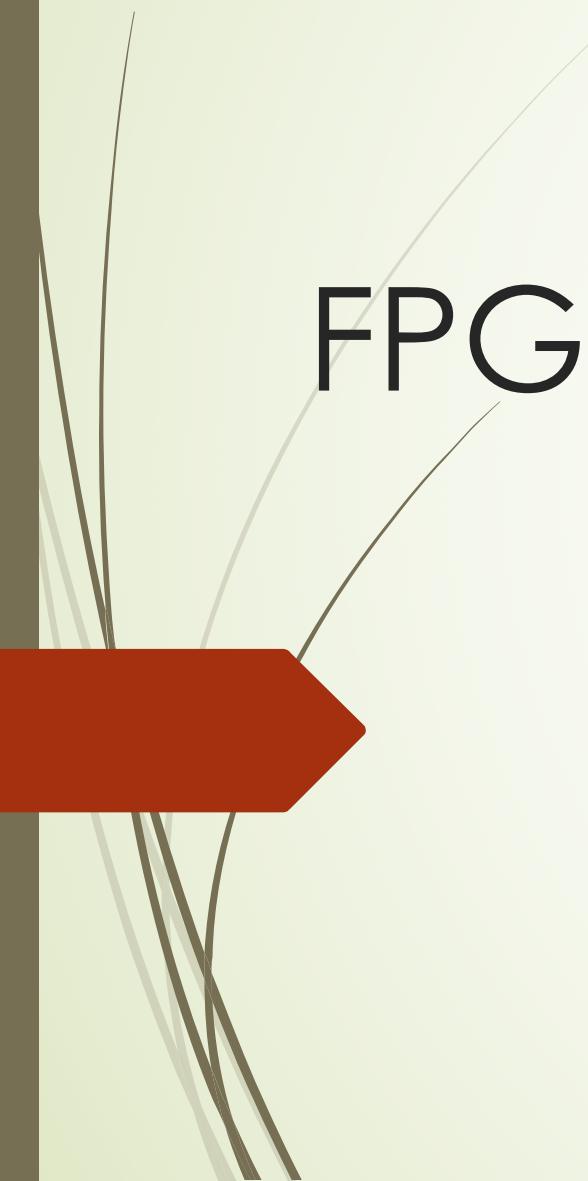


# FPGA Project Process report



Xingxing Geng

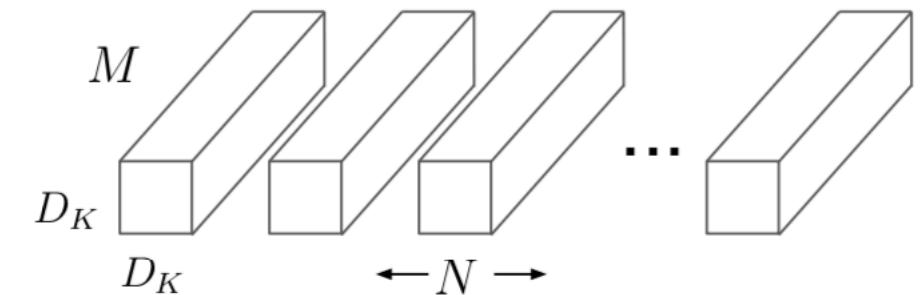
August 23, 2019

## ► Depthwise separable convolution

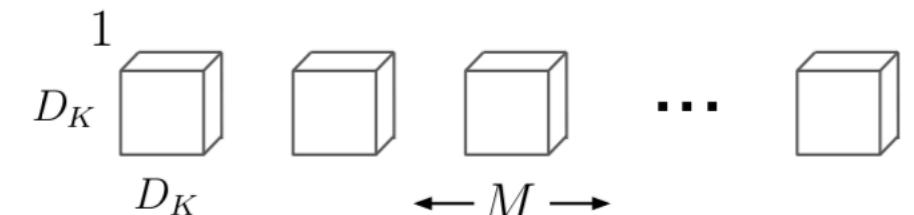
- #Depthwise convolutional filters = #input channels
- #Separable convolutional filters = #output channels = #standard convolution filters

## ► Benefits

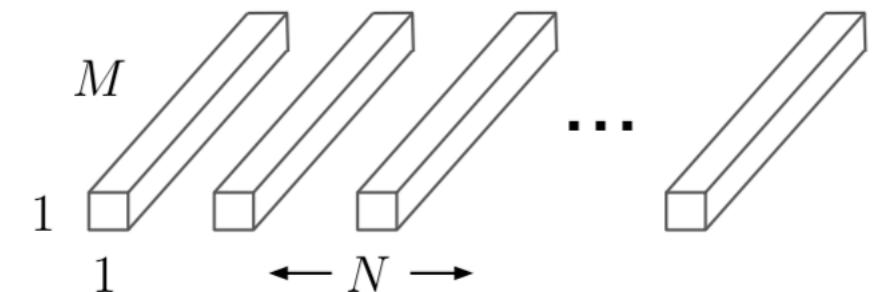
- have lesser number of parameters to adjust as compared to the standard CNN's, which **reduces overfitting**
- **computationally cheaper** because of fewer computations which makes them suitable for mobile vision applications



(a) Standard Convolution Filters



(b) Depthwise Convolutional Filters



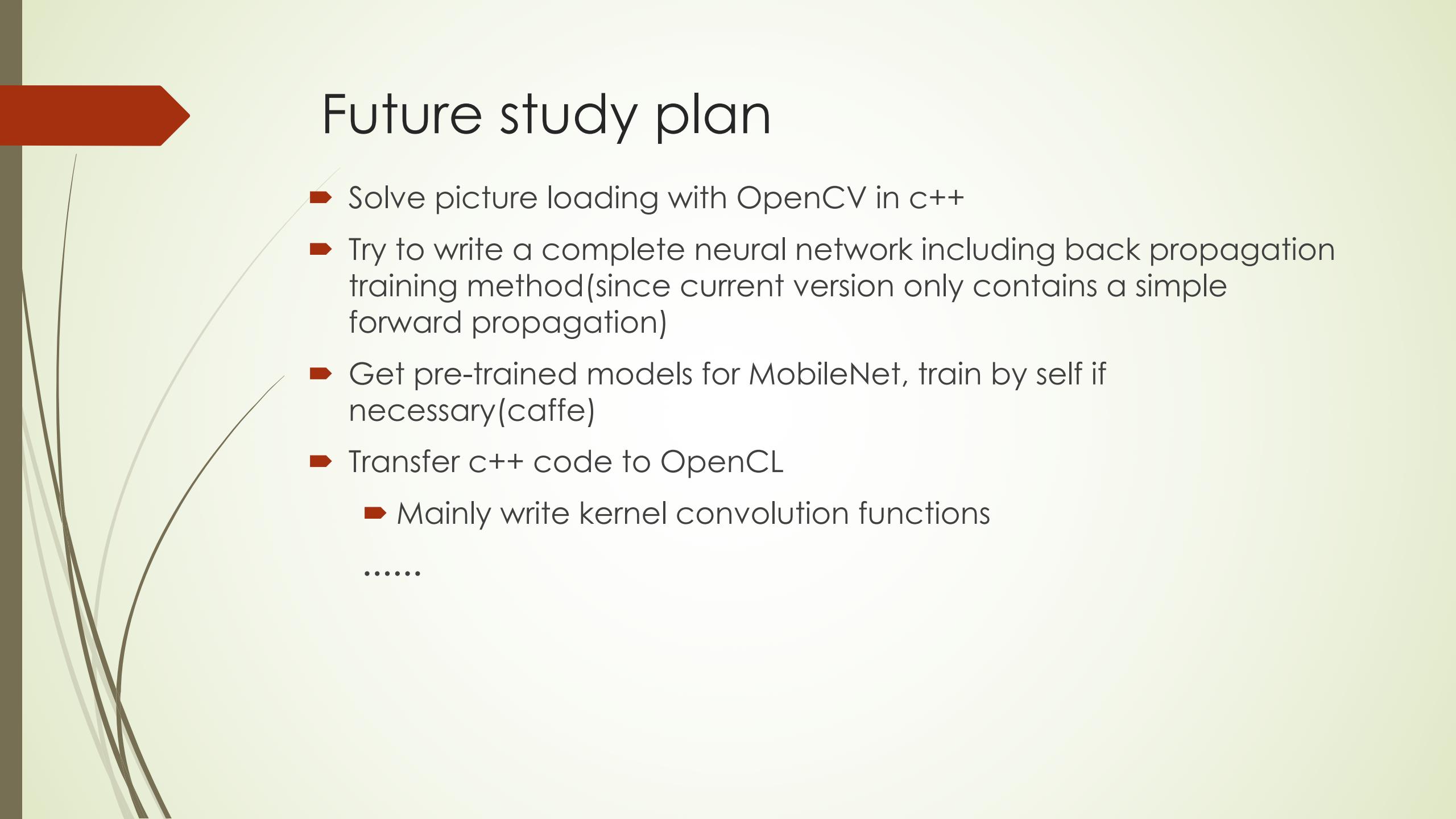
(c)  $1 \times 1$  Convolutional Filters called Pointwise Convolution in the context of Depthwise Separable Convolution

# Current Work

- ▶ Implementation of Depthwise separable convolution in c++
- ▶ Only contain depthwise separable convolution layer(Goal is given a picture, perform convolution on it and get the output or display the new picture.)
- ▶ Derived from MobileNet
- ▶ [https://github.com/xingxinggeng/summer\\_research\\_weeklyProgress/tree/master/depthwise\\_sep\\_conv](https://github.com/xingxinggeng/summer_research_weeklyProgress/tree/master/depthwise_sep_conv)

## Problem so far

- ▶ Dealing with pictures in c++ which basically depend on OpenCV.
- ▶ Pre-trained model(weights, bias, means) not handy.



# Future study plan

- ▶ Solve picture loading with OpenCV in c++
- ▶ Try to write a complete neural network including back propagation training method(since current version only contains a simple forward propagation)
- ▶ Get pre-trained models for MobileNet, train by self if necessary(caffe)
- ▶ Transfer c++ code to OpenCL
  - ▶ Mainly write kernel convolution functions

.....

# References

- ▶ 1. very tiny CNN: <https://github.com/sunziping2016/VeryTinyCnn>
- ▶ 2. MobileNet : <https://github.com/universecool/mobilenet>
- ▶ 3. OpenCV: <https://docs.opencv.org/2.4/modules/core/doc/intro.html>  
[https://docs.opencv.org/master/d7/d9f/tutorial\\_linux\\_install.html](https://docs.opencv.org/master/d7/d9f/tutorial_linux_install.html)
- ▶ 4. cmake document:<https://cmake.org/cmake/help/latest/#>



Thank you for listening