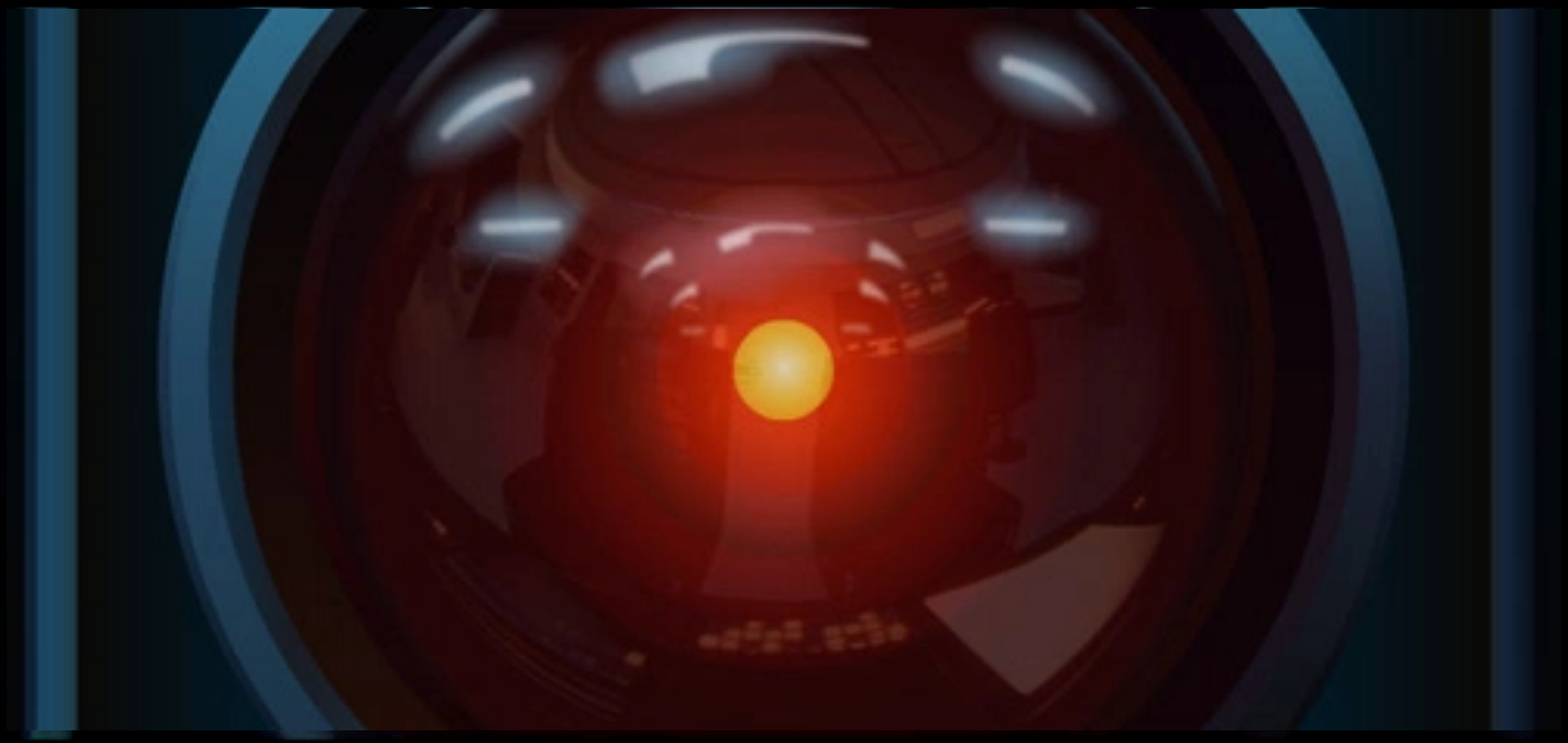
Inteligencia Artificial

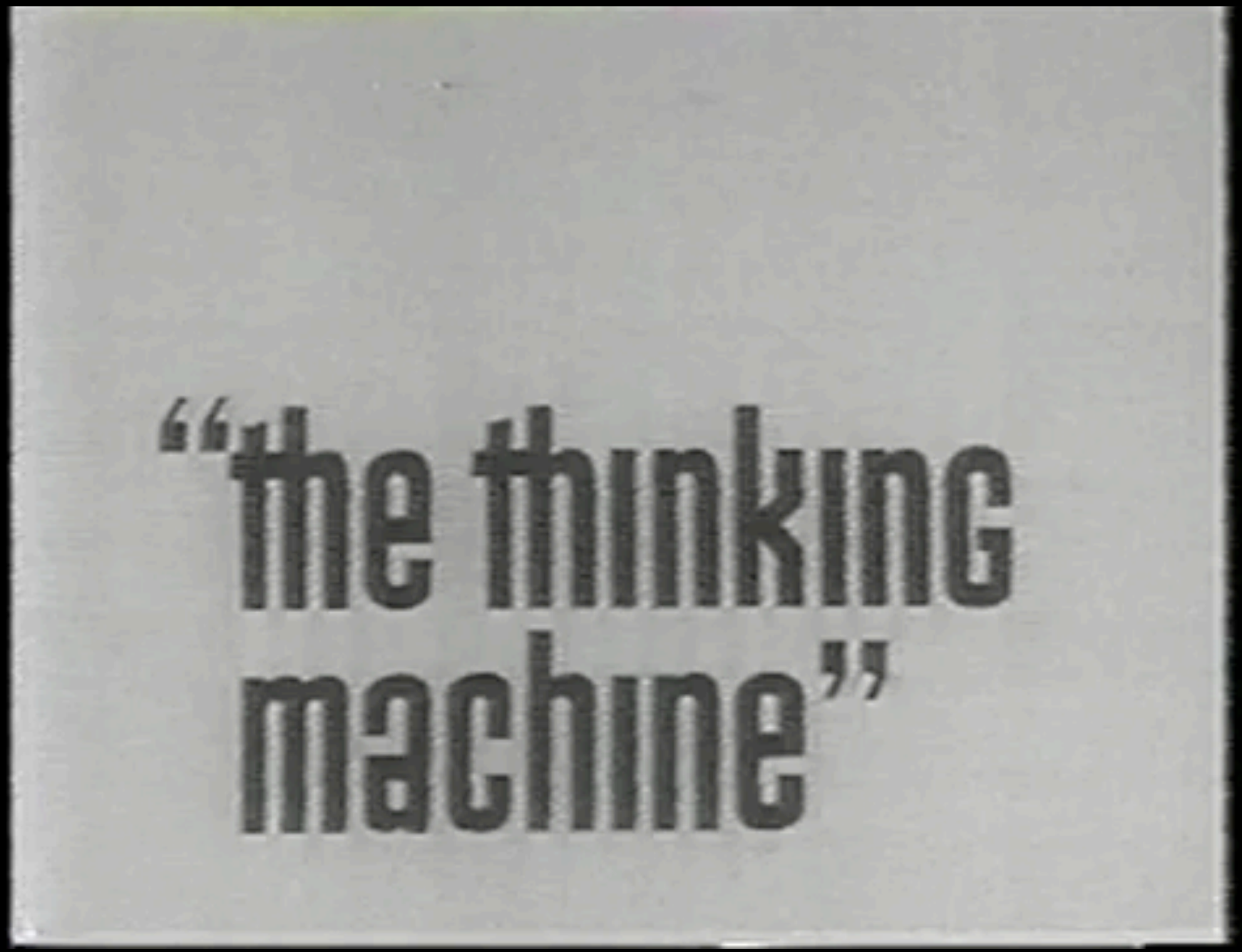
Fabio A. González
Departamento de Ingeniería de
Sistemas y Computación

CÁTEDRA *de* SEDE
José Celestino Mutis

2001: A Space Odyssey (1968)



Un poco de historia…



https://www.youtube.com/watch?time_continue=399&v=rIBjhD1oGQg

DeepBlue vs Kasparov (1997)

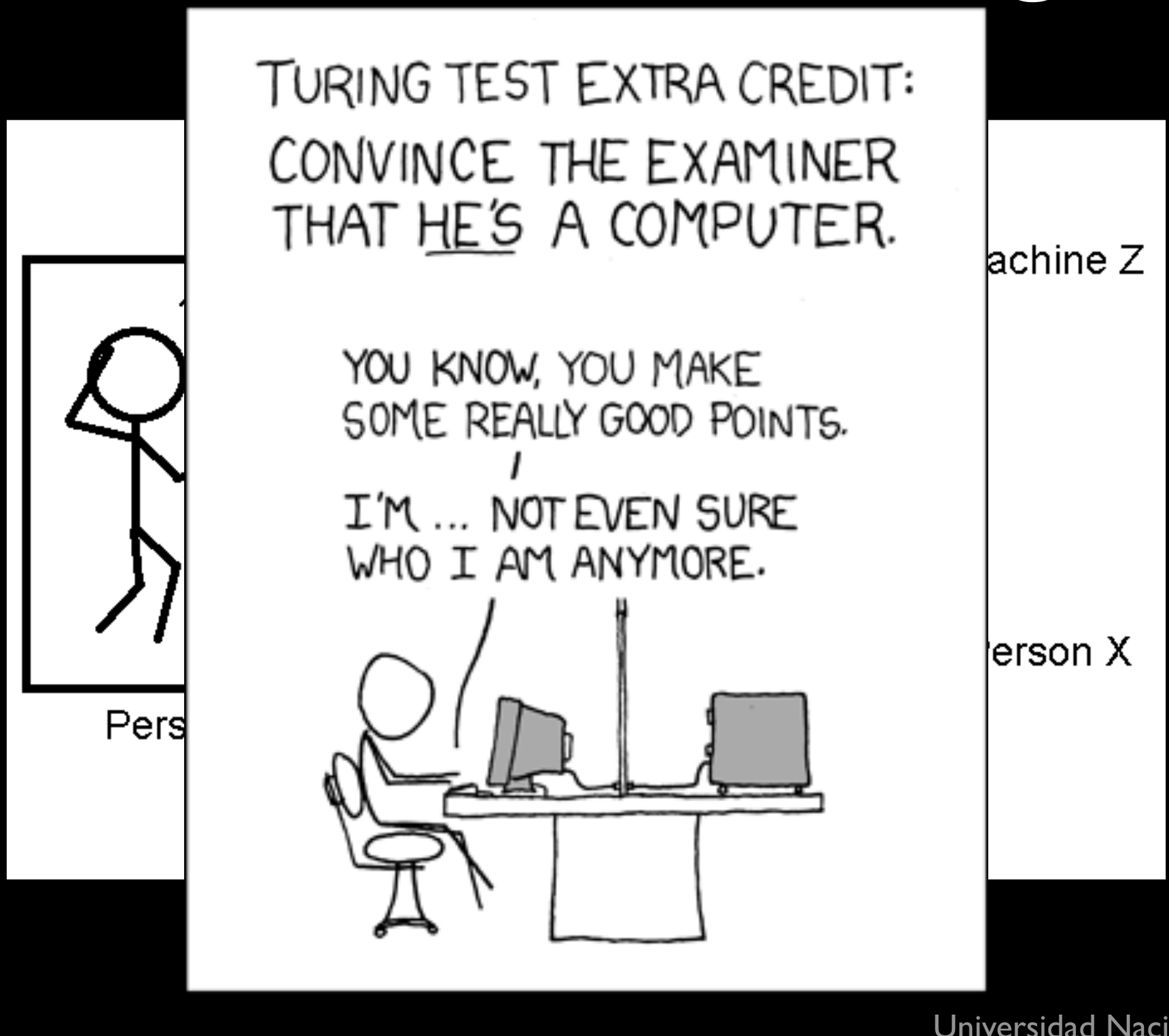
https://www.youtube.com/watch?v=NJarxpYyoFI

DeepBlue vs Kasparov (1997)

https://www.youtube.com/watch?v=JodijRqCg6k

¿Qué es la Inteligencia Artificial?

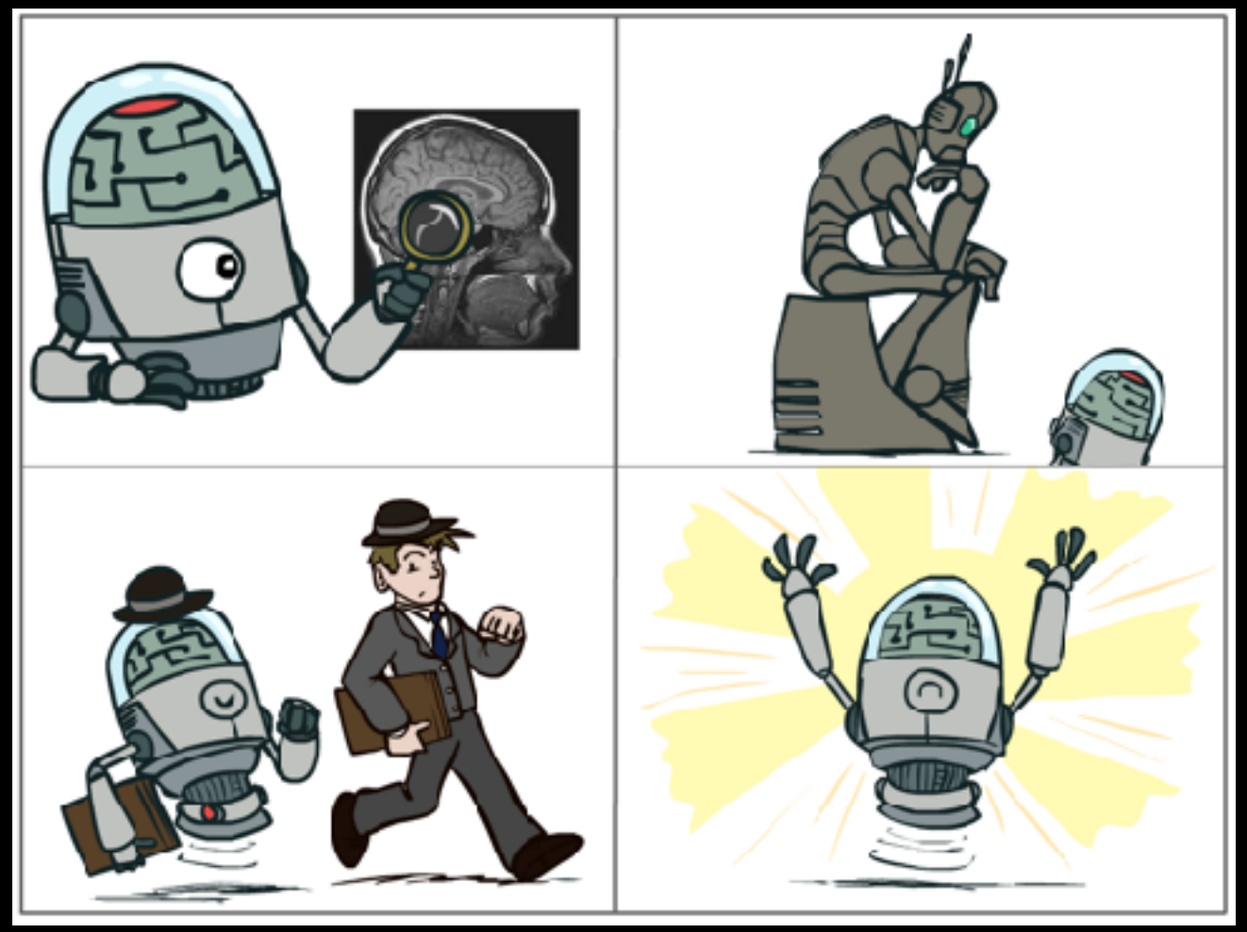
El test de Turing



Cuatro enfoques

Pensar como humano

Pensar racionalmente



Actuar como humano

Actuar racionalmente

Inteligencia Artificial hoy en día:

Racionalidad Computacional

- Racionalidad: Alcanzar, de manera óptima, objetivos predefinidos
- Objetivos → función de utilidad
- Actuar racionalmente → maximizar la utilidad


Representación del Conocimiento / Razonamiento
Aprendizaje Computacional
Planeación
Inteligencia Artificial
Percepción
Lenguaje
Robótica

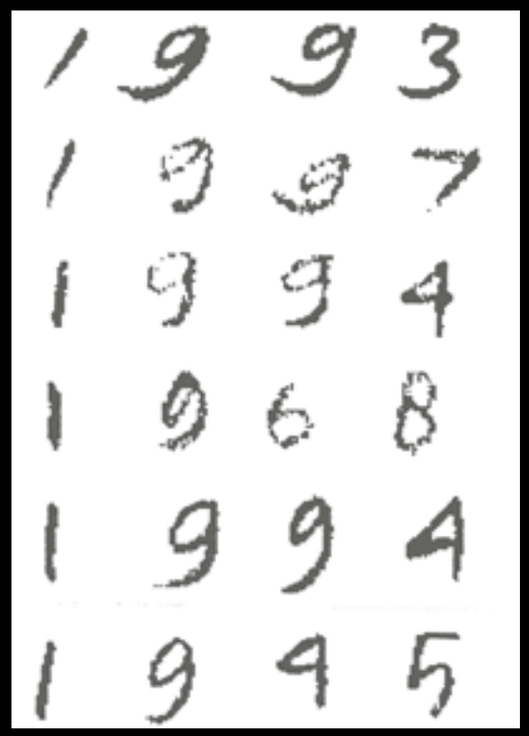
Aprendizaje Computacional

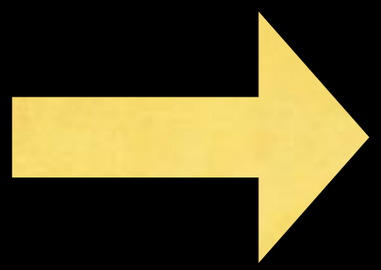
Fabio A. González

Universidad Nacional de Colombia

“Los computadores sólo pueden hacer lo que se les dice que hagan"

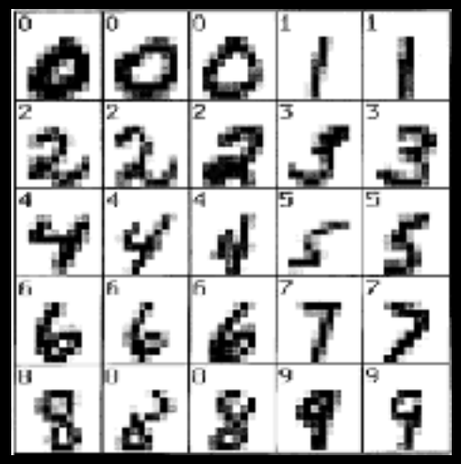
“¿Y qué tal si le decimos a la máquina que aprenda por si misma y mejore continuamente?”





1993
1997
1994
1968
1994
1945

Entrenamiento



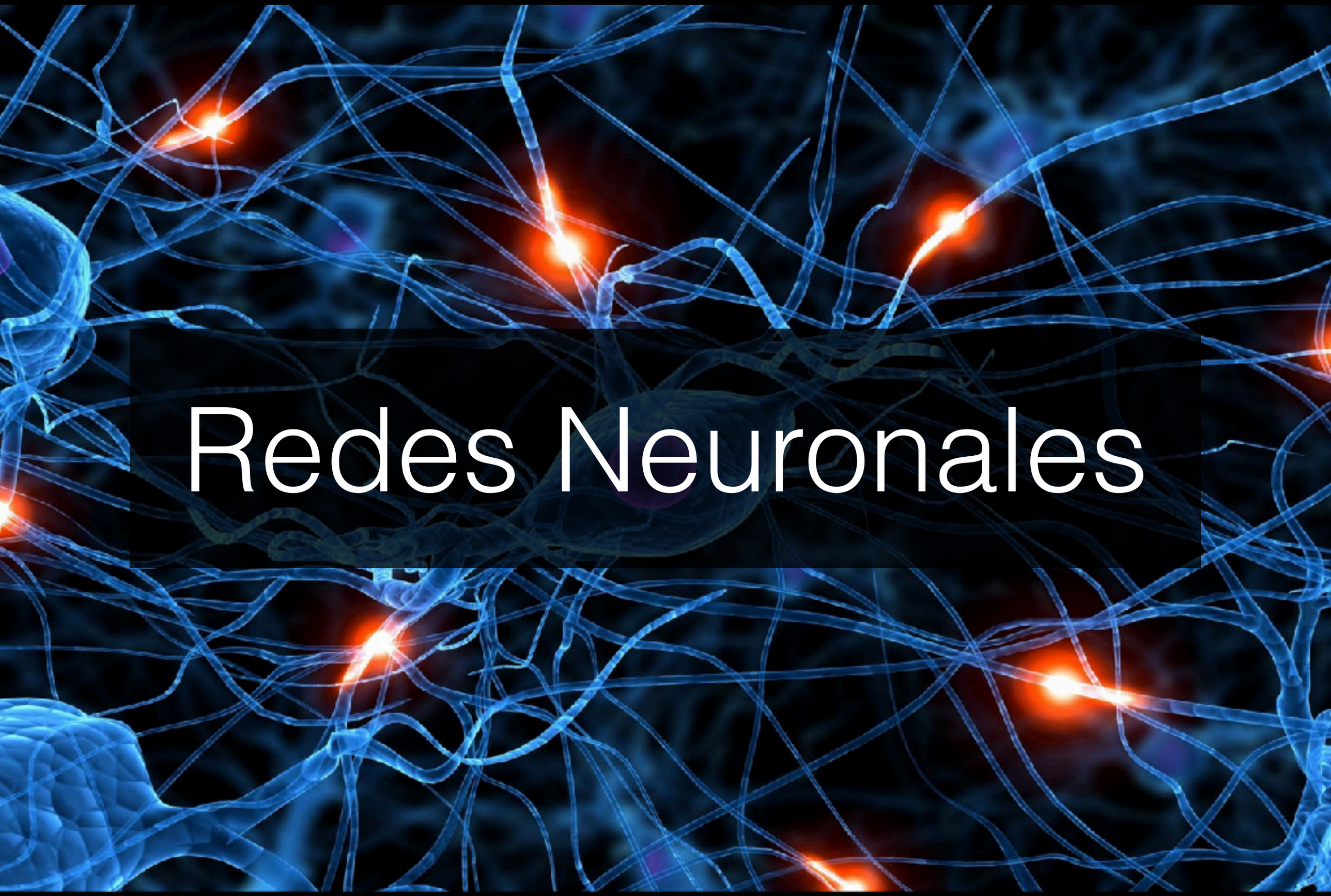
Evaluación

Algoritmo de entrenamiento

Modelo de clasificación

Predicción

9

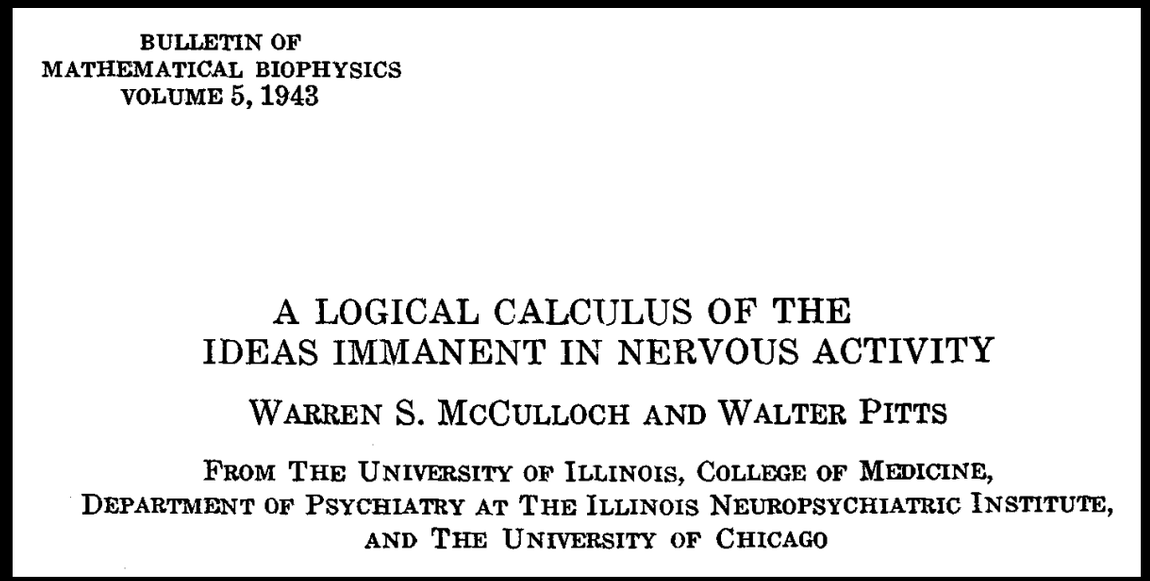


Redes Neuronales

Fabio A. González

Universidad Nacional de Colombia

McCulloch & Pitts Artificial Neuron

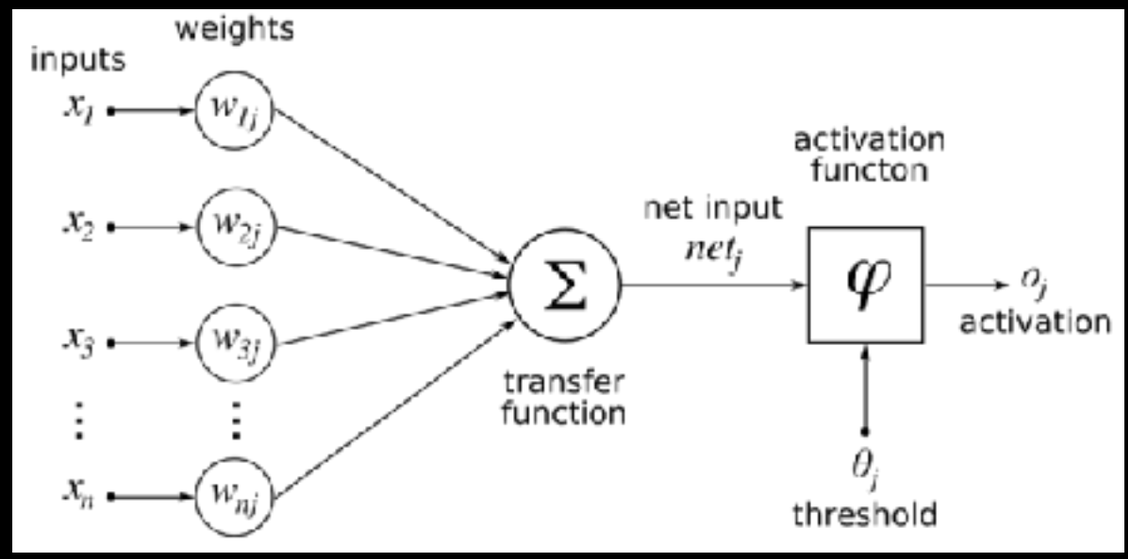


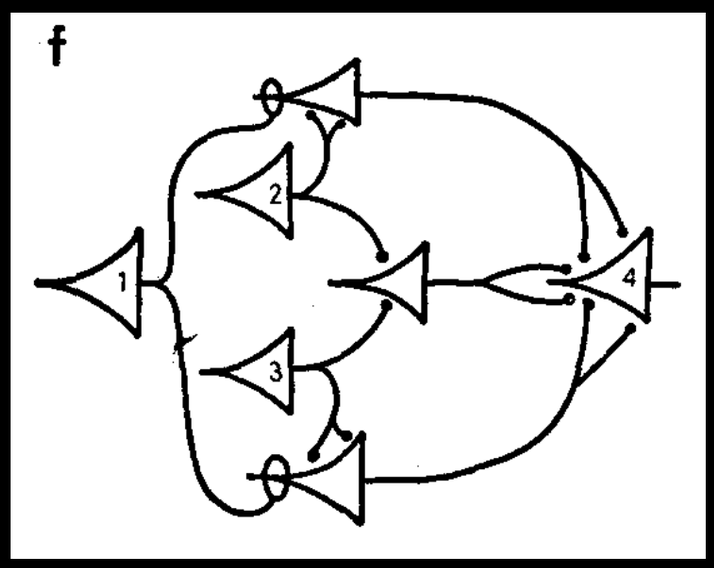
BULLETIN OF
MATHEMATICAL BIOPHYSICS
VOLUME 5, 1943

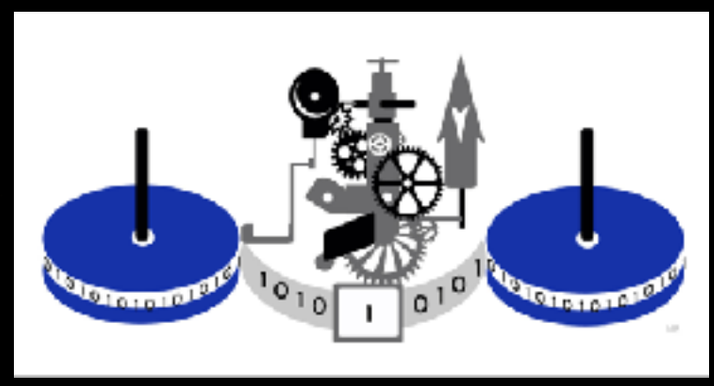
A LOGICAL CALCULUS OF THE
IDEAS IMMANENT IN NERVOUS ACTIVITY

WARREN S. MCCULLOCH AND WALTER PITTS

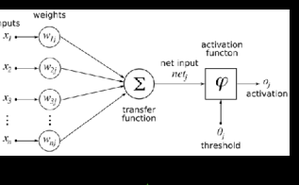
FROM THE UNIVERSITY OF ILLINOIS, COLLEGE OF MEDICINE,
DEPARTMENT OF PSYCHIATRY AT THE ILLINOIS NEUROPSYCHIATRIC INSTITUTE,
AND THE UNIVERSITY OF CHICAGO

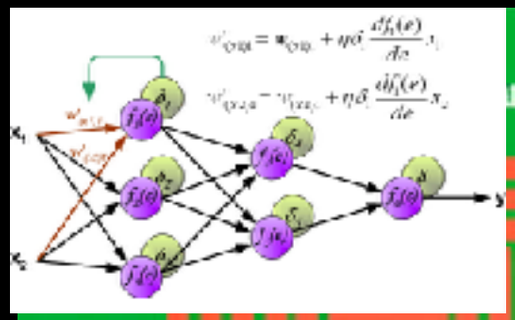






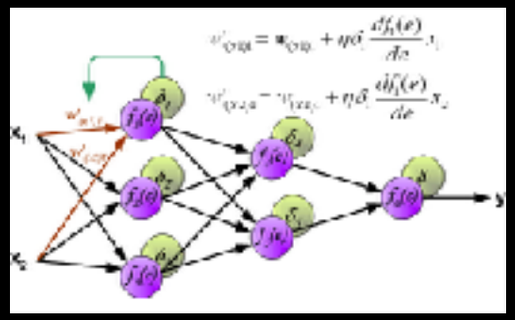
Neural networks time line

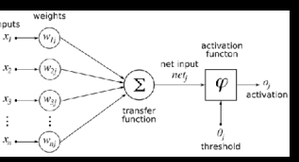


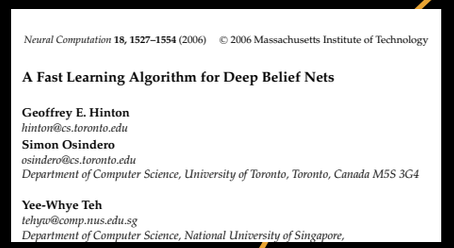


1943 1957 1969 1986 1995 2007 2012 2016

Línea de tiempo de las RNs







Neural Computation **18, 1527–1554** (2006) © 2006 Massachusetts Institute of Technology

A Fast Learning Algorithm for Deep Belief Nets

Geoffrey E. Hinton
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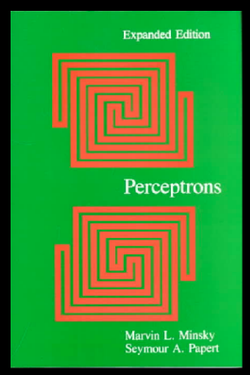
Department of Computer Science, University of Toronto, Toronto, Canada M5S 3G4

Yee-Whye Teh
tehyw@comp.nus.edu.sg
Department of Computer Science, National University of Singapore,

1943 1957 1969 1986 1995 2007 2012 2016



Deep learning boom

Tech Talk | Computing | Software

Google's Deep Mind Gives AI Boost That Lets It Navigate Underground

MIT Technology Review

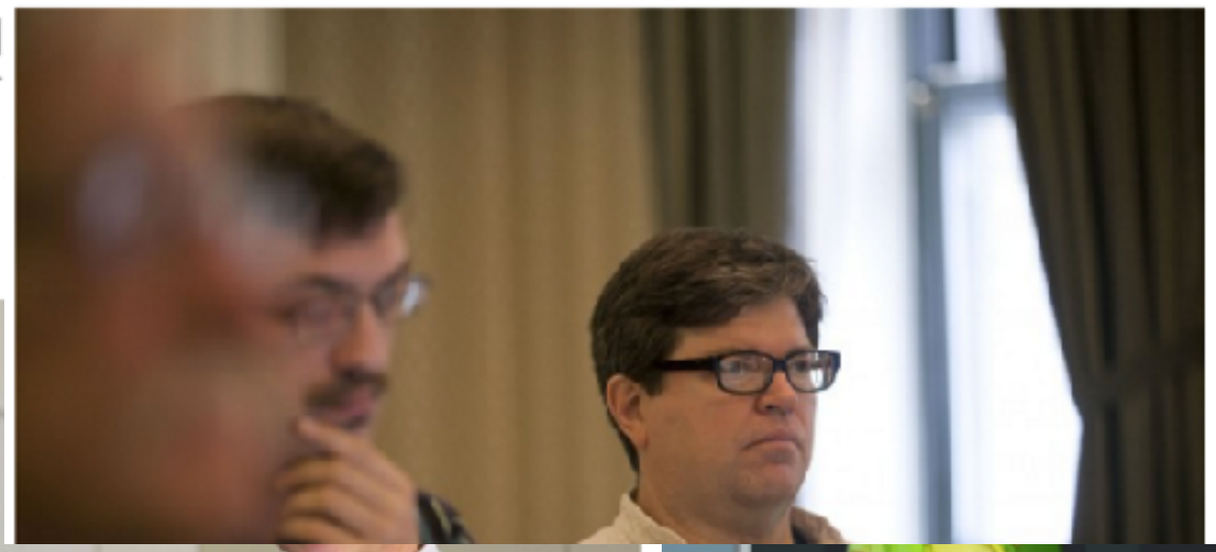
CADE METZ BUSINESS 12.09.13 3:14 PM

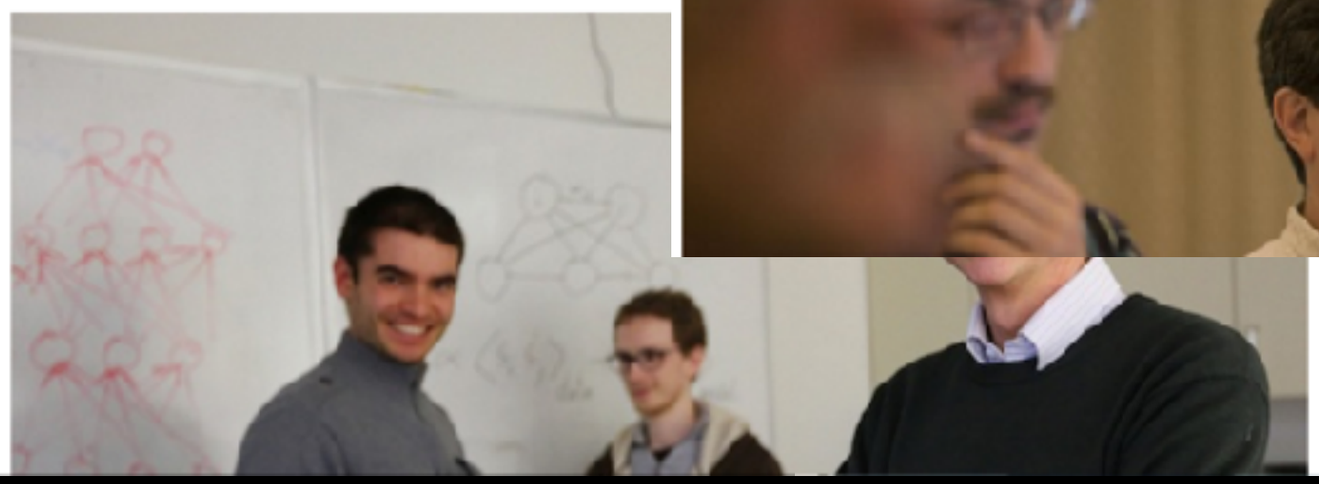
FACEBOOK TAPS 'DEEP LEARNING' GIANT FOR NEW AI LAB

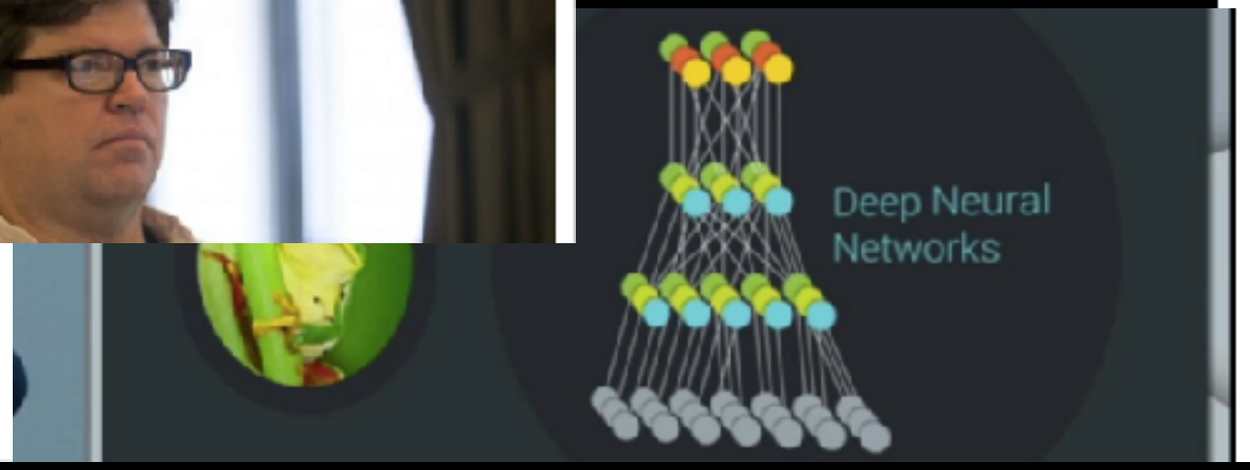
ROBERT MCMILLAN BUSINESS 03.13.13 6:30

GOOGLE HIRES B HELPED SUPERC MACHINE LEARN

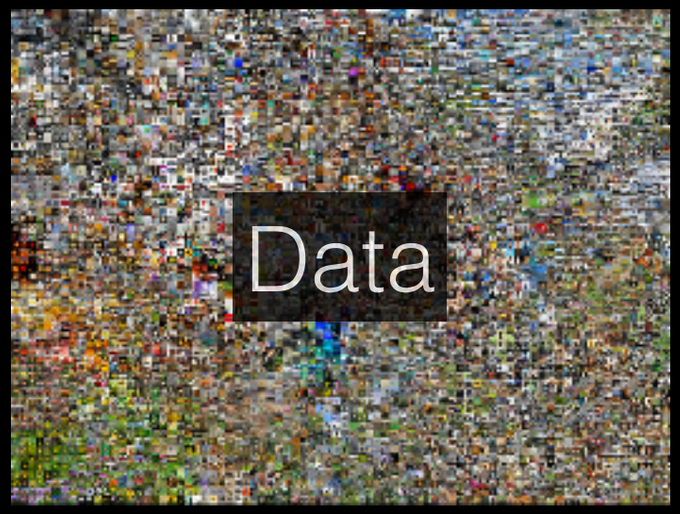
rch Giant Man Behind Brain"

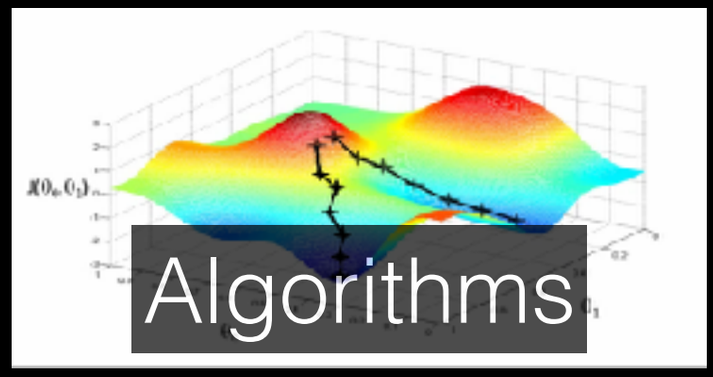


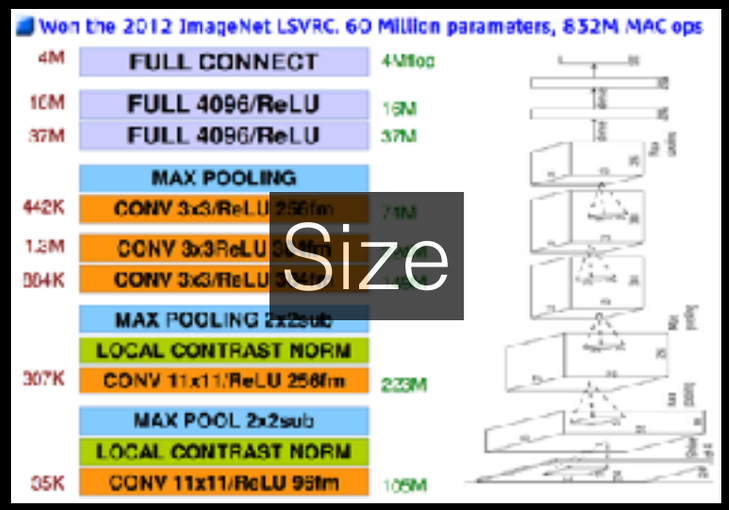


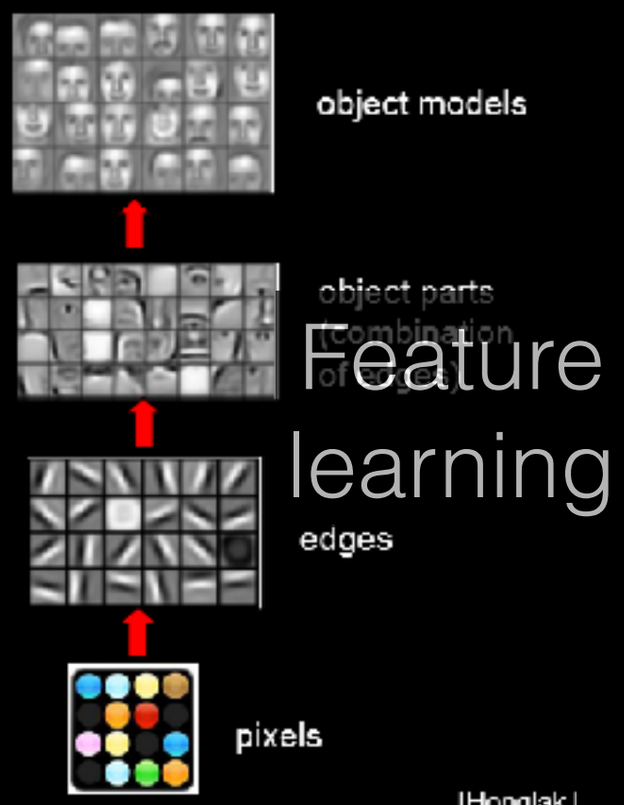


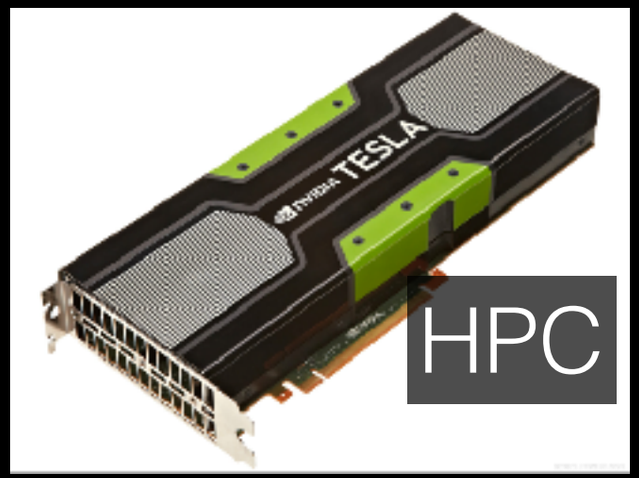
Deep learning recipe

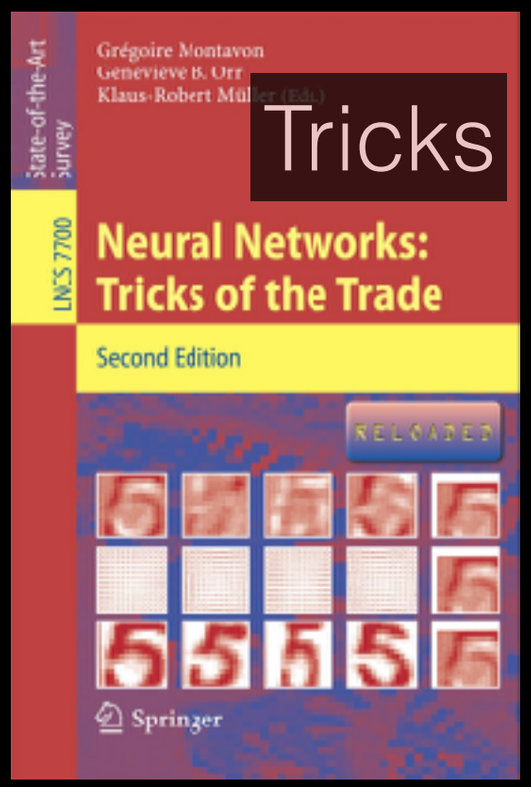




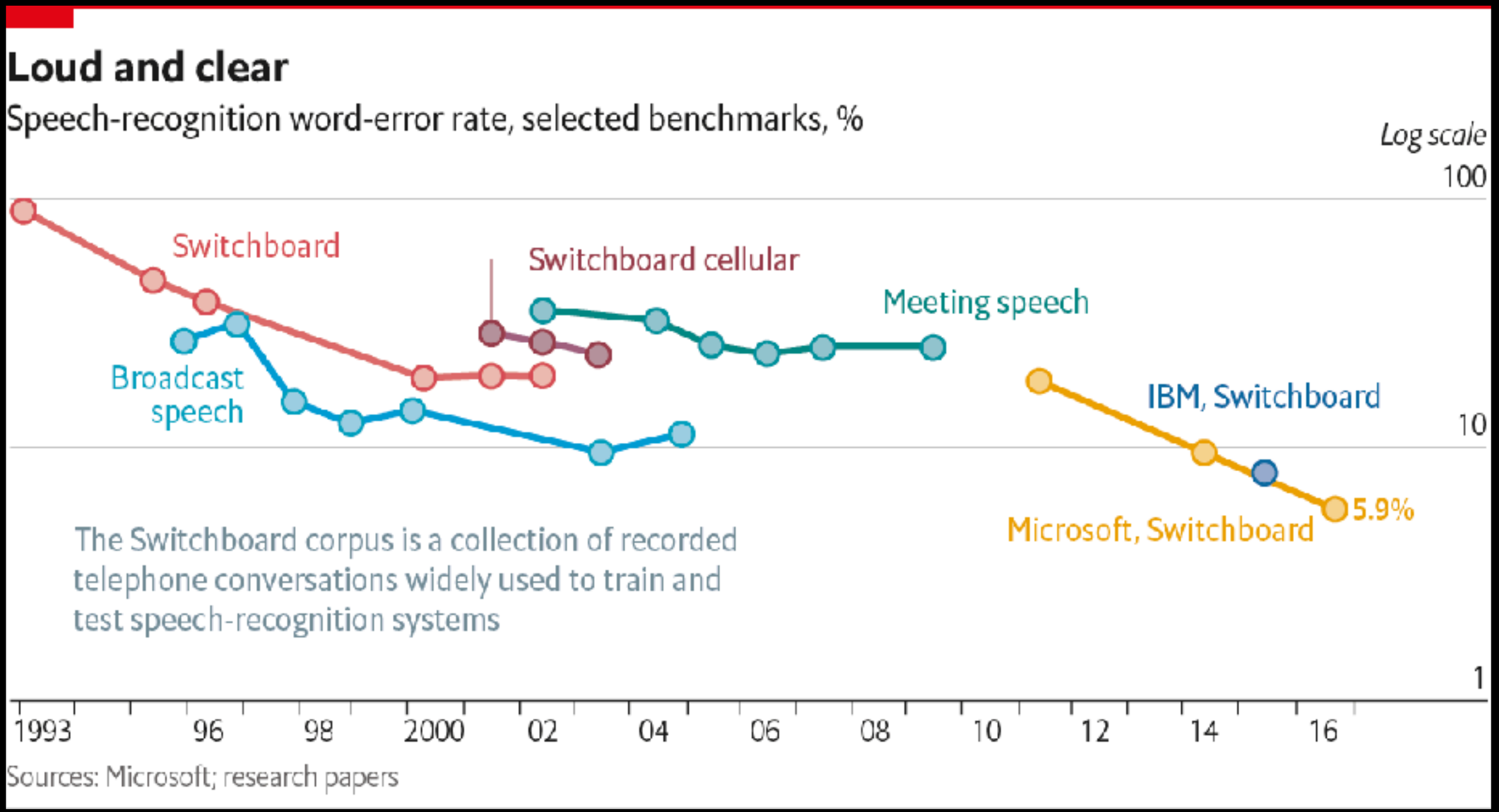








Reconocimiento de Voz

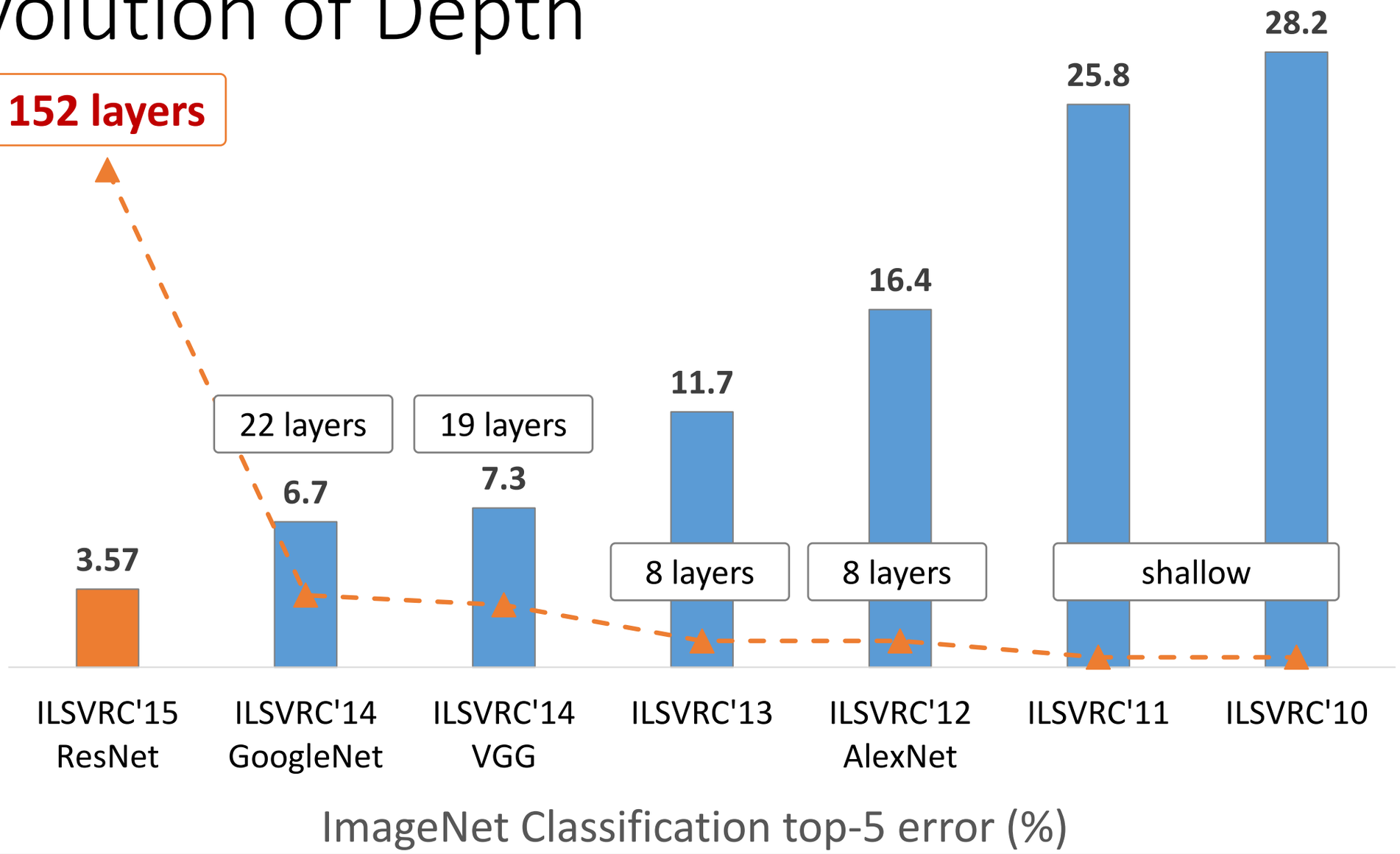


Reconocimiento de Voz

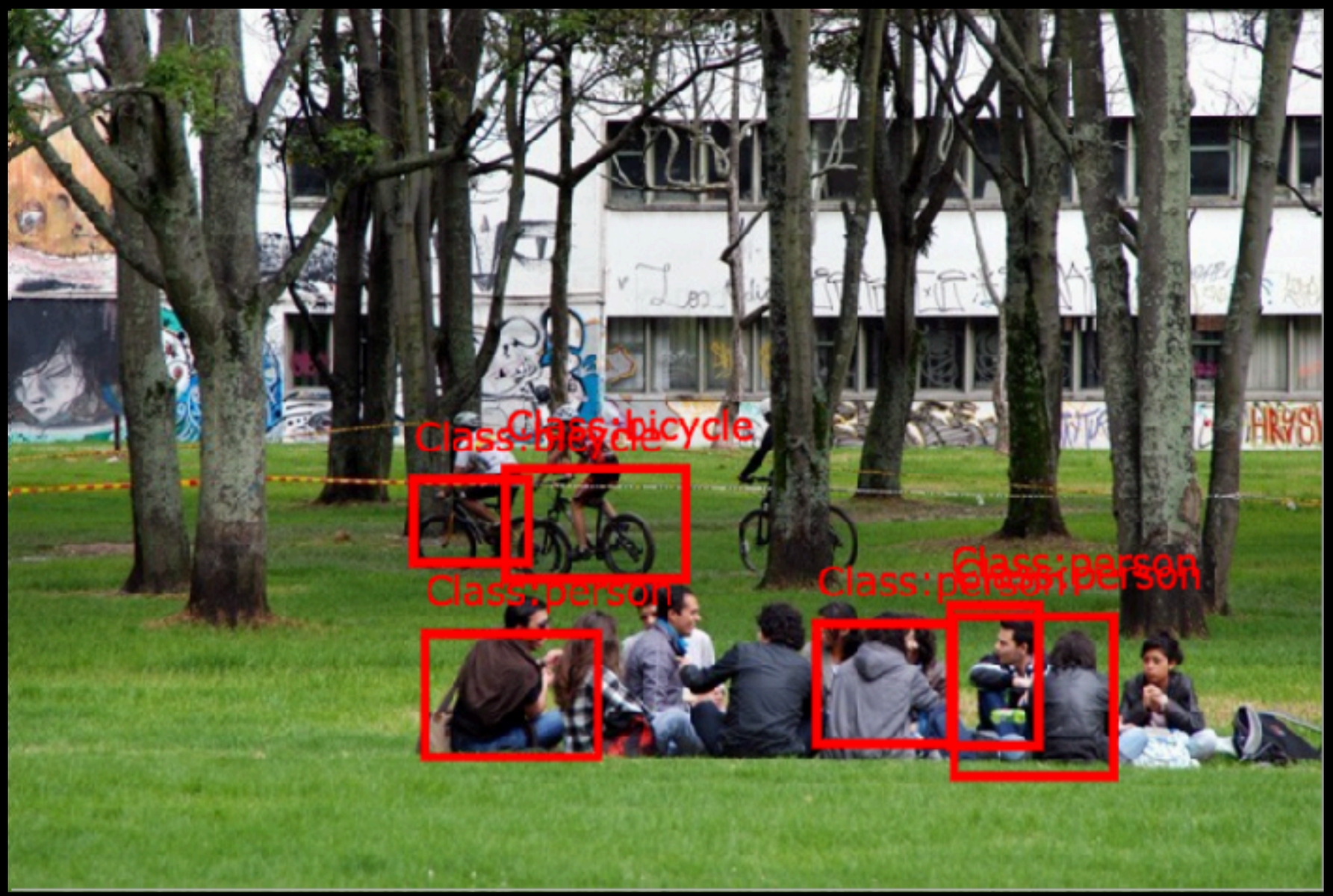
Visión por Computador

Microsoft Research

Revolution of Depth



Detección de objetos



http://silverpond.com.au/object-detector

Detección de objetos

http://silverpond.com.au/object-detector

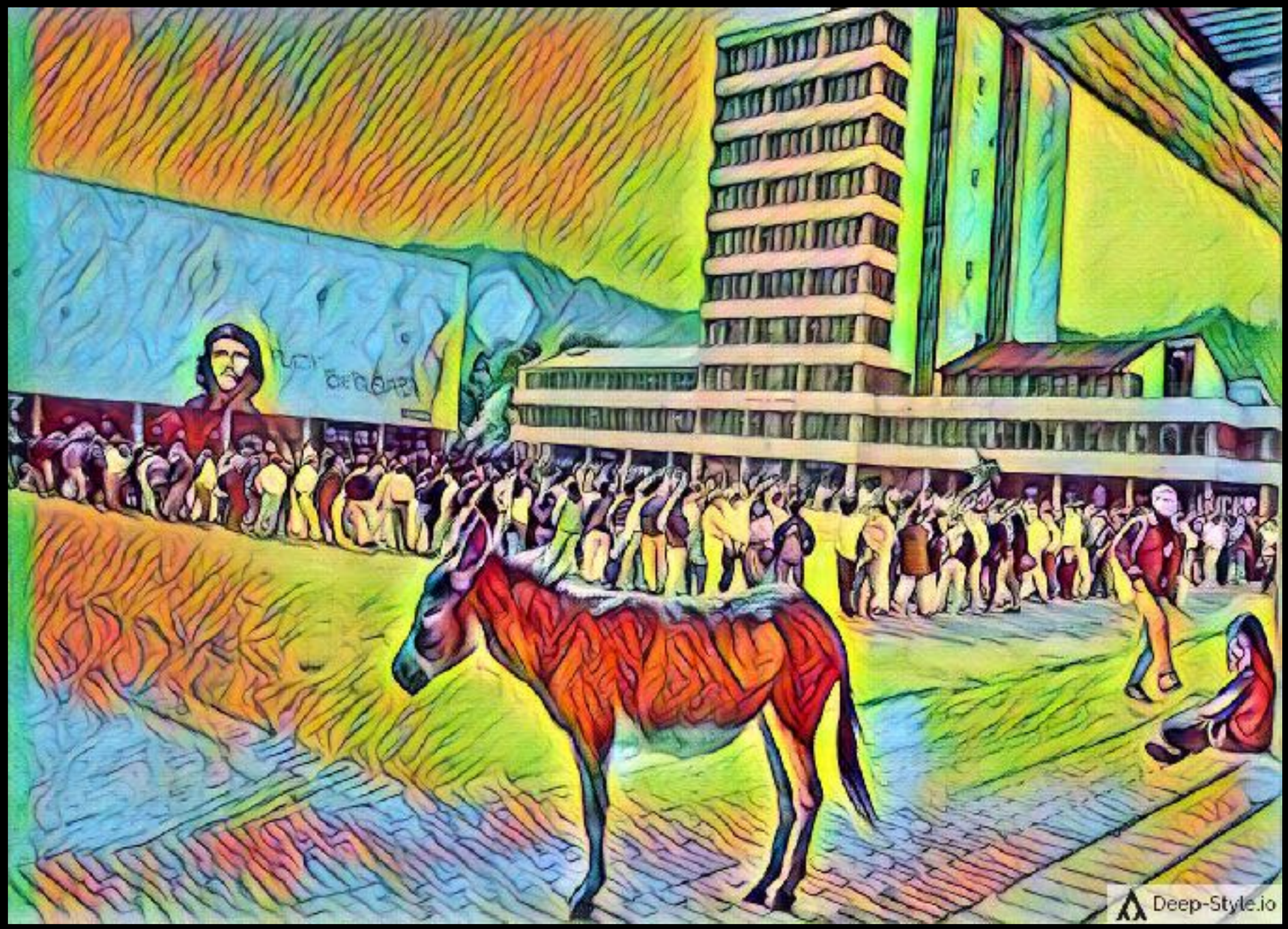
Image Captioning

I think it's a group of people sitting at a park.

Image Captioning

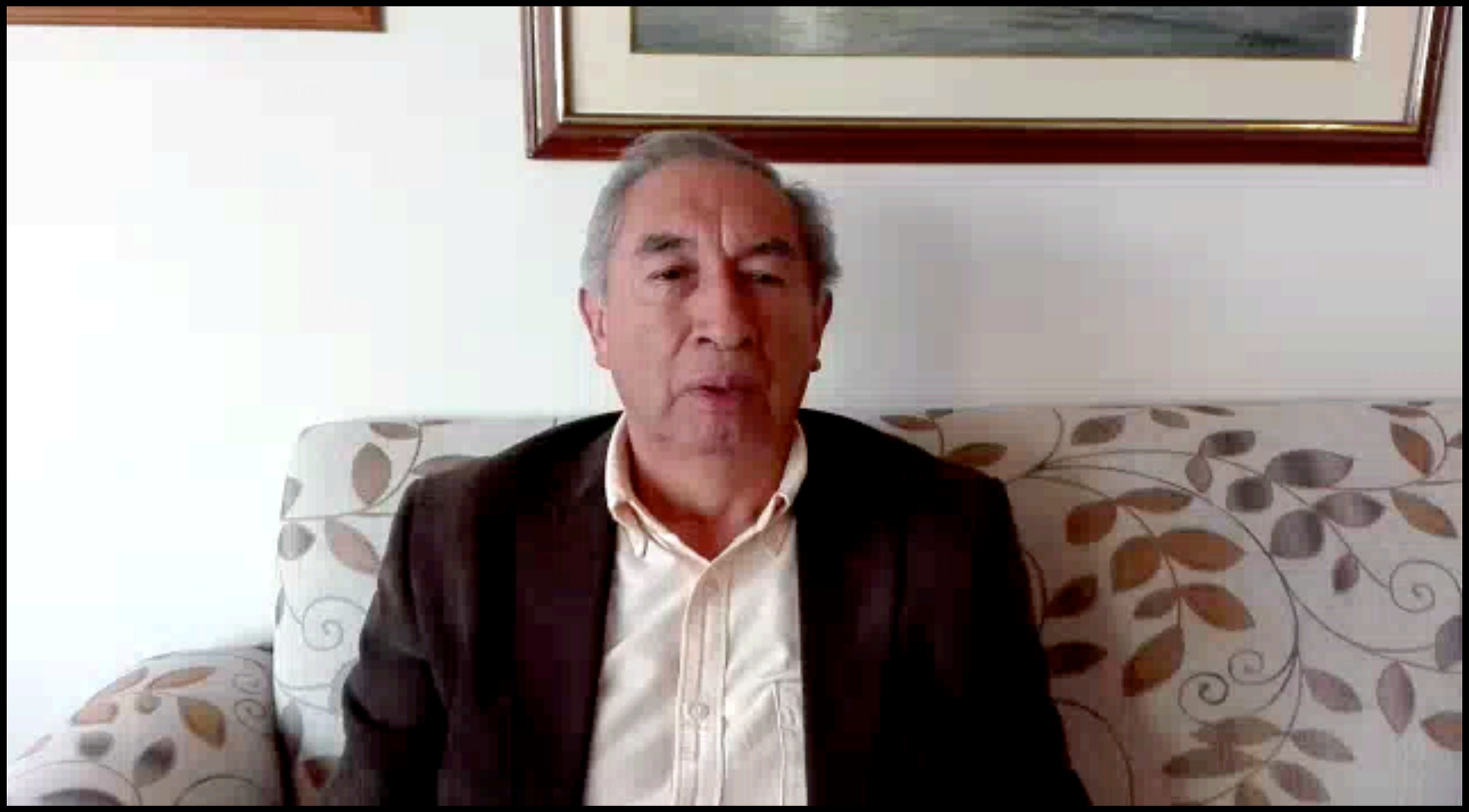
I think it's a horse standing in front of a building and he seems 😐.

Transferencia de estilo

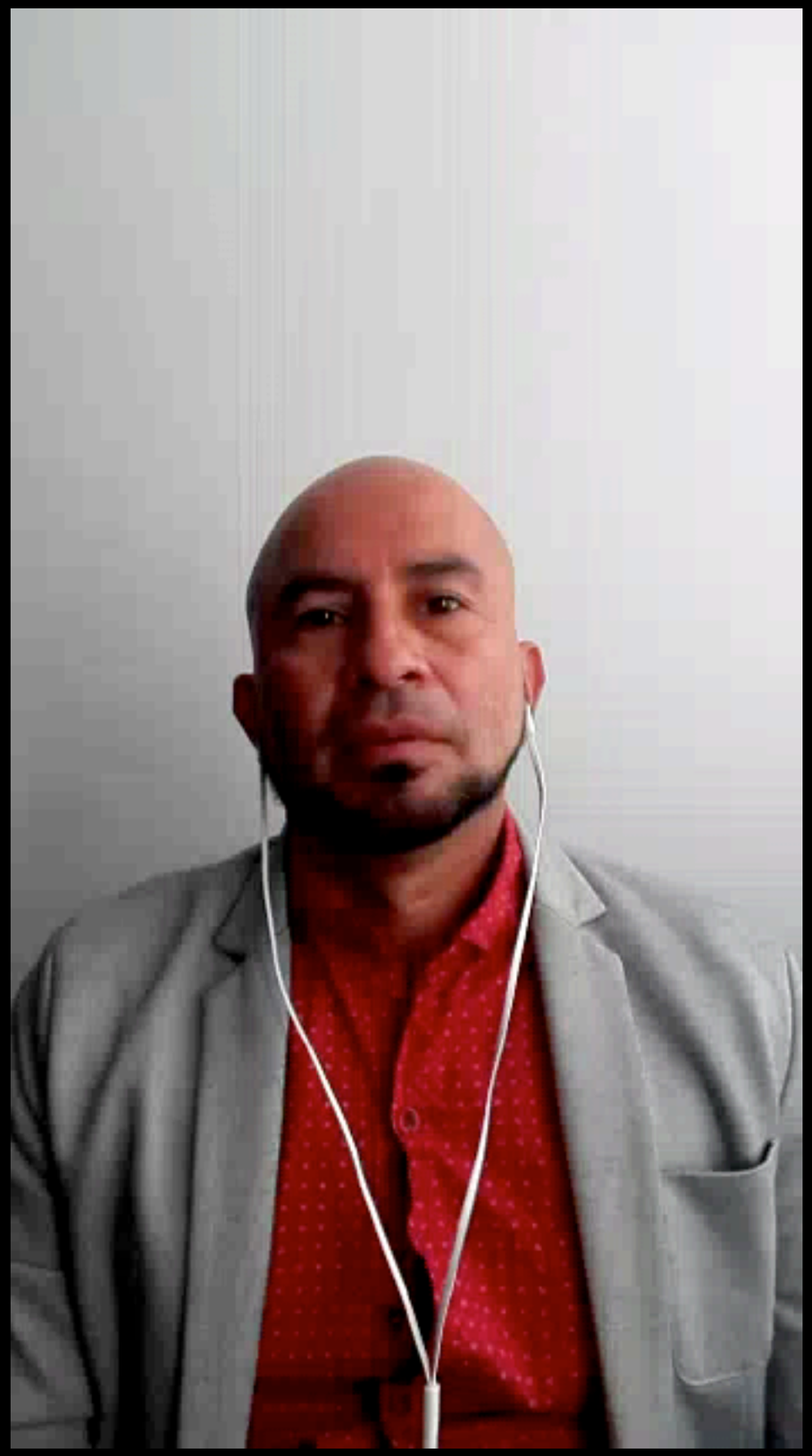


30 años de historia de IA en la UN

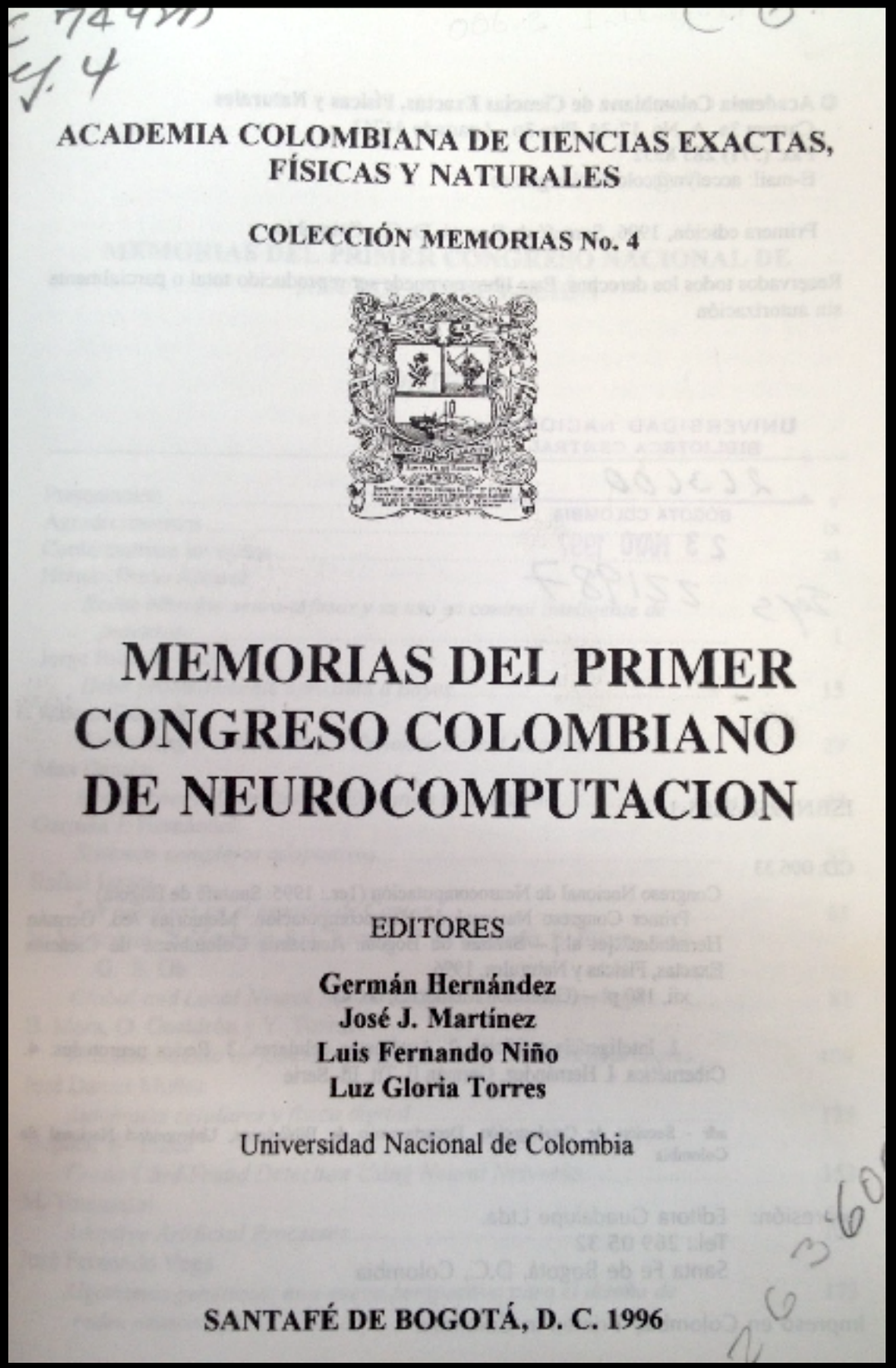
Prof. J.J. Martínez



Prof. Luis F. Niño



Primer Congreso Colombiano de Neurocomputación (1996)



ACADEMIA COLOMBIANA DE CIENCIAS EXACTAS, FÍSICAS Y NATURALES

COLECCIÓN MEMORIAS No. 4

MEMORIAS DEL PRIMER CONGRESO COLOMBIANO DE NEUROCOMPUTACION

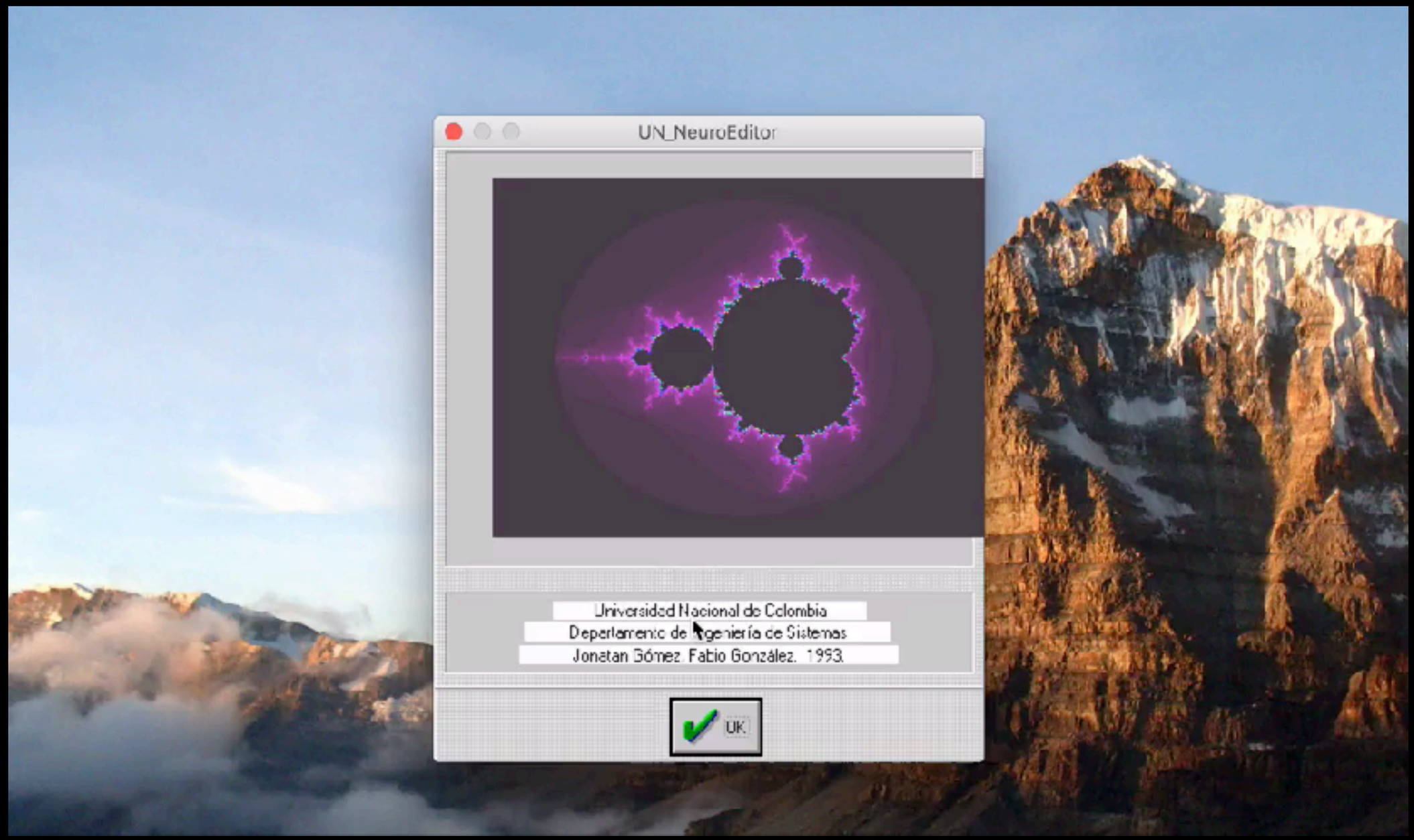
EDITORES

Germán Hernández
José J. Martínez
Luis Fernando Niño
Luz Gloria Torres

Universidad Nacional de Colombia

SANTAFÉ DE BOGOTÁ, D. C. 1996

UN Neuro (1993)



LISI

Laboratorio de investigación en sistemas inteligentes

UNIVERSIDAD NACIONAL DE COLOMBIA
SEDE BOGOTÁ

- ***Sistemas computacionales inspirados en la naturaleza***
- ***Aplicaciones de Sistemas Inteligentes***
- ***Plataformas computacionales para la implementación de sistemas inteligentes***

Luis Fernando Niño V., Ph. D.
lfninov@unal.edu.co
Director

Grupo de Algoritmos y Combinatoria (ALGOS)

- Areas de interés:
  - Trading Algorítmico, Finanzas Computacionales y Fintech
- Miembros:
  - Andrés Arevalo (Estudiante PhD)
  - Diego León (Estudiante PhD)
  - Jaime Niño (Estudiante PhD)
  - Javier Sandoval (PhD, Docente Externado)
- Director:
  - Germán Hernández (PhD, Profesor UNAL)

- Temas de investigación:
  - Machine Learning, Bioinformatics, Deep Learning
- Algunas publicaciones:

1. Market Trend Visual Bag of Words Informative Patterns in Limit Order Books
2. High Frequency Trading Strategy based on Deep Neural Networks
3. Detecting Informative Patterns in Financial Market Trends based on Visual Analysis
4. Price direction prediction on high frequency data using Deep Belief Networks
5. Complex Network Approach to Identify Potential Financial Scandals the Colombian Market Case
6. Clustering algorithms for Risk-Adjusted Portfolio Construction

Grupo de Investigación en Minería de Datos

Directora: Ing. Elizabeth León Guzmán, Ph.D.

UNIVERSIDAD NACIONAL DE COLOMBIA

Análisis de redes sociales

Análisis de opinión: elecciones presidenciales, marcas.
Detección perfiles falsos en twitter

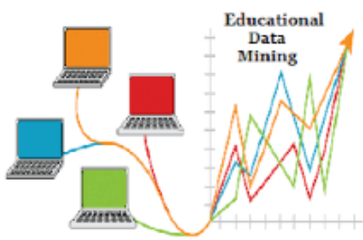
Algoritmos de agrupación

Detección de comunidades

Bioinspirados, algoritmos genéticos, gravitación
Escalables y dinámicos para manejo de Big Data

Aprendizaje de Máquina
Estadística
Inteligencia Artificial
Big Data

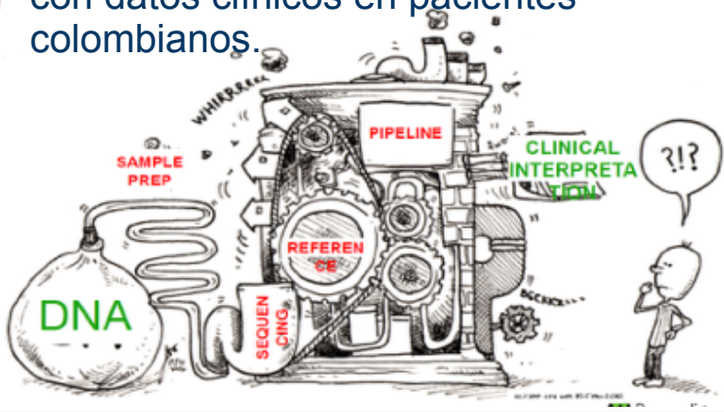
Educación



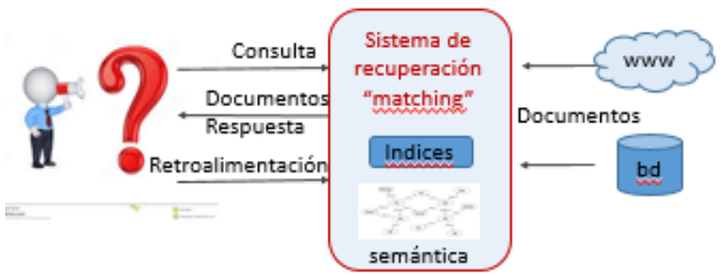
Predicción de deserción de estudiantes. Influencia de bienestar en la deserción en la U. Nacional.

Bioinformática

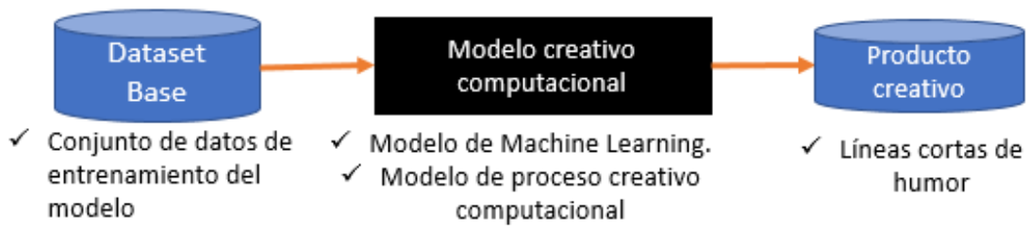
"DNA Codeword Design" usando algoritmos genéticos.
Identificación de variantes y asociación con datos clínicos en pacientes colombianos.



Sistemas de Recuperación de Información



Minería de texto

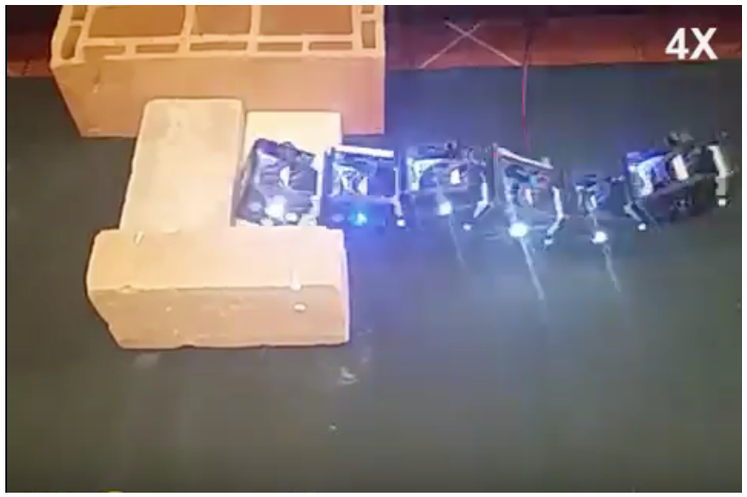


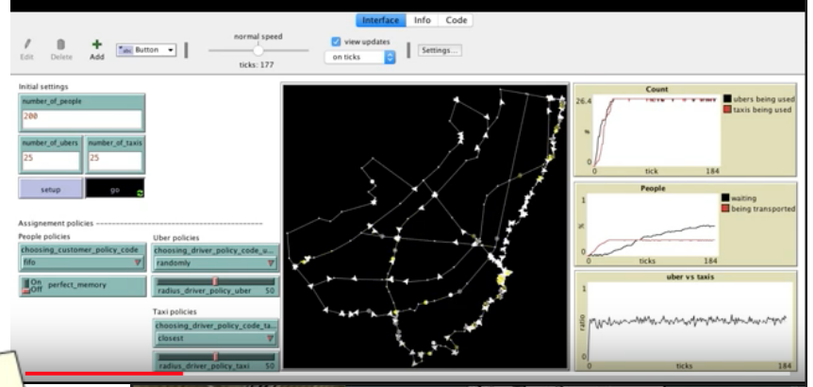
Procesamiento de Lenguaje Natural

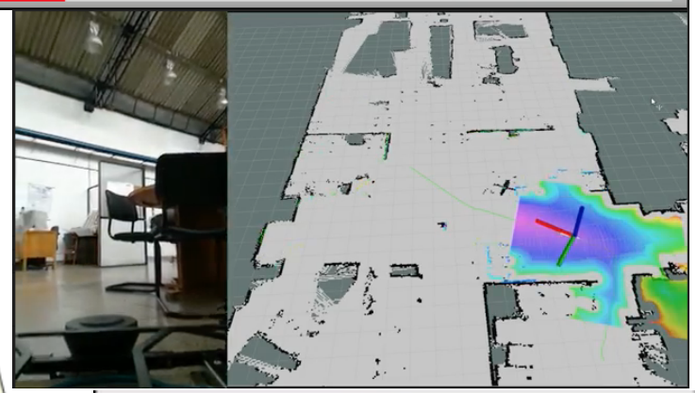
Minería web

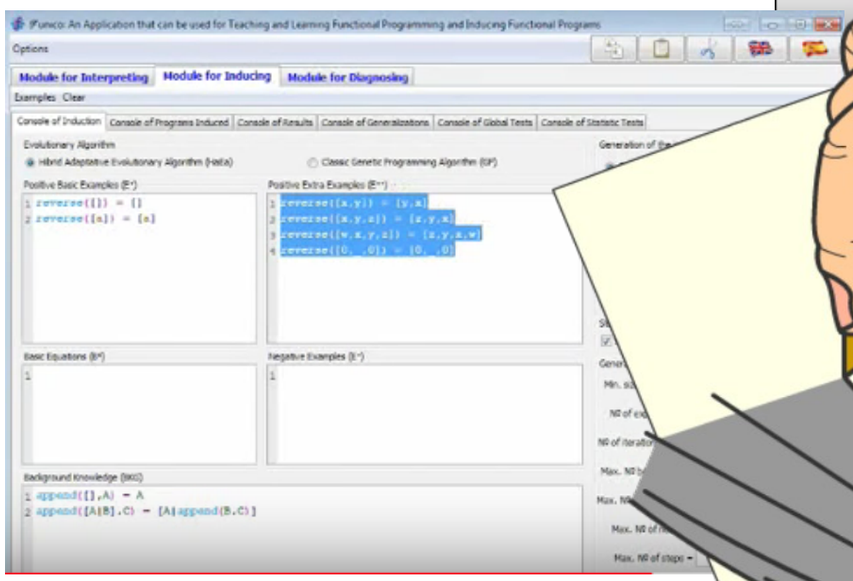
Metabuscadores Web, SRI para bibliotecas, reformulación de consultas, perfilamiento de usuarios

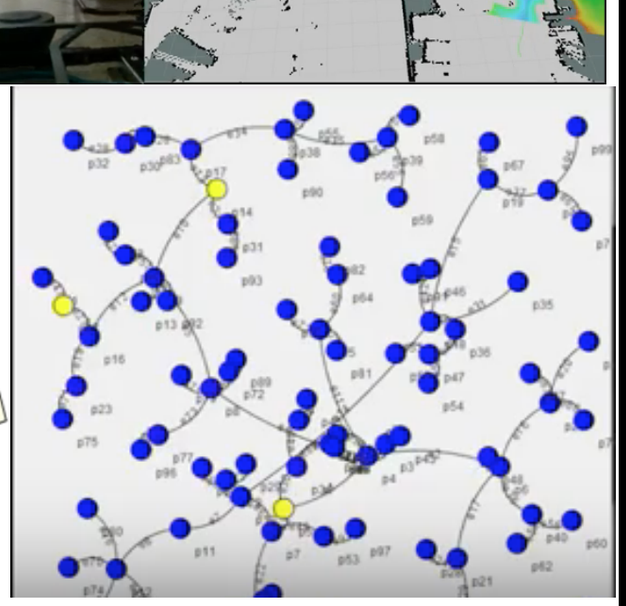
Aprendizaje profundo para generación de textos de humor

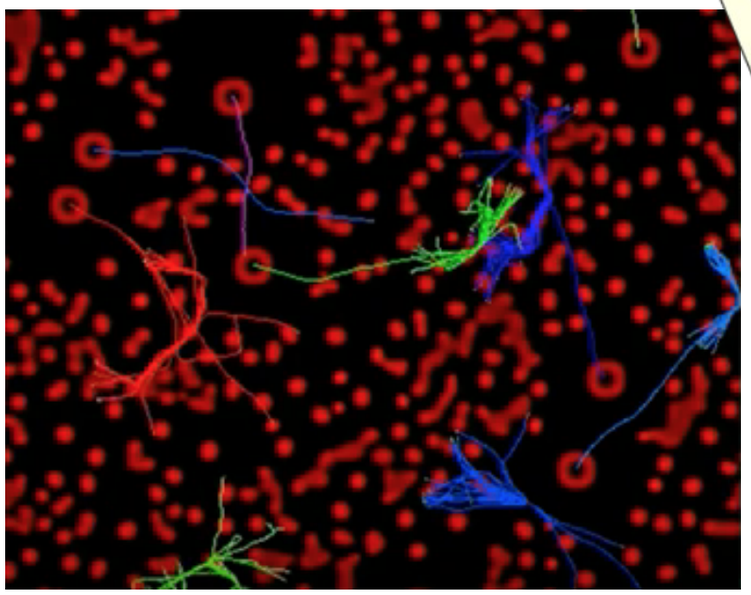




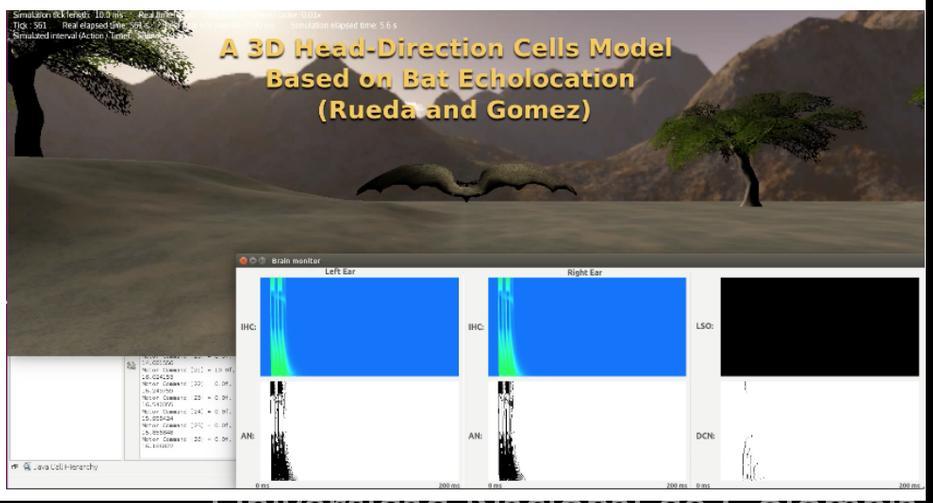








Jonatan Gómez, Ph. D.
jgomezpe@unal.edu.co
Grupo de Investigación en Vida Artificial

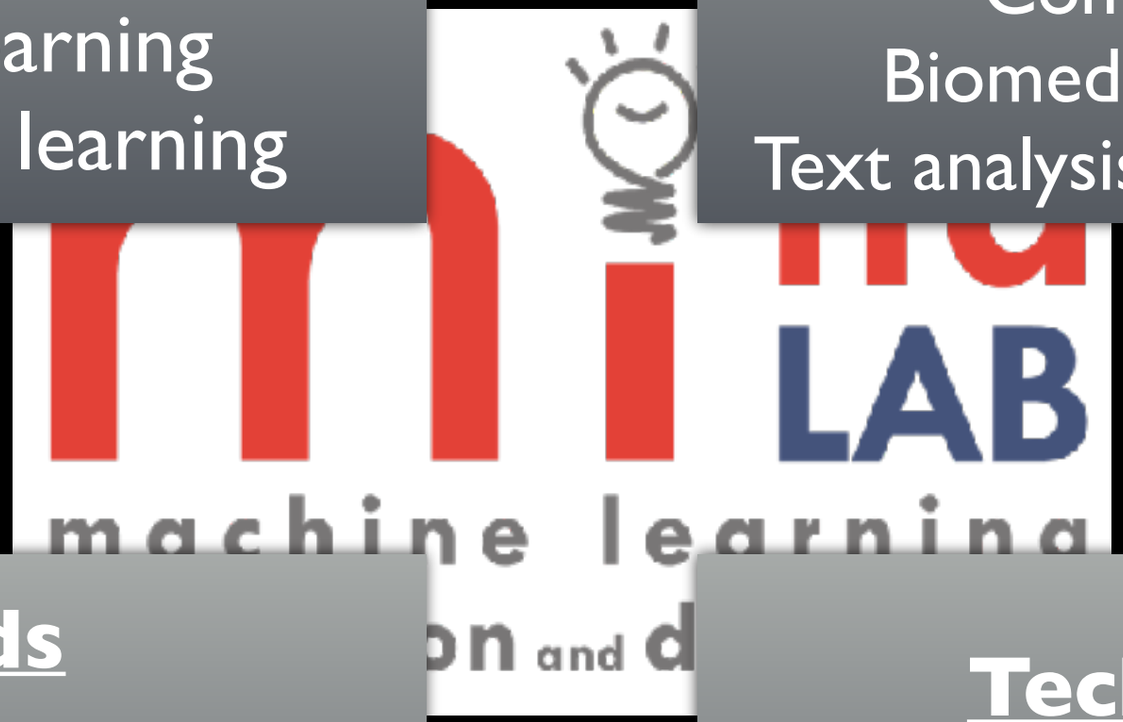


Problems

Multimodal learning
Large scale learning
Representation learning

Applications

Information retrieval
Computer vision
Biomedical information
Text analysis and understanding



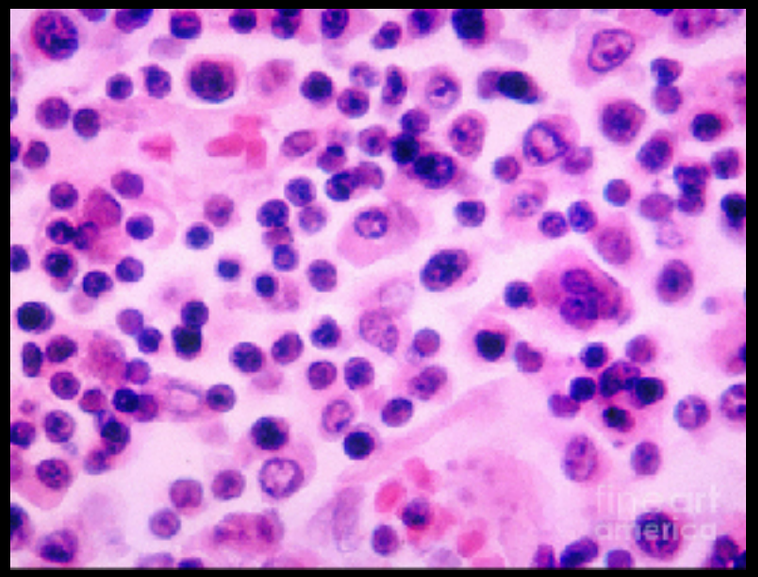
Methods

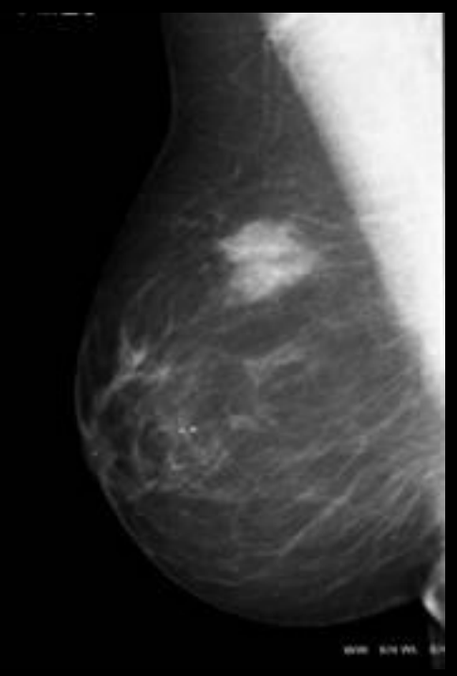
Kernel methods
Matrix factorization
Deep learning

Technologies

Distributed computing
GPGPU

Análisis de Imágenes Médicas





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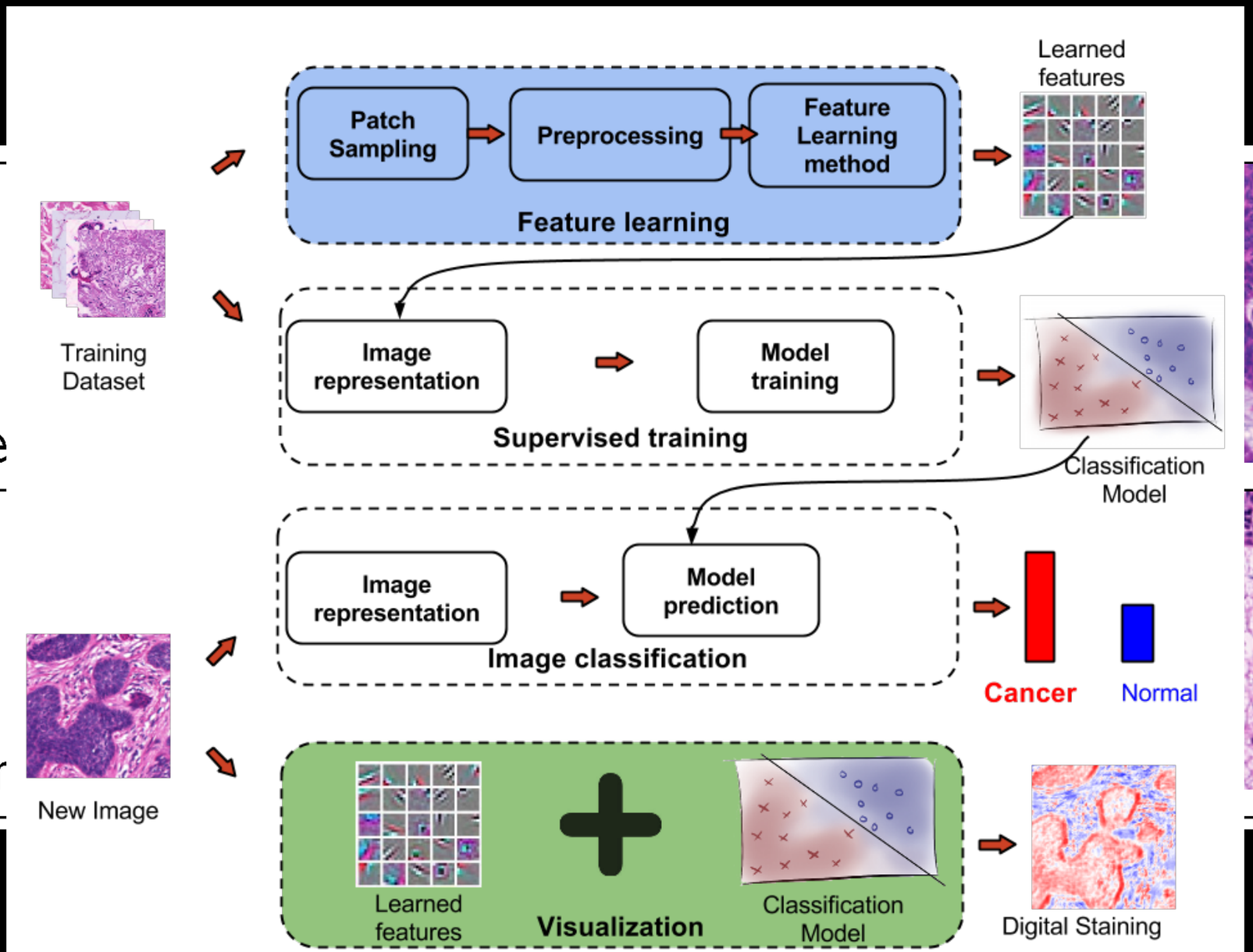

Detección Eficiente de Tumores

(12) **United States Patent**
Madabhushi et al.

(10) **Patent No.: US 9,430,829 B2**
(45) **Date of Patent: Aug. 30, 2016**

(54) **AUTOMATIC DETECTION OF MITOSIS USING HANDCRAFTED AND CONVOLUTIONAL NEURAL NETWORK FEATURES**

(71) Applicant: **Case Western Reserve University**, Cleveland, OH (US)

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(73) Assignee: **Case Western Reserve University**, Cleveland, OH (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

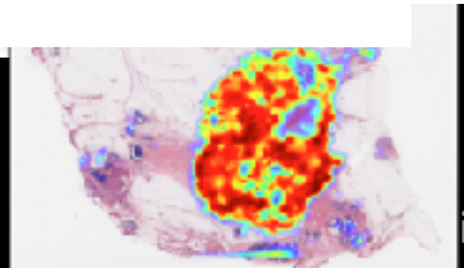
(58) **Field of Classification Search**
None
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

2007/0112701	A1 *	5/2007	Chellapilla	G06K 9/6256 706/15
2007/0140556	A1 *	6/2007	Willamowski	G06K 9/0061 382/167
2010/0002920	A1 *	1/2010	Cosatto	G06K 9/00147 382/128
2010/0172568	A1 *	7/2010	Malon	G06K 9/00147 382/133
2014/0139625	A1 *	5/2014	Mathuis	G03H 1/0005 348/40
2014/0314292	A1 *	10/2014	Kamen	A61B 6/463 382/131

* cited by examiner



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Gracias!

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