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Mathematical Foundation of Big Data Analytics (SS 2019)
Ranking II

Ex. 1 You are sales manager of an online fashion trader. In order to optimize favorable and effective distribution channels, you decide to sign a social media influencer for your next advertising campaign. You can base your decision upon on data of the social media platform. Thanks to your mathematical education you don't want to simply use the number of followers as criterion but rather choose the influencer according to a popularity ranking. All the candidates you consider spend almost the whole day with working on the perfect post, so they only have time left to like one post per day.
You have the following data:

- Influencer 1 likes either his own post or the one of Influencer 2.
- The latter sticks to the likes for "like for like" code and likes posts of 1 or 3.
- Influencer 3 gives his like to 2, 3 or 4.
- Influencer 4 likes 1, 3 or 4.

Additionally there are no preferences in between the like structure, therefore each like will be given with the same probability.

a) According to your data, which Influencer shall be signed based on a ranking?

b) Looking at the transition matrix you derived in a), would you expect the iterative calculation

$$x(t+1) = P \cdot x(t) \quad t = 0, 1, \ldots.$$

to converge?

Ex. 2 Take the following consumers behavior known from the lecture:

Family 1	AAAAAABACAAA
Family 2	CBBBBBBBBA
Family 3	CCCCCCCBCAA

a) Calculate the stationary market shares of the brands by solving the eigenvalue problem

$$P\bar{x} = \bar{x}.$$

b) Formulate and interpret the iterative approach

$$x(t+1) = P \cdot x(t) \quad t = 0, 1, \ldots.$$

Which implicit assumption is made?

c) Calculate the first five steps.

Ex. 3 Let us imagine a huge amount of brands. What problems can this cause for calculating the market shares in an iterative way? How can we compute the iterative steps

$$x(t+1) = P \cdot x(t) \quad t = 0, 1, \ldots$$

more efficient concerning the named problems? Give an economic justification for using the iterative approach.