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4. Exercise for "Sprachverarbeitung und Text Mining"

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1 Knowledge Questions

1. When is a Maximum Entropy Model called consistent to the given data? Describe the definition with your own words.
2. Name the three conditions that must be enforced during optimization of a Maximum Entropy Model. Describe their purpose in your own words.
3. When employing Maximum Markov Models in practice, how are the different features determined that are used within the model?

2 Maximum Entropy Models

Consider the sentence “Wir rennen oft zum Bus”. (English: “We often run to the bus”.)

Classify the word “rennen” (English: “run”) using the following Maximum Entropy Model.

Feature	λ for PPER	λ for VVFIN	λ for ADV	λ for APPRART	λ for NN
$x_i = Wir$	0.9	-0.2	0.1	0.1	0.2
$x_i = rennen$	0.2	0.8	0.15	-0.11	0.45
$x_i = oft$	0.1	0.05	0.9	0.15	0.01
$x_i = zum$	0.01	0.05	0.2	0.8	0.15
$x_i = Bus$	0.1	0.02	0.1	0.2	0.9
$x_{i-1} = Wir$	0.02	0.98	0.2	0.3	0.03

3 Lagrangians

Solve the optimization problem that is defined by the function

$$f(x, y) = x^2 - 2y$$

and the condition

$$g(x, y) = x + y - 5 = 0$$

by using the method of Lagrange Multipliers. Did you find a maximum or a minimum?