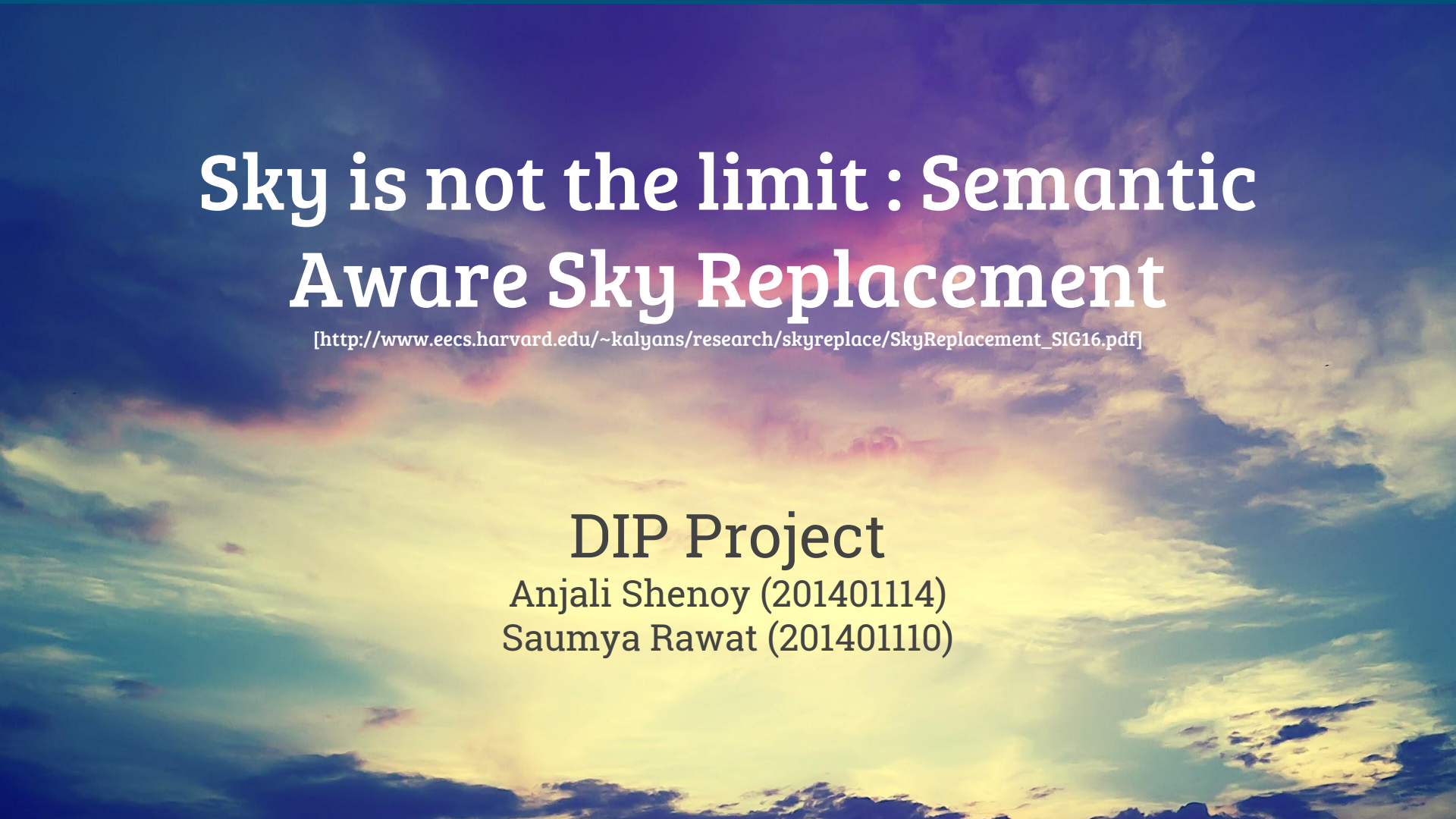


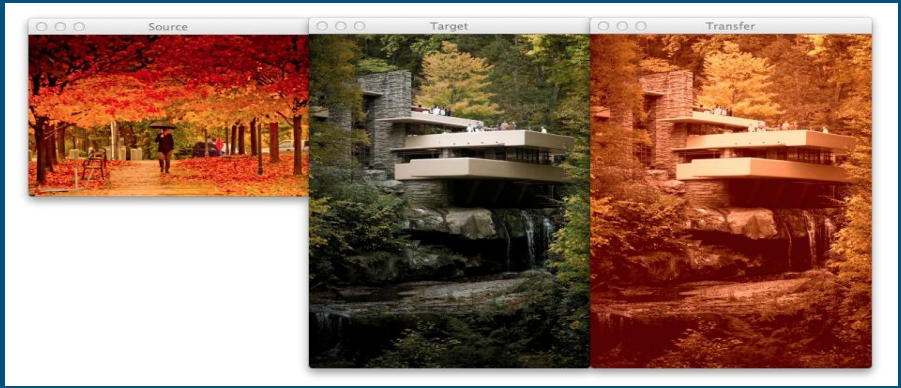
Sky is not the limit : Semantic Aware Sky Replacement

[http://www.eecs.harvard.edu/~kalyans/research/skyreplace/SkyReplacement_SIG16.pdf]

DIP Project

Anjali Shenoy (201401114)
Saumya Rawat (201401110)

What is Colour Transfer?



- Changes the appearance of a target image/video according to the colour pattern of a source image.
- Applications include enhancing photos, movie post-production, artistic design, hallucinating a new image of an existing scene at a different time of the day
- The goal of a colour transfer algorithm should be to keep the scene of the target image and accurately apply all the dominant colour styles of the source.

Problem Statement

- Often in photographs of sceneries, skies form an important part of the aesthetic and yet are less interesting due to the time of photographing. To get the best shot professional photographers have to use sophisticated tools with painstaking efforts to get effects that normal users can’t achieve.
- In the given paper, an automatic background replacement algorithm is proposed that can generate realistic, artifact-free images with a diverse styles of skies. The algorithm exploits the idea that common objects across images will have similar colour based properties.
- Given an input image, a set of possible skies are proposed for sky replacement based on higher number of matching labels found in the database. The output image consists of a sky from the chosen options and foreground objects in the modified colour space after applying an appearance transfer method, developed to match statistics locally and semantically.

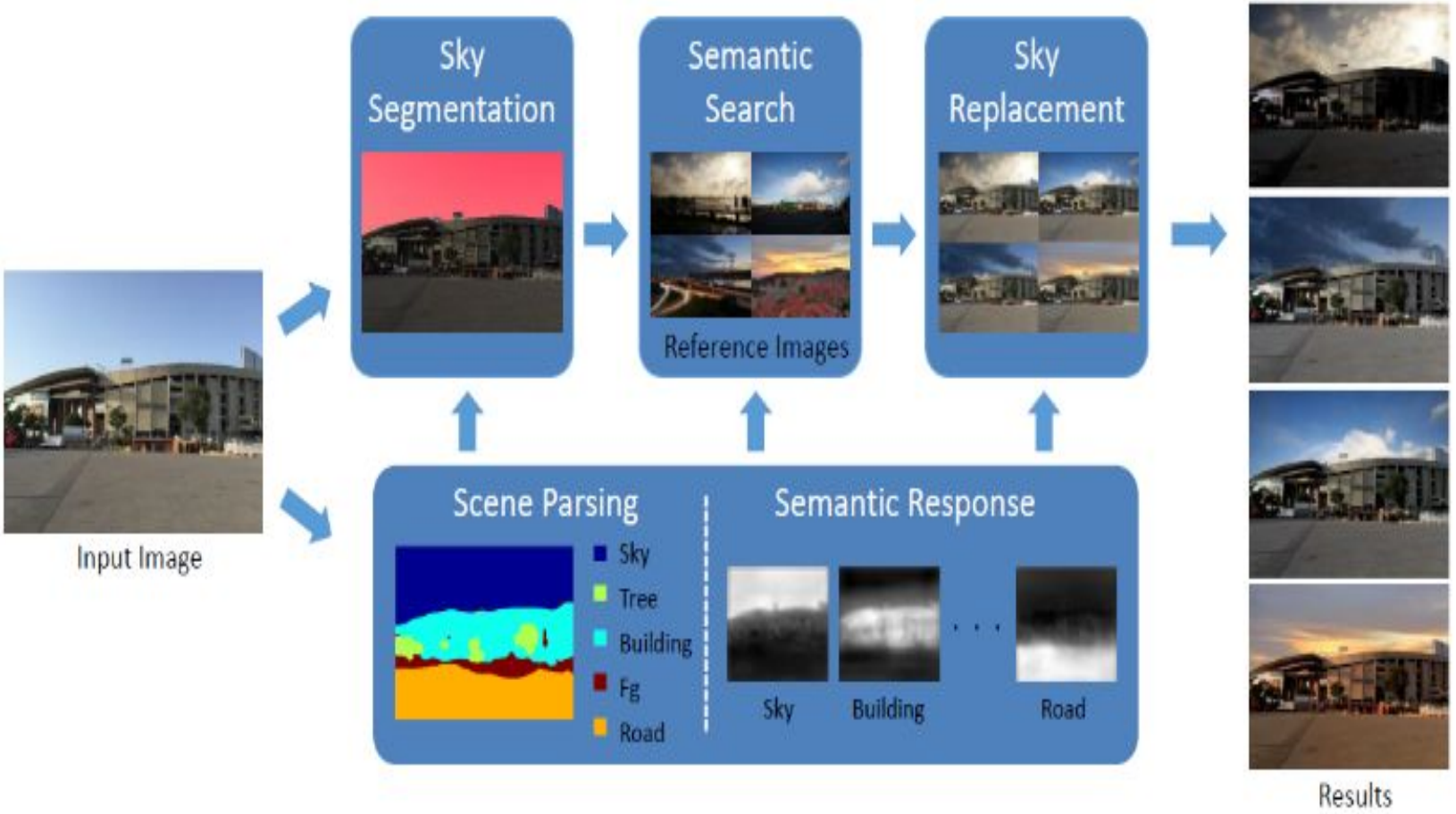
Proposed Approach

- Segment the sky of the input image using a fully convolutional network implementation on Github [https://github.com/shelhamer/fcn.berkeleyvision.org]
- Display reference images using parameters of the convolutional network so as to give images with common labels and yet having different skies, one of which is chosen as new sky for the input image.
- The sky is completely replaced and for the rest of the image :
    - Parts of the image is segmented and labelled.
    - For segments where a common label n is present in both source and target,

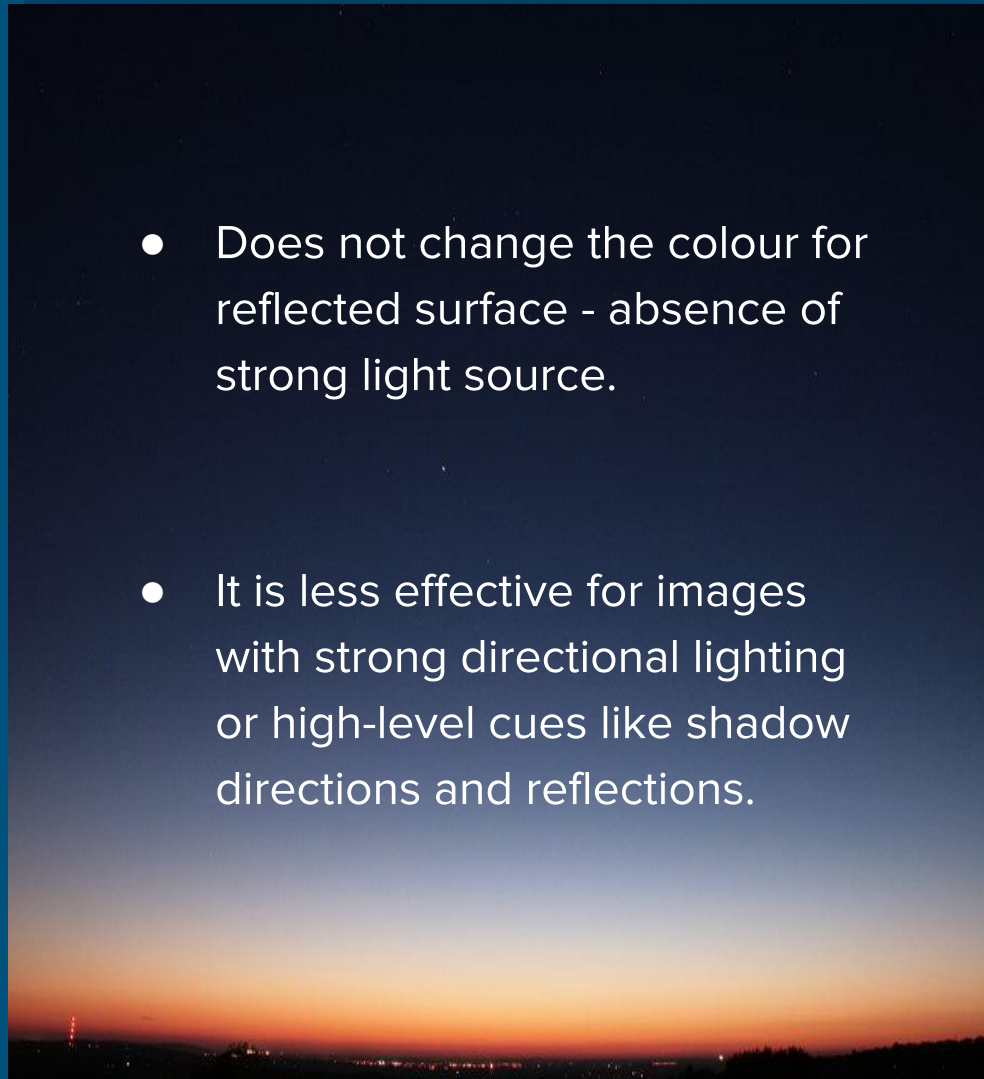
  Luminance: In the Lab colour space : shift mean of L^{source} to L^{target} regularized by the colour difference between the two skies.

  Chrominance: Model the chrominance distribution of an image using a multivariate Gaussian, and find a transfer function that creates the output image O by mapping the Gaussian statistics of the source to the Gaussian statistics of the input image I.
    - For segments where no common label exists,

  Luminance is shifted in the same way as before, the chrominance colour channels are shifted in XYZ colour space. Use compositing so that the foreground object better matches the background.


Sky Segmentation
Semantic Search
Reference Images
Sky Replacement
Input Image
Scene Parsing
Sky
Tree
Building
Fg
Road
Semantic Response
Sky
Building
Road
Results

Limitations of the given approach



- Does not change the colour for reflected surface - absence of strong light source.
- It is less effective for images with strong directional lighting or high-level cues like shadow directions and reflections.

Challenges

- Manipulating the output of the convolutional network to fit our model and understanding it’s parameters to form a relevant response map.
- Applying a decent sky replacement given that it has not been completely explained in the paper.
- Using the various filtering and refinement techniques proposed in the paper after every step in the pipeline to get the most realistic result

Timeline

Understand and modify the FCN and form a relevant response map

Getting a set of proposed skies according to the response map

Perform colour transfer of matched labels

OCTOBER

Perform realistic composting on unmatched labels

Work distribution

Anjali:

Understand and modify the FCN and form a relevant response map

Getting a set of proposed skies according to the response map

Saumya:

Perform colour transfer of matched labels on the output of the FCN (While that is being worked on : http://dags.stanford.edu/projects/scenedataset.html)

Perform realistic composting on unmatched labels

Thank you!