

SENSORES REMOTOS

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(Versión: July 25, 2020)



Machine Learning

Taxonomy of Machine Learning



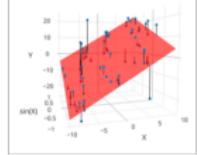
Machine Learning

Labeled Data

Supervised Learning

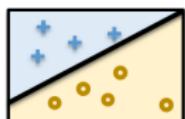
Quantitative Response

Regression



Categorical Response

Classification

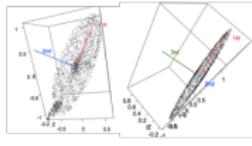


Unlabeled Data

Reinforcement Learning (not covered)

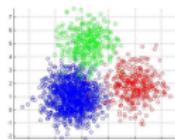


Dimensionality Reduction

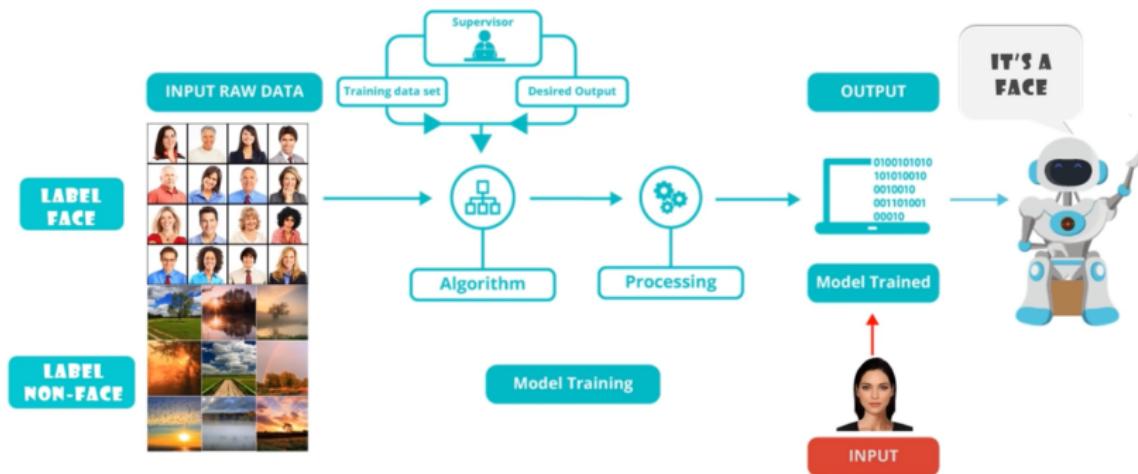


Unsupervised Learning

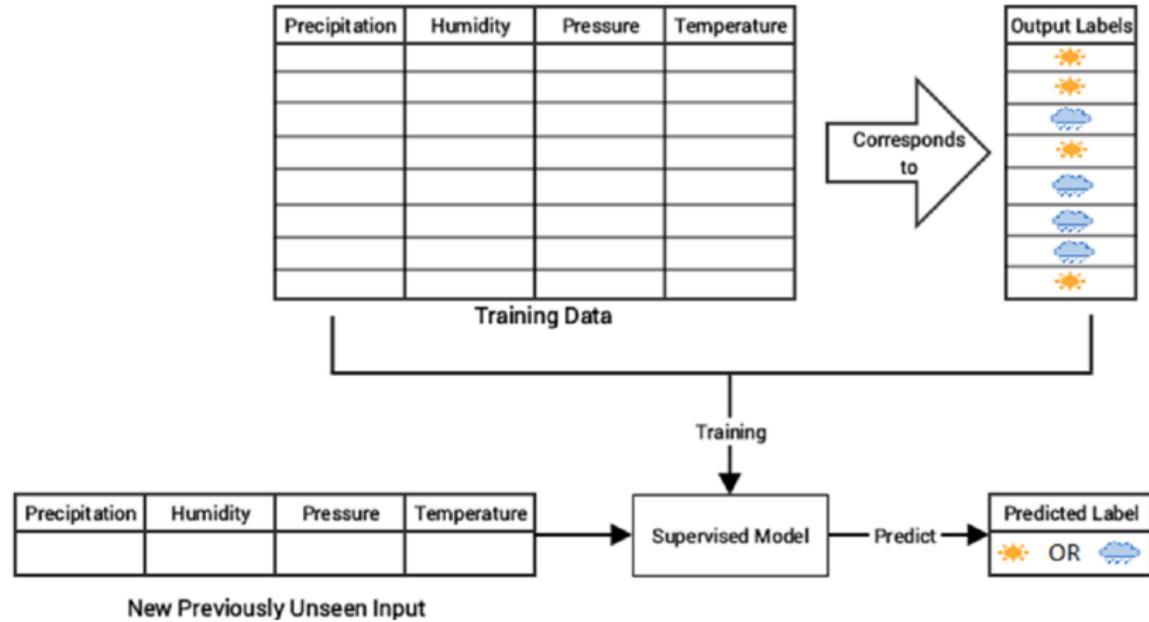
Clustering



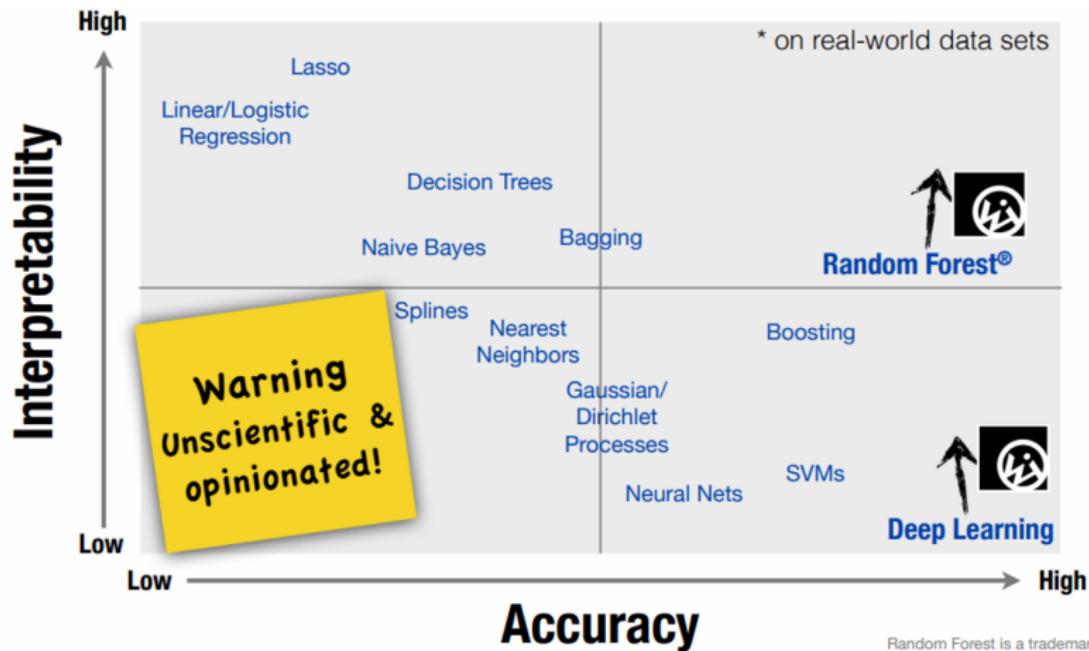
Modelos supervisados



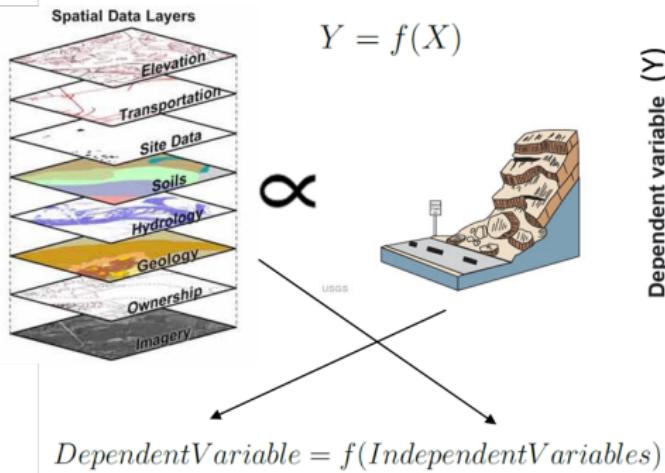
Modelos supervisados



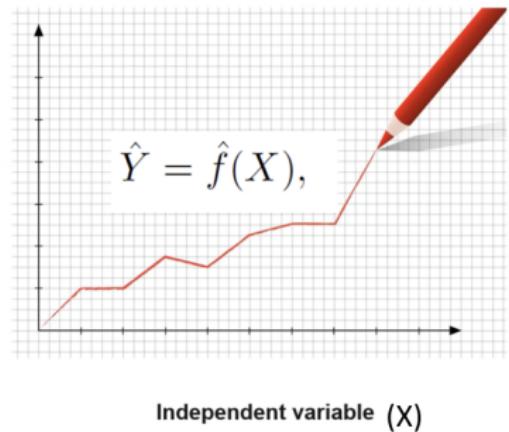
Modelos supervisados



Random Forest is a trademark of Salford

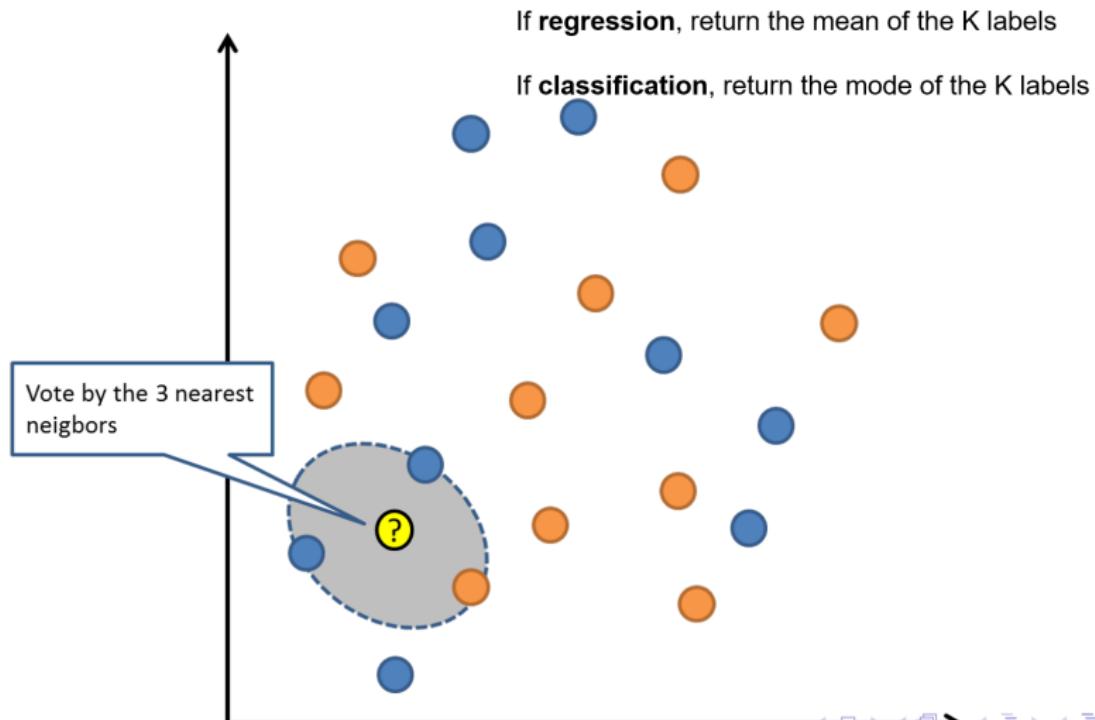


Dependent variable (Y)



Algoritmos de clasificación

KNN



KNN

A hand-drawn logo consisting of the letters "KNN" in a bold, blocky font. The letters are filled with light green color and have dark green outlines.

NEIGHBORHOOD
SIZE



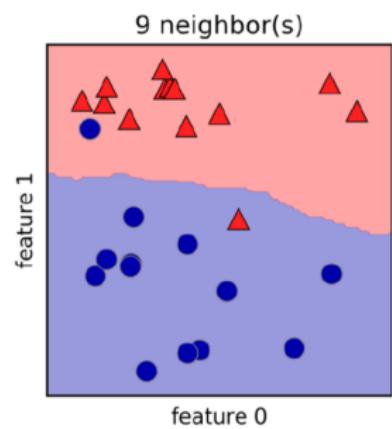
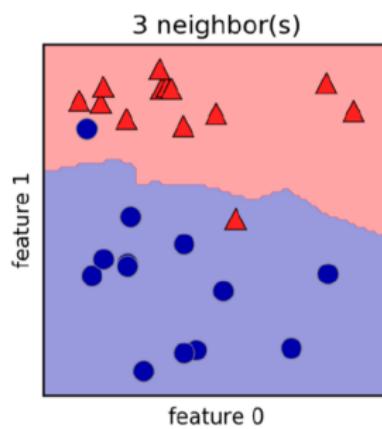
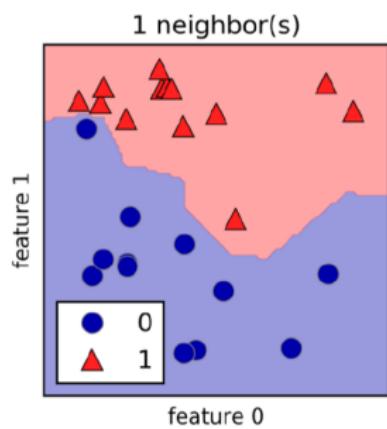
Small
 $K = \text{Low Bias, High Variance}$



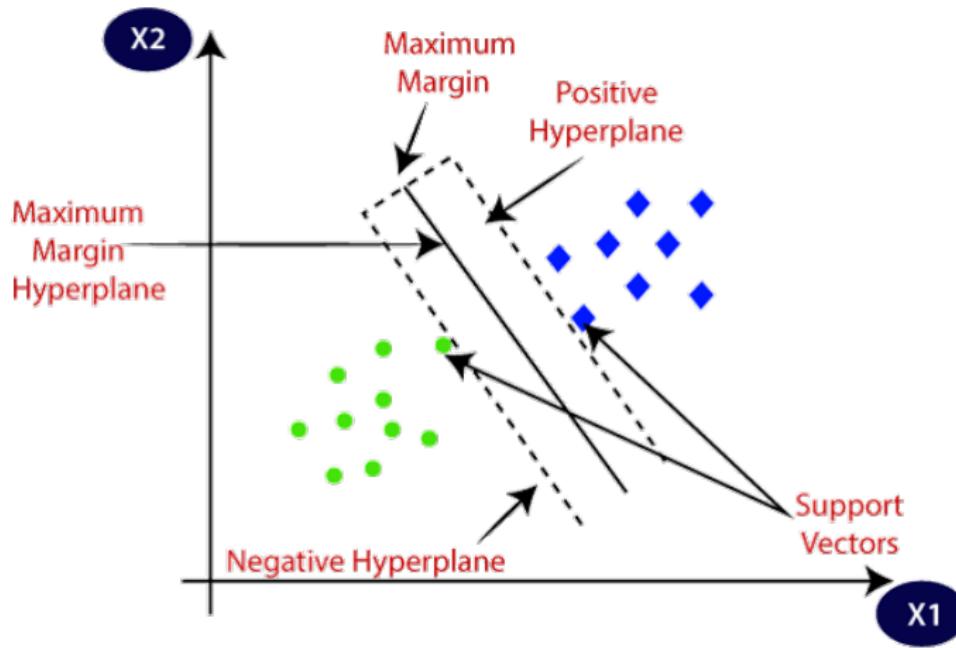
LARGE
 $K = \text{High Bias, Low Variance}$

BY CHRIS ALBON

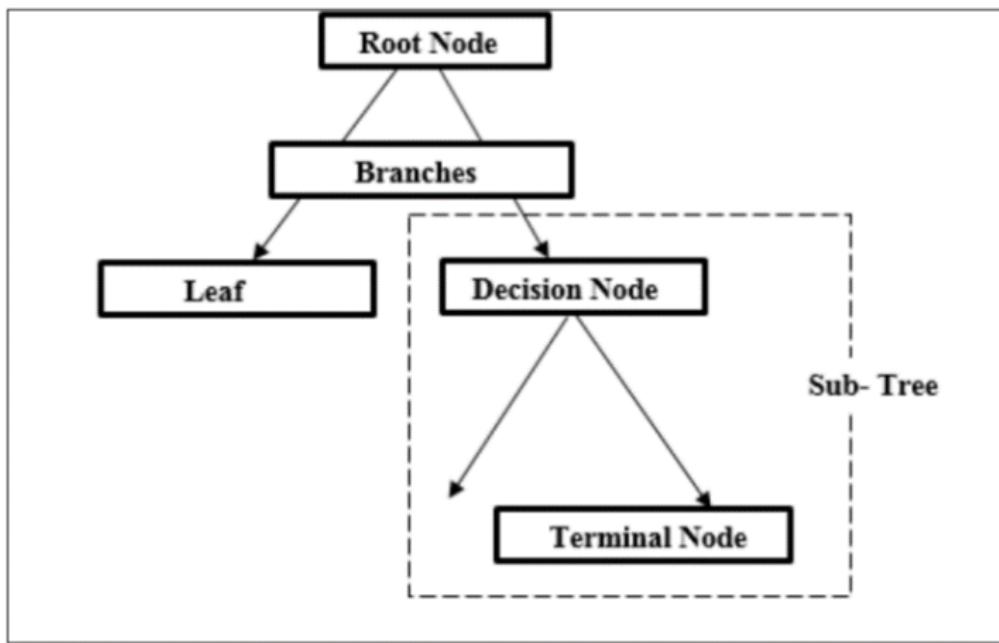
KNN



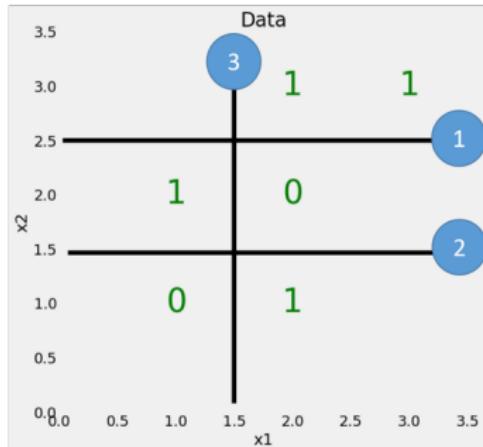
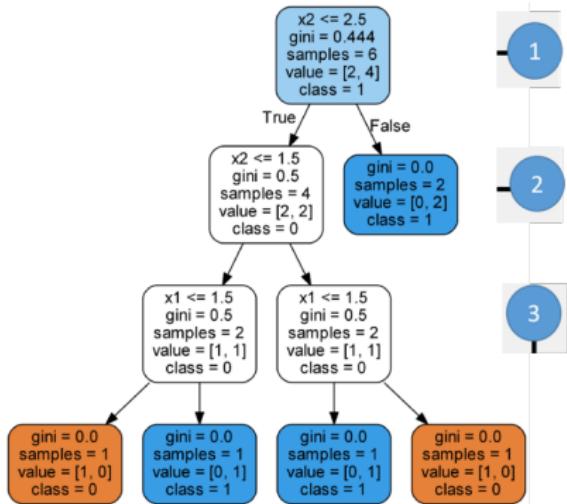
SVM



Árboles de decisión



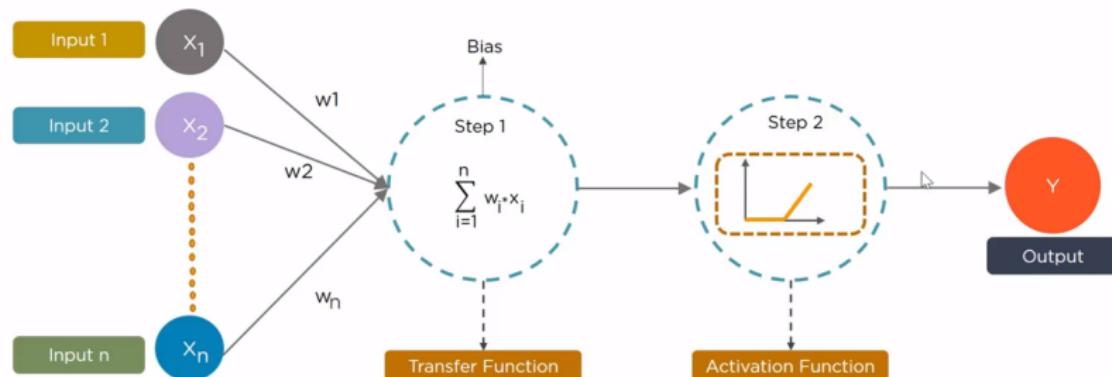
Árboles de decisión



Redes Neuronales Artificiales

What is a Neural Network?

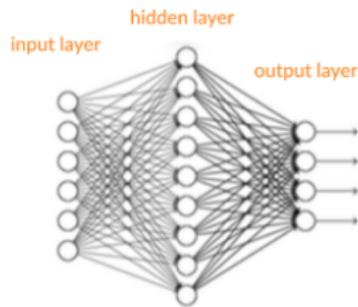
Second step in the process is to pass the calculated weighted sum as input to the activation function to generate the output



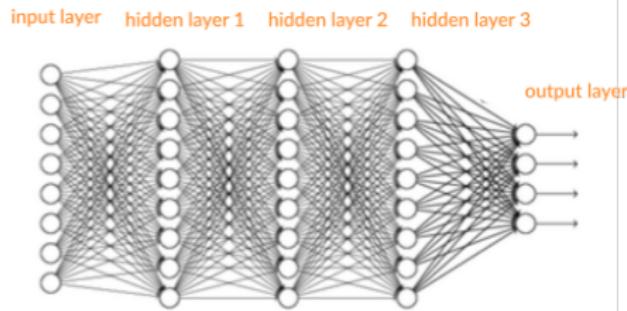
Deep learning

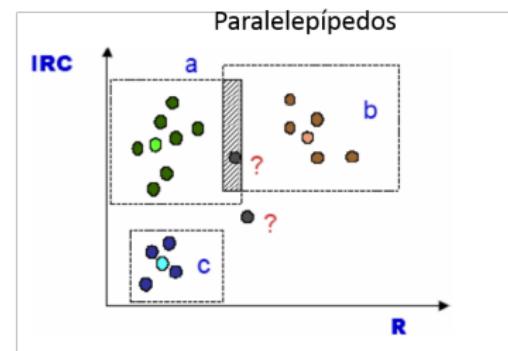
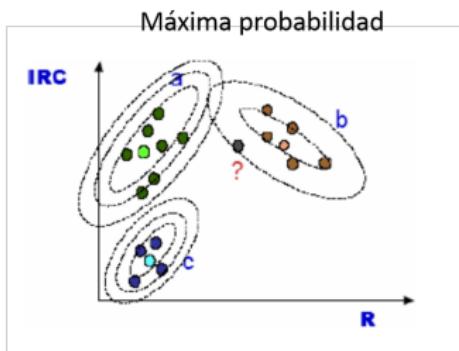
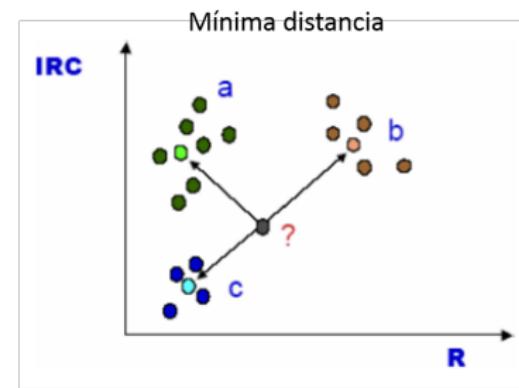
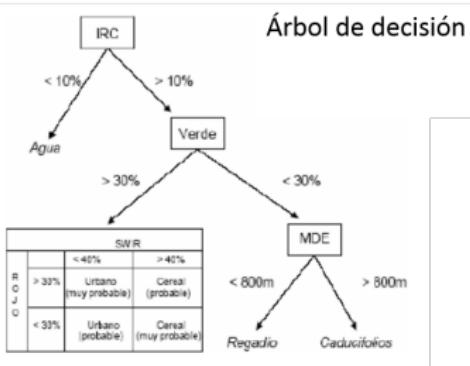
Shallow vs deep neural networks

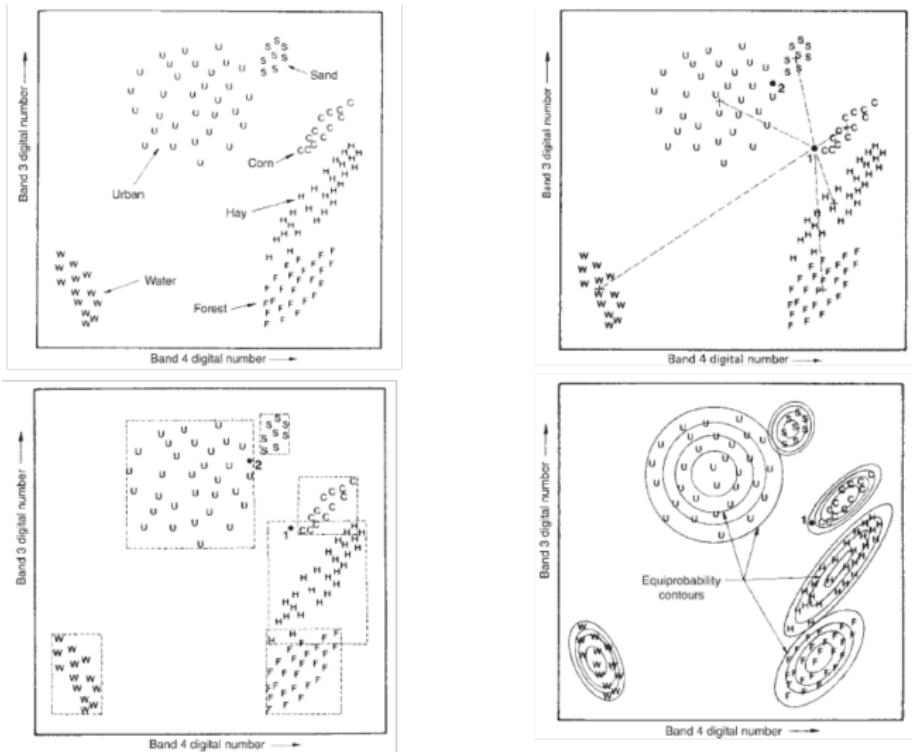
shallow feedforward
neural network



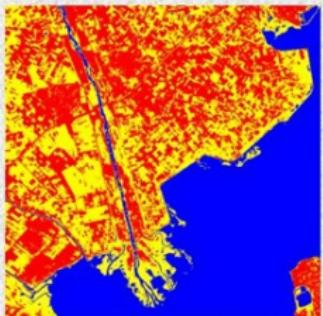
Deep neural network



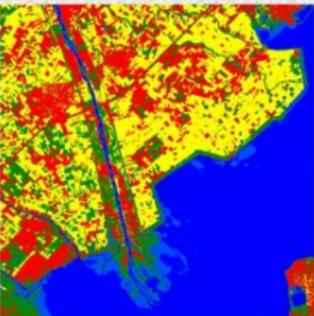




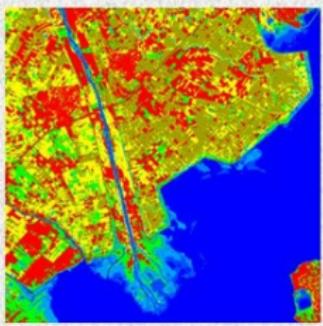
Examples of
classification using
the K-mean algorithm



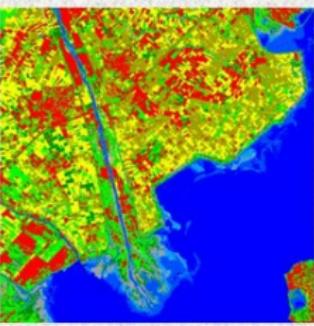
K-means: 3 classes



K-means: 5 classes



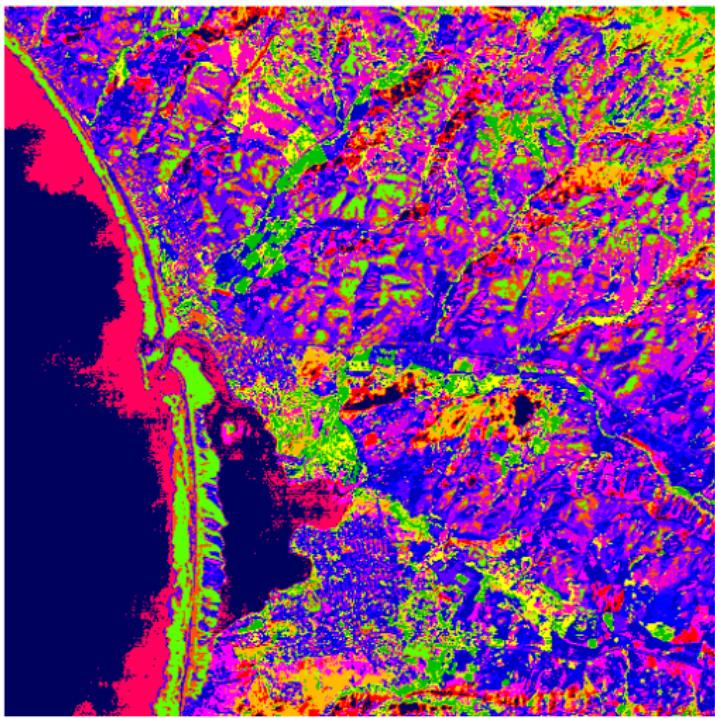
K-means: 7 classes

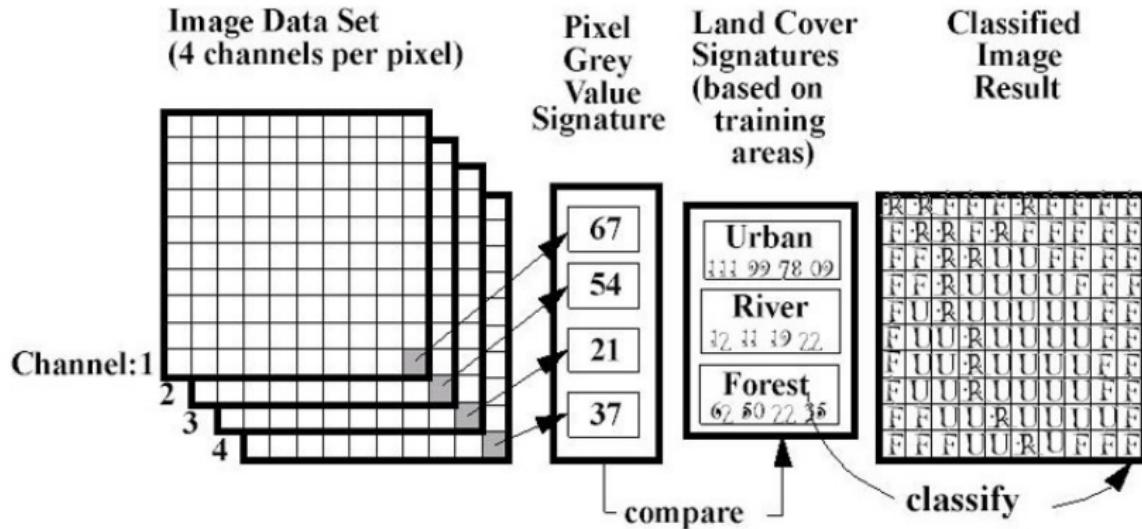


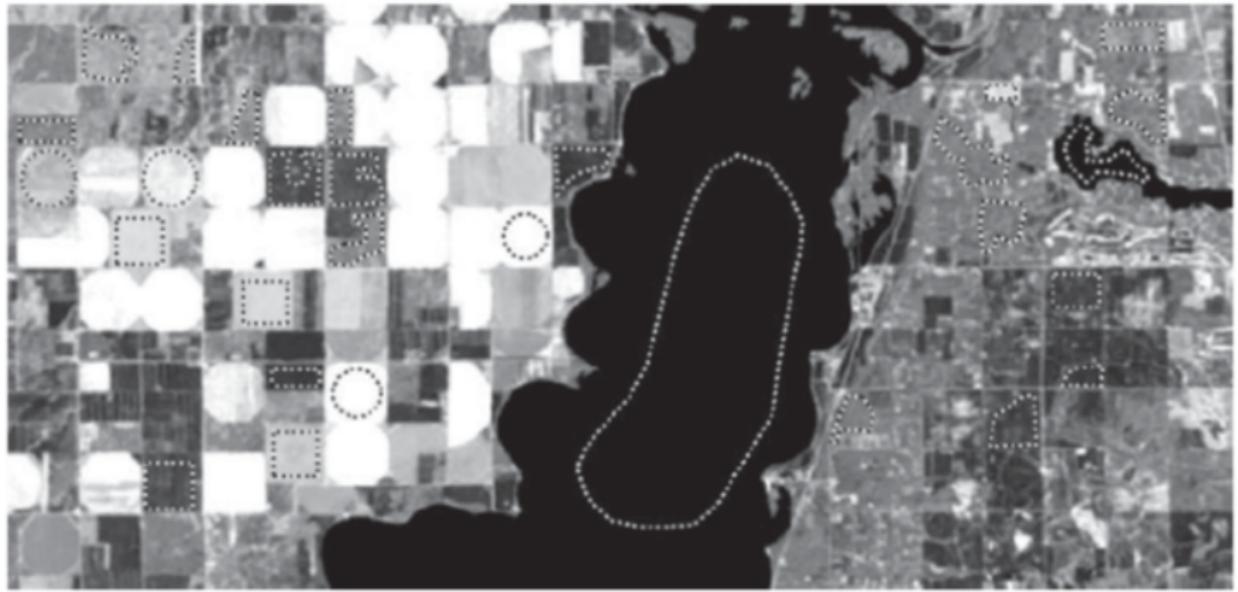
K-means: 9 classes

A. Demmanis

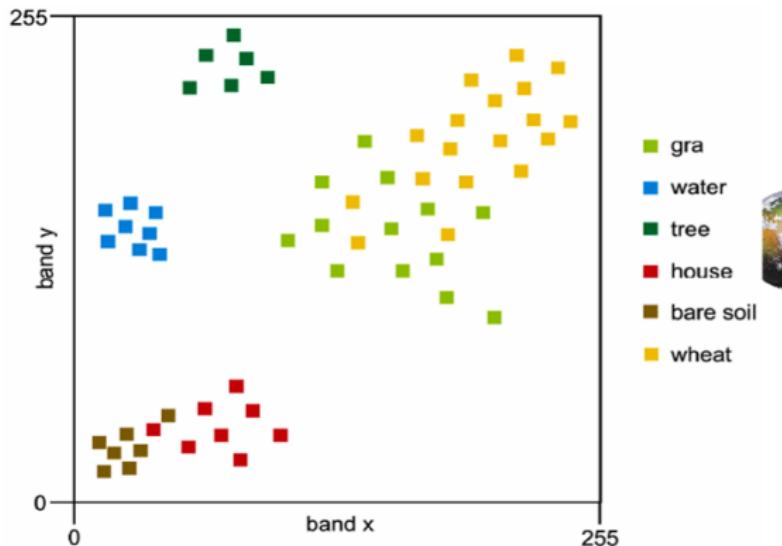
Morro Bay Comp. 234 Unsup Classif. 15 Clusters







Feature Space



UNEP-ITC RS/GIS for Monitoring and Assessment of Iraqi Marshland, 6-10 Feb 2005

TABLE 7.1 Portion of a Divergence Matrix Used to Evaluate Pairwise Training Class Spectral Separability

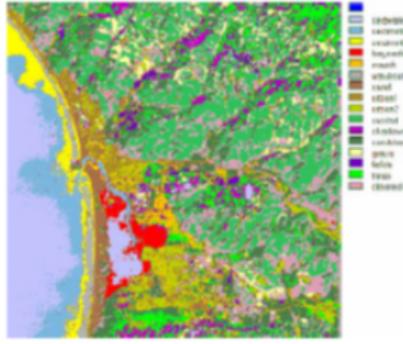
Spectral Class ^a	W1	W2	W3	C1	C2	C3	C4	H1	H2...
W1	0								
W2	1185	0							
W3	1410	680	0						
C1	1997	2000	1910	0					
C2	1953	1890	1874	860	0				
C3	1980	1953	1930	1340	1353	0			
C4	1992	1997	2000	1700	1810	1749	0		
H1	2000	1839	1911	1410	1123	860	1712	0	
H2	1995	1967	1935	1563	1602	1197	1621	721	0
:	:								

^a W. water; C. corn; H. hav.

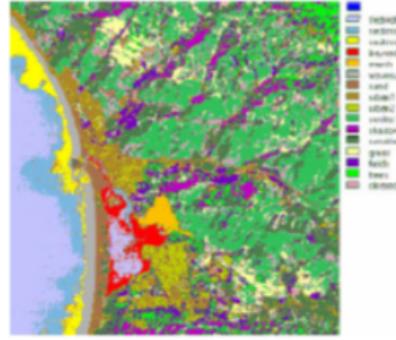
DTM



Minima Distancia:



Máxima Probabilidad:



Matriz de Confusión

		<u>True class</u>	
		P	N
<u>Hypothesized class</u>	Y	True Positives	False Positives
	N	False Negatives	True Negatives
Column totals:		P	N

Matriz de Contingencia

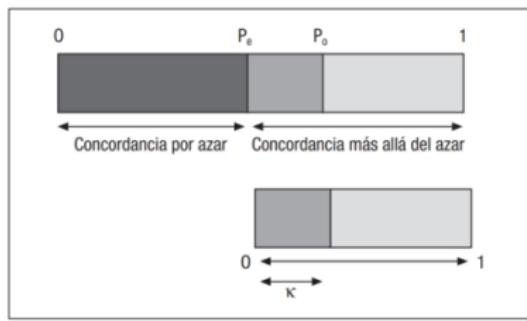
$$\text{Accuracy} + \text{Error} = 100\%$$

TABLE 7.3 Error Matrix Resulting from Classifying Test Pixels

		Reference Data ^a						Row Total
		W	S	F	U	C	H	
Classification data	Error de Acción (inclusión) → FP Error tipo II							Column total
	W	226	0	0	12	0	1	239
	S	0	216	0	92	1	0	309
	F	3	0	360	228	3	5	599
	U	2	108	2	397	8	4	521
	C	1	4	48	132	190	78	453
	H	1	0	19	84	36	219	359
De todas las que son cuantas acerté?		De todas las predice cuantas acerté?						
Producer's Accuracy		User's Accuracy						
W = 226/233 = 97%		W = 226/239 = 94%						
S = 216/328 = 66%		S = 216/309 = 70%						
F = 360/429 = 84%		F = 360/599 = 60%						
U = 397/945 = 42%		U = 397/521 = 76%						
C = 190/238 = 80%		C = 190/453 = 42%						
H = 219/307 = 71%		H = 219/359 = 61%						
Overall accuracy = (226 + 216 + 360 + 397 + 190 + 219)/2480 = 65%								

^a W, water; S, sand; F, forest; U, urban; C, corn; H, hay.

Coeficiente de Cohen Kappa



**Tabla 3. Valoración del coeficiente kappa
(Landis y Koch, 1977)⁴**

Coeficiente kappa	Fuerza de la concordancia
0,00	Pobre (<i>Poor</i>)
0,01 - 0,20	Leve (<i>Slight</i>)
0,21 - 0,40	Aceptable (<i>Fair</i>)
0,41 - 0,60	Moderada (<i>Moderate</i>)
0,61 - 0,80	Considerable (<i>Substantial</i>)
0,81 - 1,00	Casi perfecta (<i>Almost perfect</i>)

Matriz de Contingencia

Tabla 1.

		Radiólogo A			
		Neumonía	No neumonía	Total	
Radiólogo B	Neumonía	4	6	$r = a + b$	10
	No	c	d	$s = c + d$	90
Total	14	$t = a + c$	$u = b + d$	86	$N = a + b + c + d$ 100

	Reference Data ^a						
	W	S	F	U	C	H	Row Total
Classification data							
W	226	0	0	12	0	1	239
S	0	216	0	92	1	0	309
F	3	0	360	228	3	5	599
U	2	108	2	397	8	4	521
C	1	4	48	132	190	78	453
H	1	0	19	84	36	219	359
Column total	233	328	429	945	238	307	2480
Producer's Accuracy				User's Accuracy			
W = 226/233 = 97%				W = 226/239 = 94%			
S = 216/328 = 66%				S = 216/309 = 70%			
F = 360/429 = 84%				F = 360/599 = 60%			
U = 397/945 = 42%				U = 397/521 = 76%			
C = 190/238 = 80%				C = 190/453 = 42%			
H = 219/307 = 71%				H = 219/359 = 61%			
Overall accuracy = $(226 + 216 + 360 + 397 + 190 + 219) / 2480 = 65\%$							

^aW, water; S, sand; F, forest; U, urban; C, corn; H, hay.

$$\sum_{i=1}^r x_{ii} = 226 + 216 + 360 + 397 + 190 + 219 = 1608$$

$$\begin{aligned} \sum_{i=1}^r (x_{i+} \cdot x_{+i}) &= (239 \cdot 233) + (309 \cdot 328) + (599 \cdot 429) \\ &\quad + (521 \cdot 945) + (453 \cdot 238) + (359 \cdot 307) = 1,124,382 \end{aligned}$$

$$\hat{k} = \frac{2480(1608) - 1,124,382}{(2480)^2 - 1,124,382} = 0.57$$