Perform a statistical adjustement (reweighting)

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Let $X^1, \ldots, X^n$ be some categorical variables, and for each variable X^i let $m^{i1}, \ldots, m^{in_i}$ its levels, and $X^{i1}, \ldots, X^{in_i}$ the associated dummies. Let w be an initial weight. We call **adjustement** a weight w' such that :

- w' is as close as possible to w (L2 norm)

- $\sum_{k=1}^N w'_k = \sum_{k=1}^N w_k$

- $\forall k \;\; 0 \leq w_{\min} \leq w'_k \leq w_{\max}$

- the weighted values of each level m^{ij} is equal (and/or greater and/or lower) to specifed value v^{ij}.

Consequently

$$w' = \operatorname*{arg\,min}_{\forall i,j \;\; \sum_{k=1}^N x_k X_k^{ij} = v^{ij}} \|x - w\|^2$$

NB: Any equality $\sum_{k=1}^N x_k X_k^{ij} = v^{ij}$ can be replaced by an inequality.