**Description**

Features are computed from a digitized image of a fine needle aspirate (FNA) of a breast mass. They describe characteristics of the cell nuclei present in the image.   
n the 3-dimensional space is that described in: [K. P. Bennett and O. L. Mangasarian: "Robust Linear Programming Discrimination of Two Linearly Inseparable Sets", Optimization Methods and Software 1, 1992, 23-34].

This database is also available through the UW CS ftp server:   
ftp ftp.cs.wisc.edu   
cd math-prog/cpo-dataset/machine-learn/WDBC/

Also can be found on UCI Machine Learning Repository: <https://archive.ics.uci.edu/ml/datasets/Breast+Cancer+Wisconsin+%28Diagnostic%29>

Attribute Information:

1) ID number   
2) Diagnosis (M = malignant, B = benign)   
3-32)

Ten real-valued features are computed for each cell nucleus:

a) radius (mean of distances from center to points on the perimeter)   
b) texture (standard deviation of gray-scale values)   
c) perimeter   
d) area   
e) smoothness (local variation in radius lengths)   
f) compactness (perimeter^2 / area - 1.0)   
g) concavity (severity of concave portions of the contour)   
h) concave points (number of concave portions of the contour)   
i) symmetry   
j) fractal dimension ("coastline approximation" - 1)

The mean, standard error and "worst" or largest (mean of the three  
largest values) of these features were computed for each image,  
resulting in 30 features. For instance, field 3 is Mean Radius, field  
13 is Radius SE, field 23 is Worst Radius.

All feature values are recoded with four significant digits.

Missing attribute values: none

Class distribution: 357 benign, 212 malignant

**Variable description:**

1. id -ID number
2. diagnosis - The diagnosis of breast tissues (M = malignant, B = benign)
3. radius\_mean - mean of distances from center to points on the perimeter
4. texture\_mean - standard deviation of gray-scale values
5. perimeter\_mean - mean size of the core tumor
6. area\_mean
7. smoothness\_mean - mean of local variation in radius lengths
8. compactness\_mean - mean of perimeter^2 / area - 1.0
9. concavity\_mean - mean of severity of concave portions of the contour
10. concave points\_mean - mean for number of concave portions of the contour
11. symmetry\_mean
12. fractal\_dimension\_mean - mean for "coastline approximation" - 1
13. radius\_se - standard error for the mean of distances from center to points on the perimeter
14. texture\_se - standard error for standard deviation of gray-scale values
15. perimeter\_se
16. area\_se
17. smoothness\_se - standard error for local variation in radius lengths
18. compactness\_se - standard error for perimeter^2 / area - 1.0
19. concavity\_se - standard error for severity of concave portions of the contour
20. concave points\_se - standard error for number of concave portions of the contour
21. symmetry\_se
22. fractal\_dimension\_se - standard error for "coastline approximation" - 1
23. radius\_worst - "worst" or largest mean value for mean of distances from center to points on the perimeter
24. texture\_worst - "worst" or largest mean value for standard deviation of gray-scale values
25. perimeter\_worst
26. area\_worst
27. smoothness\_worst - "worst" or largest mean value for local variation in radius lengths
28. compactness\_worst - "worst" or largest mean value for perimeter^2 / area - 1.0
29. concavity\_worst - "worst" or largest mean value for severity of concave portions of the contour
30. concave points\_worst - "worst" or largest mean value for number of concave portions of the contour.
31. symmetry\_worst
32. fractal\_dimension\_worst - "worst" or largest mean value for "coastline approximation" - 1