

Basic multicriteria problem

	Crit. 1 (unit)	Crit. 2 (unit)	Crit. 3 (unit)	Crit. 4 (unit)	...
Action 1					
Action 2					
Action 3					
Action 4					
Action 5					
...					

Electre I

Condorcet principle

p_j = weight of criterion j ; $j = 1, \dots, n$.

Concordance index

$$c(a, b) = \frac{1}{P} \sum_{j | g_j(a) \geq g_j(b)} p_j$$

Discordance index

$$d(a, b) = \begin{cases} 0 & \text{si } g_j(a) \geq g_j(b), \forall j \\ \frac{1}{\delta} \max_j [g_j(b) - g_j(a)] & \text{sinon} \end{cases}$$

$$\text{où } \delta = \max_{j, c, d} [g_j(c) - g_j(d)]$$

Electre I

- Another option...

$D_j = \{(x_j, y_j) : g_j(a) = x \text{ et } g_j(b) = y \Rightarrow a \text{ does not outrank } b\}$

Outranking relation

$$a S b \quad \text{iff} \quad \begin{cases} c(a, b) \geq \hat{c}, \\ d(a, b) \leq \hat{d}; \end{cases}$$

or

$$a S b \quad \text{iff} \quad \begin{cases} c(a, b) \geq \hat{c} \\ (\mathbf{g}_j(a), \mathbf{g}_j(b)) \notin \mathbf{D}_j, \forall j \end{cases}$$

Electre I - Kernel

The kernel is a subset N such that

$$\begin{cases} \forall b \notin N : \exists a \in N : a S b \\ \forall a, b \in N : a \not S b. \end{cases}$$

N.B. If S is acyclic $\Rightarrow N$ exists and is unique

ELECTRE I : numerical example

	Price	Comfort	Speed	Esthetic
1	300	excellent	fast	good
2	250	excellent	medium	good
3	250	medium	fast	good
4	200	medium	fast	medium
5	200	medium	medium	good
7	100	poor	medium	medium
Poids	5	4	3	3

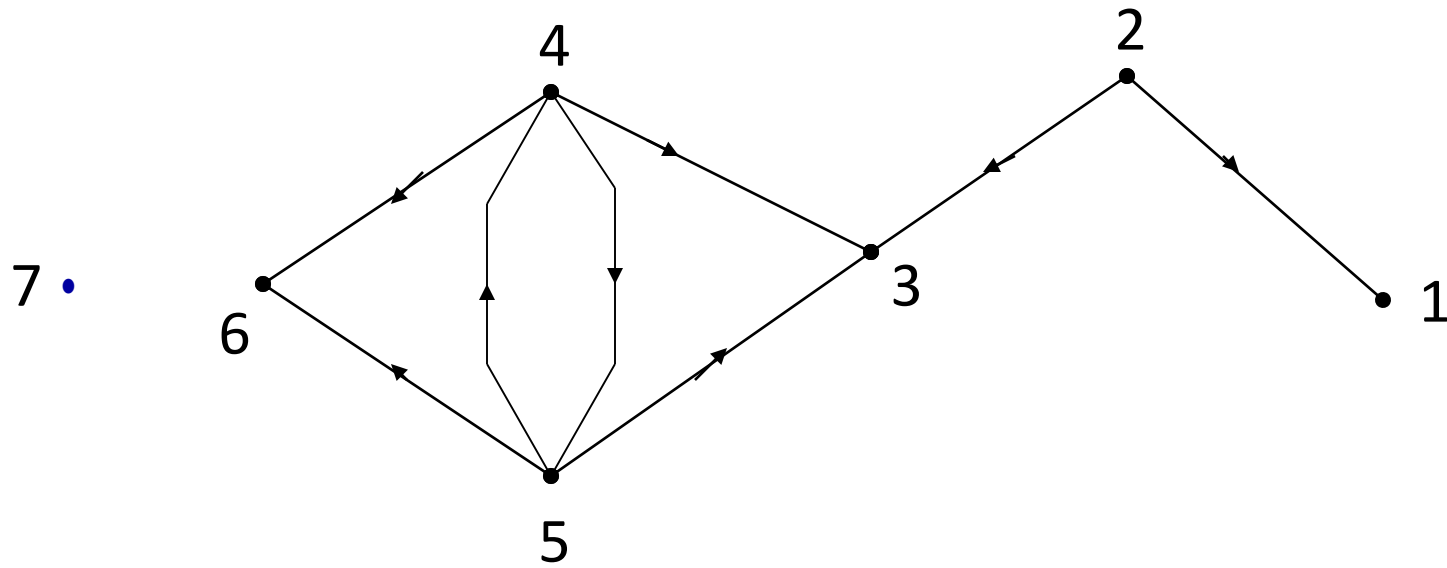
Concordance index

	1	2	3	4	5	6	7
1	-	10	10	10	10	10	10
2	12	-	12	7	10	7	10
3	11	11	-	10	10	10	10
4	8	8	12	-	12	12	10
5	8	11	12	12	-	12	10
6	11	11	11	11	11	-	10
7	5	8	5	8	8	9	-

Discordance

	Price	Price	Comfort
a	250	300	poor
b	100	100	Excellent

Outranking relation for a concordance threshold equal to 12



Kernel: 2, {4, 5}, 7

Exercice

A company want to rank 5 candidates A, B, C, D, E for a promotion (see table below). Five selection criteria have been chosen. Which are the results by ELECTRE I method, with a concordance index equal to 0.6 and a discordance index equal to 6 ?

	A	B	C	D	E	Weight
Reputation of the diploma	7	14	15	11	16	15
Skills	12	18	6	8	10	15
Personality	13	13	14	19	10	25
Spoken languages	18	16	19	13	19	25
Seniority	10	20	16	14	20	20