



DEEP VISION

Few-shot learning in Computer Vision

Jorge Sanchez
CIEM-CONICET, FaMAF-UNC

CONICET



UNC

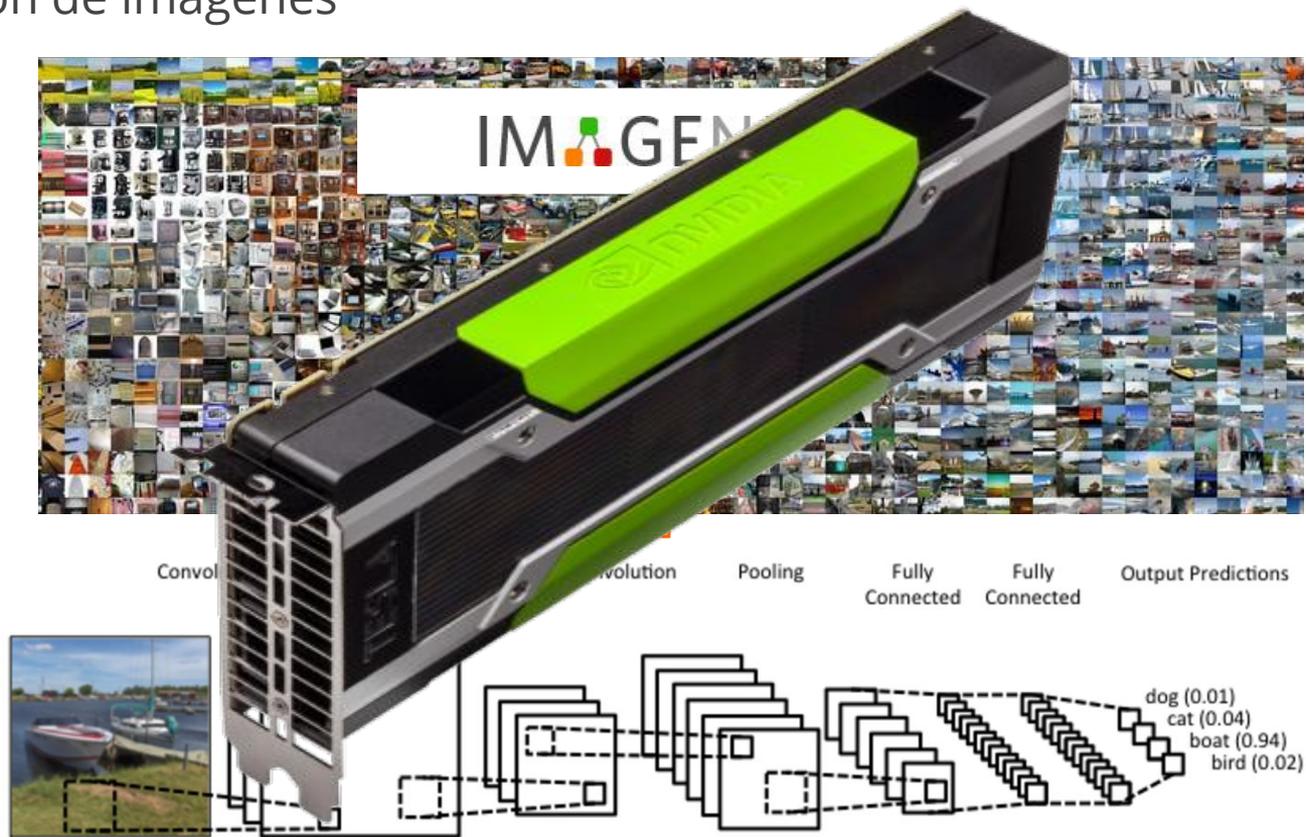
Universidad
Nacional
de Córdoba

FAMAF

Facultad
de Matemática,
Astronomía, Física
y Computación

Aprendizaje con muchos ejemplos

Clasificación de imágenes



Aprendizaje con muchos ejemplos

Clasificación de imágenes



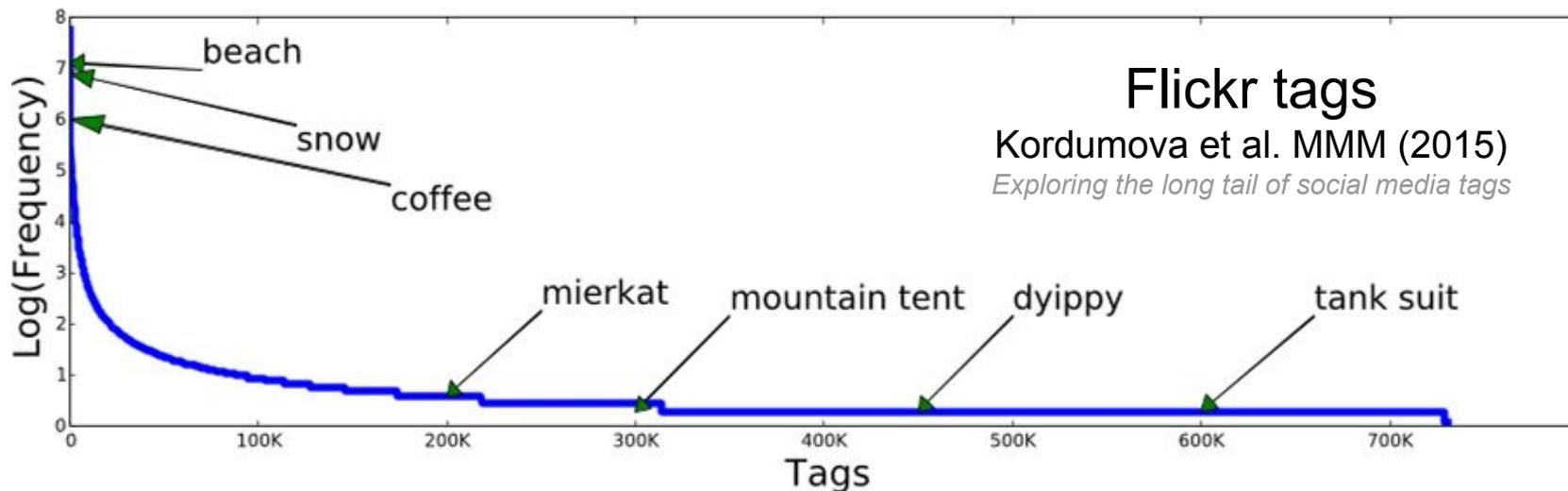
ImageNet Large-Scale Visual Recognition Challenge (ILSVRC)

Aprendizaje con ¿muchos? ejemplos



DEEP VISION

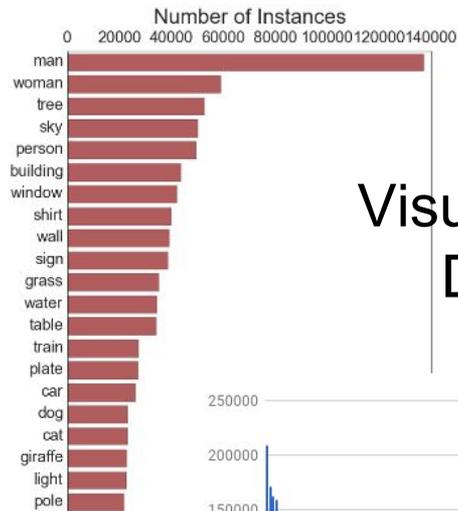
Distribución de cola larga



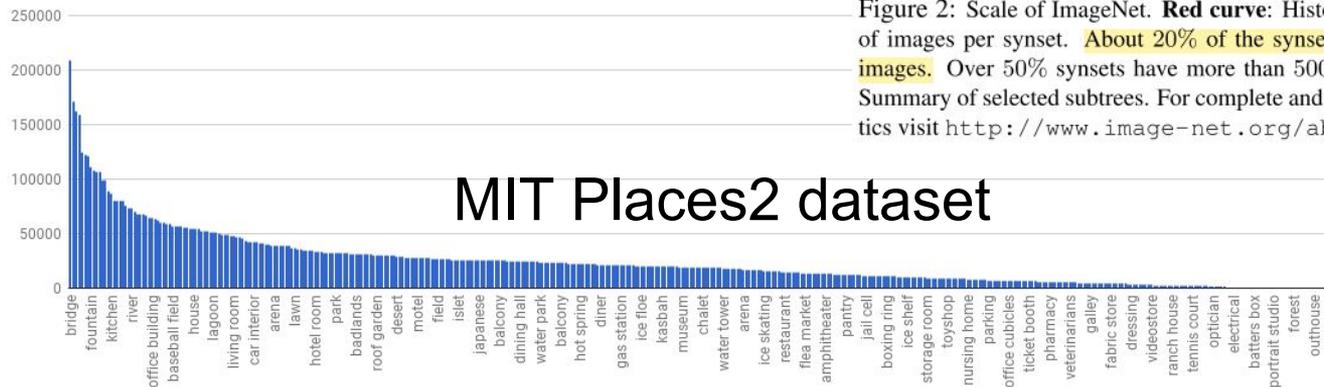
- Conceptos populares (genéricos) con millones de imágenes
- Conceptos raros (específicos) con pocas imágenes
- #unigramas > #bigramas

Aprendizaje con ¿muchos? ejemplos

Distribución de cola larga



Visual Gnome Dataset



MIT Places2 dataset

Image-Net

Deng et al CVPR (2009)

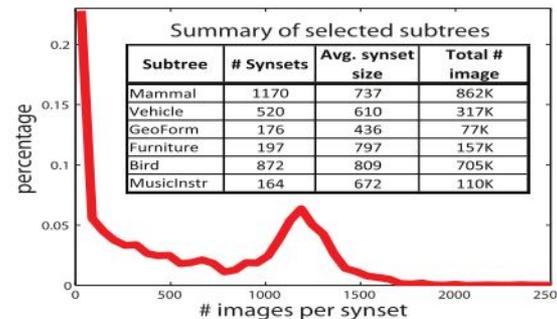
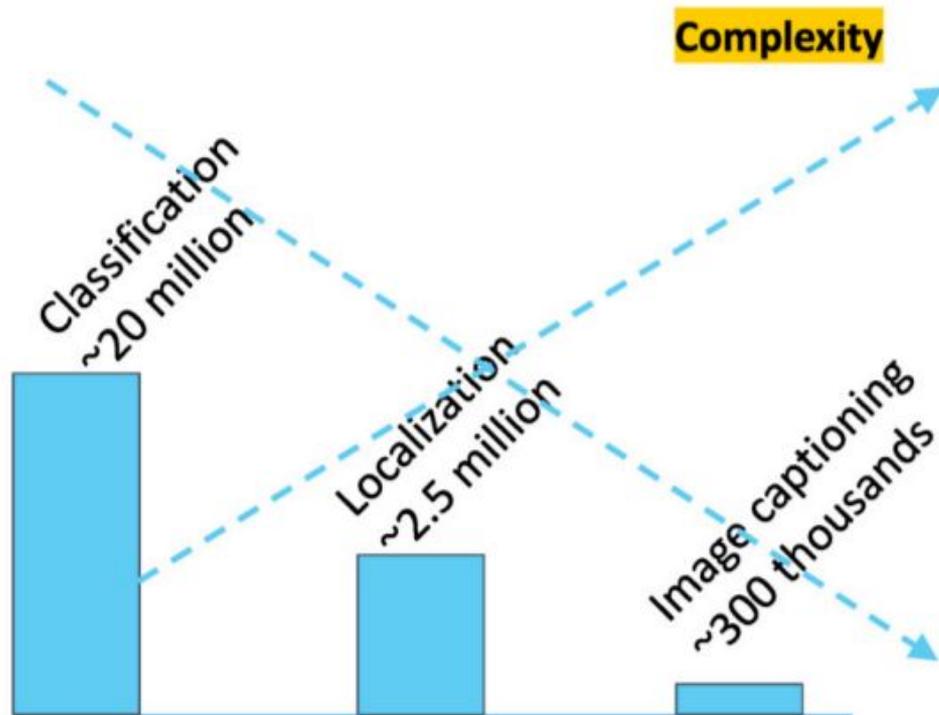


Figure 2: Scale of ImageNet. **Red curve:** Histogram of number of images per synset. **About 20% of the synsets have very few images.** Over 50% synsets have more than 500 images. **Table:** Summary of selected subtrees. For complete and up-to-date statistics visit <http://www.image-net.org/about-stats>.

Más allá del problema de clasificación

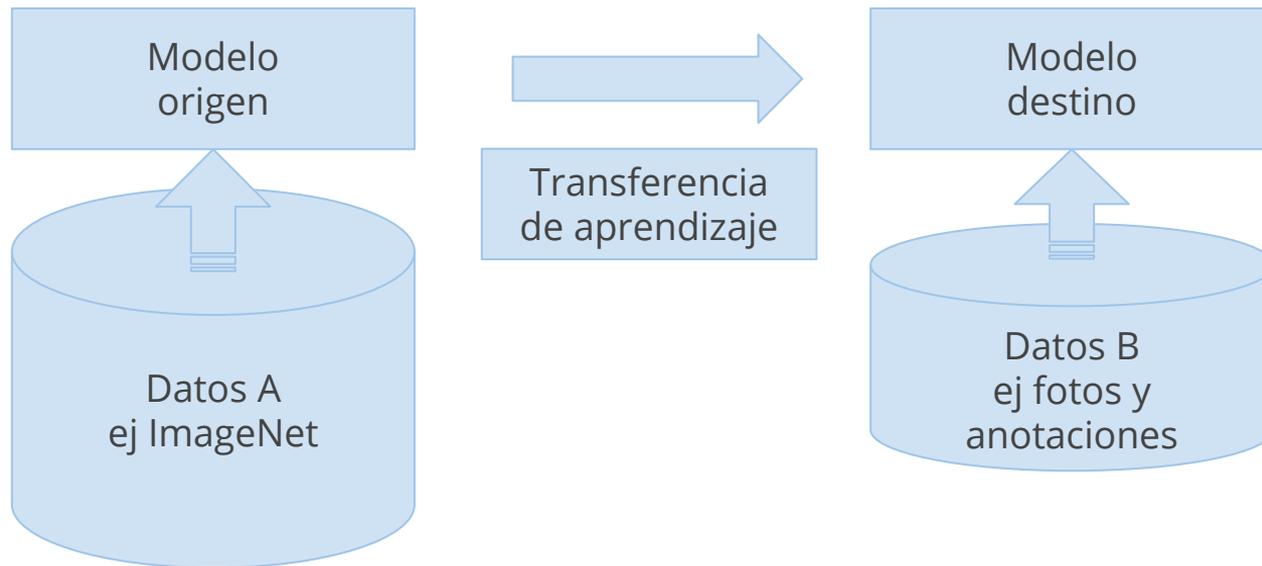
Esfuerzo de anotación vs. complejidad del problema



Transferencia de aprendizaje

Objetivo: reutilizar modelos pre-entrenados existentes

- Entrenados en una tarea específica, ej. clasificación
- Entrenados a partir de muchos ejemplos
- Adaptarlos a nuestro problema particular con pocos ejemplos

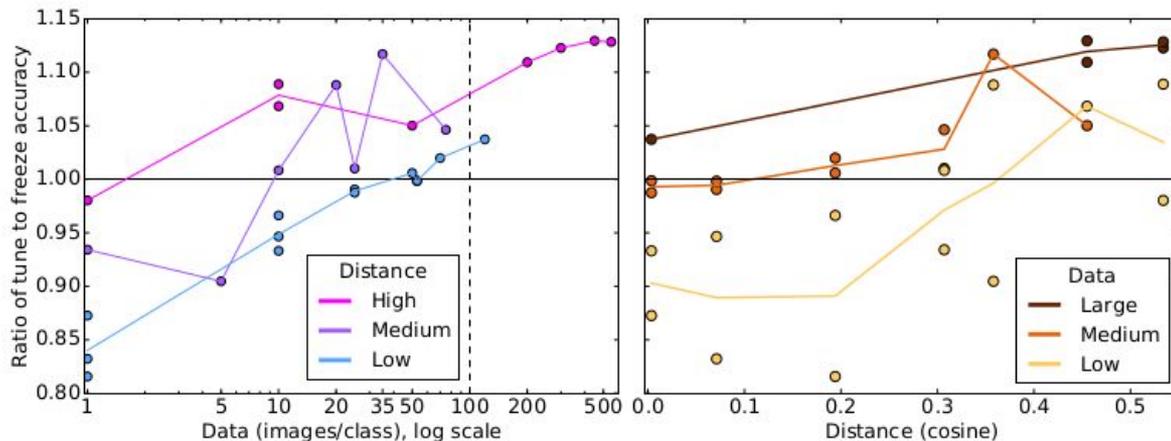


Transferencia de aprendizaje

Ajuste fino (fine-tuning)

Images per Class

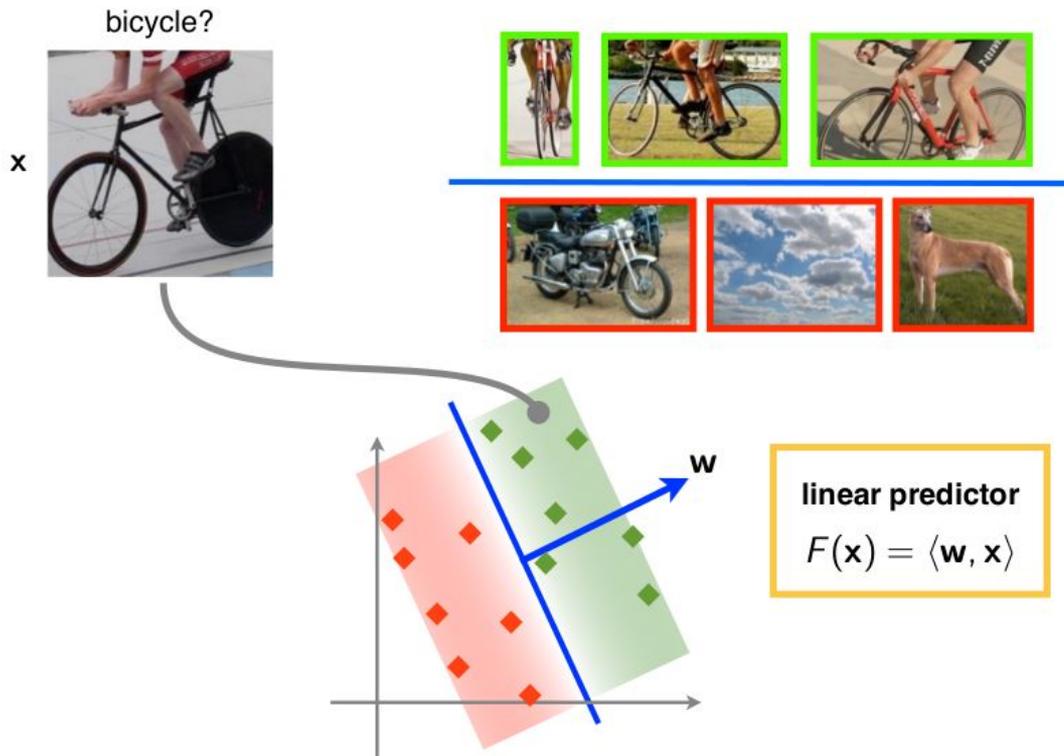
		L (1-20)	M (21-99)	H (≥ 100)
Cosine Distance	L (0.0-0.2)	Freeze	Try Freeze or Tune	Tune
	M (0.2-0.4)	Try Freeze or Tune	Tune	Tune
	H (0.4-1.0)	Try Freeze or Tune	Tune	Tune



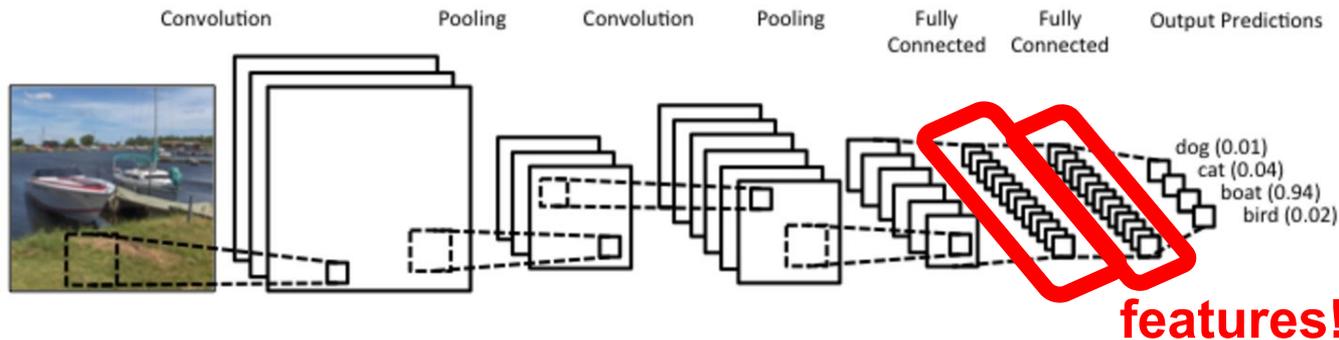
CNNs como extractores de features



DEEP VISION



CNNs como extractores de features

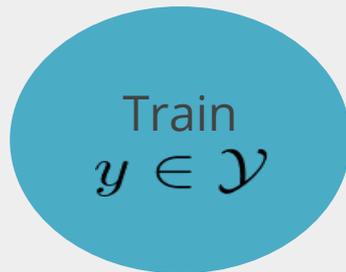


- Imagen \rightarrow punto en un espacio d-dimensional
- Uso de técnicas GOFML*, p.ej. scikit-learn
 - SVMs + kernels
 - Regresión logística
 - k-NN, NCM
 - ...

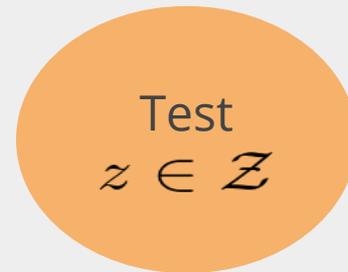


- Entradas: $x \in \mathcal{X}$
- Etiquetas:
 - Train: $y \in \mathcal{Y}$
 - Test: $z \in \mathcal{Z}$
 - ZSL: $\mathcal{Y} \cap \mathcal{Z} = \emptyset$
- Objetivo:
 - ZSL: $f : \mathcal{X} \rightarrow \mathcal{Z}$
 - GZSL: $f : \mathcal{X} \rightarrow \mathcal{Y} \cup \mathcal{Z}$

Supervised learning

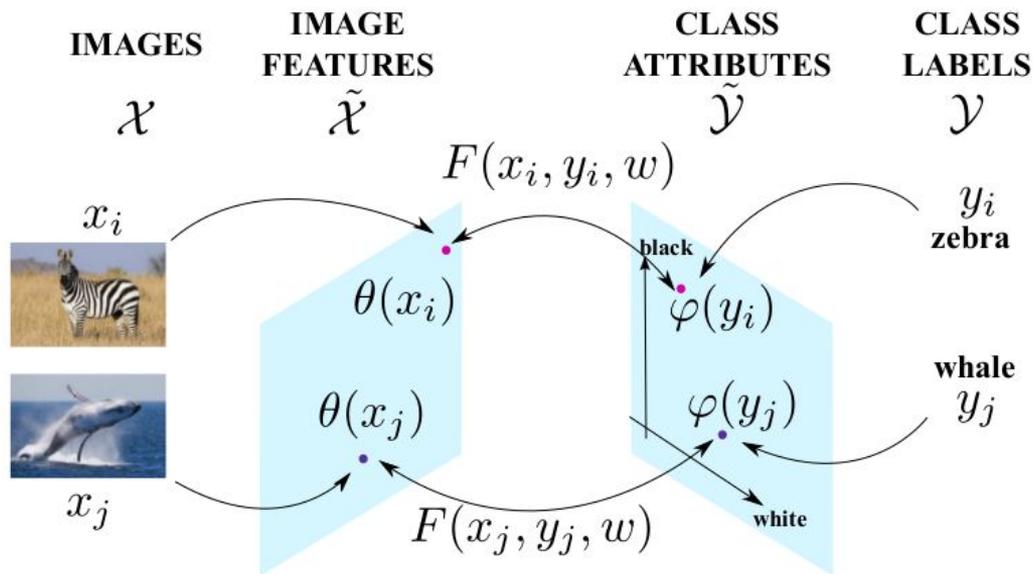


Zero-shot learning (ZSL)



Aprendizaje sin ejemplos

Función de compatibilidad

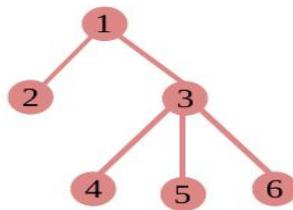


$$F(x, y; W) = \theta(x)^T W \phi(y)$$

**Compatibilidad
entrada-salida**

Aprendizaje sin ejemplos

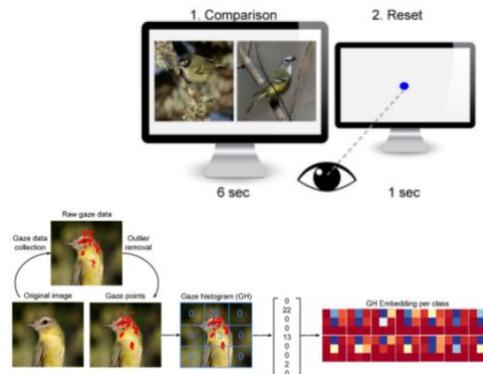
Fuentes de información lateral



$$2 = [1 \ 0 \ 2 \ 3 \ 3 \ 3]$$

Word2Vec [Mikolov et.al. NIPS'13]
GloVe [Pennington et.al EMNLP'14]

WordNet [Akata et al. CVPR'13]



Human Gaze [Akata et al. CVPR'16]



This bird has a white underbelly, black feathers in the wings, a large wingspan, and a white beak.

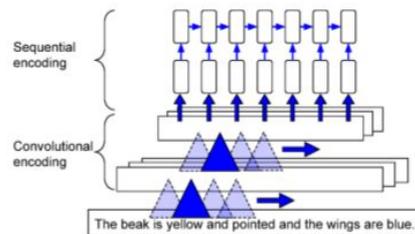


This bird has distinctive-looking brown and white stripes all over its body, and its brown tail sticks up.

Light purple petals with orange and black middle green leaves

This flower has a central white blossom surrounded by large pointed red petals which are veined and leaflike.

[Reed et al. CVPR'16, ICML'16, NIPS'16]



[Reed et al., CVPR'16]



 Paste your image url here



Visual Face



No faces were detected on this image.

Visual Brands



85% Nike

Visual Context



pullover

sleeve worn

athletic activity

long

sweater

high close-fitting

jersey

grey

grey color

clothing

headdress

Preguntas?
Gracias.

@deepvisionai



Universidad
Nacional
de Córdoba



Facultad
de Matemática,
Astronomía, Física
y Computación



DEEP VISION