

II-Probabilities Gibbs Sampling

Logik für Erklärbare KI: Technische Einführung in das ENEXA Projekt

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Sampling a distribution \mathbb{P}

Sampling is a random procedure to get index pairs

$j_0, \dots, j_{d-1} \in \times_{k \in [d]} [m_k]$ such that the probability of j_0, \dots, j_{d-1} is $\mathbb{P}(j_0, \dots, j_{d-1})$.

A naive approach would not succeed: Typically, the tensors \mathbb{P} is too large to be created.

Approach

Use the representations like Markov Networks

$$\mathbb{P} = \mathcal{N}(\{T^e : e \in \mathcal{E}\}, \mathcal{V}, \emptyset)$$

to draw samples.

Draw State for atom k a state i_k from marginalized distribution

$$\mathbb{P}[X_k] = \frac{\mathcal{C}(\{\mathbb{P}\}, \{X_k\})}{\mathcal{C}(\{\mathbb{P}\}, \emptyset)}$$

Iterate over $k \in [d]$ and draw i_k from

$$\mathbb{P}[X_k | \{e_{i_l} : l \neq k\}] = \frac{\mathcal{C}(\{\mathbb{P}\} \cup \{e_{i_l} : l \neq k\}, X_k)}{\mathcal{C}(\{\mathbb{P}\} \cup \{e_{i_l} : l \neq k\}, \emptyset)}$$

Intuition

While we initialize with an independent sample, the resampling iterations implement the dependencies of the variables with respect to each other.

Implementation in tnreason : Subpackage algorithms

The subpackage algorithms implements algorithms such as Gibbs Sampling.

