Watch and Learn: Semi-Supervised Learning of Object Detectors from Videos
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Goal: Long hours of unlabeled videos + few labels → Object Detectors

**Discovered**
- Multiple objects per frame
- Both static & moving objects

**Relaxes Standard Assumptions**
- Works in the presence of unrelated/distractor videos
- Does not require exhaustive annotation of input video frames
- Does not assume salient motion
- No explicit negative data required

**Object Detectors**
- Few labeled examples (no exhaustive labeling)
- No explicit negative data required
- Does not require exhaustive labeling

**Results: Ablation Analysis**
- Qualitative results: Subset of bounding boxes automatically labeled and used to train ESVMs across iterations
- Training detectors on automatically labeled data
- Evaluation of the labeling process

**Results: Scalability and Generalization**
- Qualitative results: Subset of bounding boxes automatically labeled and used to train ESVMs across iterations
- Evaluation of automatically labeled data

**Detection Error Modes**
- Inverse HOGs visualization for trained ESVM
- Inverse HOGs visualization for ESVM detector

**Verification using De-correlated errors**
- Multi-view Verification: Detect in one feature space; verify detections in another

**Selection of new positives**
- Goal: Diversity in training set for next iteration
- Why? Repetition in videos
- How? Compute similarity between existing models and newly labeled boxes; select diverse (unexplained) new boxes.

**Candidate box selection**
- Edge weights = $\Delta_{flow} + \Delta_{area} + \Delta_{location}$
  - Formulated as shortest path through a Trellis graph
  - Solved using DP
  - Object Proposal boxes augment weak detection prior

**Diffusion in pose of discovered examples**

**Object Proposal boxes**
- VIRAT dataset

**Goal:** Long hours of unlabeled videos + few labels → Object Detectors

**Verification using De-correlated Errors**
- Incremental and Robust training of detectors
  - Avoided detection mistakes
  - Avoided tracking mistakes

**Selection of new positives**
-discover candidate examples by conservative short-term reliable tracking