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**MATH 189Z**

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**Summaries**

**1. Hidden Markov Model for Stock Trading**

Hidden Markov model have many applications, one of them being to predict stock prices. Hidden Markov model, a “stochastic signal model,” can be applied in the field of financial mathematics, effectively forecast stock prices and inform trading stocks decisions. Akaike information criterion (AIC), Bayesian information criterion (BIC), Hannan Quinn information criterion (HQIC), and Bozdogan Consistent Akaike information criterion (HQC) help our model selection by assessing HMM under various numbers of hidden states to decide upon the most suitable one. The study settled on a four state HMM to predict monthly prices, and they saw their model beat out the “Buy & Hold Strategy.”

**2. Gene Finding and the Hidden Markov Models**

HMM can be applied to genomic data analysis: particularly Segmentation and Gene finding. With an observable sequence, initial probabilities, the transition matrix, and the emission matrix, we can uncover the hidden sequence of interest h by applying the Viterbi algorithm—crucial for the Segmentation of biological sequences. With HMM, we can also predict qualities of proteins, including hydrophobicity. This occurs through the identification of hydrophobic and hydrophilic segments in proteins. HMMs are applied through training, using methods of supervised learning and unsupervised learning in conjunction.

# 3. [A Non-Homogeneous Hidden Markov Model for the Analysis of Multi-Pollutant Exceedances Data](http://www.researchgate.net/publication/221912145_A_Non-Homogeneous_Hidden_Markov_Model_for_the_Analysis_of_Multi-Pollutant_Exceedances_Data.):

# Air Quality is important for everyone that breathes air, motivating analysis of pollutant trends across time. Human health is impacted by air quality, and this study looks at Daily data published by the US EPA and EEA. They were about to find transition probabilities that were dependent on “meteorological covariates.” They were able to weave through discussion of theory of HMM and their application of it. They presented figures of the transition probabilities from one state to other states according to their three state HMM. They use Non-homogeneous hidden Markov models to make predictions for occurrences of multi-pollutant exceedances. Finding included multiple violations, were pollutants were monitored to be above standards. In the end, the study was able to reveal the occurrences of exceedances, as well as the reasons (location of monitoring station and weather conditions).

**Extra Credit: COVID 19 Talk**

A group of people standing in front of a mirror posing for the camera

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Works Cited:

Nguyen, Nguyet. “Hidden Markov Model for Stock Trading.” *International Journal of Financial Studies*, vol. 6, no. 2, 2018, p. 36., doi:10.3390/ijfs6020036.

“(PDF) A Non-Homogeneous Hidden Markov Model for the Analysis of Multi-Pollutant Exceedances Data.” *ResearchGate*, [www.researchgate.net/publication/221912145\_A\_Non-Homogeneous\_Hidden\_Markov\_Model\_for\_the\_Analysis\_of\_Multi-Pollutant\_Exceedances\_Data](http://www.researchgate.net/publication/221912145_A_Non-Homogeneous_Hidden_Markov_Model_for_the_Analysis_of_Multi-Pollutant_Exceedances_Data).

“Computational Genomics of Photosynthetic Organisms.” *Gene Finding and the Hidden Markov Models - Computational Genomics of Photosynthetic Organisms*, www.cs.us.es/~fran/students/julian/gene\_finding/gene\_finding.html.