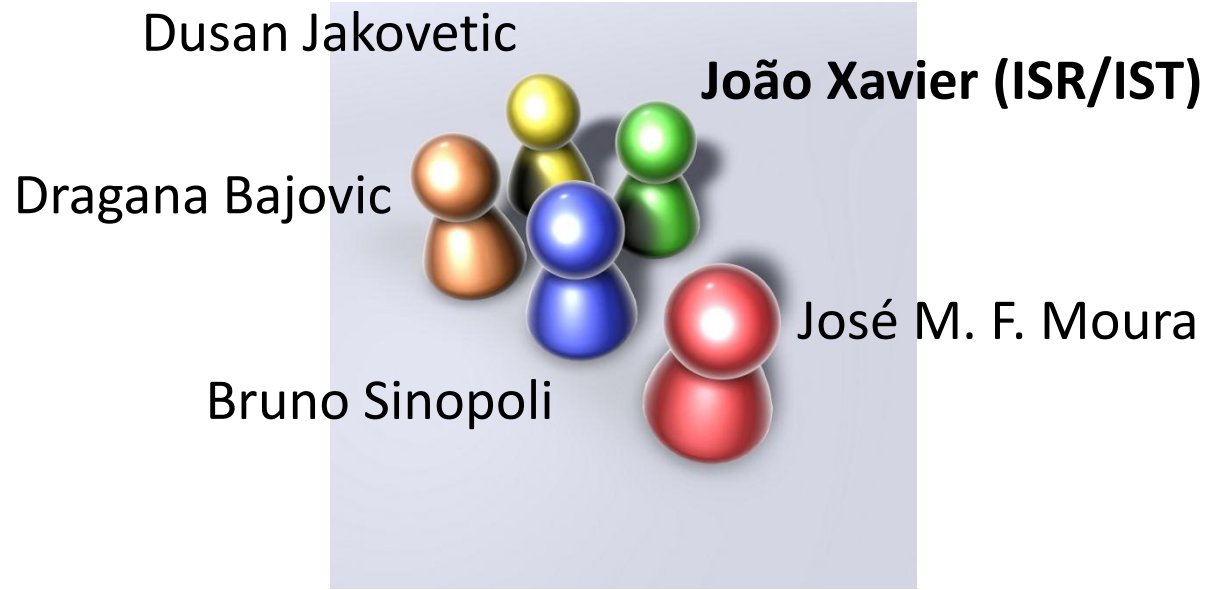
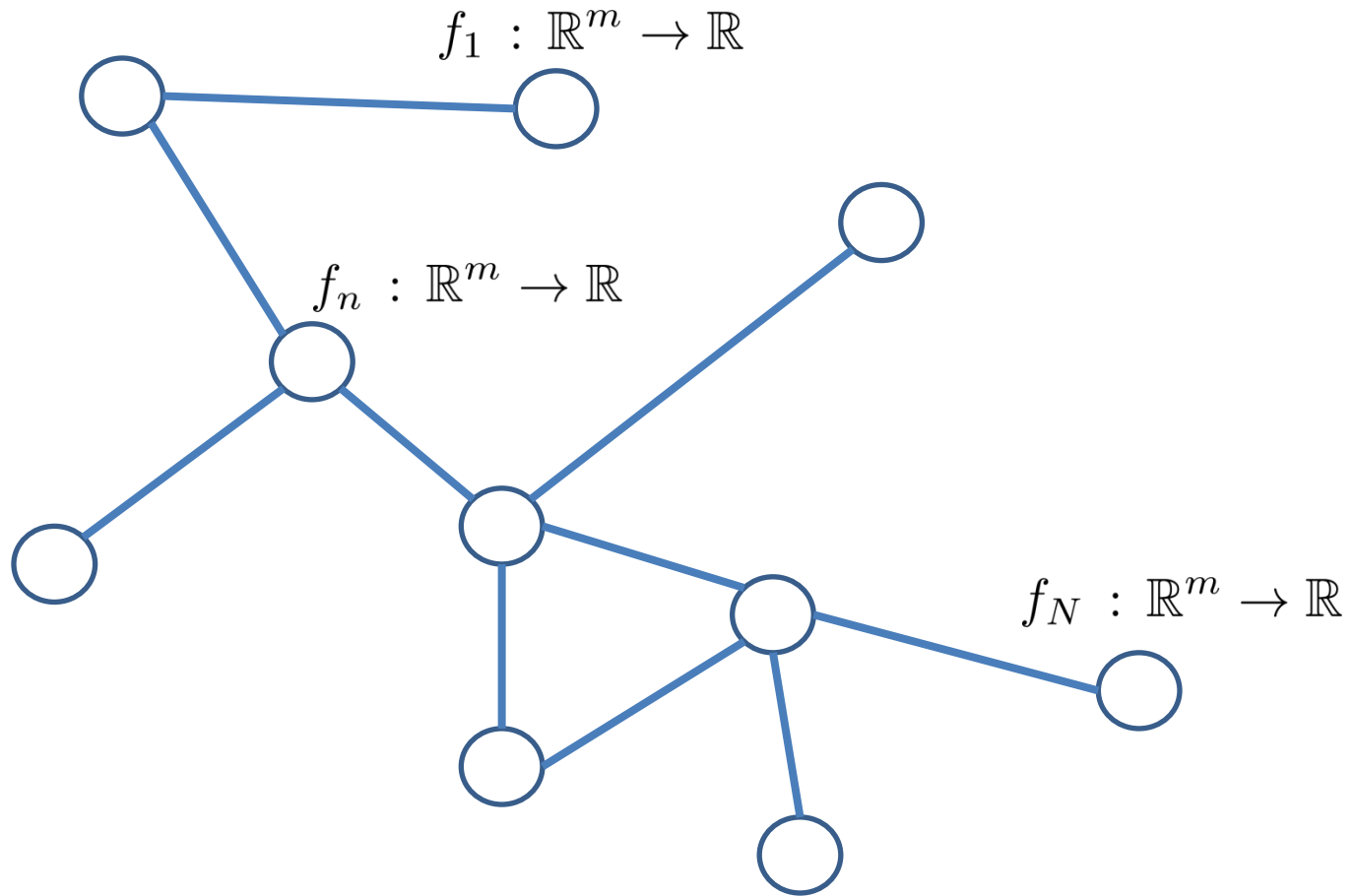


Distributed Sensing for Smart Grids

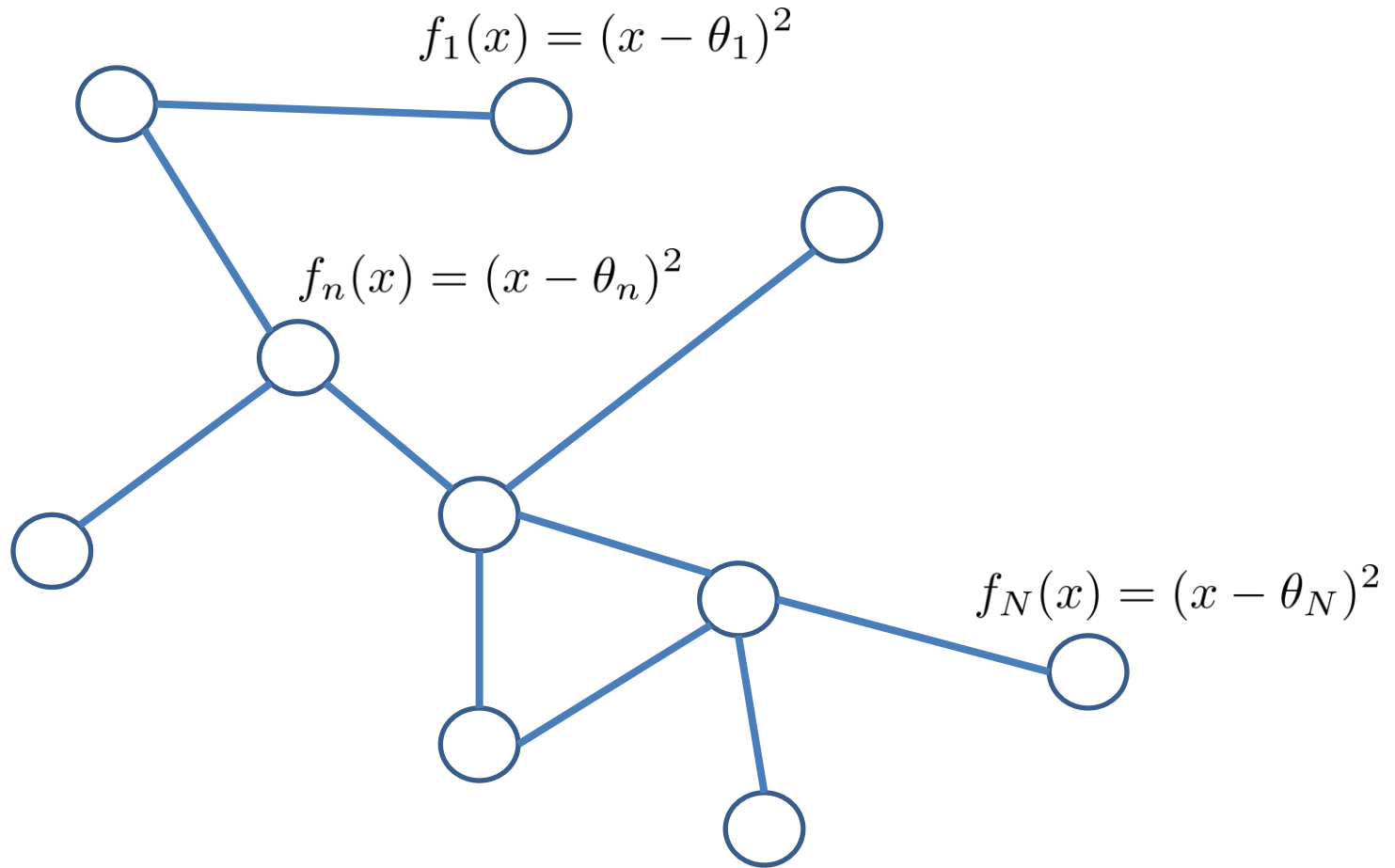


Topic 1 : distributed optimization



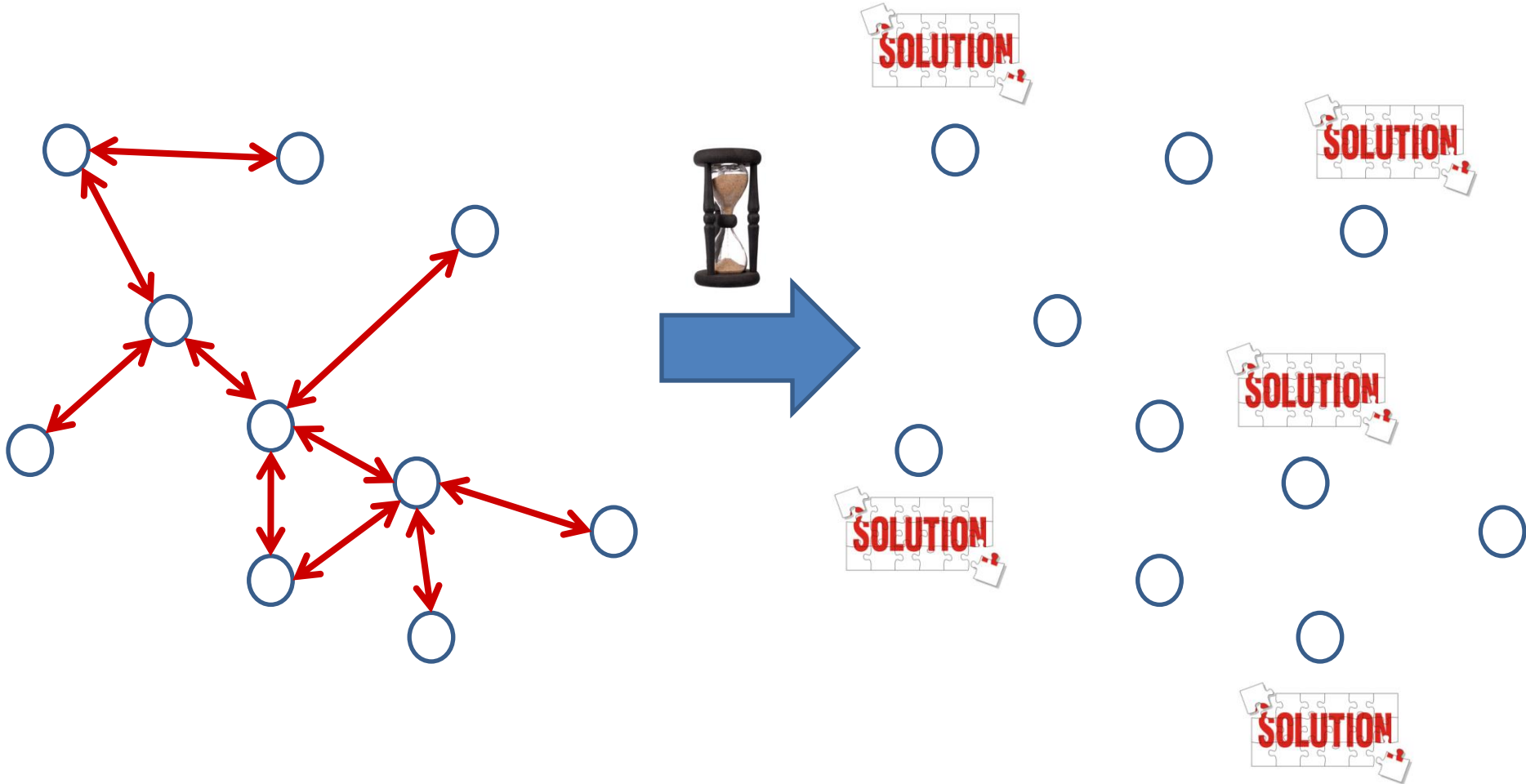
$$\begin{array}{ll} \text{minimize} & f_1(x) + \cdots + f_n(x) + \cdots + f_N(x) \\ \text{subject to} & x \in \mathbb{R}^m \end{array}$$

Example: consensus

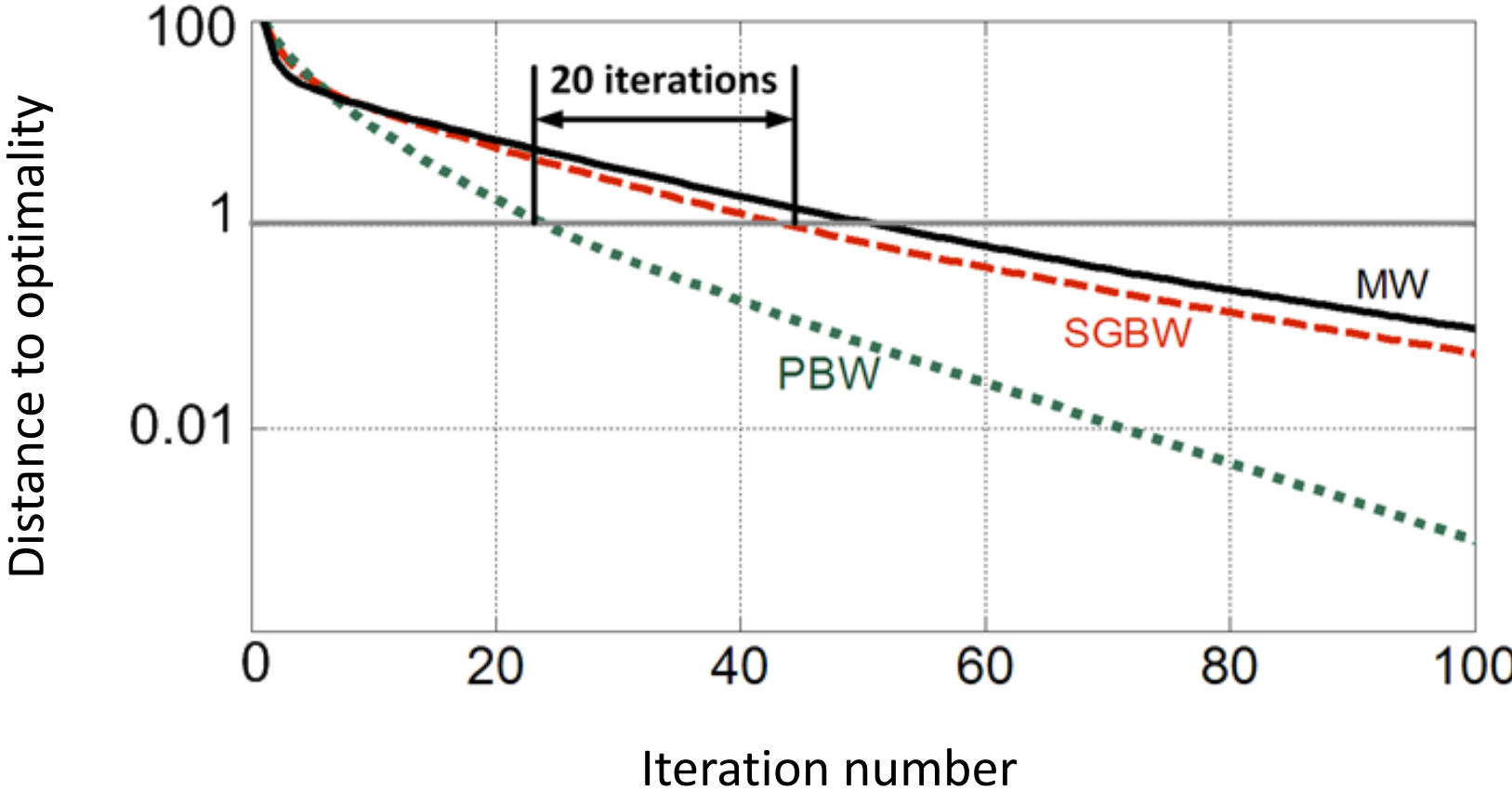


$$\begin{array}{ll} \text{minimize} & f_1(x) + \cdots + f_n(x) + \cdots + f_N(x) \\ \text{subject to} & x \in \mathbb{R}^m \end{array} \quad \Leftrightarrow \quad x^* = \frac{1}{N} \sum_{i=1}^N \theta_i$$

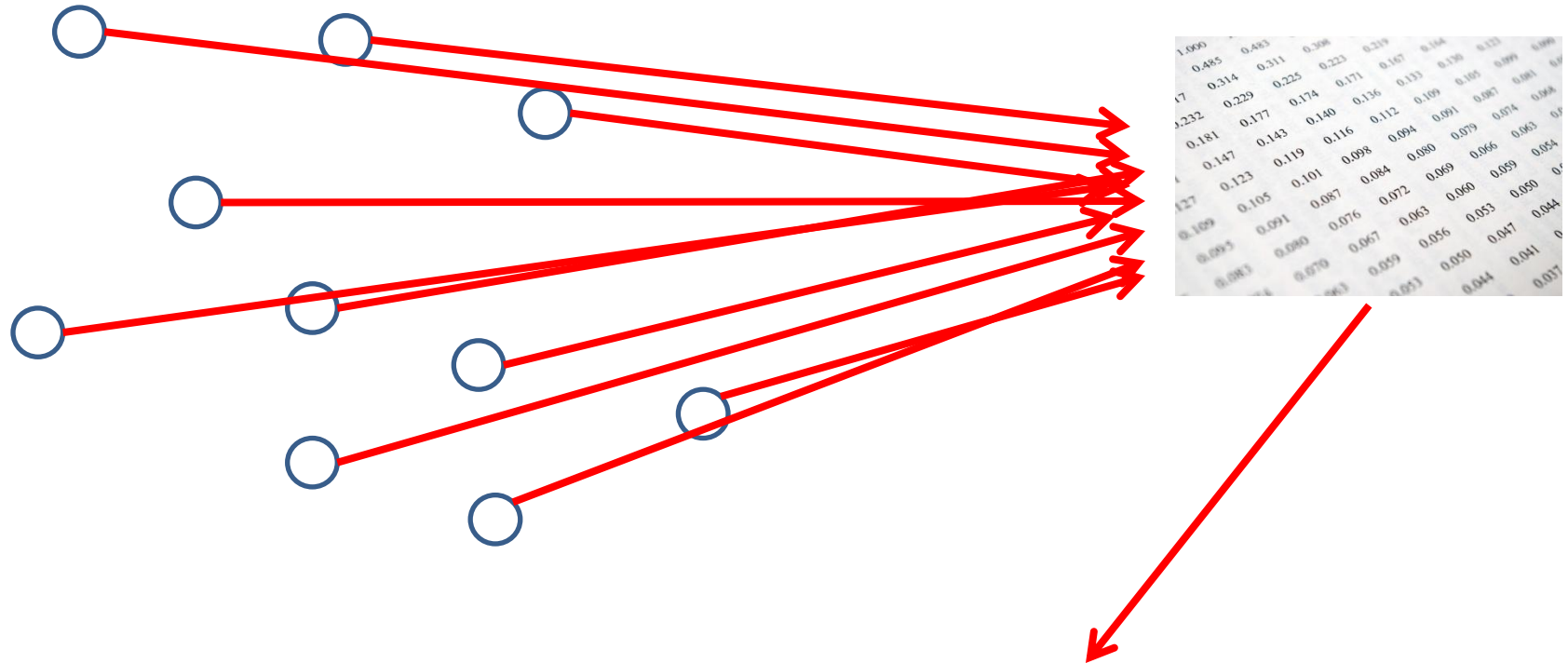
Distributed paradigm



Results



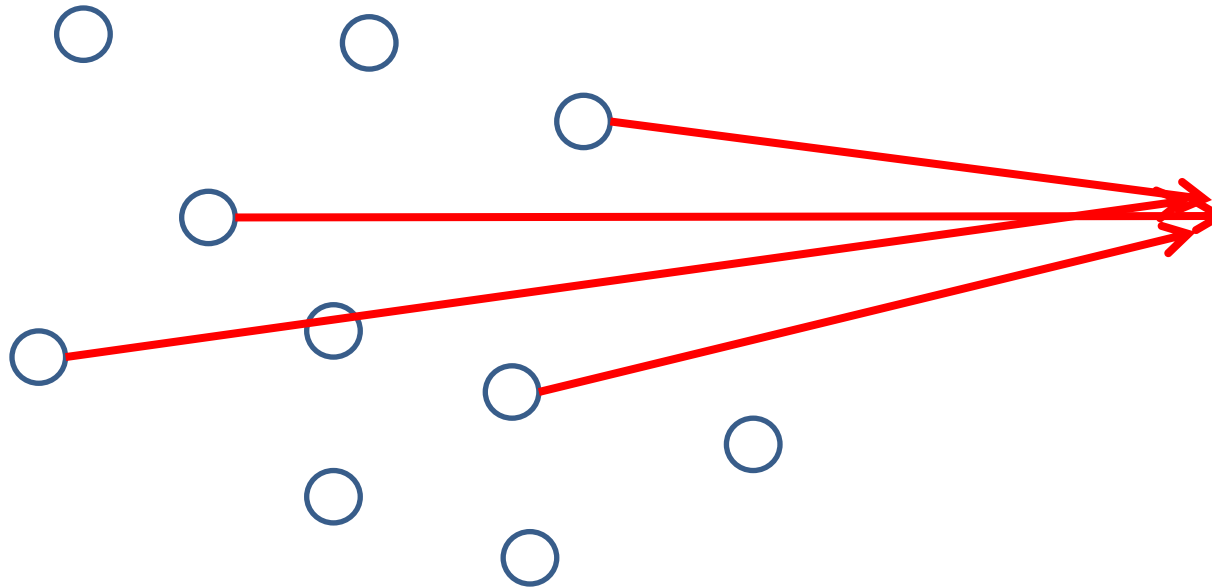
Topic 2 : sensor selection



1.690	0.485	0.483	0.398	0.319	0.164	0.123	0.999
17	0.314	0.311	0.223	0.171	0.133	0.105	0.981
1232	0.229	0.225	0.174	0.136	0.109	0.087	0.984
1	0.181	0.143	0.140	0.112	0.094	0.079	0.963
1	0.147	0.119	0.101	0.098	0.080	0.066	0.954
127	0.123	0.101	0.084	0.072	0.069	0.059	0.950
0.109	0.105	0.087	0.084	0.072	0.060	0.053	0.944
0.093	0.091	0.076	0.067	0.063	0.056	0.047	0.944
0.083	0.080	0.076	0.067	0.059	0.050	0.041	0.937
0.074	0.070	0.063	0.059	0.053	0.044	0.037	0.937



Only a few transmit...which ?




A small image showing a grid of numerical values, likely representing a data matrix or a list of values. The values are arranged in rows and columns, with some values appearing to be in scientific notation or decimal form.

$$\begin{aligned} &\text{maximize} && f(i_1, i_2, \dots, i_p) \\ &\text{subject to} && \{i_1, i_2, \dots, i_p\} \subset \{1, 2, \dots, N\} \end{aligned}$$

Results : small networks

- N = 20 sensors

p = 3	p = 5	p = 8
1.00	1.00	0.99


$$\frac{f(\text{our solution})}{f(\text{exhaustive search})}$$

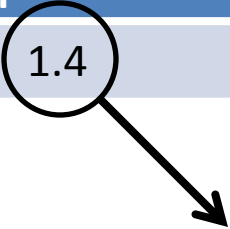
- N = 40 sensors

p = 3	p = 5	p = 8
1.00	0.91	0.87

Results : large networks

- N = 100 sensors

p = 10	p = 20	p = 40
1.4	1.6	1.3


$$\frac{f(\text{our solution})}{f(\text{random search})}$$

- Random search: 2 minutes
- Our solution: 2 seconds

