有较强的实用性。

# defectNet

Model

现今主流的物体检测框架分为两种，一种是基于区域推荐的，另一种是一个网络直接预测目标的分类和定位，所以我们的defectNet也可以分为两种，图？展示了defectNet的两种不同的情况。

Rpn-defectNet，ssd-defectNet，

图？两种defectNet网络架构

在目标检测框架中，主干网络用来提取图像特征，特征图用来做区域推荐或目标的识别和定位。

FPN 特征图：对于分类问题来讲，往往需要更深层的语义信息，而对于定位来讲，往往需要更浅层的语义信息，FPN使用特征图的快捷连接同时具有了这两种特性，所以我们使用FPN作为我们的预测的特征图。

rpn-defectNet损失函数：

ssd-defectNet损失函数：

我们的损失函数由三部分组成：瑕疵图像分类的损失，物体检测对象的置信度损失和位置损失。

Model

# Experiments

主干网络：

## Fabric Defects Dataset

In order to verify the efficiency of our models, we introduce a fabric defect dataset which was collected in the real textile workshop. The fabric defect dataset is composed of plain fabrics and patterned fabrics. The plain fabrics have ???? normal images and ???? defect images, the patterned fabrics have ???? normal images and ???? defect images. The number of plain fabrics defects categories and patterned fabrics defects categories is ?? and ?? respectively. Table ? and Table ? shows their name and number of per defects categories severally in detail.

为了对瑕疵数据集有全面的了解，图？显示了一些瑕疵的样本例子，包括正常图像，瑕疵图像，瑕疵类别示意图。

For the purpose of

Table ? The name and number of per defects categories of plain fabrics

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  | | --- | --- | | Name | Number | | hole | 1??? | | water stain | 2??? | | oil stain | 3??? | | soiled | 4??? | | three silk | 5??? | | knots | 6 | | card skip | 7 | | mispick | 8 | | card neps | 9 | | coarse end | 10 | | loose warp | 11 | | cracked ends | 12 | | |  |  | | --- | --- | | buttonhole selvage | 13 | | coarse picks | 14 | | looped weft | 15 | | hard size | 16 | | warping knot | 17 | | stitch | 18 | | skips | 19 | | broken spandex | 20 | | thin thick place | 21 | | buckling place | 22 | | color shading | 23??? | | smash | 24 | | roll marks | 25 | | |  |  | | --- | --- | | take marks | 26 | | singeing | 27 | | crinked | 28 | | uneven weaving | 29??? | | double pick | 30??? | | double end | 31??? | | felter | 32??? | | reediness | 33??? | | bad weft yarn | 34??? | |  |  | |  |  | |  |  | |  |  | |

Table ? The name and number of per defects categories of patterned fabrics

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Name | Contamination | Mis-pattern | Watermark | Variegated wool | Sewing | Sewing head seal |  |  |  |  |  |  |  |  |  |
| Number | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  | | --- | --- | | Name | Number | | stain | 1 | | broken figures | 2 | | water stain | 3 | | variegated wool | 4 | | seam allowance | 5 | | seam allowance marks | 6 | | chongnian | 7 | | |  |  | | --- | --- | | hole | 8 | | pleat | 9 | | knit fault | 10 | | through printing | 11 | | wax spot | 12 | | color shading | 13 | | broken silk | 14 | | others | 15 | |

~~从图？中，我们可以看出，布匹疵点数据集的长宽比分布不正常。~~

## PASCAL VOC2007

## PASCAL VOC2012

## COCO

## Inference time

# Related Works

# Conclusions

# Acknowledgment