



Clear Skies Ahead

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Joint work with Tavi Halperin, Harel Cain and Michael Werman (HUJI)
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Sky replacement in stills, in video and in real time

What we'll talk about

- Why sky?
- The challenges in still image compositions
- The challenges in video sky replacement
- The segmentation pipeline
- Something to feast your eyes on



Why Sky?





Control the skies

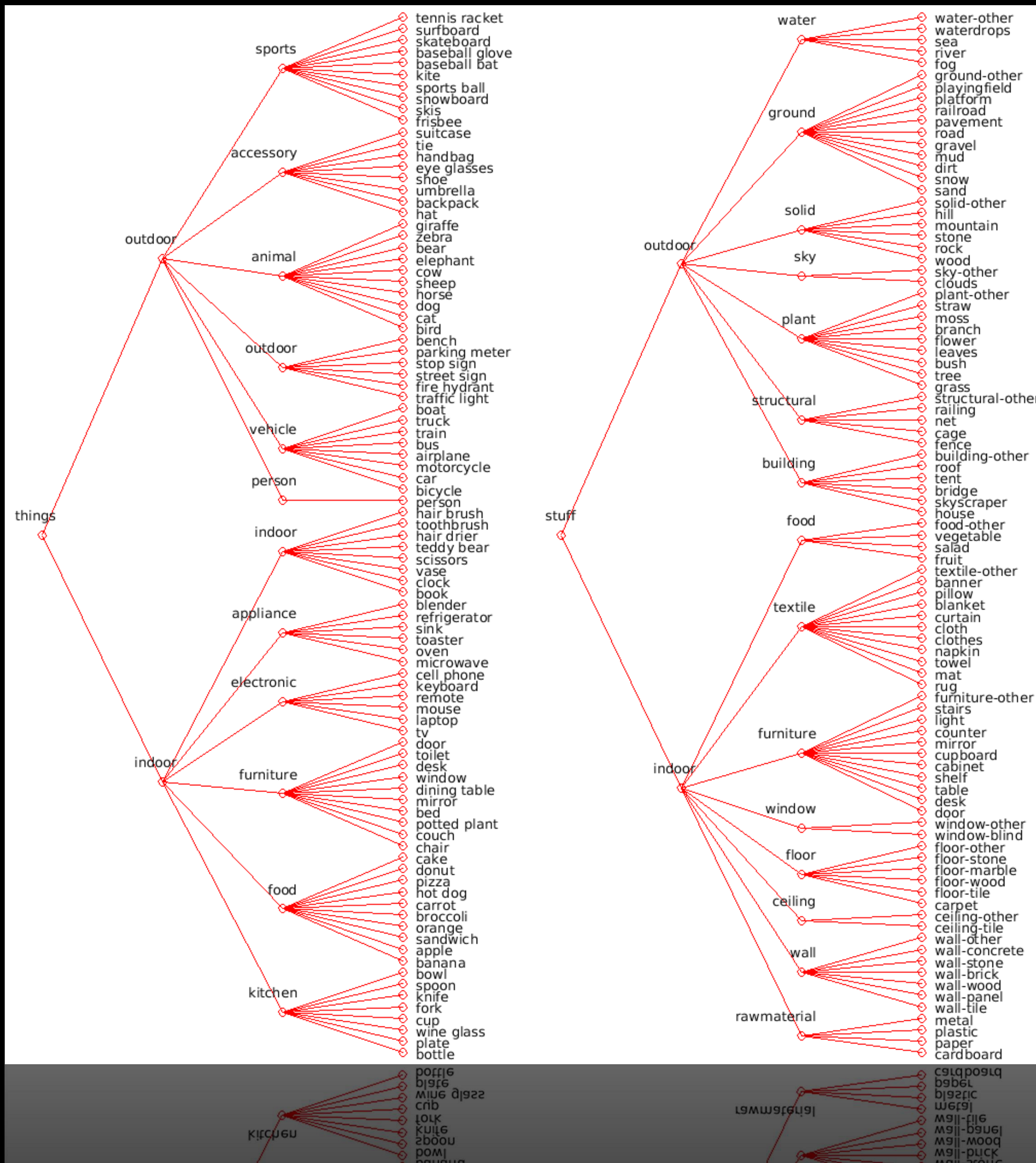
Skies can take up a significant portion of an image.

They are not always pretty.

Quickshot sky replacement to the rescue.



Sky composition challenges

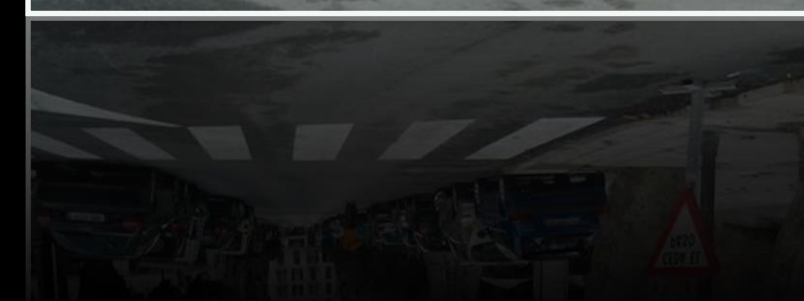


Data sources

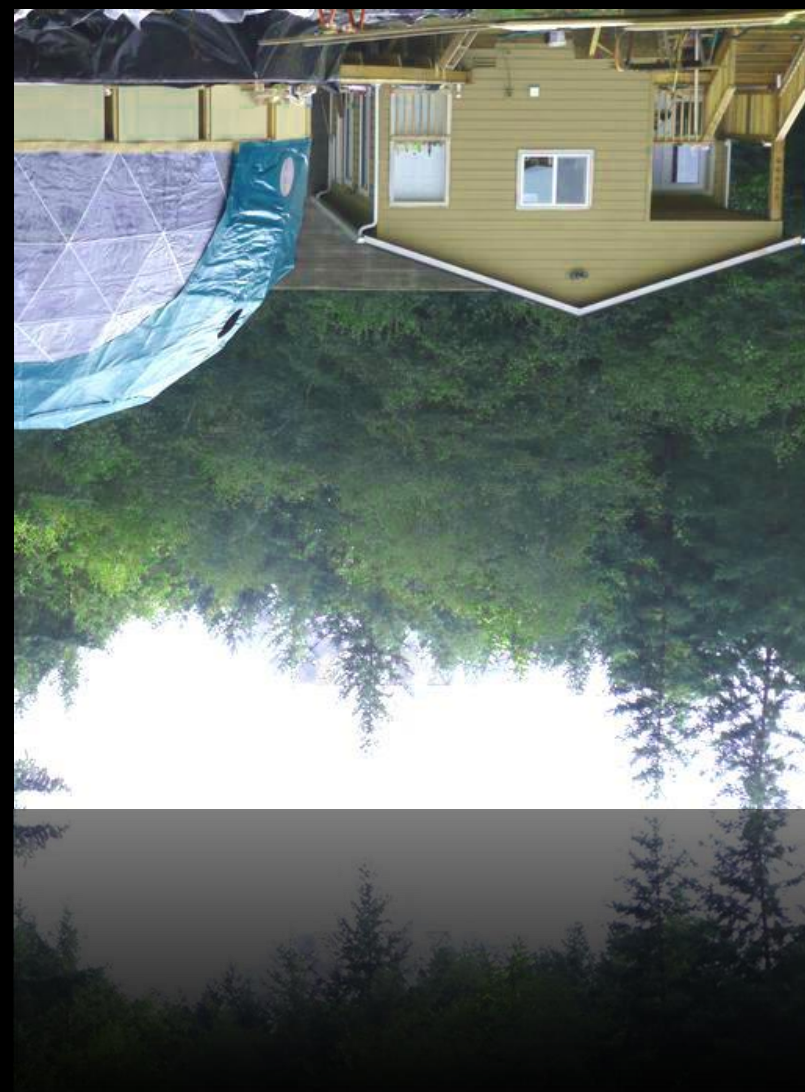
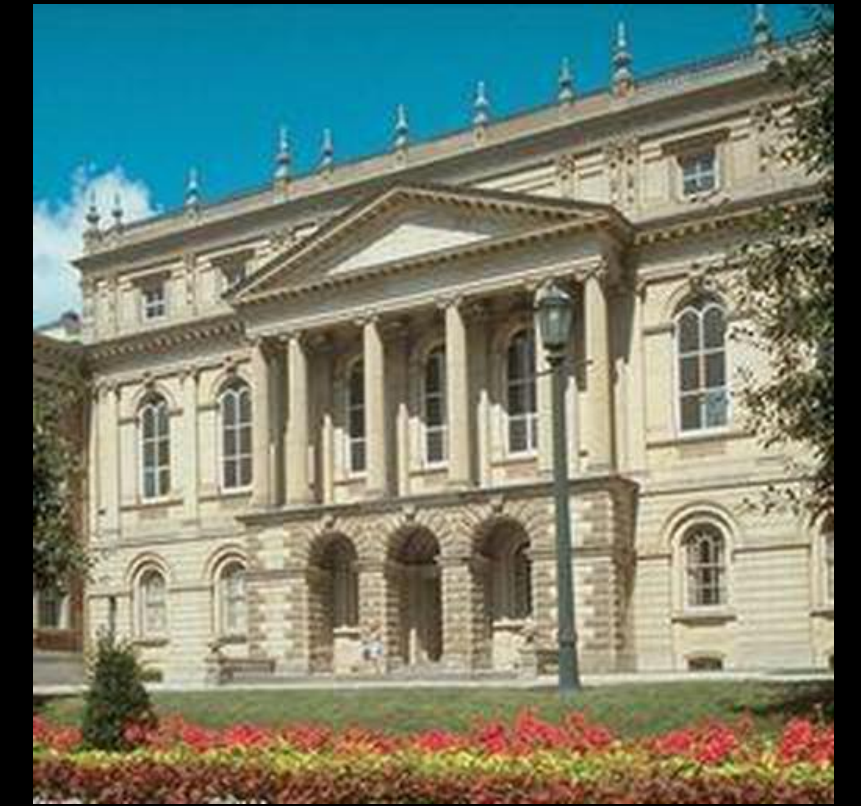
Scarcity of data for “stuff” classes, especially in video.

COCO Stuff + Pascal Context + ADE20K = ~14k still images.

Quality of ground truth.



Augmentation



Clouds



Home assignment: find as many transparent clouds as you can on google images.

Augmentation



Accuracy and bias



89.4% average mean-IoU on the LMSUN dataset (compared to ~87% in [Tsai et al.] and 88.4% without data augmentation).



68.2% of images achieve IoU > 90% (compared to ~62% in previous work [Tsai et al.] and 63.5% without data augmentation).

Training loss and post processing is biased towards labelling non-sky as sky. Ask me why.

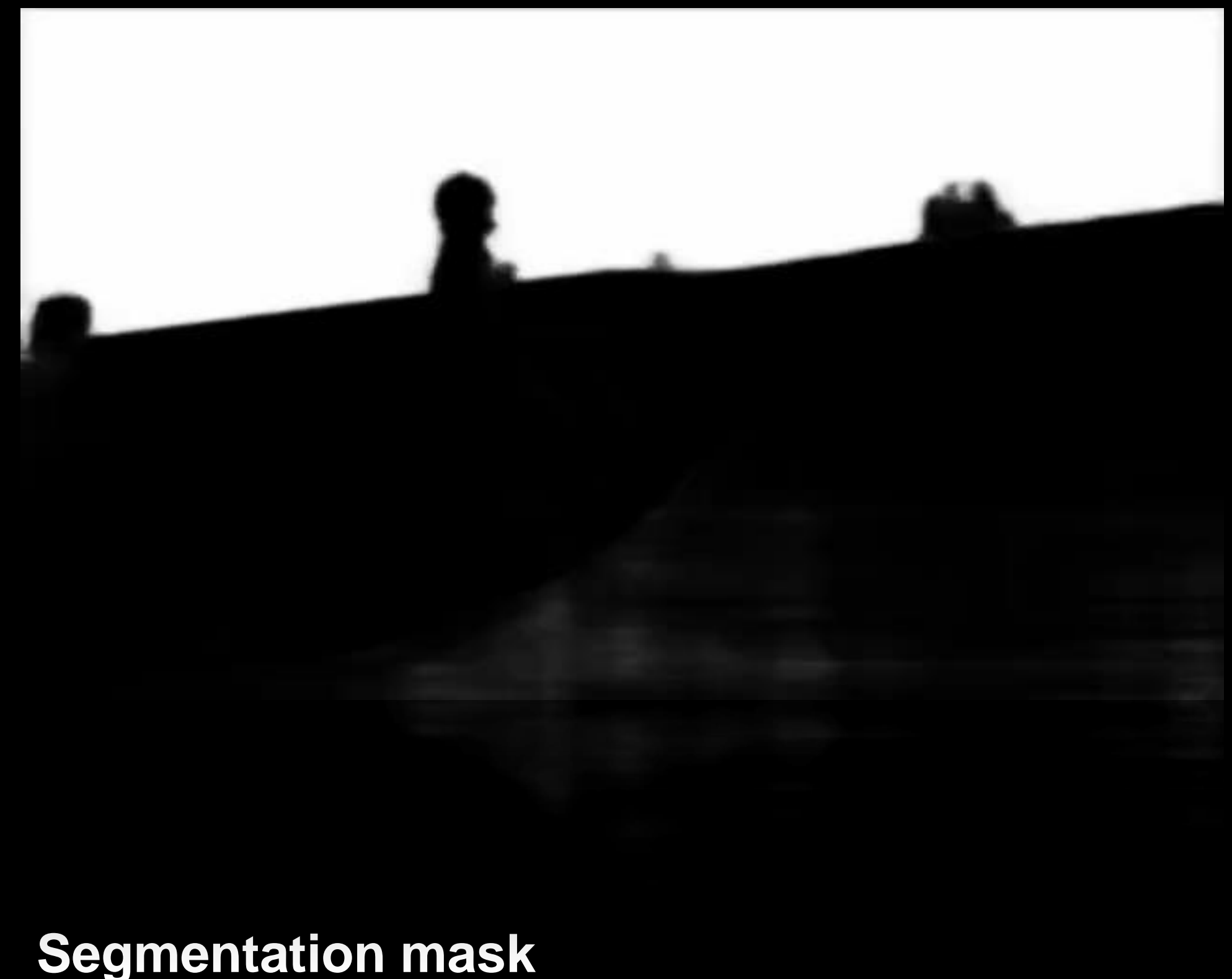
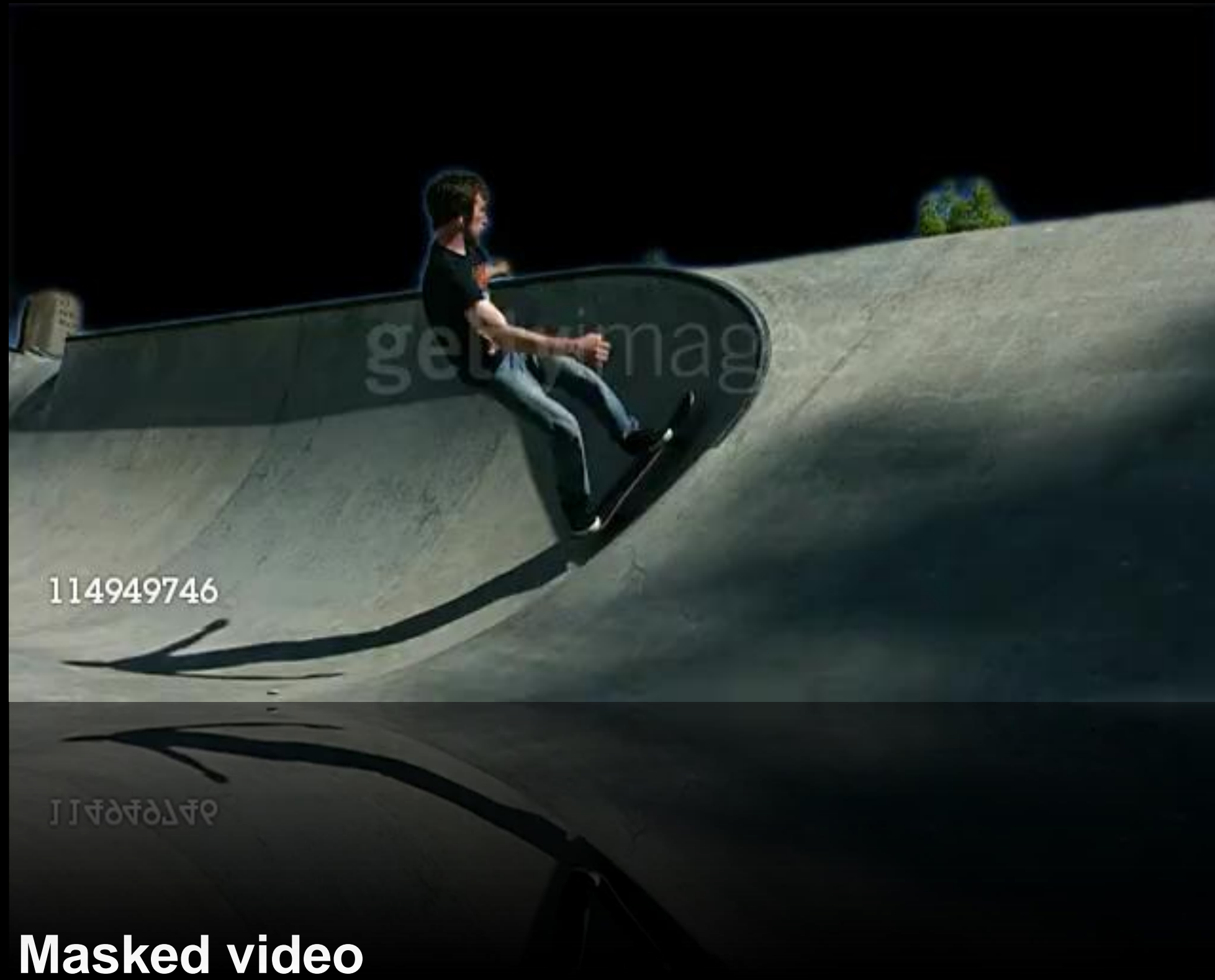
Unrealistic results



The challenges of video



Temporal consistency in segmentation



Throughput and Real-Time



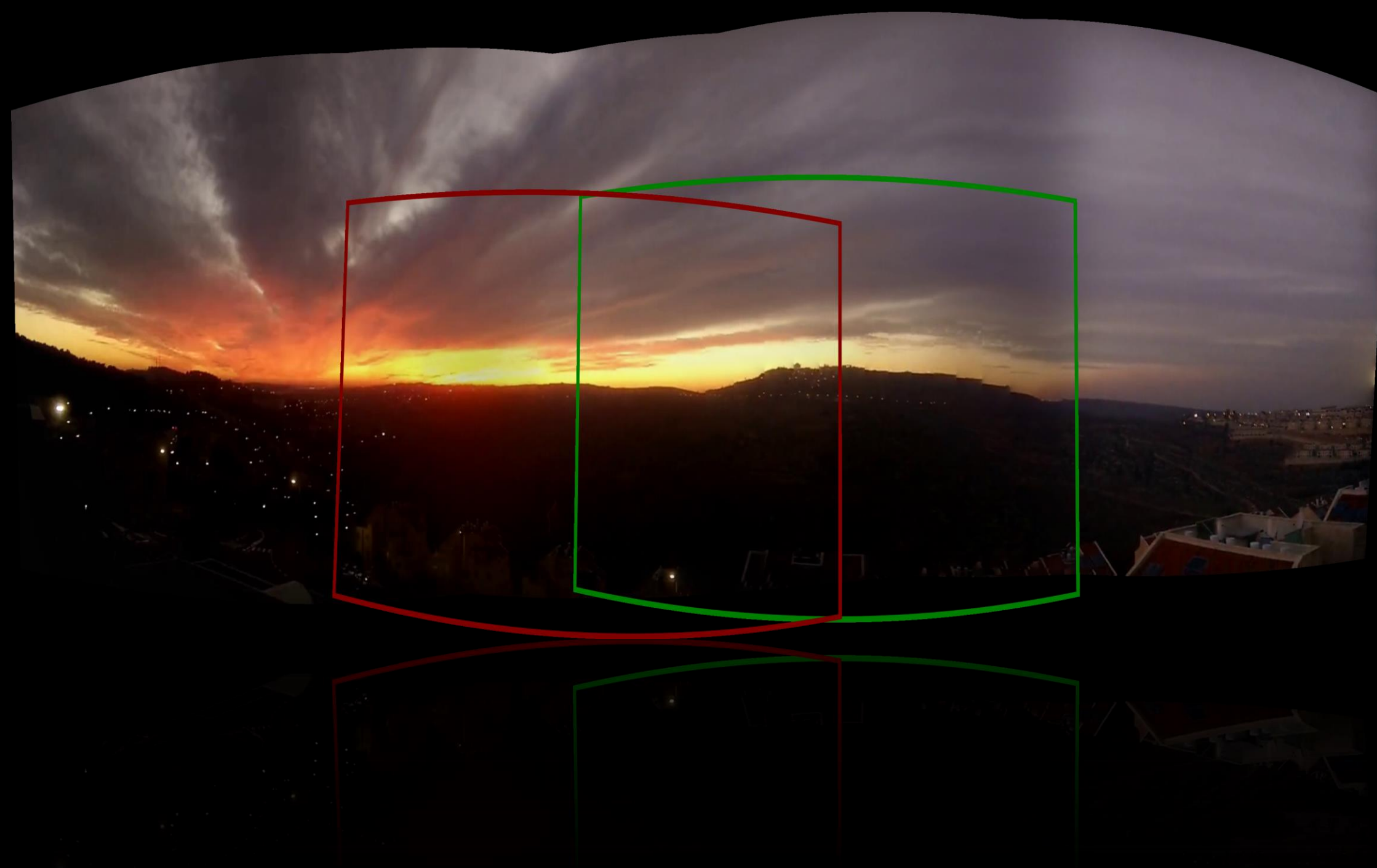
Real-Time in video is from 24 fps through 30 fps and even 60 fps.

That means ~34 ms for the processing of the entire pipeline on a 720p frame at 30 fps.

Ambience and color transfer consistency



Field of view estimation And camera tracking



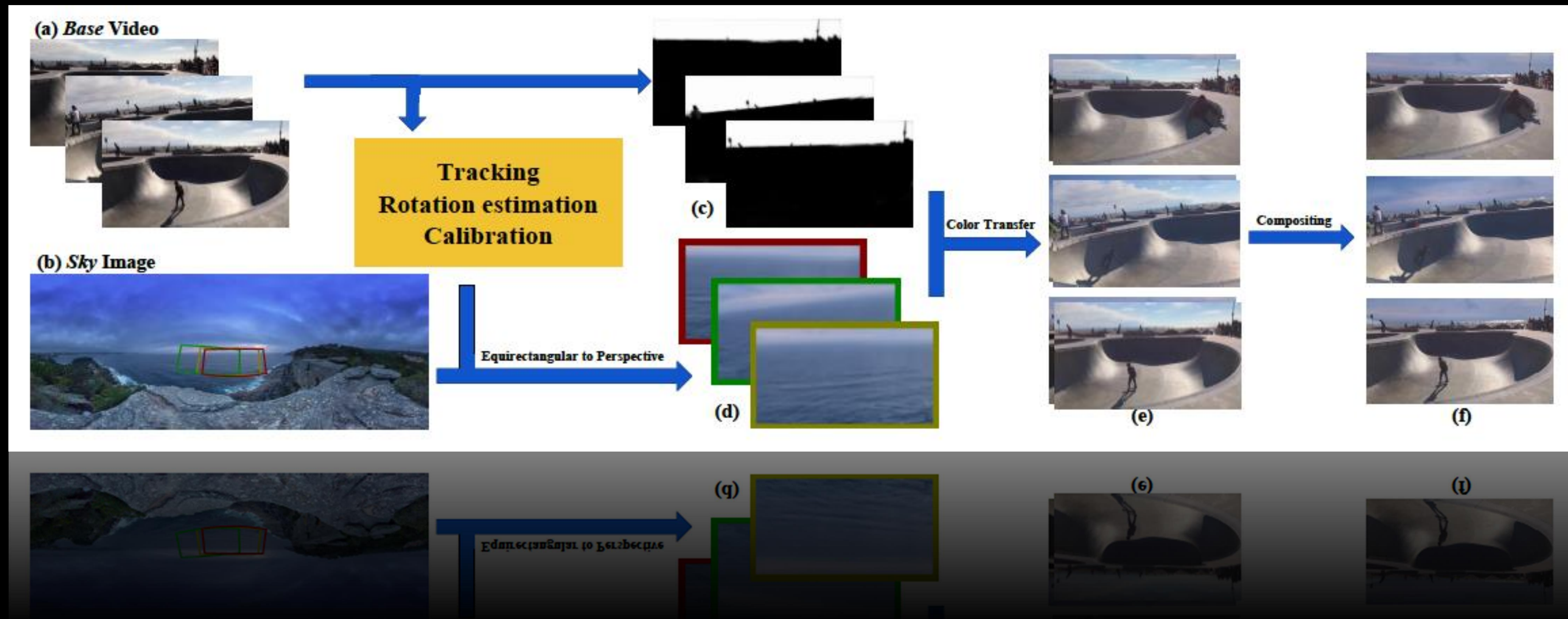
Exposure and Vignette correction



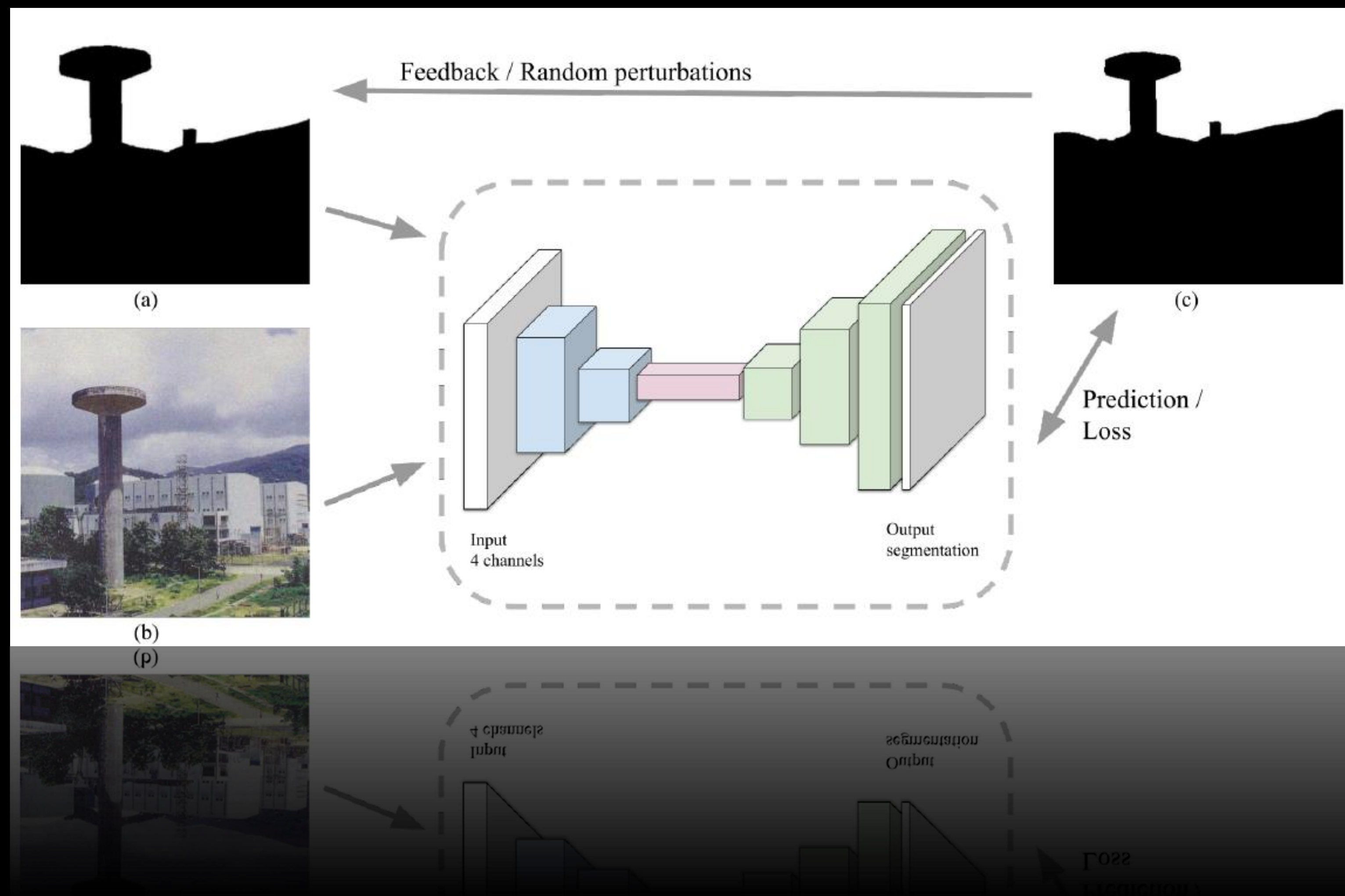
The whole pipeline



The pipeline



The feedback loop



Never blindly trust your feedback loop



Masked video



Segmentation mask

Feast, or nibble,
No cherries here

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Original



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Masked



Tracked cover



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Result



Thank You!

Yes, you guessed it, we're hiring...

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