Programing Assignment 1

-Depth from Focus with Your Mobile Phone-

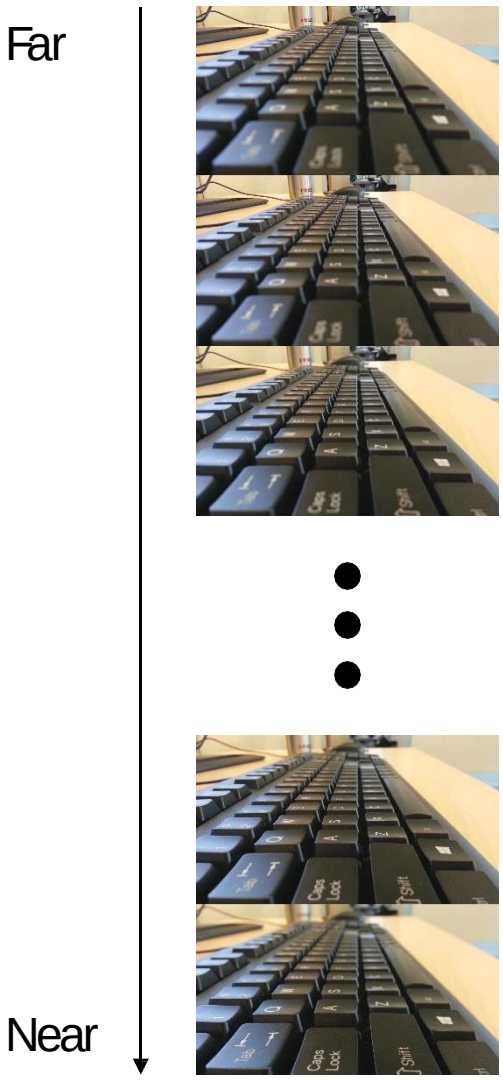
2019.10.01

Programing Assignment 1

Part 1. Depth-from-Focus by Optimization

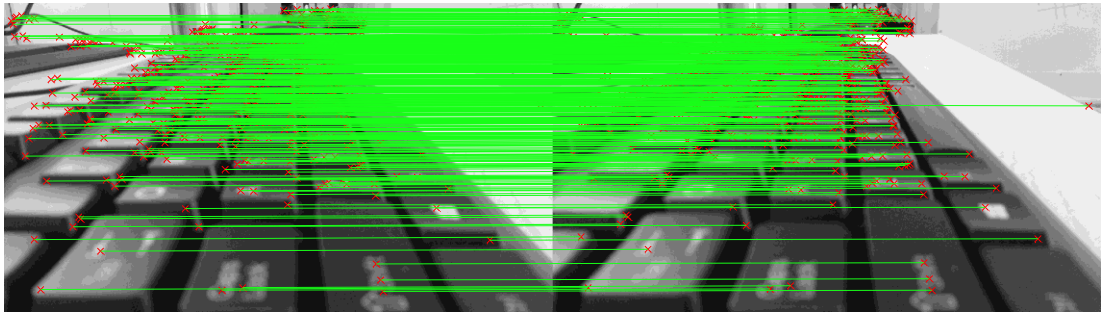
Step 1. Image Alignment

Image Alignment Toolbox – http://iatool.net/



Frame t

Frame t+ 1



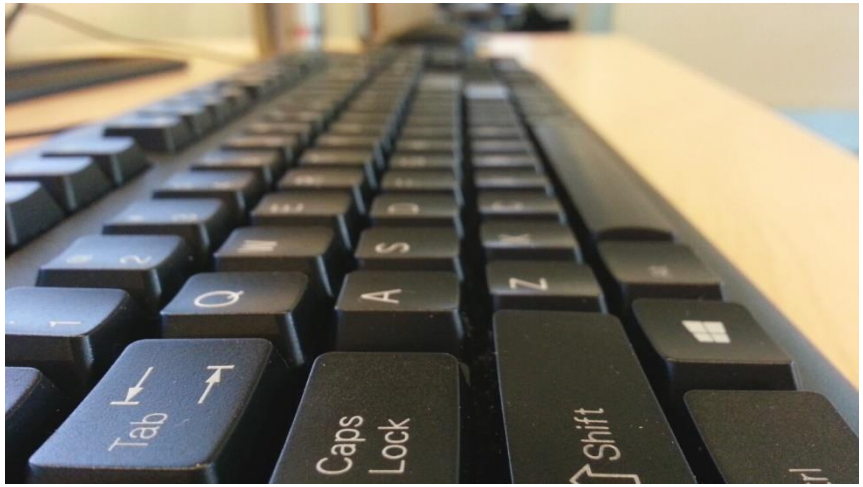
Feature based alignment

Before alignment

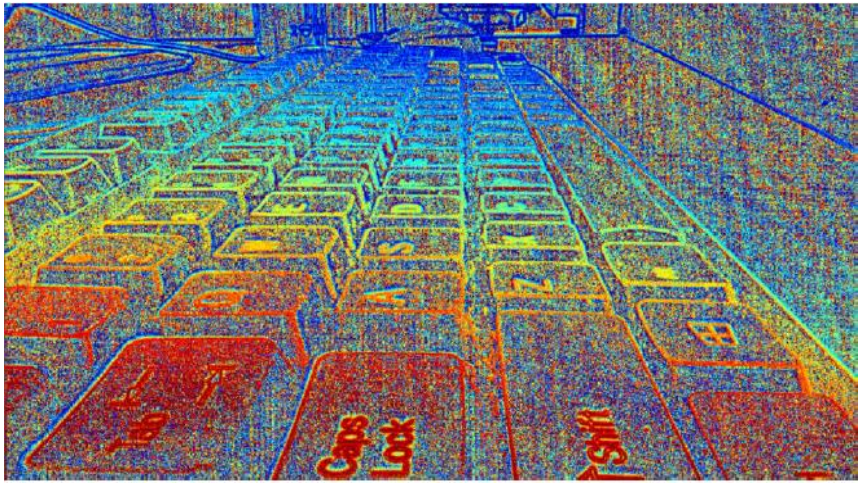
After alignment

Step 2. Focus Measure

Please refer to “A novel algorithm for estimation of depth map using image focus for 3D shape recovery in the presence of noise, A. Malik and T.-S Choi, Pattern Recognition 2008”



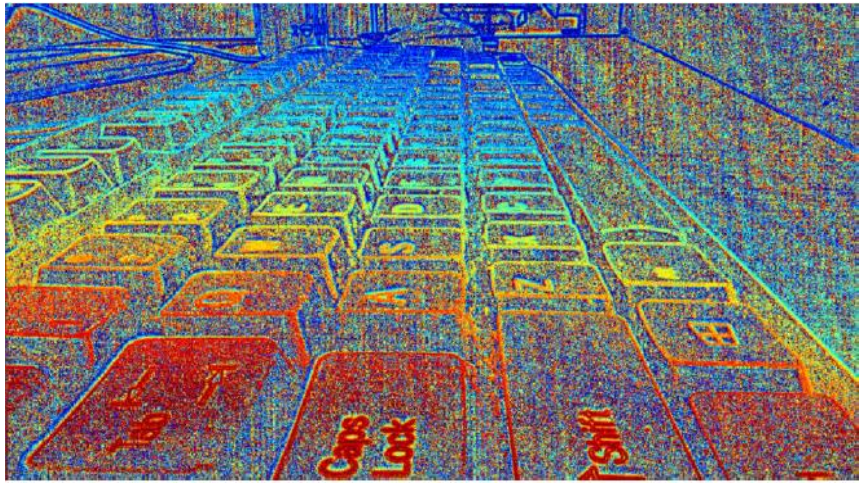
Defocused image



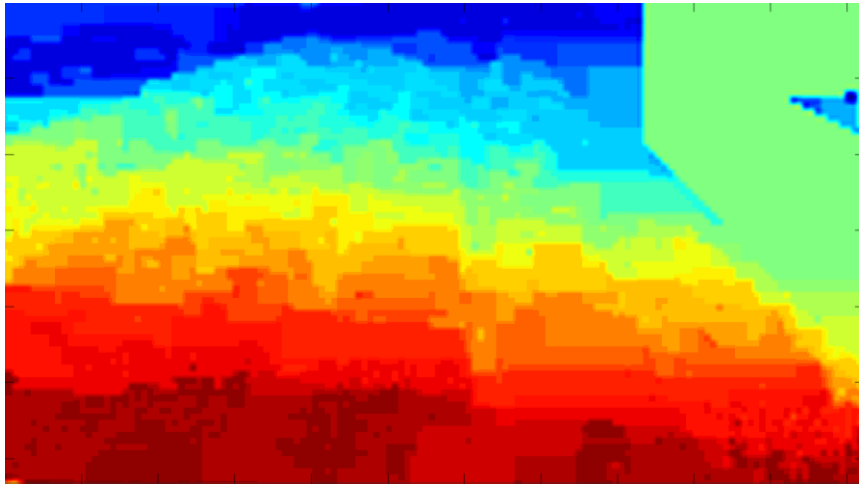
Focus map

Step 3. Graph-cuts

Please refer to “An Experimental Comparison of Min-Cut/Max-Flow Algorithms for Energy Minimization in Vision, Yuri Boykov and Vla dimir Kolmogorov, IEEE TPAMI 2004”



Initial focus map

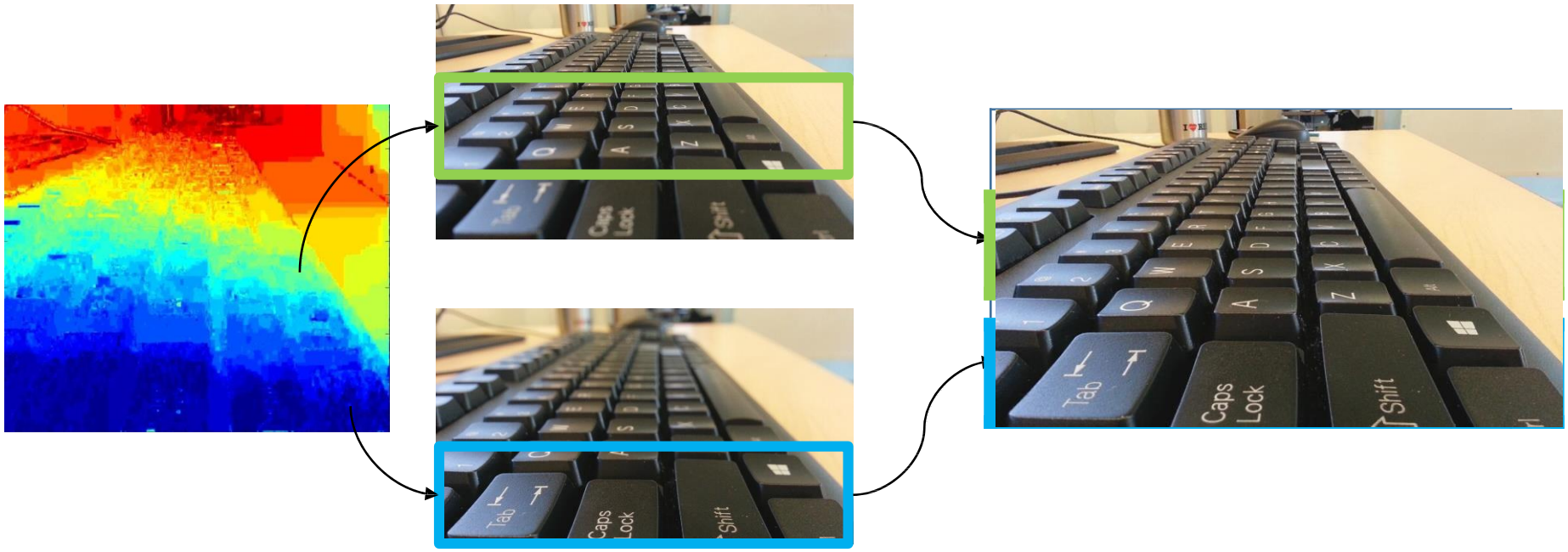


Graph-cuts result

(multi-label optimization : http://vision.csd.uwo.ca/code/)

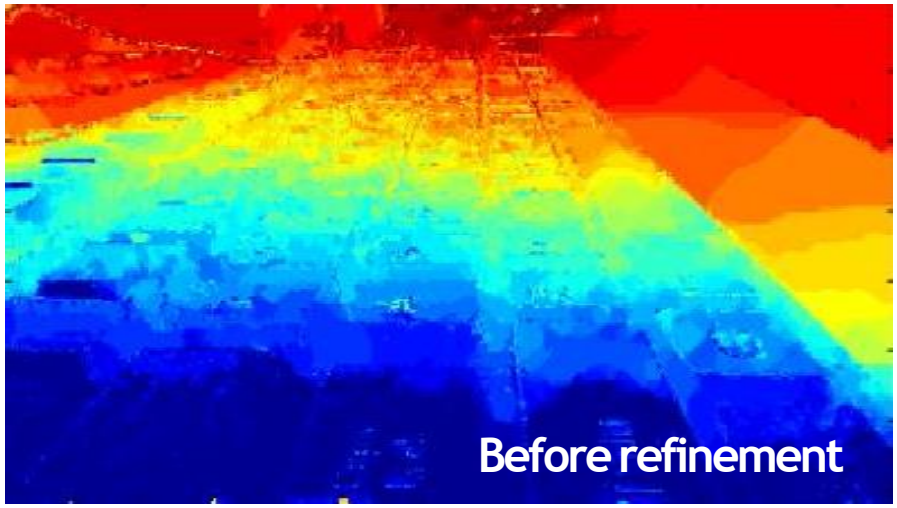
Step 4. All in Focus Image

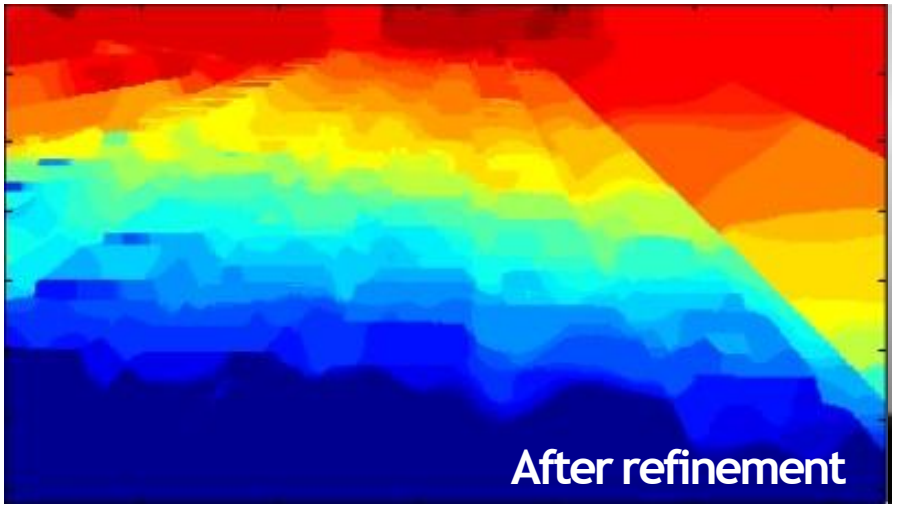
The initial labeling and resulting all-in-focus image are generated by simply finding the index of images that maximizes the focus measure response and combining them to create a label map



Step 5. Depth Refinement

Use the all-in-focus image as a guidance image of weighted median filter. Please refer to course material “Weighted Median Filter”, and Constant Time Weighted Median Filtering for Stereo Matching and Beyond, Ma *et al*., ICCV2013



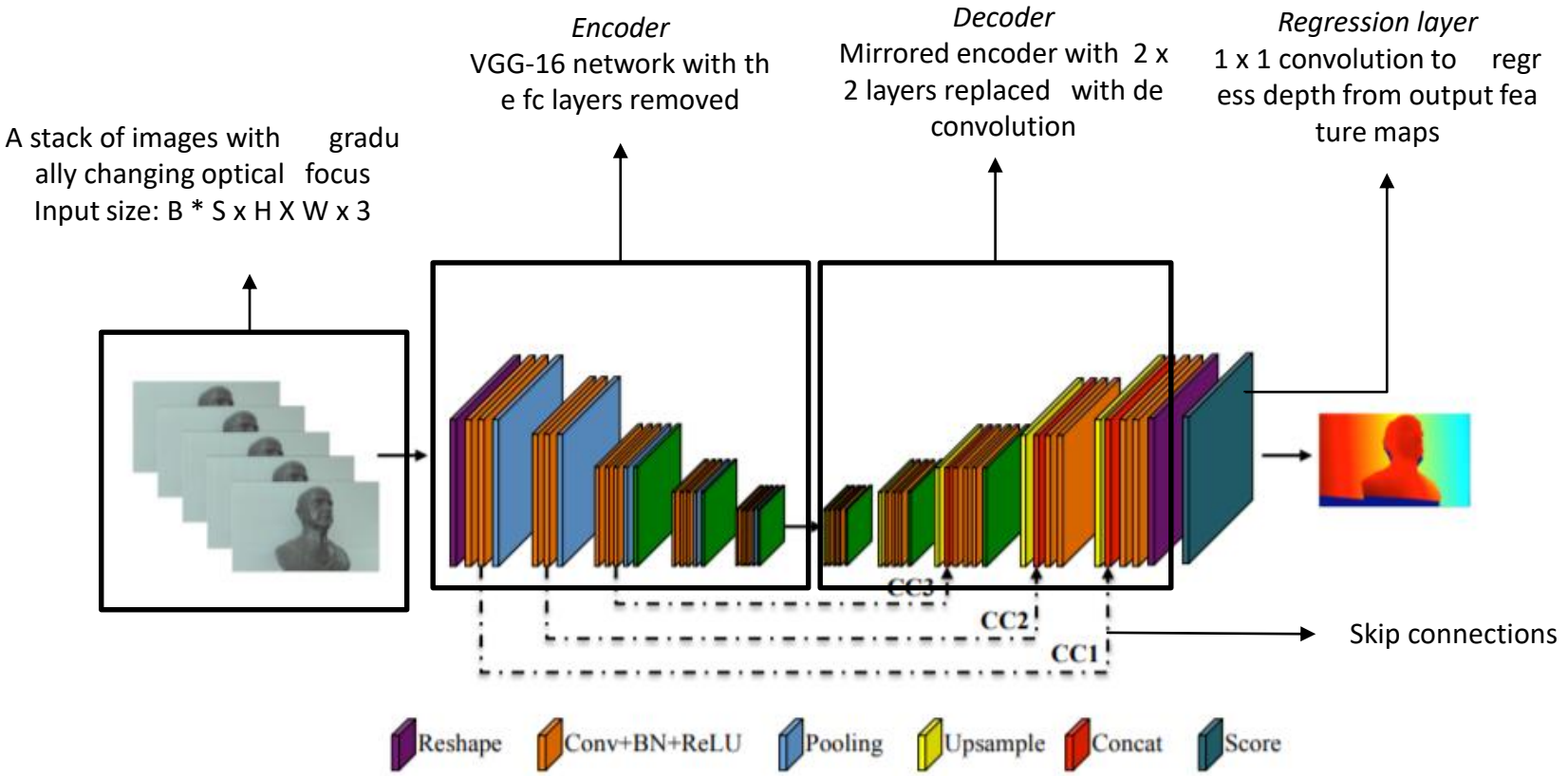


Programing Assignment 1

Part 2. Depth-from-Focus by Deep Learning

Step 1. Reproduce the Baseline

“Deep Depth From Focus”,



Caner Hazirbas, Sebastian Georg Soyer, Maximilian Christian Staab, Laura Leal-Taix ́e, and Daniel Cremers, ACCV 2018

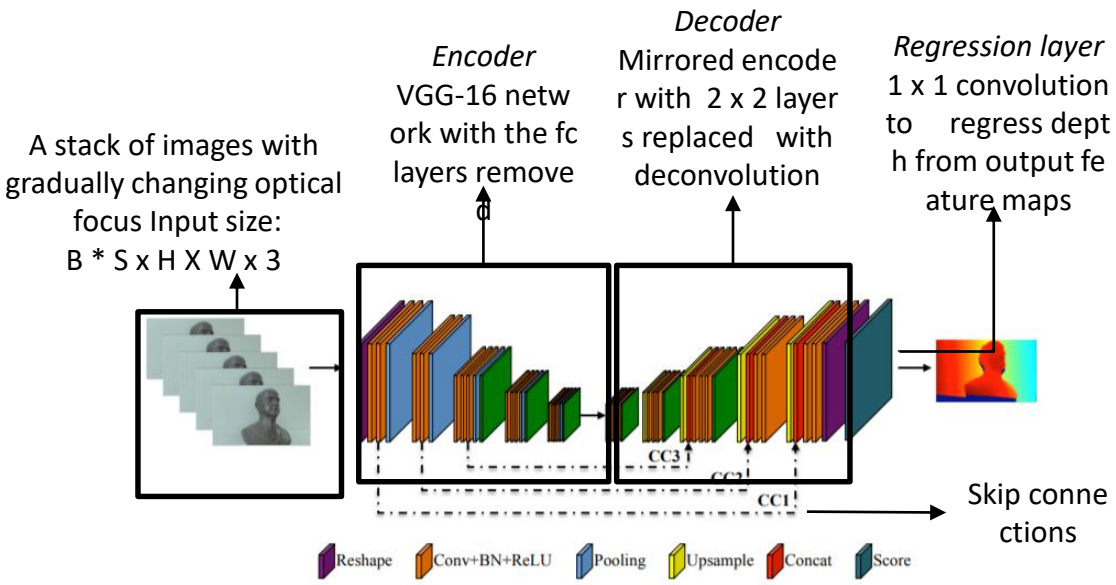
→ ***Please refer the supplementary material.***

Step 2. Learning Inter-Frame Information

- Current baseline operates in frame-by-frame manner.
- Improve the baseline by learning **inter-frame relationships**.
- Try to bring your novel way of design.

"Deep Depth From Focus", *Caner Hazirbas, Sebastian Georg Soyer, Maximilian Christian Staab, Laura Leal-Taix´e, and Daniel Cremers, ACCV 2018*

→ Please refer the supplementary material.



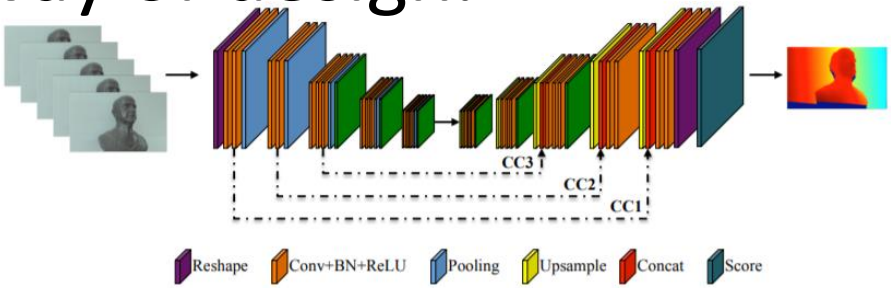
Step 3. Spatial / Volumetric Attention

- Improve the baseline by applying the **spatial** attention.
- Improve the baseline by applying the **volumetric** attention. (**volume : image stack**)

NOTE: For volumetric attention,
it's both fine to learn joint 3D attention,
or decoupled 2D+1D attention.

HINT: You can refer spatio-temporal attention methods in the video domain.

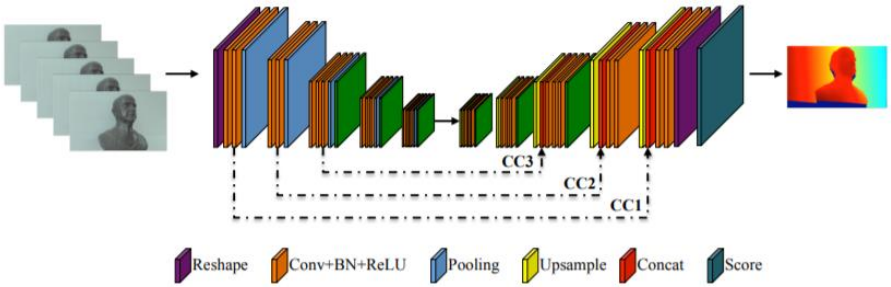
- Try to bring your novel way of design.



Deep Depth From Focus, *Caner Hazirbas, Sebastian Georg Soyer, Maximilian Christian Staab, Laura Leal-Taix´e, and Daniel Cremers, ACCV 2018*

Step 4. Comparison with Part1

- Compare the results to those of Part1.
- Discuss Pros and Cons of each methods.



Deep Depth From Focus, *Caner Hazirbas, Sebastian Georg Soyer, Maximilian Christian Staab, Laura Leal-Taix´e, and Daniel Cremers, ACCV 2018*

Part1 Due: October 13th 11:59pm (Code in Matlab)
Part2 Due: October 25th 11:59pm (Code in Python)

- Report must explain your code, your understanding and your RESULT IMAGES in doc/docx/pdf.
- Send zip file to mcahny [at] kaist.ac.kr
- Zip file naming: PA1_Part1_studentID_NAME.zip
  PA1_Part2_studentID_NAME.zip

- Read the reference material [Depth from Focus] carefully
- No delay for both parts – just submit what you've done