



## A Deep Learning Library Built around Energy

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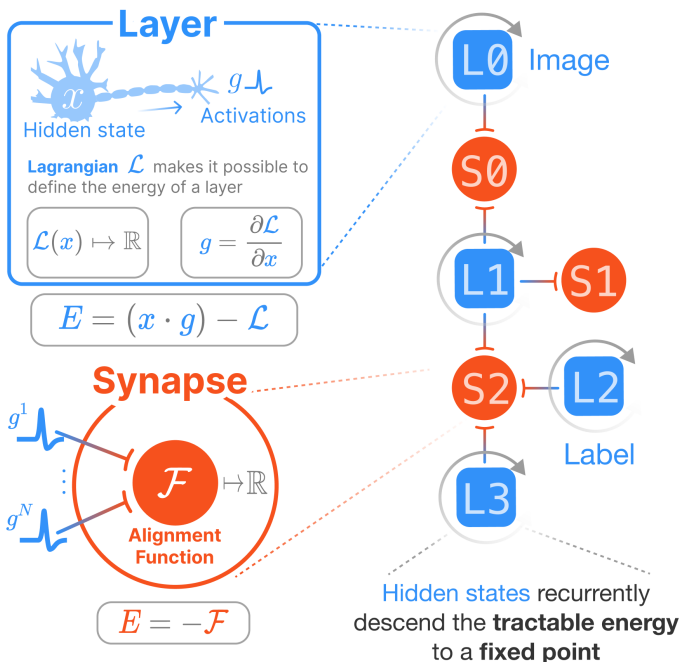
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### HAMUX lets anyone easily build & train HAMs at scale

- HAM:  Any #layers  Any differentiable ops  Many-body synapses
- Hopfield Net:  2 layers  Linear operations  Pairwise connections



```

1 layers = [
2   0 IdentityLayer((3,32,32)),
3   1 ReLUlayer((2000,)),
4   2 TanhLayer((10,)),
5   3 SoftmaxLayer((1000,)),
6 ]
7 synapses = [
8   0 ConvSynapse(kernel_size=(3,3)),
9   1 SelfAttentionSynapse(num_heads=4),
10  2 DenseSynapse()
11 ]
12 connections = [
13   ((0, 1), 0),
14   ((1, ), 1),
15   ((1, 2, 3), 2)
16 ]
17 ham = HAM(layers, synapses, connections)
    
```

$$E_{\text{HAM}} = \sum_{\text{layer}} E + \sum_{\text{synapse}} E$$



```

def classify(ham, IMAGE, DEPTH, STEP_SIZE):
    xs = ham.init_states()
    xs[0] = IMAGE
    for i in range(DEPTH):
        dEdgs = ham.dEdg(xs)
        xs = [(x - STEP_SIZE*dEdg) for (x, dEdg) in zip(xs, dEdgs)]
    return xs[2] # LABEL
    
```

