Ergänzungen zum maschinellen Übersetzen natürlicher Sprachen
5. Übungsblatt
2016-06-07

Exercise 1
Imagine the following game: Two coins are thrown and you win, if both coins land on the same
side. You are only told, if you won. Assume that one coin is rather thick and may land on the
edge. We represent the possible events with the set \( Y = \{M_1, M_2, M_3\} \times \{N_1, N_2\} \). You win with
the events \((M_1, N_1)\) and \((M_2, N_2)\).

After playing the game several times, you won 6 times and lost 18 times. Instantiate the corpus-
based EM algorithm with this scenario and calculate one EM step. Start with the probability of
2/5 for \(M_1\) and \(M_2\), and 1/3 for \(N_1\).

Exercise 2
Imagine another game: One of two coins is thrown and you win, if the coin lands on the head or
on the edge. Assume that second coin is thin and never lands on the edge. You are only told, if
you won. We represent the possible events with the set \( Y = \{M_1, M_2, M_3, N_1, N_2\} \), i.e., you win
with the events \(M_1, M_3,\) and \(N_1\).

After playing the game several times, you won 8 times and lost 12 times. Instantiate the simple
counting EM algorithm with this scenario and calculate one EM step. Start with the probability
of 2/5 for \(M_1\) and \(M_2\), 1/3 for \(N_1\), and 1/3 for choosing the first coin.

Assure yourself that \( \text{cmle}_q(c(\omega, \kappa)) = \text{cmle}_p(c(\omega, p)) \) in this particular instance of simple count-
ing EM.