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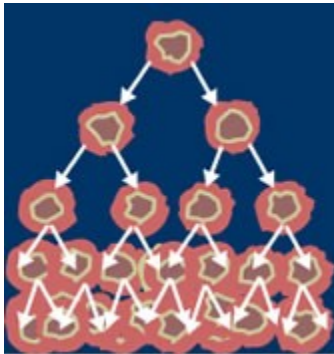
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# Breast Cancer Wisconsin (Diagnostic) Data Set

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**Abstract:** Diagnostic Wisconsin Breast Cancer Database



<b>Data Set Characteristics:</b>	Multivariate	<b>Number of Instances:</b>	569	<b>Area:</b>	Life
<b>Attribute Characteristics:</b>	Real	<b>Number of Attributes:</b>	32	<b>Date Donated</b>	1995-11-01
<b>Associated Tasks:</b>	Classification	<b>Missing Values?</b>	No	<b>Number of Web Hits:</b>	1176314

## Source:

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Donor:

Nick Street

## Data Set Information:

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. A few of the images can be found at [\[Web Link\]](#)

Separating plane described above was obtained using Multisurface Method-Tree (MSM-T) [K. P. Bennett, "Decision Tree Construction Via Linear Programming." Proceedings of the 4th Midwest Artificial Intelligence and Cognitive Science Society, pp. 97-101, 1992], a classification method which uses linear programming to construct a decision tree. Relevant features were selected using an exhaustive search in the space of 1-4 features and 1-3 separating planes.

The actual linear program used to obtain the separating plane in 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/

## 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 ( $\text{perimeter}^2 / \text{area} - 1.0$ )
- 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)

## Relevant Papers:

First Usage:

W.N. Street, W.H. Wolberg and O.L. Mangasarian. Nuclear feature extraction for breast tumor diagnosis. IS&T/SPIE 1993 International Symposium on Electronic Imaging: Science and Technology, volume 1905, pages 861-870, San Jose, CA, 1993.

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[\[Web Link\]](#)

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W.H. Wolberg, W.N. Street, D.M. Heisey, and O.L. Mangasarian. Computer-derived nuclear features distinguish malignant from benign breast cytology. *Human Pathology*, 26:792--796, 1995.

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## Papers That Cite This Data Set<sup>1</sup>:



Gavin Brown. [Diversity in Neural Network Ensembles](#). The University of Birmingham. 2004. [\[View Context\]](#).

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Robert Burbidge and Matthew Trotter and Bernard F. Buxton and Sean B. Holden. [STAR - Sparsity through Automated Rejection](#). IWANN (1). 2001. [\[View Context\]](#).

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Yuh-Jeng Lee. [Smooth Support Vector Machines](#). Preliminary Thesis Proposal Computer Sciences Department University of Wisconsin. 2000. [\[View Context\]](#).

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Chun-Nan Hsu and Hilmar Schuschel and Ya-Ting Yang. [The ANNIGMA-Wrapper Approach to Neural Nets Feature Selection for Knowledge Discovery and Data Mining](#). Institute of Information Science. 1999. [\[View Context\]](#).

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. [Prototype Selection for Composite Nearest Neighbor Classifiers](#). Department of Computer Science University of Massachusetts. 1997. [\[View Context\]](#).

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Ismail Taha and Joydeep Ghosh. [Characterization of the Wisconsin Breast cancer Database Using a Hybrid Symbolic-Connectionist System](#). Proceedings of ANNIE. 1996. [\[View Context\]](#).

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Wl/odzisl/aw Duch and Rafal/ Adamczak Email: duchraad@phys. uni. torun. pl. [Statistical methods for construction of neural networks](#). Department of Computer Methods, Nicholas Copernicus University. [\[View Context\]](#).

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Bart Baesens and Stijn Viaene and Tony Van Gestel and J. A. K Suykens and Guido Dedene and Bart De Moor and Jan Vanthienen and Katholieke Universiteit Leuven. [An Empirical Assessment of Kernel Type Performance for Least Squares Support Vector Machine Classifiers](#). Dept. Applied Economic Sciences. [\[View Context\]](#).

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Włodzisław and Rafał Adamczak and Krzysztof Grabczewski and Grzegorz Zał. [A hybrid method for extraction of logical rules from data](#). Department of Computer Methods, Nicholas Copernicus University. [\[View Context\]](#).

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