A1

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1 Introduction

For this assignment the goal was to extend assignment 1 with the Forward algorithm [1, p.104-110].

2 Method

By utilizing equations (5.42-5.53) we created the forward pass in **MarkovChain/forward.m**. Then we also finished **HMM/logProb.m** which calculates the log-probability of observing a sequence. The latter was done by using equation (5.54). When $t = 1$ by applying (eq 1), we get:

3 Verifying the implementation

To verify the implementation we used a finite HMM with the following Markov Chain:

$$q = \begin{pmatrix} 1 \\ 0 \end{pmatrix}; A = \begin{pmatrix} 0.9 & 0.1 & 0 \\ 0 & 0.9 & 0.1 \end{pmatrix}; B = \begin{pmatrix} \mathcal{N}(0,1) \\ \mathcal{N}(3,2) \end{pmatrix}; \underline{x} = \begin{pmatrix} -0.2 & 2.6 & 1.3 \end{pmatrix} \tag{1}$$

Our results from the Forward algorithm should be and was coherent with:

```
alfaHat =
        1.0000    0.3847    0.4189
             0    0.6153    0.5811


c = 1.0000    0.1625    0.8266    0.0581
```

Finally, the log-probability of observing a the sequence $\underline{x}$ above, should be and was

$$logP(X = x|\lambda) \approx -9.1877 \tag{2}$$

4 Code

See the other files in the zip-submission, **tests/testForwardPass.m** contains the tests.

References

[1] G. Leijon, A. ; Henter. *Pattern Recognition.* 2015.