\[ p(\mathbf{x} = \text{comp}_m w_n) = b \]
\[ = p(\mathbf{x} = \text{comp}_m R = 1) + p(\mathbf{x} = \text{comp}_m R = 0) \]
\[ b = \alpha p + (1-\alpha) \frac{1}{m} \]
\[ p = \frac{b - (1-\alpha)/m}{\alpha} \]

**Optimization**

\[ W = [w_1, \ldots, w_m] \quad w_i \in \{0, \ldots, n-1\} \]

**a) Exhaustive search**

- \( m \) coefficients, each has \( n \) values
  \[ \Rightarrow n^m \text{ possible } W \text{ vectors} \]
  \[ \Rightarrow O(n^m) \]

**b) Coordinate search \( W \) random restarts**

For each restart:
  
  generate a random starting \( W \)

for each iteration:

  for each coordinate \( 0 \leq i \leq m - 1 \):
    - find best possible value \( \hat{w}_i \) of \( w_i \)
      under condition that \( w_j \) fixed,
      Record \( \hat{L}_i = L((w_0,\ldots,w_{i-1},\hat{w}_i,\ldots,w_m)) \)
    
    Find \( \hat{w}_i = \text{argmin} \hat{L}_i \):
    
    \[ W \leftarrow [w_0, \ldots, w_i, \hat{w}_i, \ldots, w_m] \]

**Restarts:** \( p \)

**Iterations:** \( q \)

**Coordinates:** \( m \)

**Values:** \( n \)

Total complexity: \( p q m n \quad O(p q m n) \)

**Question:** How large does \( p \) have to take to make

\[ O(p q m n) = O(n^m) \]

\[ p = \frac{n^m}{q m n} = \frac{n^{m-1}}{q m} \]