1. Title: Mushroom Database

2. Sources:

(a) Mushroom records drawn from The Audubon Society Field Guide to North

American Mushrooms (1981). G. H. Lincoff (Pres.), New York: Alfred

A. Knopf

(b) Donor: Jeff Schlimmer (Jeffrey.Schlimmer@a.gp.cs.cmu.edu)

(c) Date: 27 April 1987

3. Past Usage:

1. Schlimmer,J.S. (1987). Concept Acquisition Through Representational

Adjustment (Technical Report 87-19). Doctoral disseration, Department

of Information and Computer Science, University of California, Irvine.

--- STAGGER: asymptoted to 95% classification accuracy after reviewing

1000 instances.

2. Iba,W., Wogulis,J., & Langley,P. (1988). Trading off Simplicity

and Coverage in Incremental Concept Learning. In Proceedings of

the 5th International Conference on Machine Learning, 73-79.

Ann Arbor, Michigan: Morgan Kaufmann.

-- approximately the same results with their HILLARY algorithm

3. In the following references a set of rules (given below) were

learned for this data set which may serve as a point of

comparison for other researchers.

Duch W, Adamczak R, Grabczewski K (1996) Extraction of logical rules

from training data using backpropagation networks, in: Proc. of the

The 1st Online Workshop on Soft Computing, 19-30.Aug.1996, pp. 25-30,

available on-line at: http://www.bioele.nuee.nagoya-u.ac.jp/wsc1/

Duch W, Adamczak R, Grabczewski K, Ishikawa M, Ueda H, Extraction of

crisp logical rules using constrained backpropagation networks -

comparison of two new approaches, in: Proc. of the European Symposium

on Artificial Neural Networks (ESANN'97), Bruge, Belgium 16-18.4.1997,

pp. xx-xx

Wlodzislaw Duch, Department of Computer Methods, Nicholas Copernicus

University, 87-100 Torun, Grudziadzka 5, Poland

e-mail: duch@phys.uni.torun.pl

WWW http://www.phys.uni.torun.pl/kmk/

Date: Mon, 17 Feb 1997 13:47:40 +0100

From: Wlodzislaw Duch <duch@phys.uni.torun.pl>

Organization: Dept. of Computer Methods, UMK

I have attached a file containing logical rules for mushrooms.

It should be helpful for other people since only in the last year I

have seen about 10 papers analyzing this dataset and obtaining quite

complex rules. We will try to contribute other results later.

With best regards, Wlodek Duch

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Logical rules for the mushroom data sets.

Logical rules given below seem to be the simplest possible for the

mushroom dataset and therefore should be treated as benchmark results.

Disjunctive rules for poisonous mushrooms, from most general

to most specific:

P\_1) odor=NOT(almond.OR.anise.OR.none)

120 poisonous cases missed, 98.52% accuracy

P\_2) spore-print-color=green

48 cases missed, 99.41% accuracy

P\_3) odor=none.AND.stalk-surface-below-ring=scaly.AND.

(stalk-color-above-ring=NOT.brown)

8 cases missed, 99.90% accuracy

P\_4) habitat=leaves.AND.cap-color=white

100% accuracy

Rule P\_4) may also be

P\_4') population=clustered.AND.cap\_color=white

These rule involve 6 attributes (out of 22). Rules for edible

mushrooms are obtained as negation of the rules given above, for

example the rule:

odor=(almond.OR.anise.OR.none).AND.spore-print-color=NOT.green

gives 48 errors, or 99.41% accuracy on the whole dataset.

Several slightly more complex variations on these rules exist,

involving other attributes, such as gill\_size, gill\_spacing,

stalk\_surface\_above\_ring, but the rules given above are the simplest

we have found.

4. Relevant Information:

This data set includes descriptions of hypothetical samples

corresponding to 23 species of gilled mushrooms in the Agaricus and

Lepiota Family (pp. 500-525). Each species is identified as

definitely edible, definitely poisonous, or of unknown edibility and

not recommended. This latter class was combined with the poisonous

one. The Guide clearly states that there is no simple rule for

determining the edibility of a mushroom; no rule like ``leaflets

three, let it be'' for Poisonous Oak and Ivy.

5. Number of Instances: 8124

6. Number of Attributes: 22 (all nominally valued)

7. Attribute Information: (classes: edible=e, poisonous=p)

1. cap-shape: bell=b,conical=c,convex=x,flat=f,

knobbed=k,sunken=s

2. cap-surface: fibrous=f,grooves=g,scaly=y,smooth=s

3. cap-color: brown=n,buff=b,cinnamon=c,gray=g,green=r,

pink=p,purple=u,red=e,white=w,yellow=y

4. bruises?: bruises=t,no=f

5. odor: almond=a,anise=l,creosote=c,fishy=y,foul=f,

musty=m,none=n,pungent=p,spicy=s

6. gill-attachment: attached=a,descending=d,free=f,notched=n

7. gill-spacing: close=c,crowded=w,distant=d

8. gill-size: broad=b,narrow=n

9. gill-color: black=k,brown=n,buff=b,chocolate=h,gray=g,

green=r,orange=o,pink=p,purple=u,red=e,

white=w,yellow=y

10. stalk-shape: enlarging=e,tapering=t

11. stalk-root: bulbous=b,club=c,cup=u,equal=e,

rhizomorphs=z,rooted=r,missing=?

12. stalk-surface-above-ring: fibrous=f,scaly=y,silky=k,smooth=s

13. stalk-surface-below-ring: fibrous=f,scaly=y,silky=k,smooth=s

14. stalk-color-above-ring: brown=n,buff=b,cinnamon=c,gray=g,orange=o,

pink=p,red=e,white=w,yellow=y

15. stalk-color-below-ring: brown=n,buff=b,cinnamon=c,gray=g,orange=o,

pink=p,red=e,white=w,yellow=y

16. veil-type: partial=p,universal=u

17. veil-color: brown=n,orange=o,white=w,yellow=y

18. ring-number: none=n,one=o,two=t

19. ring-type: cobwebby=c,evanescent=e,flaring=f,large=l,

none=n,pendant=p,sheathing=s,zone=z

20. spore-print-color: black=k,brown=n,buff=b,chocolate=h,green=r,

orange=o,purple=u,white=w,yellow=y

21. population: abundant=a,clustered=c,numerous=n,

scattered=s,several=v,solitary=y

22. habitat: grasses=g,leaves=l,meadows=m,paths=p,

urban=u,waste=w,woods=d

8. Missing Attribute Values: 2480 of them (denoted by "?"), all for

attribute #11.

9. Class Distribution:

-- edible: 4208 (51.8%)

-- poisonous: 3916 (48.2%)

-- total: 8124 instances