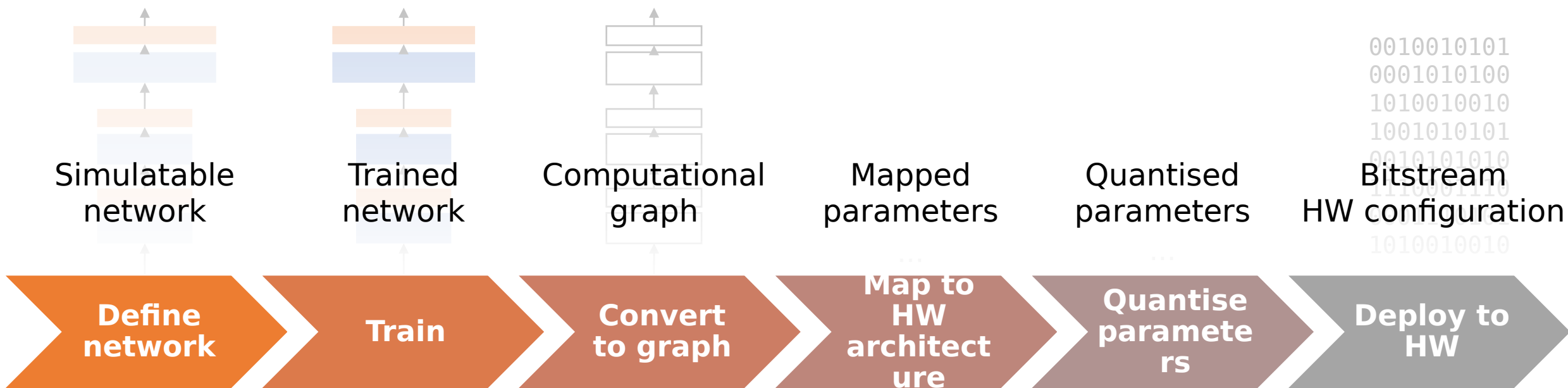


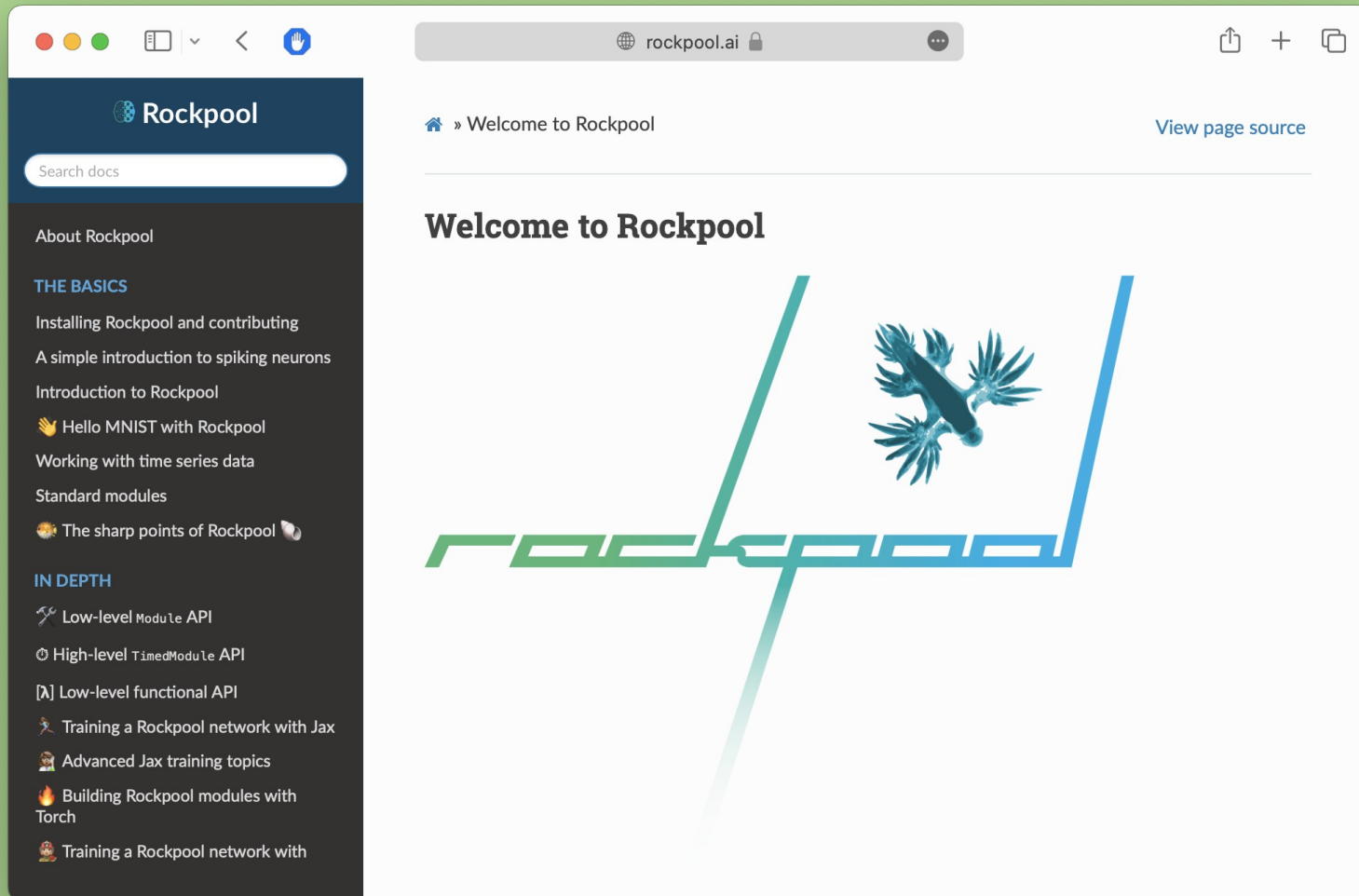
Training and deploying SNN applications with Rockpool and Xylo



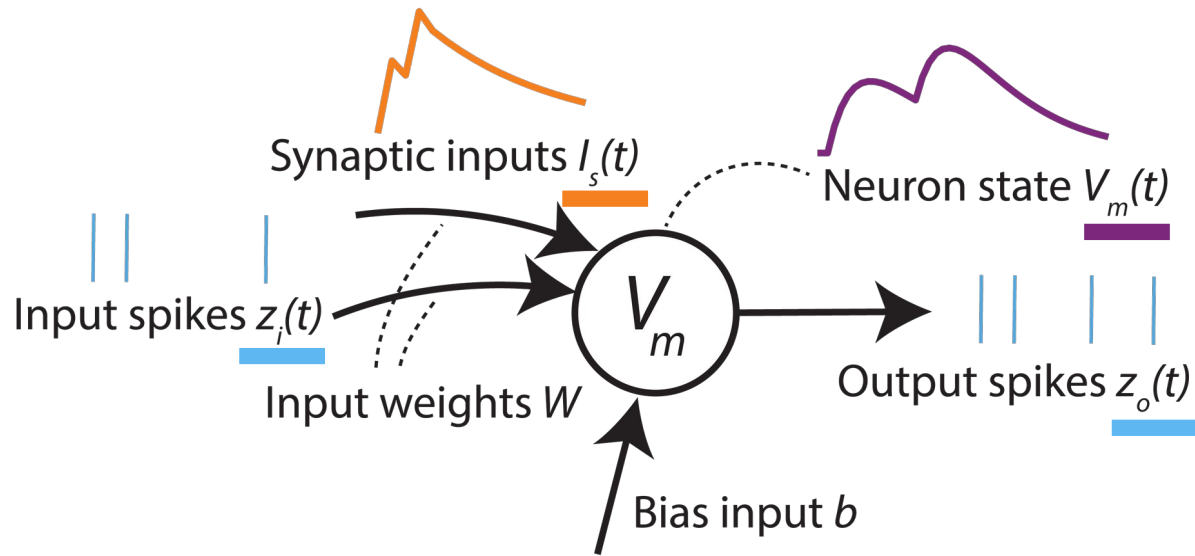
Telluride | June 2023

All code:





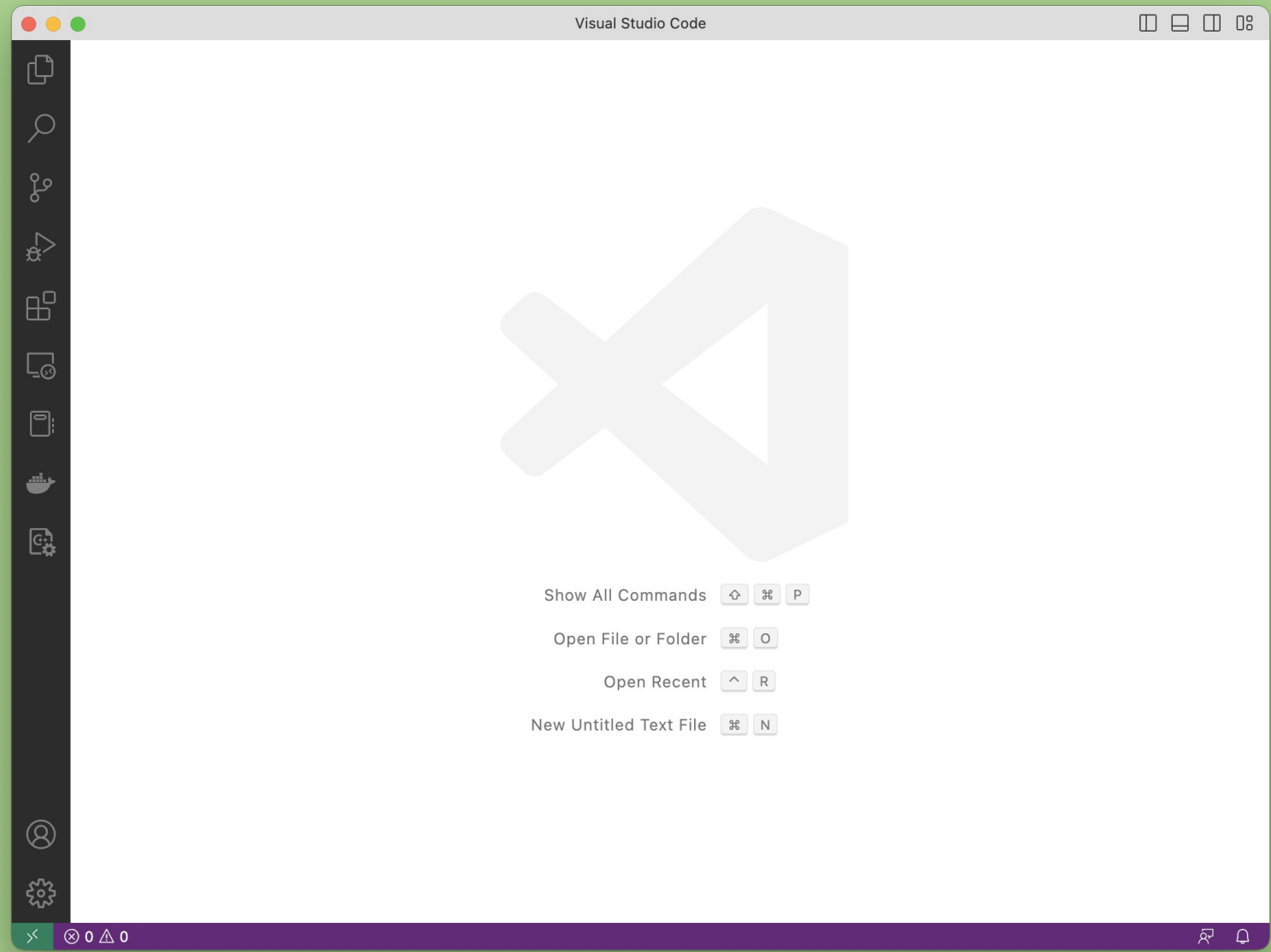
Current-Based Leaky-Integrate-and-Fire (CuBa LIF) neuron model



$$\tau_s \dot{\underline{I_s}} + \underline{I_s} = W \cdot \underline{z_i(t)}$$

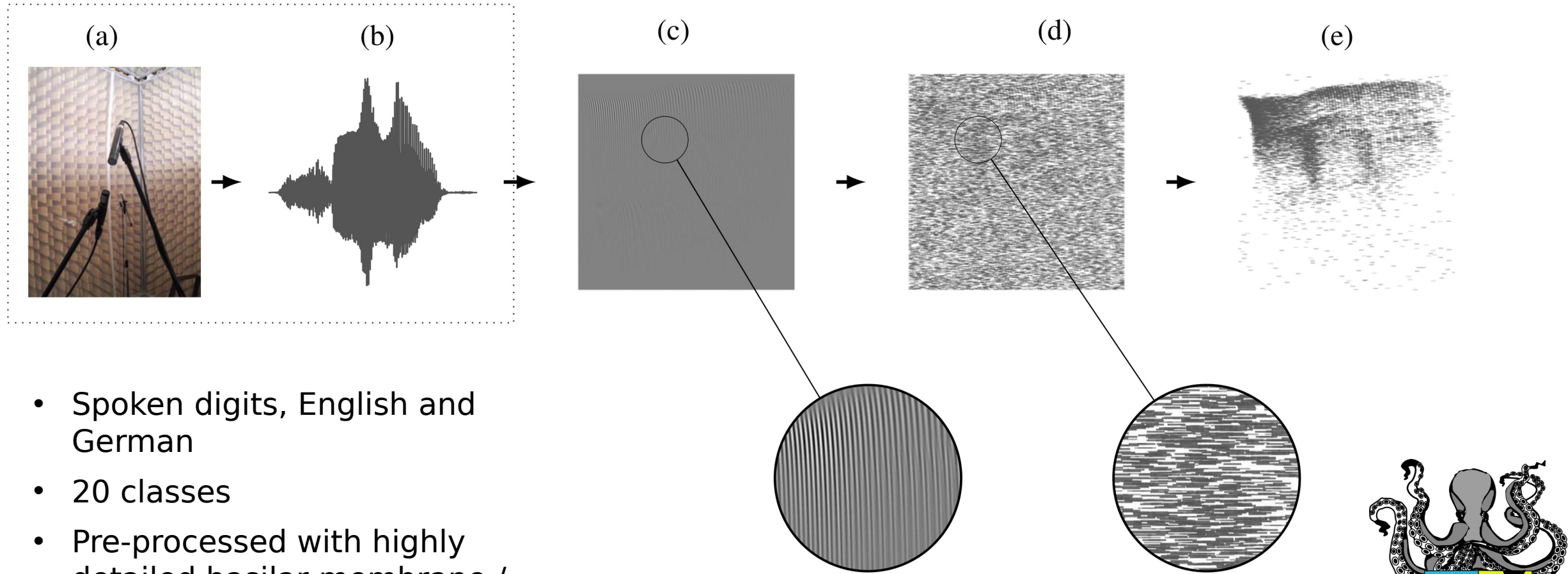
$$\tau_m \dot{\underline{V_m}} + \underline{V_m} = \underline{I_s} + b$$

$$\underline{V_m}(t_j) > \theta \rightarrow \begin{cases} \underline{V_m}(t_j) & \leftarrow \underline{V_m}(t_j) - \theta \\ \underline{z_o}(t) & \leftarrow \underline{z_o}(t) + \delta(t_j) \end{cases}$$



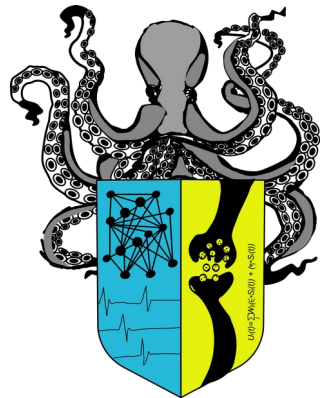
Spiking Heidelberg Digits

Heidelberg Digits



- Spoken digits, English and German
- 20 classes
- Pre-processed with highly detailed basilar membrane / cochlea model
- Input data provided as spike events

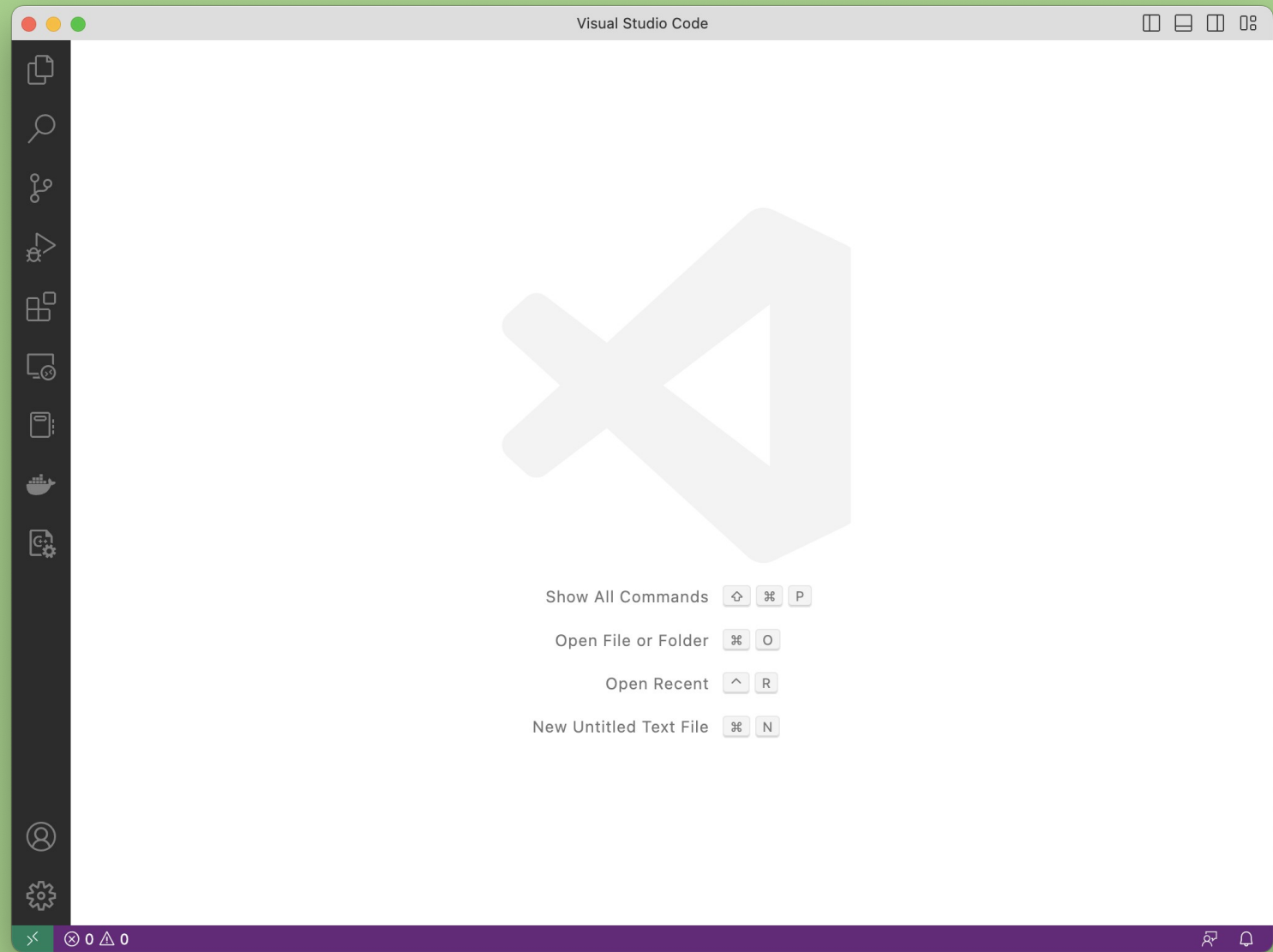
Cramer et al. 2022. IEEE Trans. NNLS 33 2744-2757.





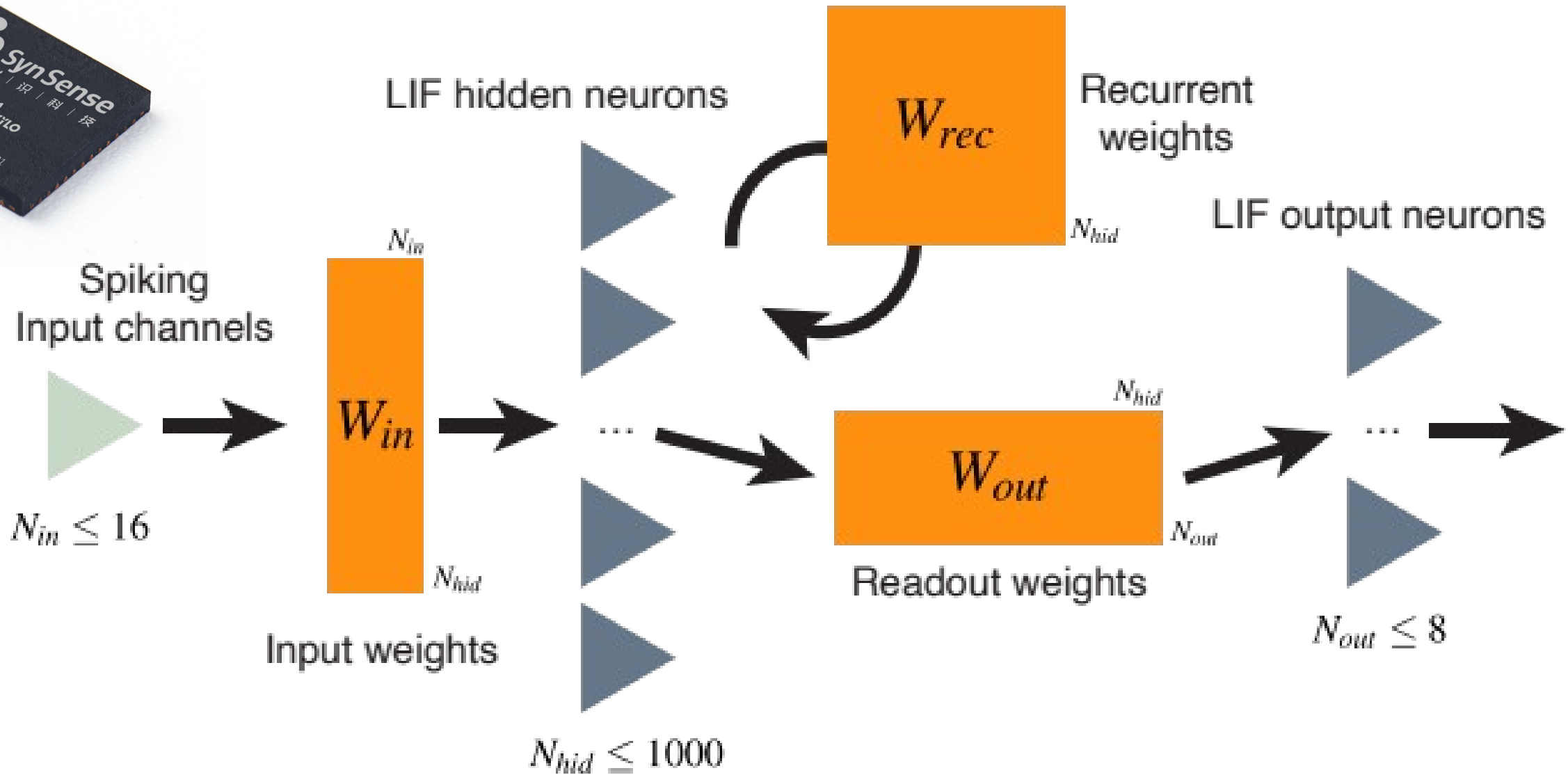
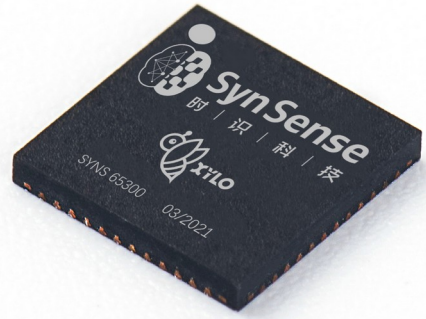
tonic.readthedocs.io

- Neuromorphic datasets
 - SHD, S-MNIST, DVSGesture,
 - ...
- Data transformations
- Data augmentation
- Caching
- Open source ♥
- ...



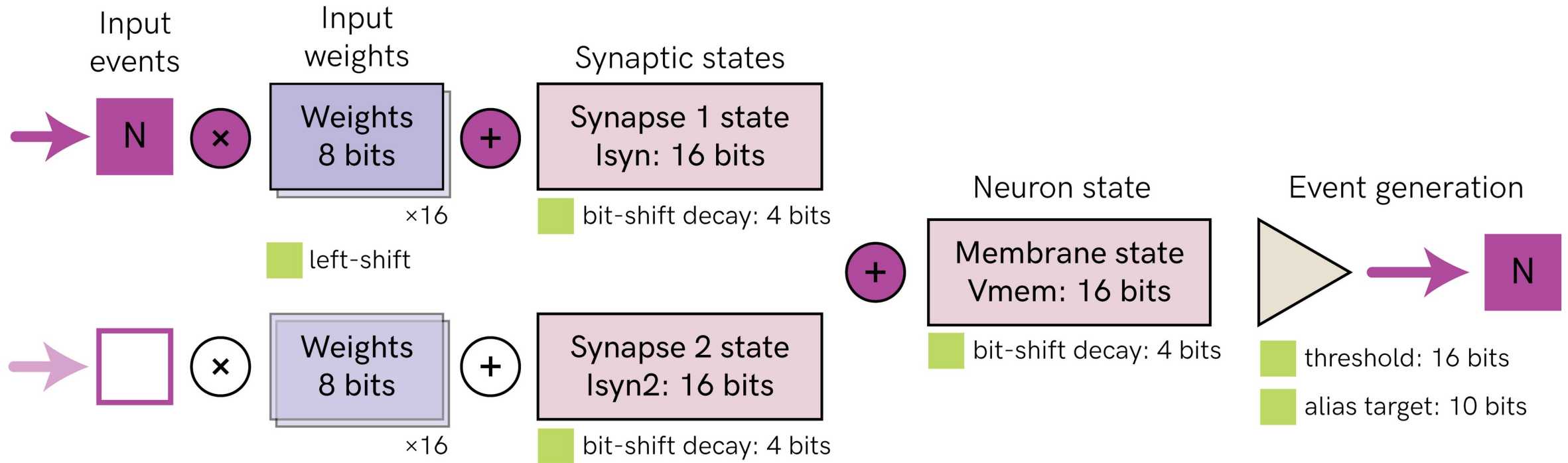
Xylo digital SNN architecture

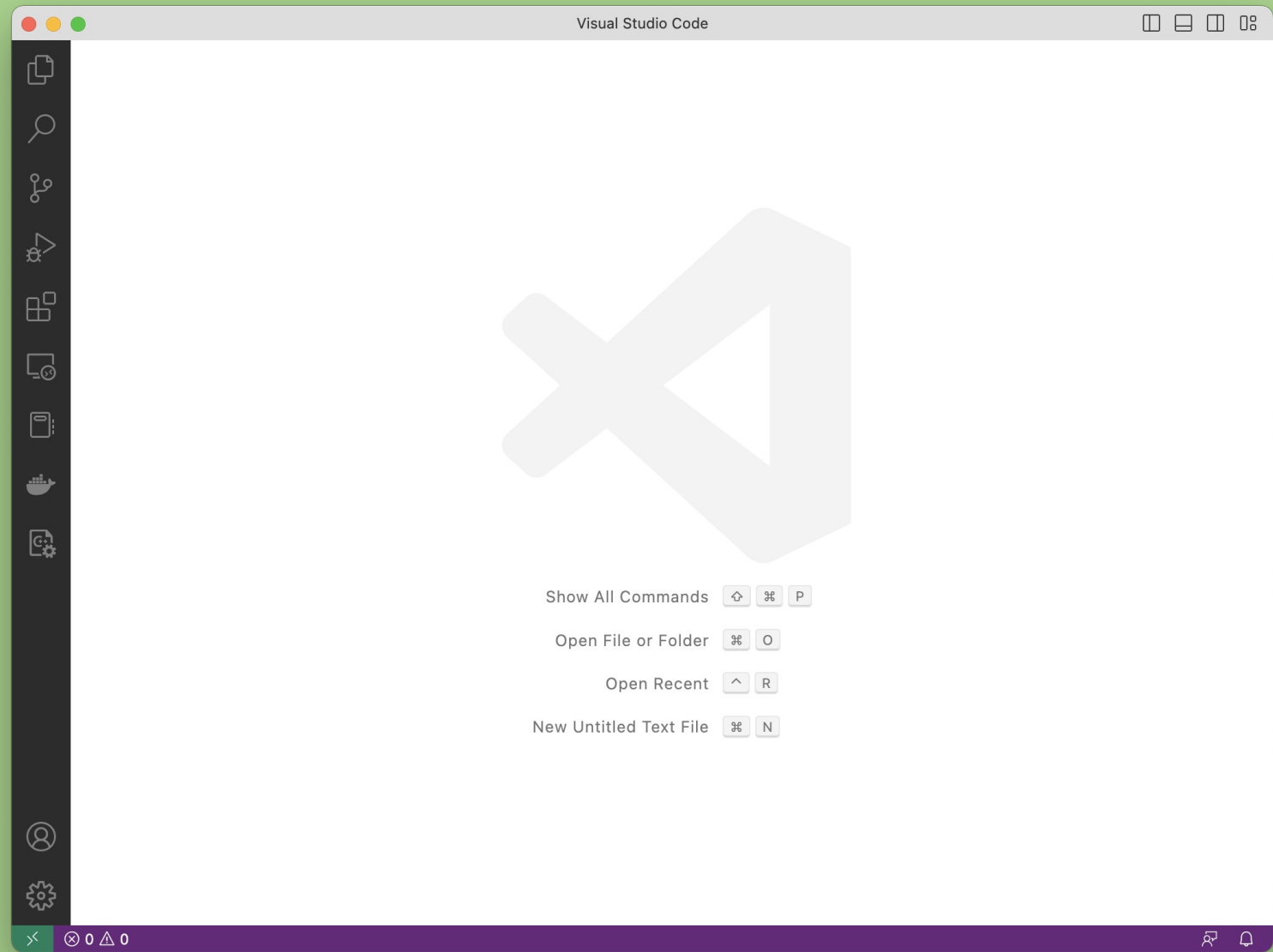
Logical network architecture



Xylo digital SNN architecture

Digital LIF Neuron







- PyTorch, Jax backends
- GPU/CUDA, TPU, MPS acceleration
- Constrained optimization for SNNs
- Time constant & threshold training
- Deployable adaptive LIF models
- Quantization-aware training
- Mixed-signal HW-aware training
- Easily extensible
- Open source ♥