6: Técnicas Independientes del Algoritmo

Some Figures in these slides were taken from
*Pattern Classification (2nd ed)* by R. O. Duda, P. E. Hart and D. G. Stork, John Wiley & Sons, 2000
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Febrero-Mayo 2005
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6 Branch and Bound in Feature Selection

- Reducing dimension d: Choosing a subset from the features set.
- If we choose \( d_r \) as the new dimension, the goal is to find a subset of features that optimizes a given criterion function from all the possible subsets:

  \[
  q(d, d_r) = \binom{d}{d_r} = \frac{d!}{d_r!(d-d_r)!}
  \]

  - Choose a performance measure \( J \) monotonically decreasing with \( d \).
  - In each level \( n=d-1:d_r \), \( J \) is evaluated for \( n \) \((n-1)\) feature space dimension.
  - Branches whose performance measure \( J \) is bounded by a threshold are skipped.

Suboptimal Selection:
- Sequential Forward Selection (It begins with features individually and increases gradually the number of features).
- Backward Selection (It begins with the complete set of features and decreases gradually the number of features without backtracking).

Help featselm (Matlab PrTools) apply to zipcode data base
6 Branch and Bound in Feature Selection

$P_c(x_2, x_4) < P_c(x_1, x_3, x_4)$

6 Sequential Backward in Feature Selection (Suboptimal)
6 Sequential Forward Feature Selection
(Suboptimal)

\[ \begin{array}{c}
\text{x}_1 \\
\text{x}_2 \\
x_3 \\
x_4
\end{array} \]

\[ \begin{array}{c}
\text{x}_1\text{x}_2 \\
x_2\text{x}_3 \\
x_2\text{x}_4 \\
\text{x}_1\text{x}_2\text{x}_3 \\
\text{x}_1\text{x}_2\text{x}_4
\end{array} \]