



title

Farhad Gassemi Melvin Orichi Socana
 {farhadg, msorichi}@stanford.edu

Introduction

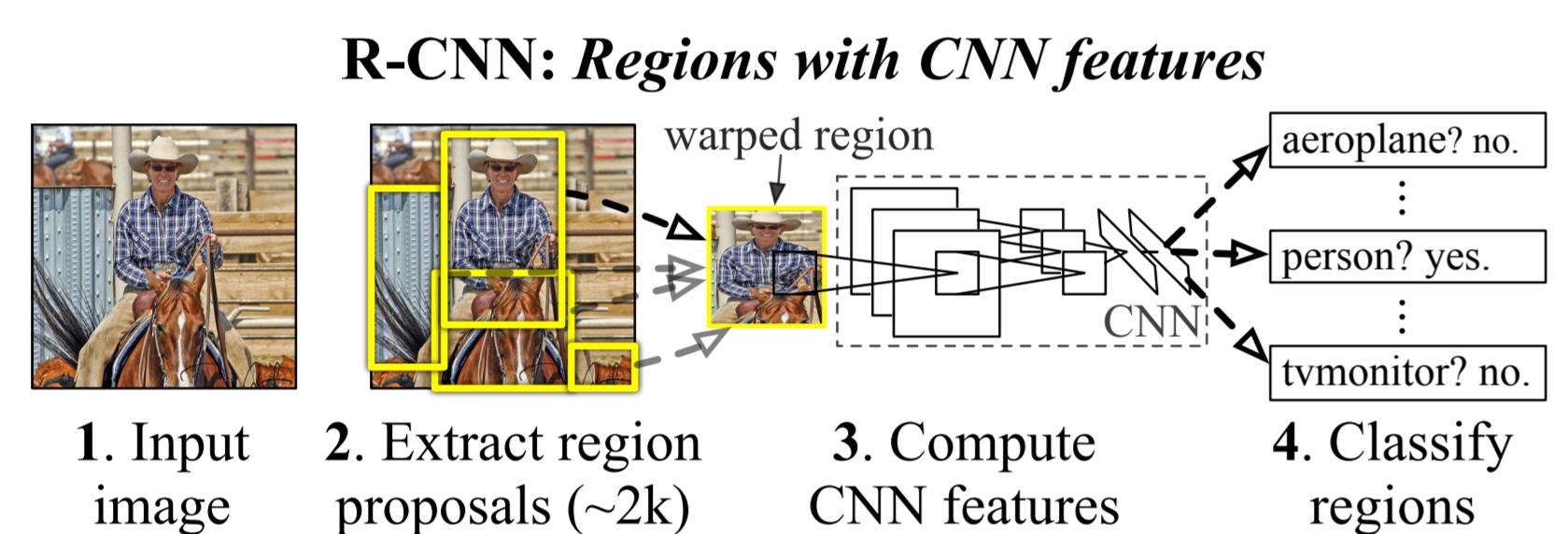
Objective: Detect objects in images without training on a dataset

- We approach the challenging problem of unsupervised object detection by leveraging properties of randomly initialized CNNs
- Experiments show the promise of random networks in tasks predominantly approached using supervised learning

Related Work

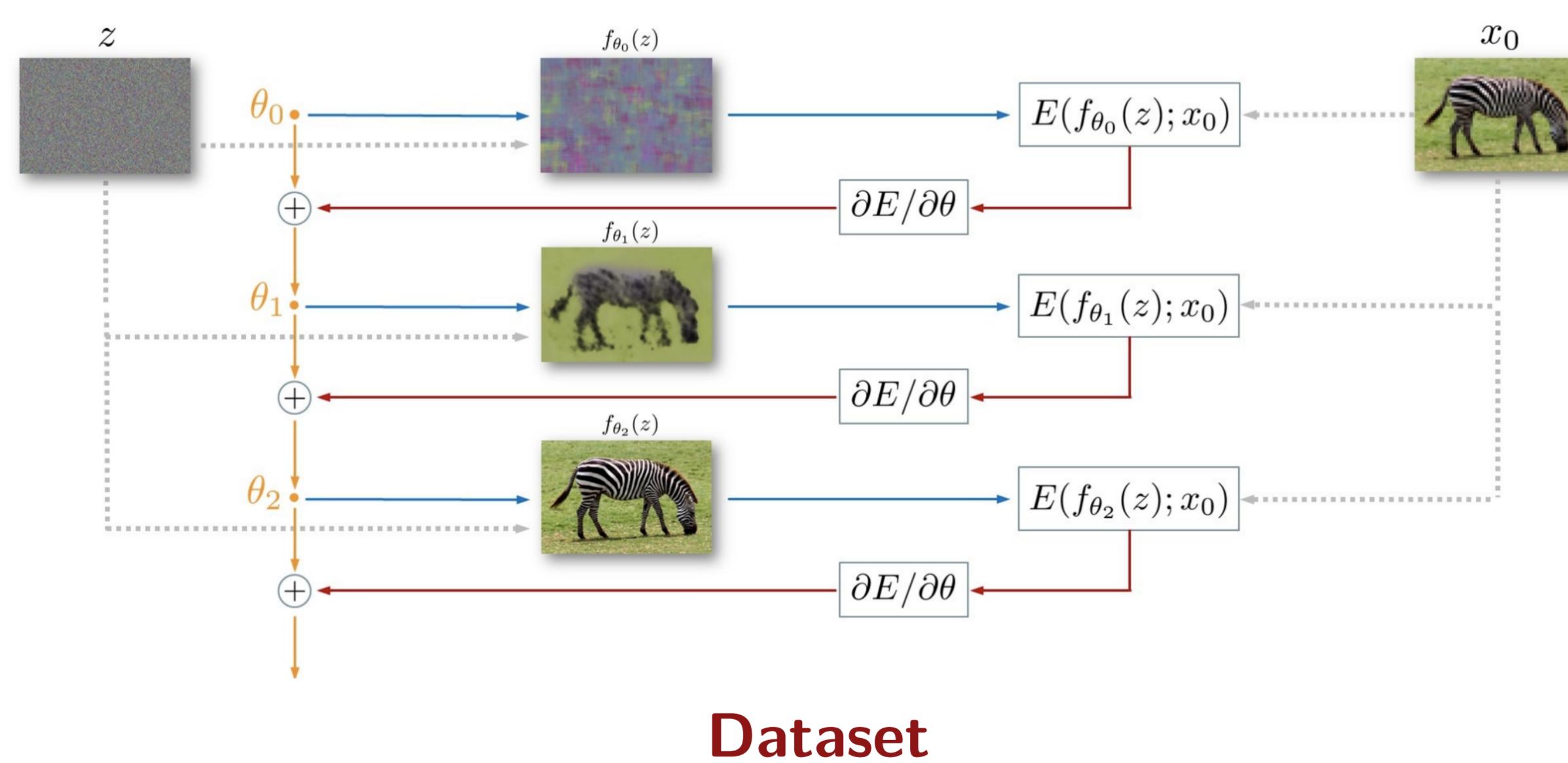
- Existing work in object detection predominantly uses learning

R-CNN: Girschick et al. (CVPR 2014)



- Randomly initialized CNNs have shown promise in several tasks

Deep Image Prior: Ulyanov et al. (CVPR 2018)



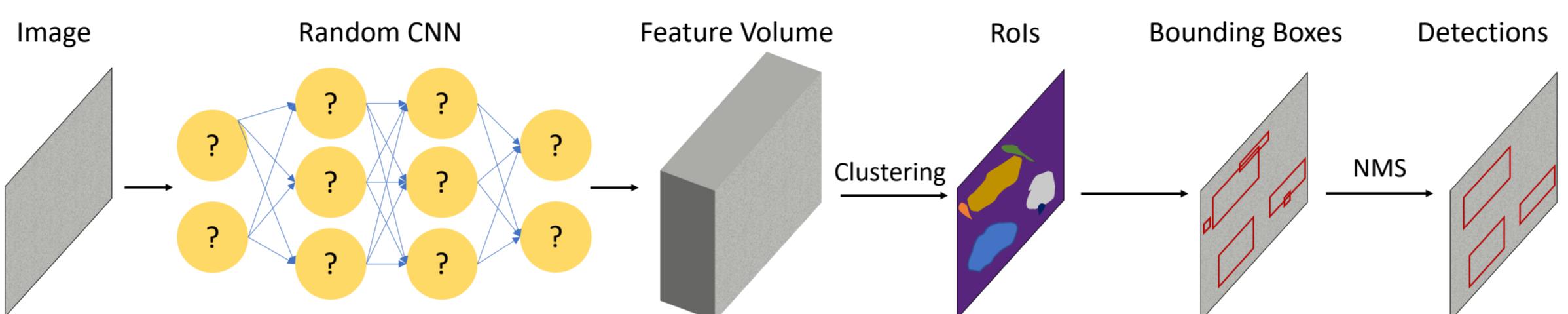
- We use a random subset of the CoCo 2017 validation set for choosing hyperparameters and evaluation
- Our validation set has 50 images and test set has 497 images



Method

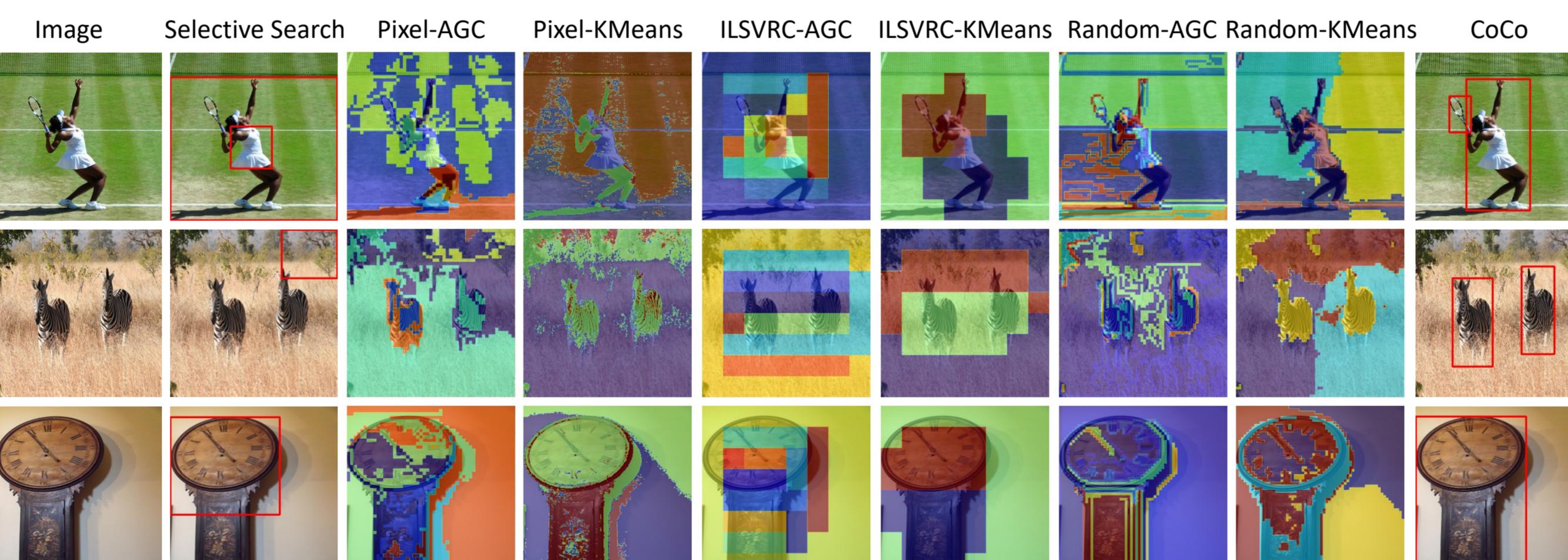
We propose an approach to detect objects in images using randomly initialized CNNs that involves:

1. Feature extraction from input image using a random CNN
2. Cluster features to get regions of interest (Rois)
3. Convert Rois to bounding boxes by finding the best fit rectangles
4. Suppress unlikely bounding boxes using a non-max suppression (NMS) heuristic to get predictions

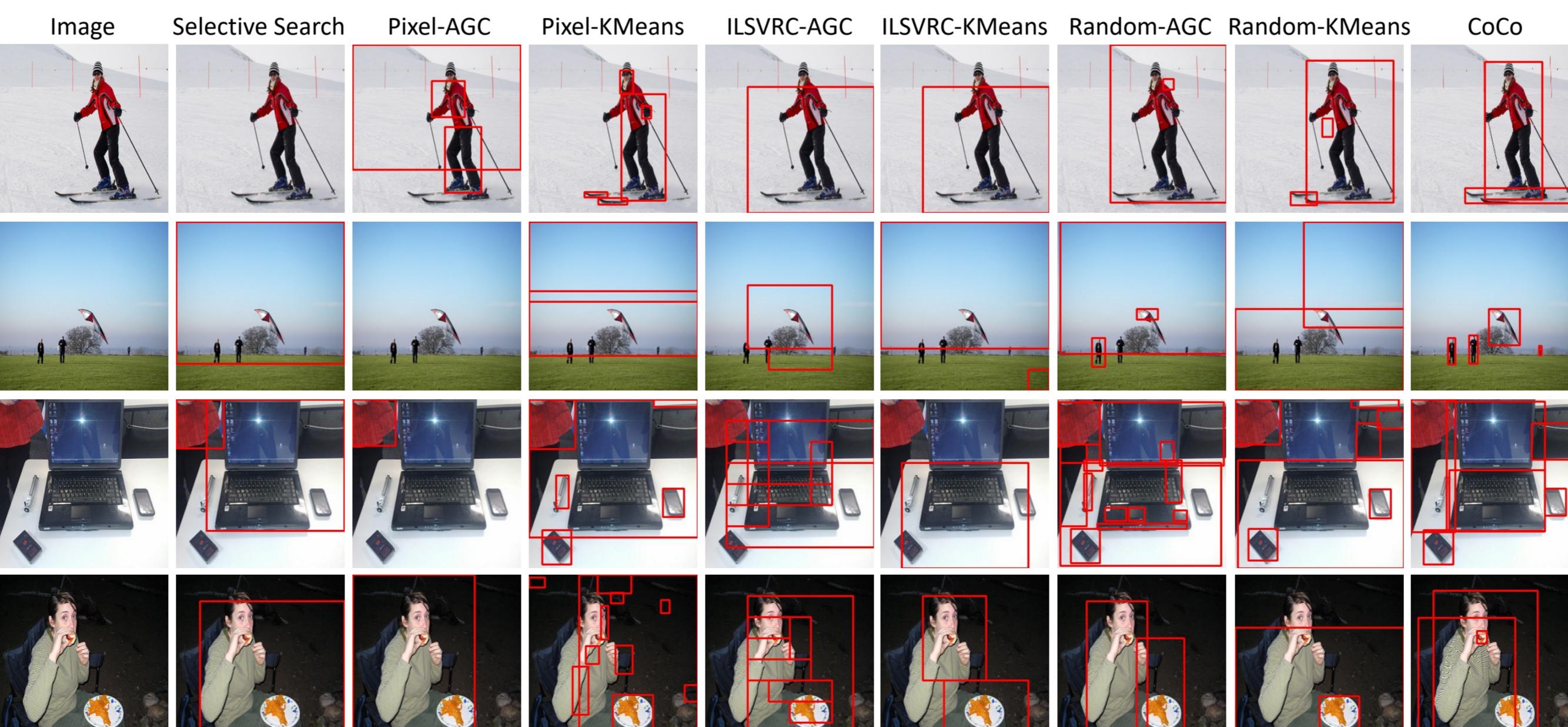


Qualitative Results

Comparison of regions of interest (Rois):



Comparison of object detections:



Quantitative Results

Object Detection Evaluation

- We evaluate our approach and baselines on bounding box quality

Entity Linker	Dataset	Questions
Exact Mentions		
ReFinED	Compmix	1680
1383		
ReFinED+GPT-3.5	Compmix	1680
1516		
ReFinED	WikiWebQuestions	454
400		
ReFinED+GPT-3.5	WikiWebQuestions	454
426		

Design of Region of Interest (RoI) Clustering Step

- We study how the design of the RoI clustering step in our approach affects object detection quality

Entity Linker	Dataset	Average F1 Score
ReFinED	Compmix	0.63
ReFinED+GPT-3.5	Compmix	0.80
ReFinED	WikiWebQuestions	0.73
ReFinED+GPT-3.5	WikiWebQuestions	0.83

Conclusion

- We propose an approach that performs class-agnostic object detection using features from random CNNs
- Unsupervised object detection is an exciting area of research and progress in such approaches would allow us to develop more robust object detectors
- Future work includes: developing clustering method specific to randomized features, working on NMS heuristics and extending our unsupervised object detector to perform unsupervised object discovery