Intelligent Data Analysis 2

Exercise on Structured Prediction

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Exercise 1   *Viterbi Algorithm*

Assume that you have an HMM whose states represent parts-of-speech and whose observations are terms. The following probabilities have been estimated from a corpus.

t\ t+1	JJ	VBG	VBP	PRP	VBD	π	schlau	werden	wir
JJ	0.3	0.0	0.1	0.3	0.3	0.3	0.2	0.0	0.0
VBG	0.2	0.2	0.2	0.2	0.2	0.2	0.0	0.3	0.0
VBP	0.2	0.3	0.1	0.3	0.1	0.1	0.0	0.5	0.0
PRB	0.0	0.4	0.3	0.1	0.2	0.3	0.0	0.0	0.2
VBD	0.2	0.1	0.2	0.2	0.3	0.1	0.4	0.0	0.0

Please draw the HMM as an automaton and use the Viterbi algorithm to infer the most likely sequence of states for the observation sequence "wir werden schlau". Visualize your inference and the solution.

Exercise 2   *Inference in structured-prediction models*

Please develop a version of the Viterbi algorithm that allows you to infer the label sequence $\hat{\mathbf{y}}$ that maximizes the decision function value $f_\theta(\mathbf{x}, \mathbf{y}) = \theta^\top \Phi(\mathbf{x}, \mathbf{y})$ of a linear sequence model.