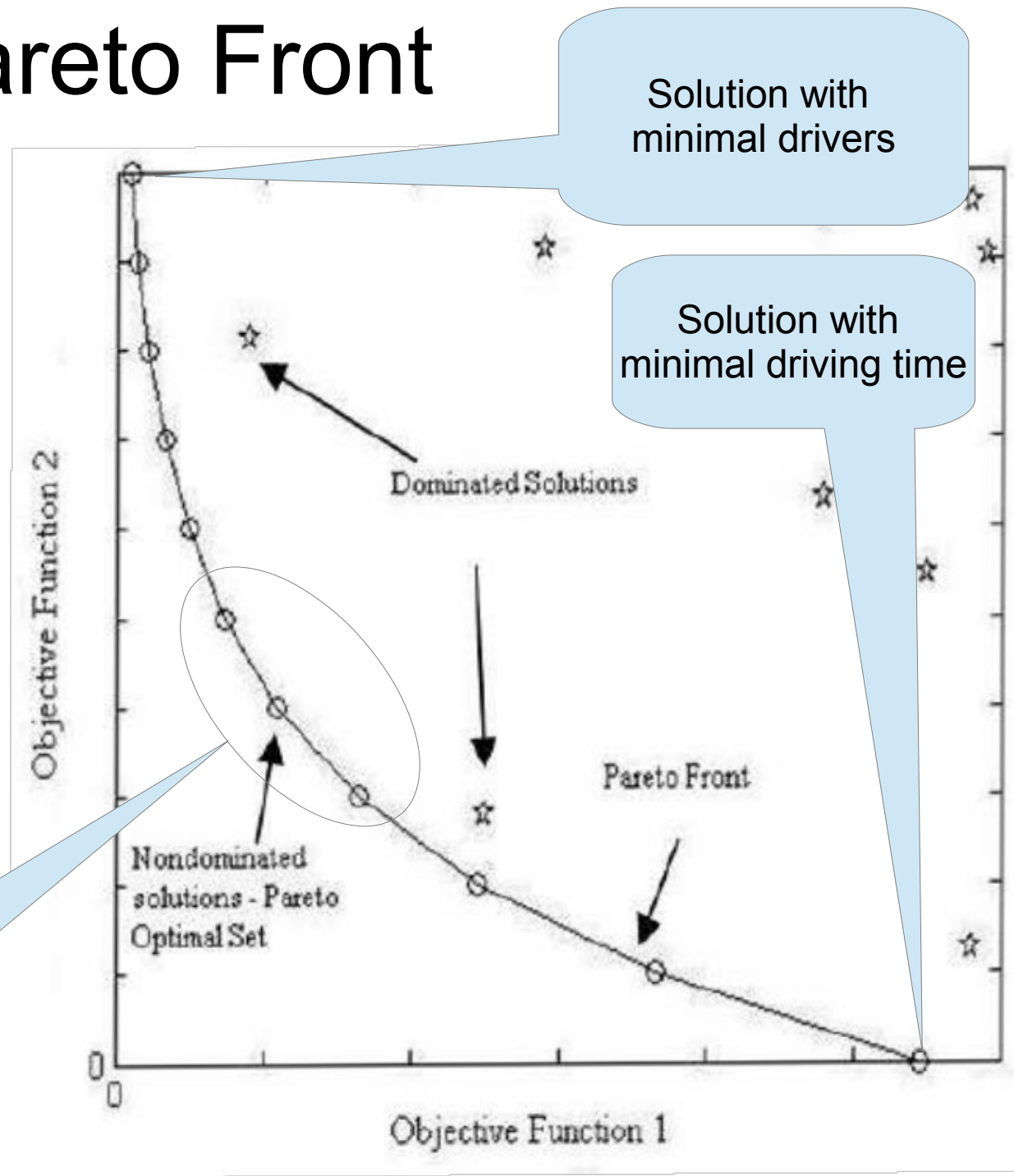# Pareto Front

- Objective 1 = Minimal Number of Drivers
- Objective 2 = Minimal Driving Time
- Pareto Optimal Set
  - Non-dominated solutions (on the line)
- Dominated solutions (inside lined area)
  - Non-optimal

Solution with minimal drivers

Solution with minimal driving time

Solutions that balance between minimal time and minimal drivers

Objective Function 2

Objective Function 1

Dominated Solutions

Pareto Front

Nondominated solutions - Pareto Optimal Set

Multi-Objective Fitness

$$Fitness(s) = w_1(DrivingTime) + w_2(Drivers) + penalty(ConstraintsViolated)$$

w1, w2 are weights; penalty ensures solutions with less driving time and/or no. of drivers but that violate constraints are worse than those that do not violate constraints

DrivingTime is normalized (to be between 0 and 1):
*(solution total driving time / (max assumed driving time for 1 job * total no. of jobs to assign))*

Drivers is normalized (to be between 0 and 1):
(solution total no. of drivers assigned / total no. of jobs to assign)

Pareto optimal set is calculated as follows:
For each candidate solution: check that no other solution exists that has
((less or equal driving time) AND less no. of drivers) OR ((less or equal no. of drivers) AND less driving time)

Note: *driving time* and *no. of drivers* used to calculate pareto optimal set is not normalized.