Assignment - 1 :1

Heuristic - Searching technique (informed) which systematically explores a state-space.

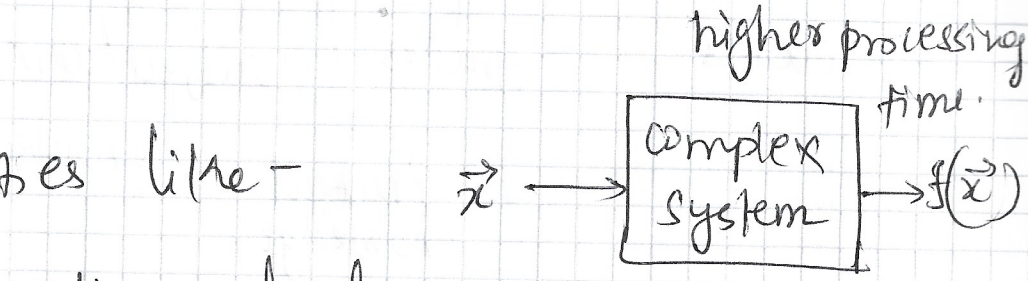
ex: TSP.

Meta-heuristic - Problem independent

Black box, uses feedback from the obj. function, prior decisions & prior performance metrics. (ex. pandemic situation)

Assignment - 2

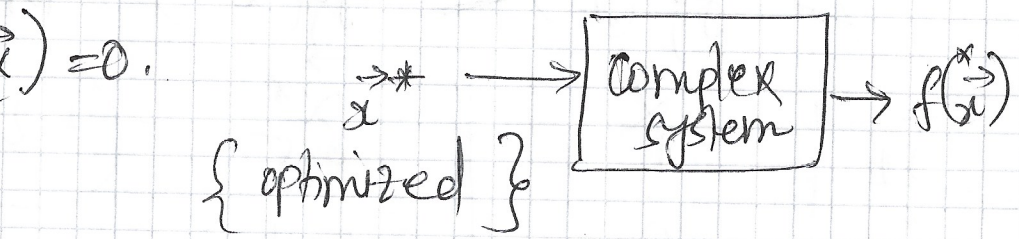
EA has properties like -



- non-linear functions dealing.
- dealing with computationally complex problems
- involving many constraints
- Uncertainties & dynamic functions

$\vec{x}^* = \arg\min f(\vec{x})$ s.t $\vec{x} \in S$.

$\vec{g}(\vec{x}) \leq 0$, $\vec{h}(\vec{x}) = 0$.



Slightly lower processing time.

S-search space.

1.3 · SOP → just only one objective function to be optimized. (ex: just getting credits for a course)

$\min f(\vec{x})$ s.t. $\vec{x} \in S$.

MOP → many objective functions to be optimized - at the same time.

$\text{Min}\,(f_1(\vec{x}), f_2(\vec{x}), \ldots f_m(\vec{x}))$ s.t $\vec{x} \in S$.

f_1: credits; f_2: grades; f_m: subject/domain knowledge

Practical knowledge.

1.4 · Pareto-optimality (PO).

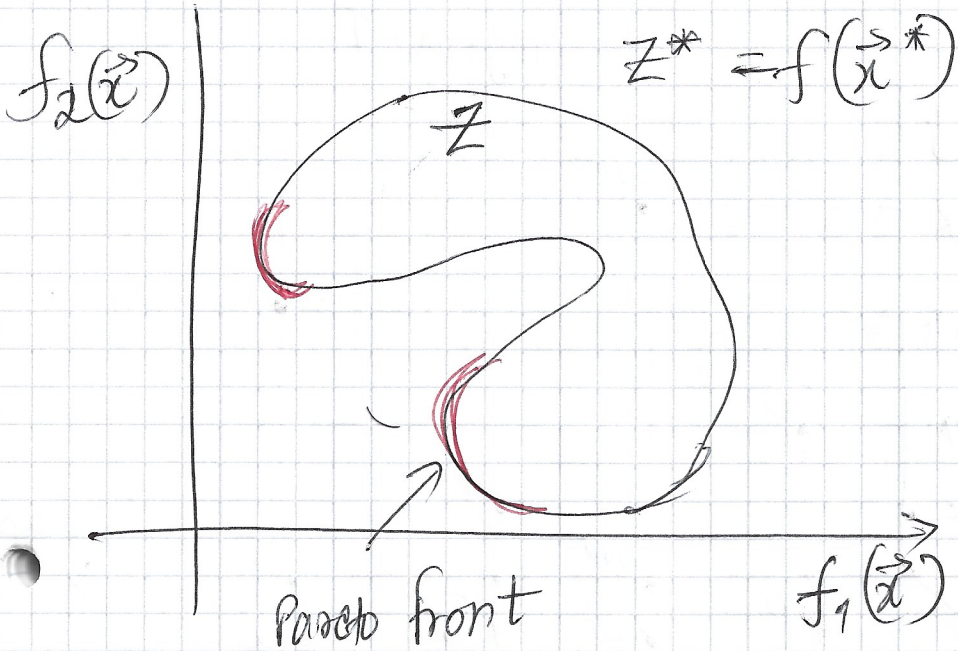
$\vec{x}^* \in S$ is PO ; if there does not exist another $\vec{x} \in S$ | $f_i(\vec{x}) \leq f_i(\vec{x}^*)$ $\forall i = 1, 2, \ldots m$

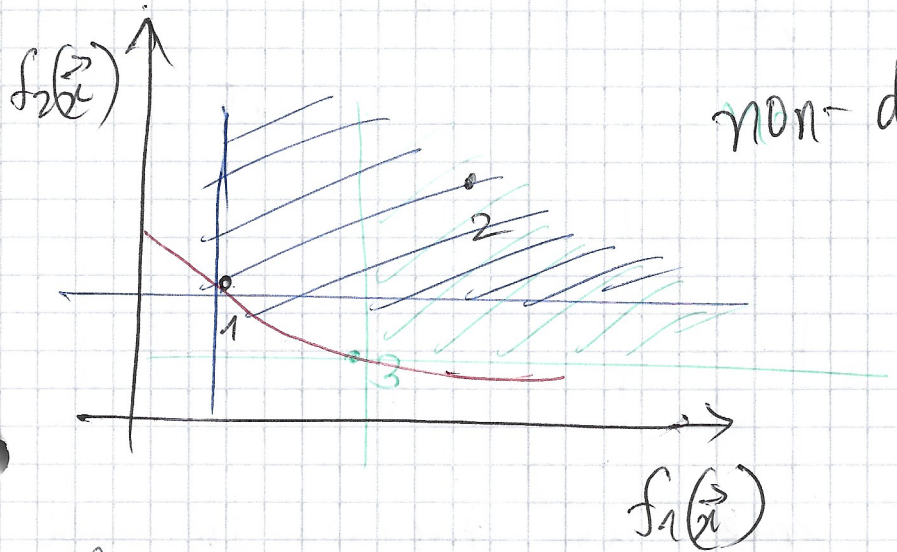
& $f_j(\vec{x}) < f_j(\vec{x}^*)$ for at least one j.

	$\vec{x}$	$\vec{x}^*$
f_1	1	0.5
f_2	2	0.9
f_3	3	0

1, 2, 3 → f_1, f_2, f_3 → 0.5, 0.9, 0.

PO solutions form a non-convex & disconnected PO set.





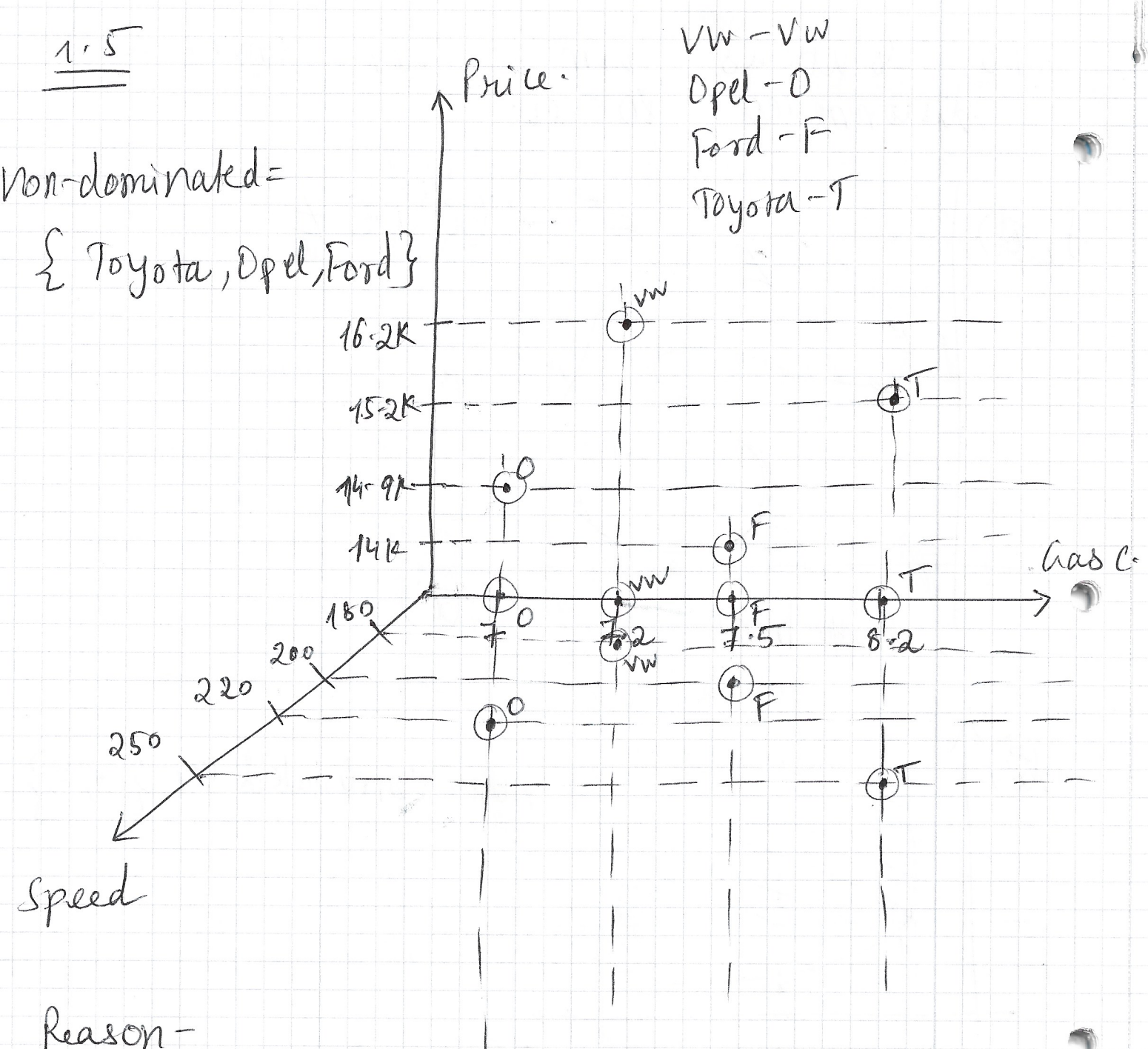
non-dominated set = {1, 3}

Goal: obtain a possible set of best solutions according to your objective function.

1.5

Non-dominated =

{ Toyota, Opel, Ford }



Reason -

VW has highest price as compared to all also lowest speed which is not fulfilling the objective criteria.

On the other hand Toyota has good gas consumption & also max speed certainly it is a choice for buying.

Ford & Opel has a small tie-breaker in terms of all three objectives so neither of them are mutually dominating each other.