Preserving Semantic Relations for Zero-Shot Learning

Yashas Annadani  
NITK  
yashas.annadani@gmail.com  
Soma Biswas  
Indian Institute of Science  
somabiswas@iisc.ac.in

Overview

Goal  
Classify samples belonging to unseen categories.

Motivation  
Proper choice of embedding space is essential.

Direction of Mapping  
Problem

Visual to Semantic  
Hubness

Semantic to Visual  
Semantic structure not preserved!

Contribution  
We propose to devise objective functions which aim to learn a similarity metric and preserve semantic structure in the visual embedding space.

Semantic Relations

Given class embeddings \(y_m\) and \(y_n\), semantic relation between them is defined as:

- Identical if \(s(y_m, y_n) = 1\)
- Semantically similar if \(\tau \leq s(y_m, y_n) < 1\)
- Semantically dissimilar if \(s(y_m, y_n) < \tau\)

Technical Details

Objective for identical and dissimilar classes

\[
\min_{\theta_f} -s(f(y_r; \theta_f), x_i) + (r - \delta_{x_I}) \cdot s(f(y_r; \theta_f), x_k)
\]

Objective for similar classes

\[
\min_{\theta_f} [r - s(f(y_r, \theta_f), x_j)]_+ + [s(f(y_r, \theta_f), x_j) - \delta_{x_J}]_+ +
\]

Reconstruction Objective

\[
\min_{\theta_f, \theta_e} ||y_r - \hat{y}_r||^2
\]


text continues...