

1 Introduction and Scope _____

Enhancing the Accuracy of Decisions
Enhancing the Utility of Decisions
Scope of Our Discussion
Four Illustrative Diagnostic Tasks
Increasing accuracy
Increasing utility

4 Components of Diagnostic Decision Making _____

Characteristics of Diagnostic Tasks
Several or many pieces of relevant information
Merging information into a diagnostic probability
Setting a decision threshold on the probability continuum
Merging Objective Data and Subjective Judgments
Objective data
Subjective judgments
Subjective data
Combining objective and subjective data statistically
Balancing objective and subjective contributions

5 Statistical Machinery _____

Measures of Accuracy and the Decision Threshold
The ROC graph
Measure of the decision threshold, S
Measure of accuracy, A
Constructing an empirical ROC
How Statistical Prediction Rules (SPRs) are Developed
Alternative methods
Validating statistical prediction rules
Determination of truth
Methods for Optimizing the Decision Threshold
Alternative decision goals
A general decision goal

10 Examples of Enhanced Decision Making _____

Increased Accuracy
Predicting violence
Violence Risk Appraisal Guide.
Iterative Classification Tree.
Clinical vs. actuarial predictions.
Diagnosing cancer
General approach.
Breast cancer.
Prostate cancer.
Successful application of an SPR for prostate cancer.
Other work.

Increased Utility: Setting the Best Decision Threshold

Screening for the HIV of AIDS

ROC data for the HIV.

Fixed vs. changing threshold.

Screening low-risk populations.

Detecting cracks in airplane wings

ROC data.

A note on accuracy.

A confirming study.

Other Examples in Brief

Weather forecasting

Law school admissions

Aircraft cockpit warnings

Disability determination

Quality of sound in opera houses

“It’s laptop vs. nose”

20 Conclusions and Discussion _____

Additional Benefits of a Systematic Approach to Predictor Variables

Speeding the specification of diagnostic features

Facilitating communication among diagnosticians

Why Are These Methods Relatively Little Used?

These methods are little known

The need for adaptive SPRs

Accountability

Inconvenience

The ideas are technical

The tools are cumbersome

Defining benefits and costs

More complex computer-based systems have not done well

What do these hindrances add up to?

The Importance of Public Awareness of Decision-Support Methods

23 Acknowledgements _____

23 References _____

25 Appendix: Some Concepts of Probability _____

Joint probabilities

Conditional probabilities

Prior probabilities

Relation among the three probabilities

Calculation of probabilities from a frequency table

Two basic probabilities

Inverse probabilities and Bayes’ theorem