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## 4.1.1 Predicting the Weather

# 4.1.1 Predicting the Weather

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# Discussion

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## Autocomplete Features

discussion posted 11 days ago by [yandoryn](#)

So the first thing I thought of when I learned about Markov Chains is autocomplete features, where it decides what word I'm most likely typing when I add a few letters. I did some research, which I didn't completely understand, but as far as I can tell, yes, you can use a Markov Chain to do this, but I'm not sure that's what's being used on most phones. :) For instance, I found this project that someone had created:

<https://devpost.com/software/markov-autocomplete>

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1 response

[maggiemyers](#) (Staff)

11 days ago

Thanks! Can you post this **also** under "Have you seen any good linear algebra lately?" please?

They did use these approaches for autocomplete features as well as voice recognition. Actually they used HMM (Hidden Markov Models) which are related but you don't know the state only observations that hint about the states that you have been. I believe that other machine learning methods are becoming more popular, but I haven't been keeping up with the research lately.

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## Homework 4.1.1.1

3/3 points (graded)

		Today		
		sunny	cloudy	rainy
Tomorrow	sunny	0.4	0.3	0.1
	cloudy	0.4	0.3	0.6
	rainy	0.2	0.4	0.3

If today is cloudy, what are the probability that tomorrow is

sunny →  ✓

cloudy →  ✓

rainy →  ✓

✓ Correct (3/3 points)



## Video

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## Homework 4.1.1.2

3/3 points (graded)

		Today		
		sunny	cloudy	rainy
Tomorrow	sunny	0.4	0.3	0.1
	cloudy	0.4	0.3	0.6
	rainy	0.2	0.4	0.3

If today is sunny, what is the probability that the day after tomorrow is

sunny → .3



cloudy → .4



rainy → .3



Submit

✓ Correct (3/3 points)



## Video

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## Homework 4.1.1.3

1/1 point (graded)

		Today		
		sunny	cloudy	rainy
Tomorrow	sunny	0.4	0.3	0.1
	cloudy	0.4	0.3	0.6
	rainy	0.2	0.4	0.3

Follow the instructions in the above video.

☒ Done



Submit

☒ Correct (1/1 point)



## Video

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## Homework 4.1.1.4

9/9 points (graded)



## Given

		Today		
		sunny	cloudy	rainy
Tomorrow	sunny	0.4	0.3	0.1
	cloudy	0.4	0.3	0.6
	rainy	0.2	0.4	0.3

fill in the following table that predicts the weather the day after tomorrow given the weather today:

		Today		
		sunny	cloudy	rainy
Day after Tomorrow	sunny			
	cloudy			
	rainy			

.3

✓ Answer: 0.3

.25

✓ Answer: 0.25

.25

✓ Answer: 0.25

.4

✓ Answer: 0.4

.45

✓ Answer: 0.45

.4

✓ Answer: 0.4

.3

✓ Answer: 0.3

.3

✓ Answer: 0.3

.35

✓ Answer: 0.35

## Explanation

**Answer:** By now surely you have noticed that the  $j$ th column of a matrix  $A$ ,  $a_j$ , equals  $Ae_j$ . So, the  $j$ th column of  $Q$  equals  $Qe_j$ . Now, using  $e_0$  as an example,

$$\begin{aligned} q_0 = Qe_0 &= P(Pe_0) = \begin{pmatrix} 0.4 & 0.3 & 0.1 \\ 0.4 & 0.3 & 0.6 \\ 0.2 & 0.4 & 0.3 \end{pmatrix} \left( \begin{pmatrix} 0.4 & 0.3 & 0.1 \\ 0.4 & 0.3 & 0.6 \\ 0.2 & 0.4 & 0.3 \end{pmatrix} \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix} \right) \\ &= \begin{pmatrix} 0.4 & 0.3 & 0.1 \\ 0.4 & 0.3 & 0.6 \\ 0.2 & 0.4 & 0.3 \end{pmatrix} \begin{pmatrix} 0.4 \\ 0.4 \\ 0.2 \end{pmatrix} = \begin{pmatrix} 0.3 \\ 0.4 \\ 0.3 \end{pmatrix} \end{aligned}$$

The other columns of  $Q$  can be computed similarly:

		Today		
		sunny	cloudy	rainy
Day after Tomorrow	sunny	0.30	0.25	0.25
	cloudy	0.40	0.45	0.40
	rainy	0.30	0.30	0.35

Submit

**i** Answers are displayed within the problem