NEIL: Extracting Visual Knowledge from Web Data
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All models and relationships can be found at www.neil-kb.com

Why NEIL Works?
1. Micro-Vision → Macro-Vision
2. Structure in Visual World
3. Semantically-Driven Acquisition

Statistics
• Running for ~4 months on ~200 cores
• >2000 concepts, including >1000 objects, >1000 scenes, ~90 attributes
• Analyzed 5m images
• Labeled 60K images
• Discovered 3K relationships

Subcategories
• Falcon
• Bean

Relationships
• Van is a kind of/looks similar to Automobile
• Nilgai is a kind of/Baby
• Gypsy moth is a kind of/looks similar to Butterfly
• F18

More Relationships
• Scene Classification mAP
  - Seed Classifier (15 Google images) 0.52
  - Bootstrapping (without relationships) 0.54
  - NEIL Scene Classifiers 0.57
  - NEIL (Classifiers + Relationships) 0.62

Object Detection mAP
• Latent SVM (50 Google images) 0.34
• Latent SVM (500 Google images) 0.28
• Latent SVM (450, Aspect Ratio Clustering) 0.30
• Latent SVM (450, HOG-based Clustering) 0.33
• Seed Detector (NERG, Clustering) 0.84
• Bootstrapping (without relationships) 0.45
• NEIL Detector 0.49
• NEIL Detector + Relationships 0.51

Scene Classification
- Desktop Computer (1)
- Desktop Computer (2)
- Desktop Computer (3)
- Monitor (1)

Relationship Discovery
- (1) Subcategory Discovery
- (2) Train Detectors
- (3) Relationship Discovery
- (4) Add New Instances
- (5) Retrain Detectors

Visual Instances Labeled by NEIL
- Desktop Computer
- Monitor
- Keyboard
- Television

Relationships Extracted by NEIL
- Desktop Computer
- Monitor
- Keyboard
- Television

Learned relationships:
• Monitor is a part of Desktop Computer
• Keyboard is a part of Desktop Computer
• Television looks similar to Monitor

(a) Objects (w/Bounding Boxes and Visual Subcategories)
(b) Scenes
(c) Attributes

(O-O) Wheel is a part of Car.
(S-O) Car is found in Raceway.
(S-O) Pyramid is found in Egypt.
(O-A) Wheel is a Round shape.
(S-A) Alley is a Narrow
(5-A) Bamboo forest is a Vertical lines.
(O-A) Sunflower is a Yellow.

(0) Seed Images
Desktop Computer
Monitor
Keyboard
Television

F18
Helicopter is found in Airfield

Zebra is found in Savanna

Lion is a part of Baby

(mAP)