I Have Seen Enough: Transferring Parts Across Categories

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Overview

Main question: What is the minimal amount of supervision needed to perform transfer of object parts?

Analysis on animal parts

- Parts are shareable among object categories:
  - Train a part detector on source categories, test on held-out target categories
  - Find the saturation point of the detector performance on held-out classes
  - Additional analysis: Evaluation of part transfer between categories

A novel Animal Parts dataset for studying transfer learning problems:
- Animal “eye” and “foot” keypoint annotations
- Annotated ~15K ImageNet images of “vertebrate” animals

Related problems

Active Learning [1] Studies how many images should be annotated s.t. performance saturates ASAP
Domain adaptation [2] Animal classes ~ domains; detecting parts ~ the shared task
  - use the domain knowledge to improve the part detector

Proposed methods

Active learning with uncertainty/random sampling [3]

Active-transfer learning by auto-validation

During SGD iterations of CNN training perform simultaneously:

- Train domain specific classifiers
- Online validation error estimation on L’s complementary domain

Conclusions

- Extensive testing of part transferability
  - Evaluation of part detectors in presence of a domain shift with bounded number of annotations
  - Introduced a novel Animal Parts dataset
  - Excellent performance achieved only from a limited number of training samples
  - The proposed Ensemble+QBC active-transfer learning method outperforms other competitors on the “foot” detection task

References