Can I see an Example? Active Learning the Long Tail of Attributes and Relations
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Overview
- An agent could better understand a scene by asking questions about particular objects, attributes, or relationships in a scene.
- We introduce an active learning framework allowing agents to ask questions at the category level instead of the example level.
- Challenge: The distribution of attributes and relations in the natural world is long-tailed, causing overfitting.
- Goal: Train an agent to better understand visual scenes while minimizing the number of questions it asks an annotator.

Model Architecture
- We perform Visual Triple Completion where an agent is provided with two elements in a triple, and it must predict the missing element.
- We use a Neighborhood Component Analysis Loss (Metric Learning) for training.

Experimental Setup
- We propose the QBCat-Tail active sampling method that selects data from tail classes uniformly at random.
- We compare QBCat-Tail to four conventional active learning baselines: Random, Confidence, Entropy, and Margin.
- We perform incremental active learning over 10 increments.
- We compare performance on the Visual Genome dataset using a full test set and a tail test set.

Incremental Results
- QBCat-Tail has strong performance on tail data without sacrificing performance on the natural data distribution.
- QBCat-Tail outperforms all baselines.
- Performance differences among conventional active learners are minimal.

Summary
- We introduced the Query-by-Category framework to train agents to predict objects, predicates, and attributes in visual scenes.
- We introduced a simple yet effective active sampling approach (QBCat-Tail) that asks for examples from tail classes.
- We demonstrated the effectiveness of QBCat-Tail on the Visual Genome dataset compared to active learning baselines.

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Code Available
https://github.com/tyler-hayes/Can-I-See-An-Example

Query-by-Category (QBCat) Framework

Conventional Active Learning: What is the label of this subject?

Query-by-Category (Ours): Can I see an example of the predicate eating?

Conventional Data
Model
Oracle

Query-by-Category (Ours)
Model
Oracle

Unlabeled Data
Uncertainty Scores
Uncertain Samples
Labeled Uncertain Samples

Class Dictionary
Uncertainty Scores on Class Labels
Uncertain Classes
Labeled Uncertain Classes

Full Test (AUROC) Full Test (mAP) Tail Test (mAP) Tail Test (mAP)

Average Ω
0.75 0.80 0.85 0.90 0.95 1.00

✓ QBCat-Tail has strong performance on tail data without sacrificing performance on the natural data distribution.
✓ QBCat-Tail outperforms all baselines.
✓ Performance differences among conventional active learners are minimal.