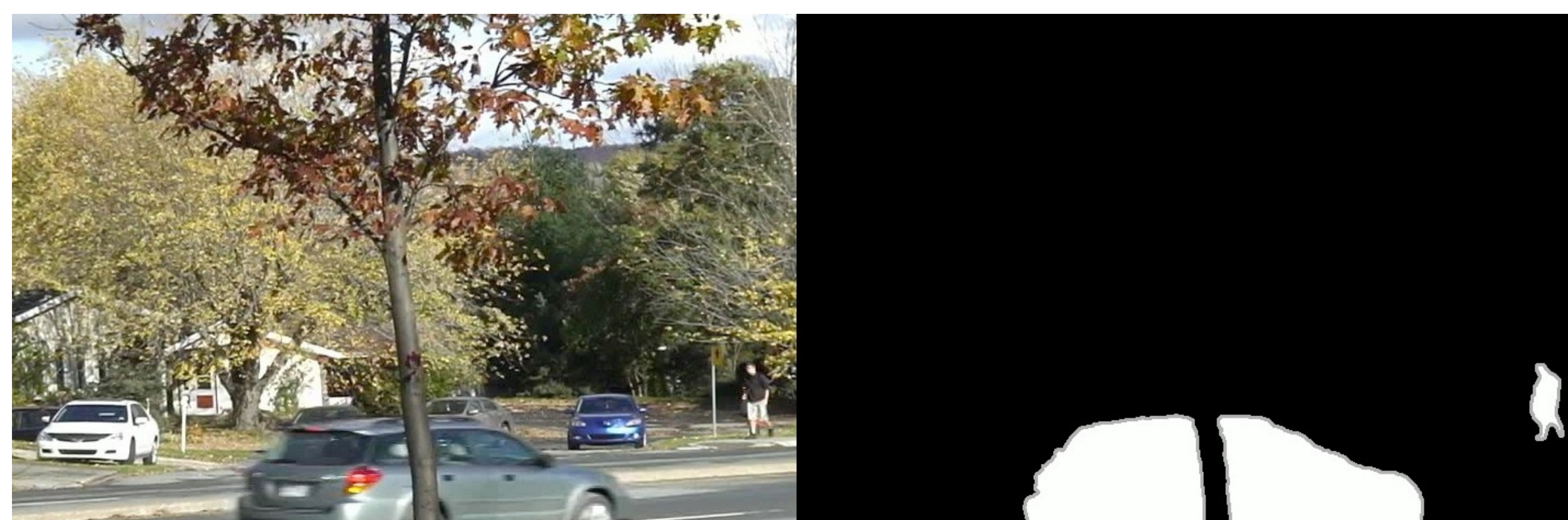


Foreground segmentation

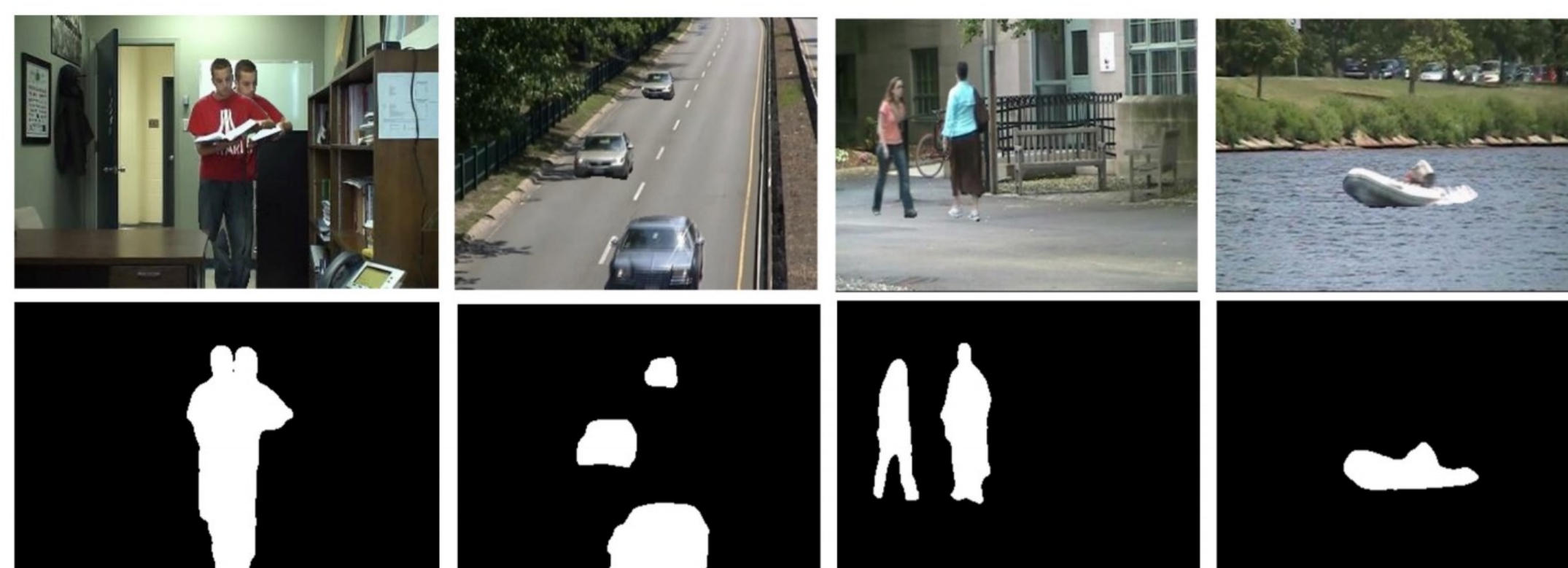
Foreground segmentation a major computer vision task that detects changes in image sequences.



The problem

The premier system for a static scene utilizes between 25-200 manually labeled images for each scene.

Manual marking is an expensive process, so we made an automatic system that creates a training set - without the need for human intervention.



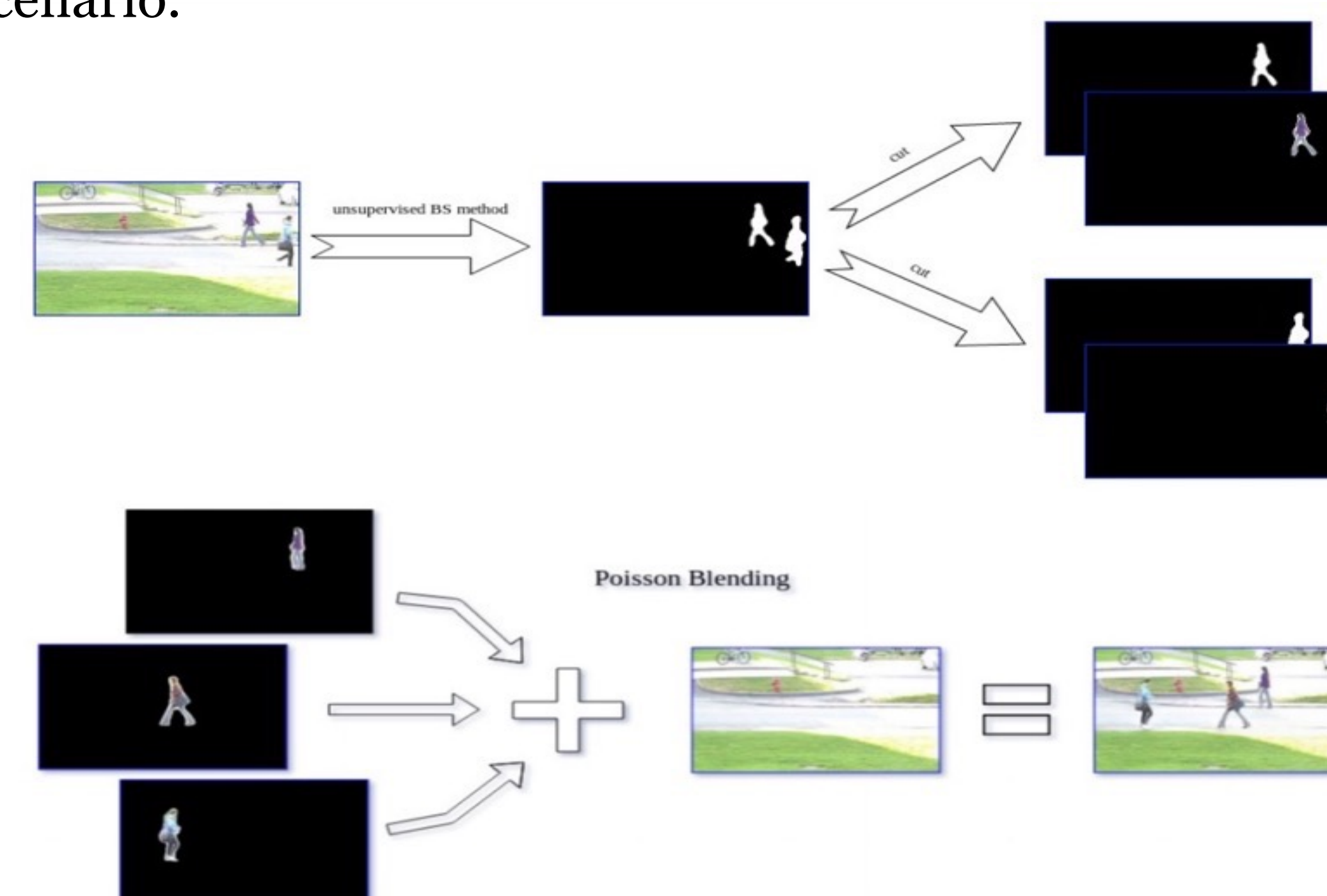
Building the "supervised" training dataset

We use the foreground segmentation results of an unsupervised method to extract objects from the video.

The foreground objects are extracted with unsupervised methods in a 'cut & paste' fashion such that a foreground object and its mask are extracted to create a foreground database.

Then, we randomly chose from these objects and insert them in their original position into a background image

As these objects are spatially positioned exactly where they were found, cars are on the right roads, pedestrians on the traversed paths, and everything is where it really should be and with the correct projection and lighting, without having to analyze the scenario.

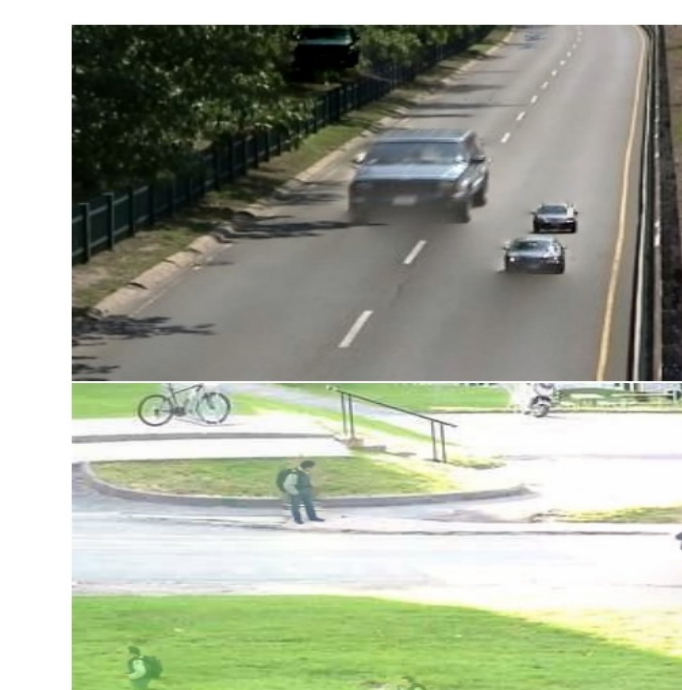


Experiments

In our experiments we examined our results against the results of the state-of-the-art unsupervised methods that were not finetuned to the specific scene. Our method beat them with a big margin.

In addition, to emphasize the importance of "understanding the scene" were also compared when pasting objects randomly and not in their natural place or objects that do not belong to the scene.

In both cases there was a decrease in the quality of the results.



Category	baseline	shadow	dynamic
BSUV-Net v2			
Reference	0.962	0.956	0.905
FgSegNet V2			
BSUV	0.964	0.950	0.946
Objects from different scene & random location	0.739	0.673	0.648
Same scene objects & random location	0.923	0.893	0.854
Same scene objects & specific location	0.984	0.960	0.956

Summary

We showed how a supervised foreground segmentation algorithm can be made unsupervised by replacing the supervision with augmented frames based on objects extracted with an unsupervised algorithm. This leads to a state-of-the-art unsupervised foreground segmentation.

