Motivation
- Explanations are important for understanding and interacting with intelligent systems

Visual Explanations
- Visual explanations must be image relevant and class consistent

Justification vs. Introspection
- Justification explanations detail why a prediction is compatible with visual evidence
- Introspective explanations detail the internal mechanisms of a model

Here, concentrate on justifications as they are useful for non-experts

Method:
- Introduce novel discriminative loss based on REINFORCE [1]

Relevance Loss
Encourages sentences to be image relevant by minimizing cross entropy between ground truth and predicted words.

\[ L_R = \sum_{t=1}^{T-1} \log p(w_{t+1}|w_{0:t}, I, C) \]

where \( I \) is an image feature, \( w_t \) is a ground truth word, and \( C \) is a class label.

Discriminative Loss
Encourages sentences to be class discriminative by maximizing a reward, \( R_D \), which measures class discriminativenss of a sampled sentence \( \tilde{W} \).

\[ L_D = -E_{W \sim p(W)} [R_D(\tilde{W})] \]

Estimate \( L_D \) with Monte Carlo sampling because computing an expectation over descriptions is intractable.

Use REINFORCE [1] to estimate the expected gradient of \( L_D \):

\[ \nabla E_{W \sim p(W)} [R_D(\tilde{W})] = E_{W \sim p(W)} [R_D(\tilde{W})] \nabla \log p(W) \]

Data
- Use finegrained descriptions collected in [2]
- 200 bird classes, >11k images, 5 captions/image
- Finegrained descriptions more class informative than attributes.

Metrics
- Measure image relevance using CIDEr.
- Measure class relevance using class similarity rank.

Results
- Explanations are more class relevant than descriptions.
- Explanations are more image relevant than definitions.

Examples for incorrect classification decisions.

- Correct: Anna Hummingbird
  Predicted: Green Violetear
  Explanation: This is a green and brown bird with a long pointed beak.
  Green Violetear Definition: This bird is green with blue on its head and has a long pointed beak.

- Correct: Anna Hummingbird
  Predicted: Anna Hummingbird
  Explanation: This bird has a white belly, a long, thin bill, a white throat, and a green head.
  Anna Hummingbird Definition: This bird is white and brown in color with a long skinny beak, and brown eye rings.

Quantitative Evaluations

Human Evaluations
- Expert Rank
- Discriminativeness

Qualitative Evaluations