Pattern Recognition. Overview

Pooran Singh Negi

Pattern Recognition

Supervised Learning example Unsupervised Learning Example Applications of pattern recognition

pattern recognition 1.4: Some basic concepts in machine learning

Pattern Recognition. Overview

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Outline

Pattern Recognition. Overview

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recognition
1.4: Some basic concepts in machine learning

1 Pattern Recognition

- Basic problems
- Supervised Learning example
- Unsupervised Learning Example
- Applications of pattern recognition
- 1.4: Some basic concepts in machine learning

What is pattern Recognition

Pattern Recognition. Overview

Pattern

Recognition

Finding Pattern and regularities in data usually to solve more complex problem.

Basic Type of learning problem

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Basic problems

- Supervised Learning
 - Naive Bayes
 - Support vector machine
 - Decision Tree
- Unsupervised Learning
 - Clustering, k-mean.
 - Dimensionality reduction. PCA
- Reinforcement learning

Classification

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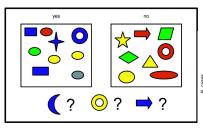
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Pattern Recognition

Supervised Learning

Learning example

Learning
Example
Applications of pattern recognition
1.4: Some basi



D features (attributes)

	Color	Shape	Size (cm)		
1	Blue	Square	10		
	Red	Ellipse	2.4		
	Red	Ellipse	20.7		
.					

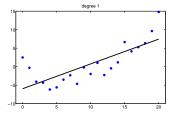
Label	
1	
1	
0	

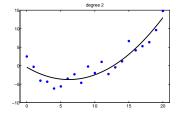
Regression

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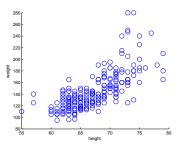


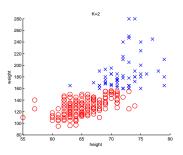
Clustering

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Unsupervised Learning

Example





Discovering latent factors. Manifold Learning

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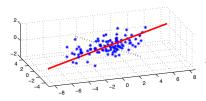
Supervised Learning example

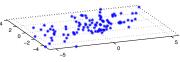
Unsupervised Learning

Example Applications o

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PCA

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mean

principal basis 2



principal basis 1





Collaborative filtering(S1.3.4.2)

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example Unsupervised Learning

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lack	1		?	3	5	?	
movies	?	1				2	
\downarrow		4		4	5	?	

Applications

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Pattern Recognition Basic problems Supervised Learning example Unsupervised Learning Example Applications of

Applications of pattern recognition
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- Recommendation system of Google and . ► Amazon

- Fraud detection in credit card transaction.
- Timeseries prediction. Natural Language Processing, Machine translation etc, Financial market etc. For e.g. Real time translation on skype. Chat bot in customer services.

Parametric vs non-parametric models

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Parametric: Model has a fixed number of parameters.

non-parametric: Number of parameters grow with training data.

Note: hyperparameters are parameters whose values are set before starting the learning process

K-nearest neighbors

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concepts in

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$$p(y = c | \mathbf{x}, \mathcal{D}, \mathcal{K}) = \frac{1}{K} \sum_{i \in N_k(\mathbf{x}, \mathcal{D})} \mathbb{I}(y_i = c)$$









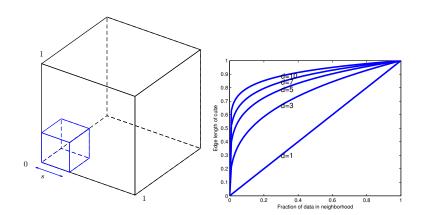




Curse of dimentionality

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1..4.4: Parametric models for classification and regression

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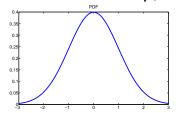
Basic problem Supervised Learning example

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$$y(\mathbf{x} = W^T \mathbf{x}) + \epsilon = \sum_{i=1}^{D} w_i x_i + \epsilon$$

Where
$$\epsilon \sim \mathcal{N}(\mu, \sigma^2) = \frac{1}{\sqrt{(2\pi\sigma^2)}} \exp(-\frac{2\sigma^2}{(x-\mu)^2})$$



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Thank you!