Visual Flow Analysis and Saliency Prediction

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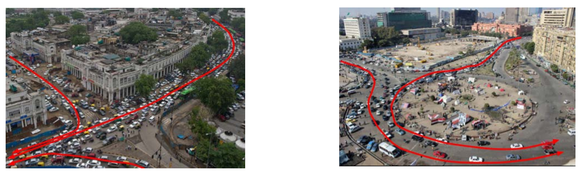
Flow Analysis in Surveillance Videos

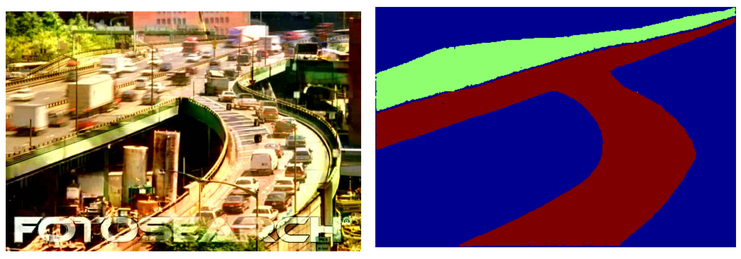
• Dominant Flows - Recurring motion patterns in a video



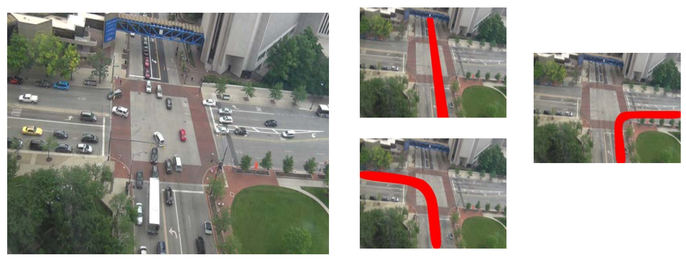
Applications:

• Flow statistics, Path Prediction, Anomaly Detection

• Static Flow Videos

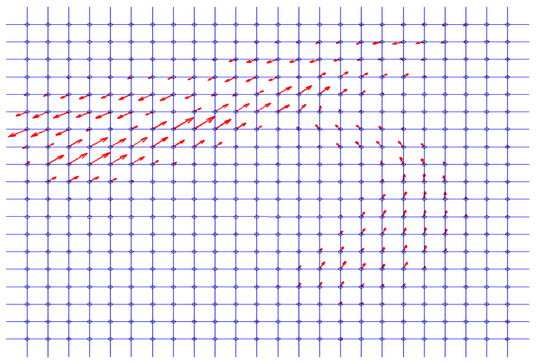


• Dynamic Flow Videos

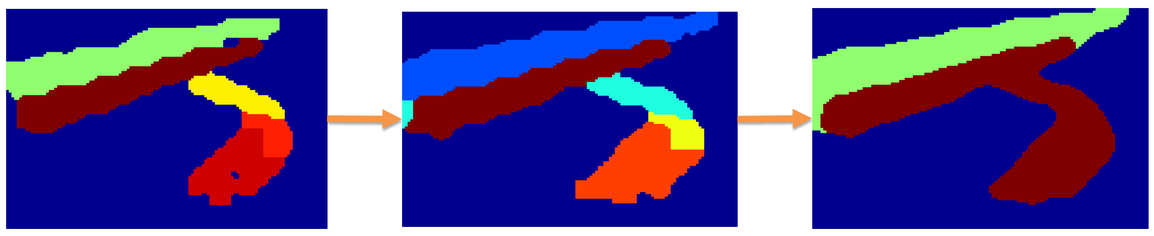


Static Flow Scenarios

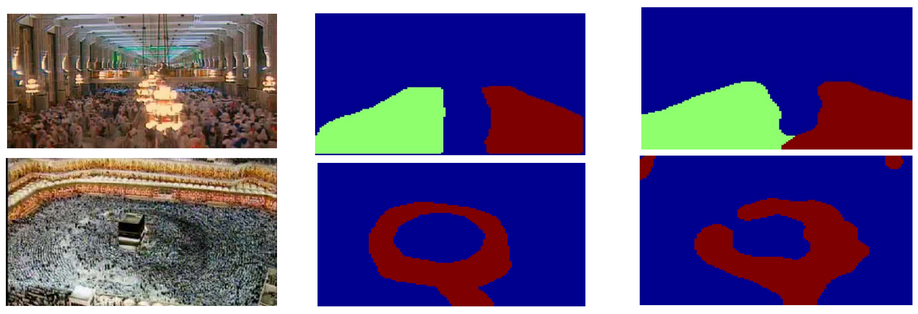
Video Frame



Mean motion vectors represented on a Conditional Random Field

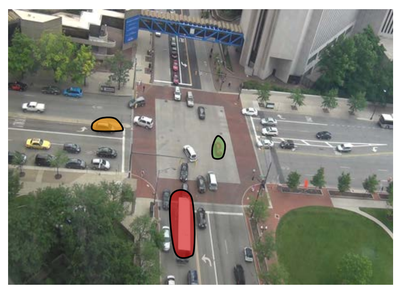


Coarse Orientation Segments Fine Orientation Segments Final Flow Segments

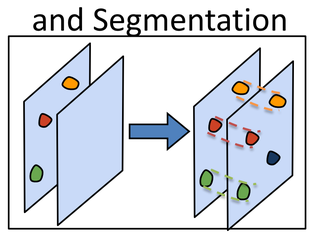


Video Frame Ground-truth Proposed Method

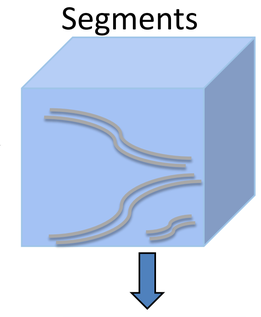
Dynamic Flow Scenarios



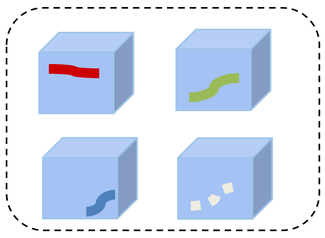
Moving Object Detection and Segmentation



Long-term Flow Segments

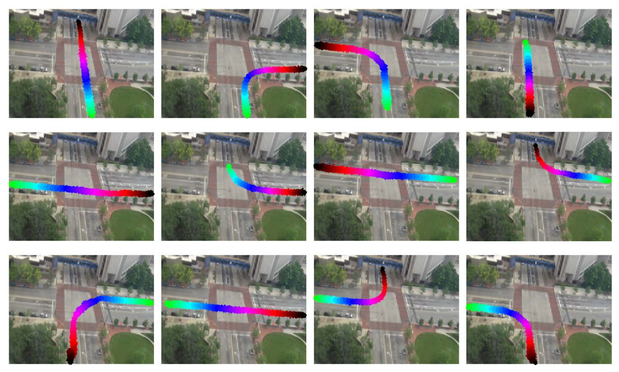


Flow Segment Clustering

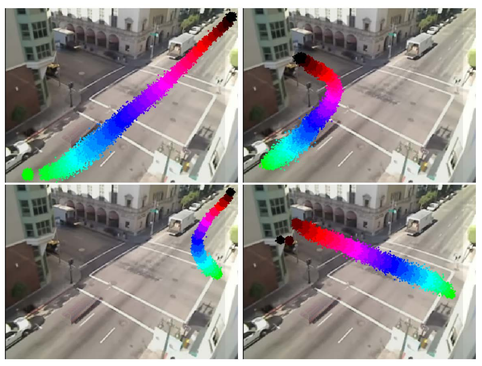


Dominant Flow Models

Application: Vehicle Path Prediction



Junction Video: 12 Dominant Flows



Adams: 4 Dominant Flows

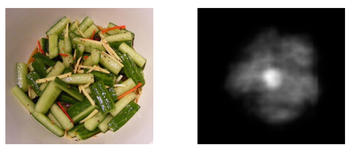
Visual Saliency Prediction using Deep Convolutional Networks

• **Visual saliency** is the distinct perceptual quality of a region in the image which makes it to stand out and grab human attention

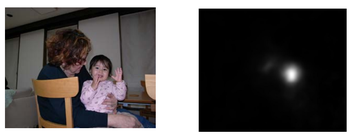
• Text

• Color Contrast

• Centre bias



• Faces



• many more

• Wide variety of possible causes, both *low-level* and *high-level*, make it difficult to hand-craft good features for predicting saliency

• Our Approach: End-To-End Deep Learning system from image to saliency map

DeepFix: Fully Convolutional Network for Eye Fixation Prediction

● Large depth - to enable the extraction of complex semantic features

● Kernels of different sizes operating in parallel -- to characterize the object semantics simultaneously at multiple scales

● Kernels with large receptive fields - for capturing the global context

● Location biased convolutional layers - for learning location dependent patterns such as the center-bias present in eye fixations

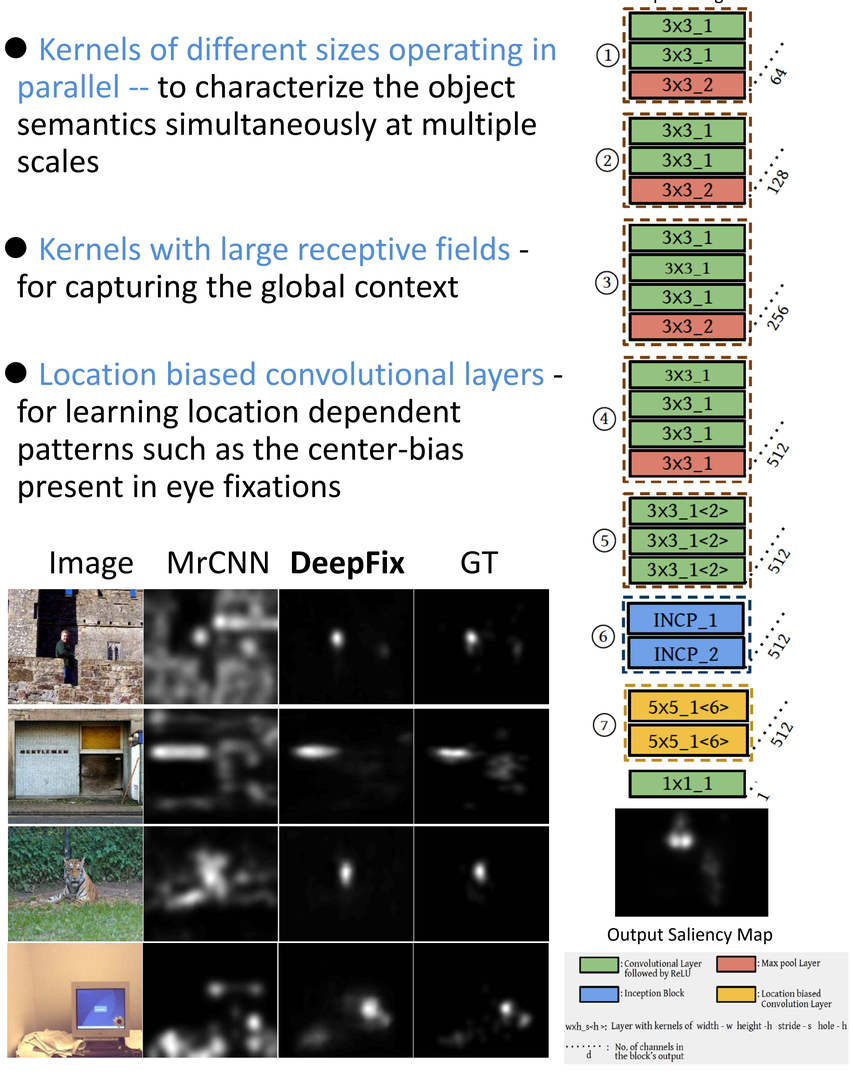
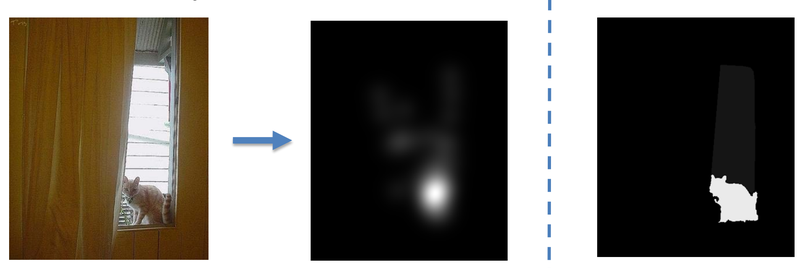


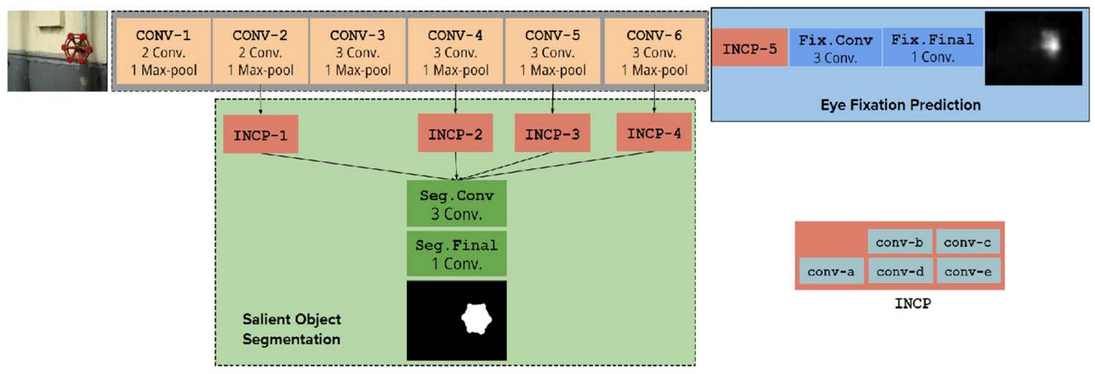
Image MrCNN **DeepFix** GT

Saliency Unified: A Deep Architecture for simultaneously predicting Eye Fixations and segmenting Salient Objects

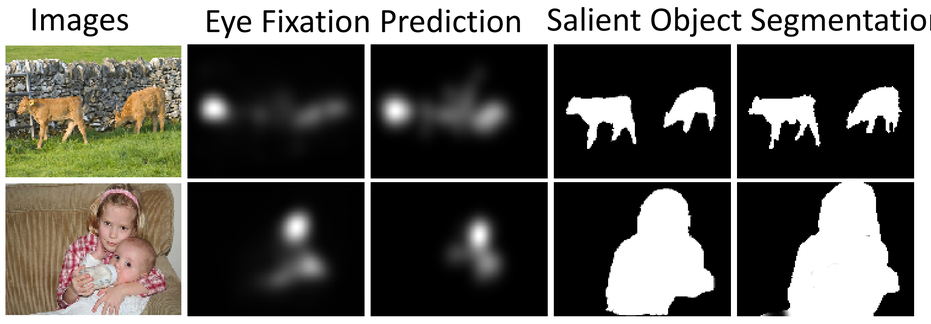
• Two worlds of Saliency



Eye Fixation Prediction Salient Object Segmentation



Images Eye Fixation Prediction Salient Object Segmentation



Prediction GT Prediction GT

References: 1. Srinivas K and R. Venkatesh Babu. "Crowd flow segmentation in compressed domain using CRF." *IEEE ICIP*, 2015.
2. Srinivas K, and R. Venkatesh Babu. "Dominant Flow Extraction and Analysis in Traffic Surveillance Videos." *IEEE CVPRW* 2015.
3. Srinivas K, Kumar Ayush, and R. Venkatesh Babu. "DeepFix: A Fully Convolutional Neural Network for predicting Human Eye Fixations." *arXiv 2015*
4. Srinivas K, Vennela G., Jaley D. and R. V. Babu. "Saliency Unified: A Deep Architecture for simultaneous Eye Fixation Prediction and Salient Object Segmentation." *IEEE CVPR* 2016.