1.1 Basic assumptions

(1) There are three types of migros stores are considered in this project:
migros supermarket, migros and migroslingo.Each type has different service ranges, infrastructure costs and also number of employers.
The service range can be regarded as a circle, represented by its radius.
Under a typical type of store, they have the same infrastructure cost and number of employees.

We use M_s, M_n,$M_l$represents these three types of migros stores respectively. Based on the data of …, we got the values below.

stores category	service radius	infrastructure cost	number of employees
migros supermarket M_s	SR^{M^s}= 2km	I^{M^s}= 10000	NE^{M^s}=100
Migros M_n	SR^{M^n}=1km	I^{M^n}= 1000	NE^{M^n}=10
Migroslino M_l	SR^{M^l}=1km	I^{M^l}= 1000	NE^{M^l}=10

(2) We only consider coop and denner as the competitors of migros stores, and other migros stores are also competitors for the new store.

1.2 Benefits for creating a new store

The benefits for creating a new store mainly contain two aspects, one is the retail revenue, and another is the potential policy or strategic considerations.
For strategic consideration, sometimes the decision maker may consider the business strategy instead of revenue. For example, for humanitarian to create stores for some special groups. Or to capture the market first, they will create stores in some regions. In this project, we only consider retail revenue as the benefits for creating a new store.

Assumptions:

(1) People with higher rent spend more money on stores.
(2) The volume of a store increases with the population of its service range.

The retail revenue for creating a migros store on point/square i with type M,R_i^M, can be calculated as following:

$$R_i^M = \sum_{g \in SR^M} R_{i,g}^M = MS * \sum_{g \in SR^M} P_g * \gamma_g$$

where:

$R_{i,g}^M$: retail revenue for a migros store i on grid g, g belong to the service range SR
MS: average market share of migros stores (total is 23.3%(2020) based on the migros report),$Ms = \alpha_i * Cp_i$
α_i: correction parameter of occupancy of store i (based on the volume of store i)
Cp_i: the market share affected by competitors in the service range of store i, $Cp_i = \prod \frac{Rn}{SR}$
R_n:the distance between competitor store to the migros store
P_g: the population of grid g
γ_g: correction parameter related to the money for people in different regions(with different salaries) spend on shopping

1.3 Costs for creating a new store

The costs for creating a new store mainly contains: the rent, the pay for employees, the transport cost between the supply logistics post and the creating store, the infrastructure cost and other costs. Other costs can be regarded as the same for each store, so we ignore this part.

1.3.1 Rent

The rent for creating a migros store on point/square i with type M:

$$Re_i^M$$

1.3.2 Pay for employees

The pay for employees for creating a migros store on point/square i with type M:

$$Pe_i^M = Pe_{ave} * NE^M \quad * \beta_i$$

Pe_{ave}: average pay for one employee(4537CHFin2020, from migros facts and figures

NE^M : number of employers for type M

β_i: correction parameter for store on different locations

1.3.3 Transport cost

The transport cost can be regarded as the distance to a insection.The transport cost for creating a migros store on point/square i with type M:

$$Tr_i^M$$

1.3.4 The infrastructure costs

Different types of stores have different infrastructure costs.

I^M only related to the type

1.3.5 Total costs

$$C_i^M = \omega_1 * Re_i^M + \omega_2 * Pe_i^M + \omega_3 * Tr_i^M + \omega_4 * I^M$$

where:

ω is the weighted for each parameter.

1.4 Optimization model

maximum profit for creating one store on point i in type M = maximum(benefits-costs)

$maxZ_i^M = max(B_i^M - C_i^M)$