- **Input:** Two m-tuples of inhomogeneous multivariate polynomials of degree 2

$$f = (f^{(1)}, \ldots, f^{(m)}), \qquad p = (p^{(1)}, \ldots, p^{(m)}) \in \mathbb{F}_q[x_1, \ldots, x_n]^m.$$

- **Question:** Find – if any – $S \in \mathrm{GL}_n(\mathbb{F}_q)$ and $T \in \mathrm{GL}_m(\mathbb{F}_q)$ such that $p = T \circ f \circ S$

1. The decision version of this problem is easy? Or not. I don't know yet.

1 Modelling

$$\begin{bmatrix} p^1(x) \\ p^2(x) \\ \vdots \\ p^m(x) \end{bmatrix} = T \begin{bmatrix} f^1(Sx) \\ f^2(Sx) \\ \vdots \\ f^m(Sx) \end{bmatrix} \tag{1}$$

giving

$$p^i(x) = \sum_{i=1}^{m} t_{ij} f^j(Sx) = \sum_{i=1}^{m} t_{ij}(x^T S^T A S x + BSx + C) \tag{2}$$