

Report for Homework 2

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Model description

Linear regression for functions $g(p_{11}, p_{13}, p_{21}, p_{23}) = (M_1, M_2)$ and $f(M_1, M_2) = (p_{11}, p_{13}, p_{21}, p_{23})$ is chosen as given algorithm have higher interpretability. Furthermore, to have better result for models, more complex curve was used, it means that higher order function is used (degree = 5).

Additionally, SVR (Support Vector Regression) was used for both functions g and f . SVR as well as Linear regression has higher interpretability.

For SVR different parameters for checked and higher performance for function g was shown by linear kernel and regularization $C = 0.5$

For SVR that estimate function f parameters was tuned. Finally **linear** kernel and **poly** kernel of degree 1 and 2 show best result

Performance of models was evaluated with **Mean average error** and **Mean square error**. Results are shown bellow

Metric	ML algoeithm	Function	Result	Value
MAE	Linear regression	prob->MarketShare	Company's market share	0.0168
		prob->MarketShare	Compatitor Company's market share	0.0167
		MarketShare->prob	Company's ratio of satisfied and disjointed clients	0.0391
	SVR	prob->MarketShare	Compatitor Company's market share	0.143
		prob->MarketShare	Company's ratio of satisfied and disjointed clients	0.408
		MarketShare->prob	Company's ratio of satisfied and disjointed clients	0.091
MSE	Linear regression	prob->MarketShare	Company's market share	0.0019
		prob->MarketShare	Compatitor Company's market share	0.0020
		MarketShare->prob	Company's ratio of satisfied and disjointed clients	0.0084
	SVR	prob->MarketShare	Company's market share	0.301
		prob->MarketShare	Compatitor Company's market share	0.0334
		MarketShare->prob	Company's ratio of satisfied and disjointed clients	0.015

Linear regression show better performance, so it will be used as approximation of functions described above.

Convergence

Given simulation model converge if difference between 30 pairs of values is less than epsilon 10^{-5} .

Convergence of model

On average system converge at time **72**. On notes it is shown that low number of examples converge to positions 600. Thus model can be simulated for 600 time ticks and model will always converge.