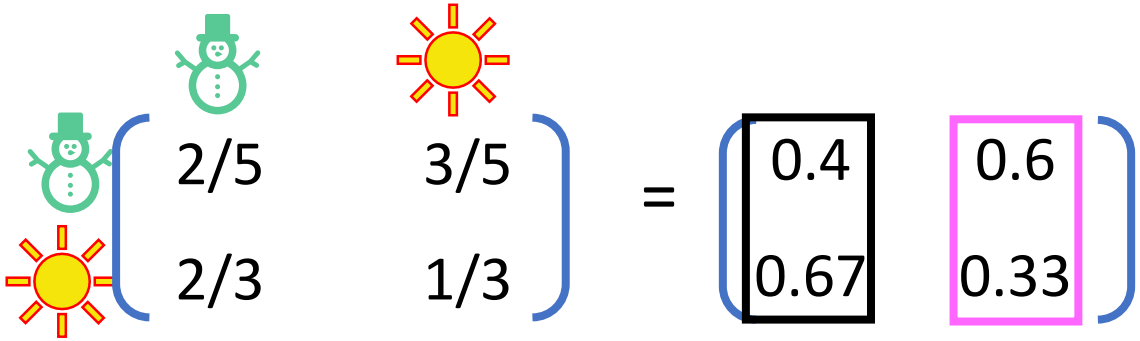
Steady State Weather Forecast

- Training data

- Transition matrix:



- Initial state vector (today) = [1 0]
- Prediction: Initial state vector * Transition Matrix

- Tomorrow = [1 0] * [0.4; 0.67] [1 0] * [0.6; 0.33] = [0.4 0.6]

- Markov Chain: A stochastic (random) process with Markov Property.

Markov Property: Current state is enough to determine the next state of the system (the previous sequence does NOT provide more information).

A Markov model of land-use change dynamics in the Niagara Region, Ontario, Canada

Michael R. Muller & John Middleton

Landscape Ecology **9**, 151–157(1994) | Cite this article

Abstract

Regional Niagara is the site of an intense three-way land-use conflict among urban, agricultural and natural uses. Large scale spatial and temporal land-use data were used to investigate the dynamics of land-use change in this area. A first order Markov chain was used as a stochastic model to make quantitative comparisons of the land-use changes between discrete time periods extending from 1935 to 1981.

The Markov model allowed for two main conclusions about the historic dynamics of land-use change in the Regional Municipality of Niagara.

1. The urbanization of agricultural land was the predominant land-use change.

2. A continuing 'exchange' of land area occurs between wooded and agricultural land-use categories that has little effect on the net amount of wooded land but which could undermine the long-term ecological value of remaining natural areas in Niagara.

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Predicting Customer Churn and Retention Rates in Nigeria's Mobile Telecommunication Industry Using Markov Chain Modelling

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Abstract. The telecommunication industry is one of the service industries that is most affected by the problem of subscribers' churn. Although several techniques have been used to predict customer churn in developed countries, many of those studies used secondary data which are not readily available in Nigeria for researchers. This study investigates how Markov chains help in modelling and predicting the customer churn and retention rate in the Nigerian mobile telecommunication industry. The data generated through the survey were input in the Windows-based

http://www.acta.sapientia.ro/acta-econ/C3/econ3-04.pdf

Other Examples

- Land-Use change dynamics [Müller & Middleton 1997]
- Election results in Ghana [Nortey et al. 2016]
- Google's PageRank algorithm (until last year).
- Speech recognition (Hidden Markov Model).
- Democratisation of a country.
- Text generation.
- Computer music composition.

Links

- A very nice & simple explanation of financial modelling: http://www.math.chalmers.se/Stat/Grundutb/CTH/mve220/1617/redingprojects16-17/IntroMarkovChainsandApplications.pdf
- Heavier explanation but good if you feel motivated: https://twiecki.io/blog/2015/11/10/mcmc-sampling/
- Musical signature of classical music composers: https://www.worldscientific.com/doi/pdf/10.1142/S2010194512007829
- A Hidden Markov Model with probabilistic states: https://en.wikipedia.org/wiki/Hidden_Markov_model
- Burn-in if you are into statistics: http://users.stat.umn.edu/~geyer/mcmc/burn.html
- Land use change in the Niagara Region https://link.springer.com/article/10.1007%2FBF00124382
- Market share example https://towardsdatascience.com/marketing-analytics-through-markov-chain-a9c7357da2e8
- Democratisation https://en.wikipedia.org/wiki/Markov_chain#Social_sciences

Markov Chains So Far

- Markov Chain: A stochastic process with Markov Property.

Markov Property: Next state only depends on the current state (the previous sequence doesn't give more information).

- Monte Carlo experiment: An algorithm that uses random variables to sample the parameter space.
- Markov Chain Monte Carlo: A Markov Chain of which, the states are provided by the random sampling of the parameter space.