Finding Association Rules in Mammograms

Knowledge Discovery in Data

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Why is it important?

- it is about life;
- breast cancer is the is the second leading cause of cancer deaths in women today;
- is the most common cancer among women;
- error rate in detection by humans is high;
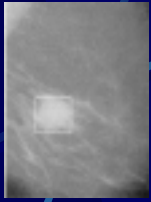- interpretation of mammograms is difficult.

Mammograms

- the only way to survive is early detection;
- most reliable method of detection;
- very difficult to interpret;
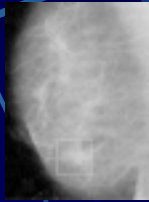- a lot of methods for detection but not very accurate.

Mammography Database

- free online MIAS database ;
- 322 digitized mammograms;
- normal, malign and benign;
- different types of tumors;
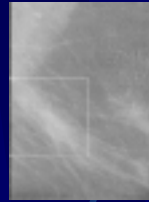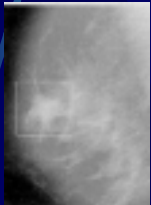- some global features already in the database.
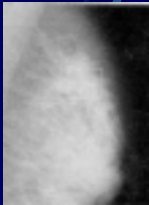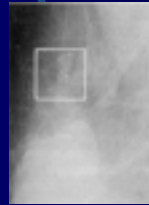
Mammography Database

Circumscribed Mass   Spiculated Mass   Ill-defined Mass

Architectural Distortion   Asymmetry   Clustered Microcalcifications

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Used Features

MIAS:
- mdb058 D MISC M 318 359 27 R
- mdb059 F CIRC B 253 475 13 L
- mdb060 F NORM R

Extracted:

- statistical parameters;

- histogram parameters.

Extracted Features

- mean, variance, skewness, kurtosis;

$$M_n = \frac{\sum (x - \bar{x})^n}{N}$$

- mean and peak over the histogram.

Association Rule Algorithm

- apriori algorithm is used;

- each feature is an item;

- each image is a transaction.

mdb005	F	CIRC	B	SW	21->40	L	NW:>200	SW:75->100	NE:75->100
SE:150->175			NW:<=750		SW:3000->3800		NE:2200->3000		SE:<=750
NW:>1.5	SW:0->0.5		NE:-0.5->0		SE:-1->-0.5		NW:<=1.5		SW:2->3
NE:1.5->2	SE:7->10		NW:<=100		SW:100->200		NE:<=100		
SE:<=100	NW:900->1500		SW:600->900		NE:300->600		SE:<=300		

Conclusions

• time consuming pre-processing;

• difficult to interpret data;

• extracted features are very important but hard to choose;

• apriori finds redundant associations;

• time consuming for large databases and small support and confidence.

Conclusions

• some association rules could lead to interesting conclusions;

• choice of support and confidence is crucial;

• such association rules could assist a radiologist or a physician in taking better decisions.

The Demo