The good, the bad, and the ugly

October 23, 2024

Abstract

1 Bruto

$||X||$: cardinality of X

$\forall Q \in \mathcal{Q} = 2^B \setminus \{\emptyset, B\}$,

1. $\mathbf{TIF}^Q = \frac{\sum_{i \in Q} IIF_i}{||Q||}$, where $||Q||$ is the cardinality of set Q
2. $\overline{\Delta}_{\mathbf{TIF}^Q} = mean(|\mathbf{TIF}^* - \mathbf{TIF}^Q|)$

$Q_{bruto} = \arg\min_{Q \in \mathcal{Q}} \overline{\Delta}_{\mathbf{TIF}^Q}$

spiegazione dell'algoritmo a parole

2 Item Locating Algorithm

Siccome la filosofia di ILA e ISA è molto simile sarebbe carino trovare loro un nome comune e poi declinarle nelle loro specificità. ci pensiamo

Set up:

B: Item bank

$Q^k \subset B$: Set of item indexes selected for inclusion in the STF up to iteration k

$\mathbf{TIF}^*$: TIF target

i^*: Item selected at each iteration

$||Q^k||$: cardinality of Q^k at iteration k

At $k = 0$: $\mathbf{TIF}^0(\theta) = 0 \, \forall \theta$, $Q^0 = \emptyset$. For $k \geq 0$,

1. $\theta_{target} := \arg\max |\mathbf{TIF}^* - \mathbf{TIF}^k|$
2. $i^* = \arg\min_{i \in B \setminus Q^k} |\theta_{target} - b_i|$
3. $\mathbf{pTIF}_{i^*} = \frac{TIF^k + IIF_{i^*}}{||Q^k|| + 1}$
4. Termination Criterion: $|\mathbf{TIF}^* - \mathbf{pTIF}_{i^*}| \geq |\mathbf{TIF}^* - \mathbf{TIF}^k|$:
   - FALSE: $Q^{k+1} = Q^k \cup \{i^*\}$, $TIF^{k+1} = pTIF_{i^*}$, iterates 1-4
   - TRUE: Stop, $Q_{ILA} = Q^k$

3 Item Selecting Algorithm

Same as ILA but based on the Item Information Functions.

Set up same as ILA: B: Item bank

$Q^k \subset B$: Set of item indexes selected for inclusion in the STF up to iteration k

$\mathbf{TIF}^*$: TIF target

i^*: Item selected at each iteration

$||Q^k||$: cardinality of Q^k at iteration k

At $k = 0$: $\mathbf{TIF}^0(\theta) = 0 \, \forall \theta$, $Q^0 = \emptyset$. For $k \geq 0$,

1. $\theta_{target} := \arg\max |\mathbf{TIF}^* - \mathbf{PIF}_D^k|$
2. $i^* := \arg\max_{i \in B \setminus Q^k} IIF_i(\theta_{target})$
3. $\mathbf{pTIF}_{i^*} = \frac{TIF^k + IIF_{i^*}}{||Q^k|| + 1}$
4. Termination Criterion: $|\mathbf{TIF}^* - \mathbf{PIF}_D^k| \geq |\mathbf{TIF}^* - \mathbf{TIF}^k|$:
   - TRUE: $k := k+1$, $Q^k = Q^{k-1} \cup \{D\}$, iterates 1-5 (Ho scritto $k-1$ perché siccome ho scritto all'inizio che k si aggiorna e diventa $k+1$ mi sembrava sensato)
   - FALSE: The item in D does not contribute to reduce the distance from the TIF target, hence: $Q_{ISA} = Q^k$

4 Frank

The setup is like the one of ILA and ISA:

B: Item bank

Q^k: set of items selected at iteration k

i^*: provisional item selected at each iteration

PIF: provisional mean tif

At $k = 0$, $\mathbf{PIF}^0 = (0, 0, \ldots, 0)$, $Q^0 = \emptyset$, iterate gira il cirterio di terminazione e uniforma con gli altri

1. $A^k = B \setminus Q^k$ (sets of available items at iteration k)

2. $\forall i \in A^k$, $\mathbf{PIF}_i^k = \frac{\mathbf{TIF}^k + \mathbf{IIF}_i}{||Q^k||+1}$

3. $D = \arg\min_{i \in A^k} |\mathbf{TIF}^* - \mathbf{PIF}_i|$

4. Termination criterion: $|\mathbf{TIF}^* - \mathbf{PIF}_D^k| < |\mathbf{TIF}^* - \mathbf{TIF}^k|$:

   - If true, $k := k + 1$, $Q^k = Q^{k-1} \cup \{D\}$, restart from 1 C'è il meno 1 per la stessa ragione scritta per ILA e ISA
   - If false, stops, $Q_{Frank} = Q^k$