

Three Problems

1. **Decoding** – finding the most likely path

Given: model, parameters, observations (data)

Find: most likely states sequence (path)

$$S_1^* S_2^* \dots S_T^* = \arg \max_{S_1 S_2 \dots S_T} p(S_1 S_2 \dots S_T | O) = \arg \max_{S_1 S_2 \dots S_T} p(S_1 S_2 \dots S_T, O)$$

2. **Evaluation** – computing observation likelihood

Given: model, parameters, observations (data)

Find: the likelihood to generate the data

$$p(O | \lambda) = \sum_{S_1 S_2 \dots S_T} p(O | S_1 S_2 \dots S_T) p(S_1 S_2 \dots S_T)$$