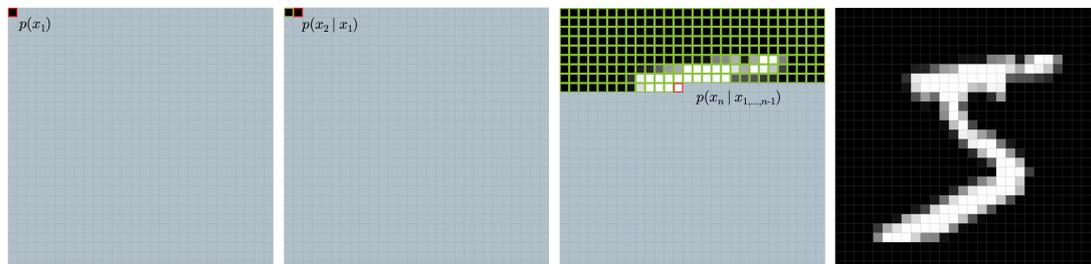


Autoregressive Generative Modeling with Spiking Neural Networks



Spiking neural networks (SNNs) are a class of neural models inspired by biological neurons, where information is communicated through discrete spikes over time rather than continuous activations. This event-driven computation can enable efficient and temporally structured processing, and is particularly attractive for energy-efficient and neuromorphic hardware. In this project, we will explore how SNNs can be effectively used for autoregressive generative modeling [1,2], in particular for image generation and inverse image restoration problems. In particular, we will investigate if suitable inductive biases in the SNN backbone architecture and spiking neuron models can enable efficient sequential generation of images and support structured generative modeling.

[1] van den Oord et al. “Pixel recurrent neural networks”, ICML 2016.

[2] van den Oord et al. “Conditional image generation with PixelCNN decoders”, NeurIPS 2016.

Goals & Tasks

- Review of the state-of-the-art on generative modeling with SNNs.
- Simulating and benchmarking an autoregressive SNN-based generative model [1,2].
- Experiments on image generation and inverse image restoration problems.

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Qualifications

- Interest in brain-inspired deep learning.
- Experience with the Python based deep learning framework PyTorch.
- Registered to one of the following:
 - Bachelor Thesis
 - Seminar Project
 - Master Thesis