


Layers for MobileNet from TensorFlow #9517

Merged opencv-pushbot merged 1 commit into `opencv:master` from `dkurt:tf_mobilenet` on 18 Sep

 Conversation 15

 Commits 1

 Files changed 5

+151 -19 



dkurt commented on 30 Aug • edited ▼

Member

This pullrequest changes

resolves [#9462](#) (waiting for feedback)

- ReLU6 layer added
- depthwise_conv2d layer from TensorFlow (convolution with `#groups == #input_channels`)
- Not fused batch normalization by single `Mu1` and `Add` support

Merge with extra: [opencv/opencv_extra#370](#)

How to run MobileNet using DNN:

- Go to https://github.com/tensorflow/models/blob/master/slim/nets/mobilenet_v1.md and download checkpoint for `MobileNet_v1_1.0_224` model. Unpack and navigate into the folder that contains:

```
mobilenet_v1_1.0_224.ckpt.data-000000-of-00001
mobilenet_v1_1.0_224.ckpt.index
mobilenet_v1_1.0_224.ckpt.meta
```

- Create `.pb` model by:

Reviewers

 [vpisarev](#)



 [alalek](#)



Assignees

 [vpisarev](#)

Labels

None yet

Milestone

No milestone

Notifications

5 participants



```
python ~/tensorflow/tensorflow_models/slim/export_inference_graph.py \
  --model_name=mobilenet_v1 \
  --output_file=mobilenet_v1.pb \
  --image_size=224
```

source: <https://github.com/tensorflow/models/blob/master/slim/README.md#exporting-the-inference-graph>

- Freeze

```
python ~/tensorflow/tensorflow/python/tools/freeze_graph.py \
  --input_graph=mobilenet_v1.pb \
  --input_checkpoint=mobilenet_v1_1.0_224.ckpt \
  --output_graph=mobilenet_v1_frozen.pb \
  --output_node_names=MobilenetV1/Predictions/Softmax \
  --input_binary
```

source: <https://github.com/tensorflow/models/blob/master/slim/README.md#freezing-the-exported-graph>

- Modify for DNN: fuse batch normalizations and remove Squeeze op.

```
~/tensorflow/bazel-bin/tensorflow/tools/graph_transforms/transform_graph \
  --in_graph=mobilenet_v1_frozen.pb \
  --out_graph=mobilenet_v1_for_dnn.pb \
  --inputs=input \
  --outputs=MobilenetV1/Predictions/Softmax \
  --transforms="fold_constants sort_by_execution_order remove_nodes(op=Squeeze)"
```

- Enjoy with DNN:

```
#include <iostream>

#include <opencv2/opencv.hpp>
```

```
#include <opencv2/dnn.hpp>

int main() {
    cv::dnn::Net net = cv::dnn::readNetFromTensorflow("../mobilenet_v1_for_dnn.pb");

    cv::Mat input = cv::imread("toucan.jpg");
    cv::Mat blob = cv::dnn::blobFromImage(input, 1.0 / 255, cv::Size(224, 224));

    net.setInput(blob);
    cv::Mat output = net.forward();

    double minVal, maxVal;
    cv::Point minLoc, maxLoc;
    cv::minMaxLoc(output, &minVal, &maxVal, &minLoc, &maxLoc);
    std::cout << maxLoc << " " << maxVal << std::endl;

    return 0;
}
```

output:

```
[97, 0] 0.999997
```

And if I'm right and MobileNet uses 0th class as None, 97th class is a toucan (see [synset_words.txt](#))



This was referenced on 30 Aug

DNN Unknown layer type Mean #9519

 Closed

Unable to import mobilenet model using latest OpenCV. #9462

 Closed **vpisarev** reviewed on 30 Aug[View changes](#)

modules/dnn/include/opencv2/dnn/all_layers.hpp

...	...	@@ -343,6 +343,12 @@ CV__DNN_EXPERIMENTAL_NS_BEGIN
343	343	static Ptr<ReLULayer> create(const LayerParams ¶ms);
344	344	};
345	345	
	346	+ class CV_EXPORTS ReLU6Layer : public ActivationLayer

**vpisarev** on 30 Aug

Contributor

can we make the layer slightly more universal? `result(x, y, c) = min(max(src(x, y, c), a), b)` with customizable `a` and `b`?

**dkurt** on 31 Aug

Member

Generalized. Name of layer is the same.



Reply...

 **vpisarev** reviewed on 30 Aug[View changes](#)

modules/dnn/src/layers/elementwise_layers.cpp

 Show outdated **vpisarev** reviewed on 30 Aug[View changes](#)


modules/dnn/src/tensorflow/tf_importer.cpp

564


+


}

	565	+	kshape[0] = inCh * chMultiplier;
	566	+	kshape[1] = 1;
	567	+	}
547	568		layerParams.set("kernel_h", kshape[2]);
548	569		layerParams.set("kernel_w", kshape[3]);
549	570		layerParams.set("num_output", kshape[0]);

 **vprisarev** on 30 Aug Contributor

set some min_value=0 and max_value=6 here

 1

 Reply...



 **alalek** reviewed on 1 Sep

[View changes](#)

modules/dnn/src/layers/elementwise_layers.cpp

 Show outdated

modules/dnn/src/layers/elementwise_layers.cpp

 Show outdated



quarcko commented on 1 Sep

Tried your patch and it works, except one thing.

Recently it became possible to "retrain" model, and when doing this, there is added new layer that is still unsupported: "PlaceholderWithDefault"

https://www.tensorflow.org/api_docs/cc/class/tensorflow/ops/placeholder-with-default

Tried removing that layer from model, but it seems without it model fails with cvassert on "add" operation later on.



dkurt commented on 1 Sep

Member

@quarcko, could you please provide some way to reproduce it? I think we could resolve it faster if there were some steps like at the PR's topic.



quarcko commented on 4 Sep

Sure,

I used this blog post to train my model:

<https://hackernoon.com/creating-insanely-fast-image-classifiers-with-mobilenet-in-tensorflow-f030ce0a2991>

Used model is "mobilenet_1.0_224"

After "retraining" the model as i mentioned there is added new unsupported layer.

Which is between input layer and "add" operation later on, so removing it crashes the model (i think so).

Here i will attach my retrained sample model so you can test it without doing the training part.

This is unmodified file, so you still have to: "fold_constants sort_by_execution_order

remove_nodes(op=Squeeze)"

You will notice, that after this model will fail at "PlaceholderWithDefault"

Sure, you can try to remove it also, but then when running "forward()" model will crash.

https://www.dropbox.com/s/r1u6w52flwgt8ft/output_graph.pb?dl=0



dkurt commented on 4 Sep

Member

@quarcko, Could you try it again? The necessary changes were made. There are transformations that must be applied to referenced model:

```
~/tensorflow/bazel-bin/tensorflow/tools/graph_transforms/transform_graph \  
--in_graph=output_graph.pb \  
--out_graph=transformed_graph.pb \  
--inputs=input \  
--outputs=final_result \  
--transforms="fold_constants sort_by_execution_order remove_nodes(op=Squeeze, op=Placeho]
```



 **dkurt** referenced this pull request on 8 Sep

Dnn module unable to use dense layer in tensorflow frozen graph #9594

 Closed



vpisarev commented on 13 Sep

Contributor

@**dkurt**, cannot merge the patch because of conflicts, could you please fix it?



 **dkurt** referenced this pull request on 14 Sep

Unknown layer type in tf_importer.cpp while running import->populateNet(Net) #9459

 Closed



 Layers for MobileNet from TensorFlow

✓ d891e9b



dkurt commented on 16 Sep

Member

@**vpisarev**, the conflicts were solved.



 **vpisarev** self-assigned this on 18 Sep

vpisarev commented on 18 Sep

[Contributor](#)

 **opencv-pushbot** merged commit **d891e9b** into `opencv:master` on 18 Sep

[View details](#)

1 check passed



opencv-pushbot pushed a commit that referenced this pull request on 18 Sep



Merge pull request #9517 from dkurt:tf_mobilenet

e012ccd



dkurt deleted the `dkurt:tf_mobilenet` branch on 21 Sep



 **JosiahKane** referenced this pull request on 20 Oct

DNN-no minimum layer #9894

[Open](#)