Neural Networks Fail to Learn Periodic Functions and How to Fix It

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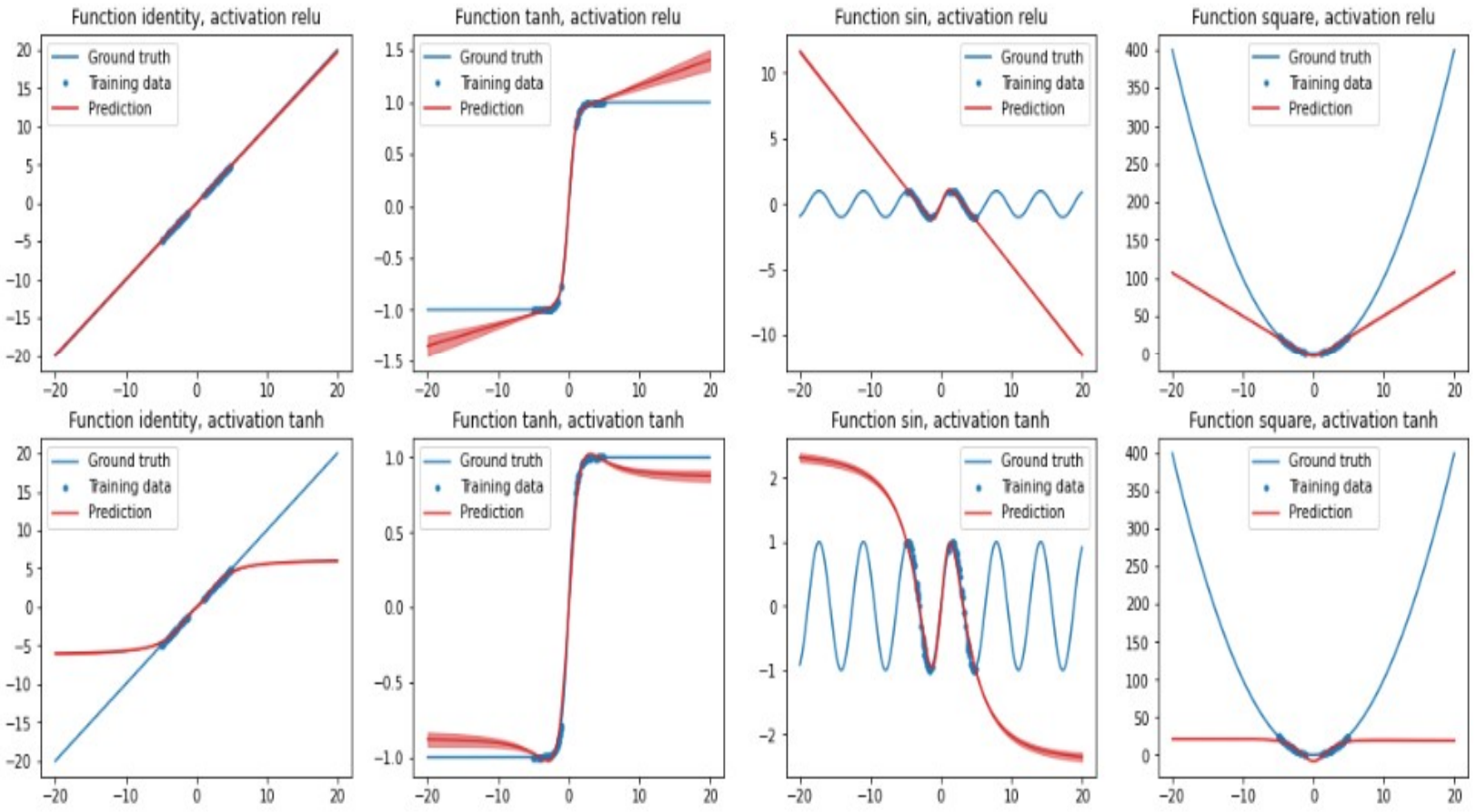
- The paper uses experimental evidence to show that common activations like ReLU, tanh, sigmoid, and their variations are all incapable of learning how to extrapolate basic periodic functions.

- The research went on to suggest a new activation, which is referred as the snake function.

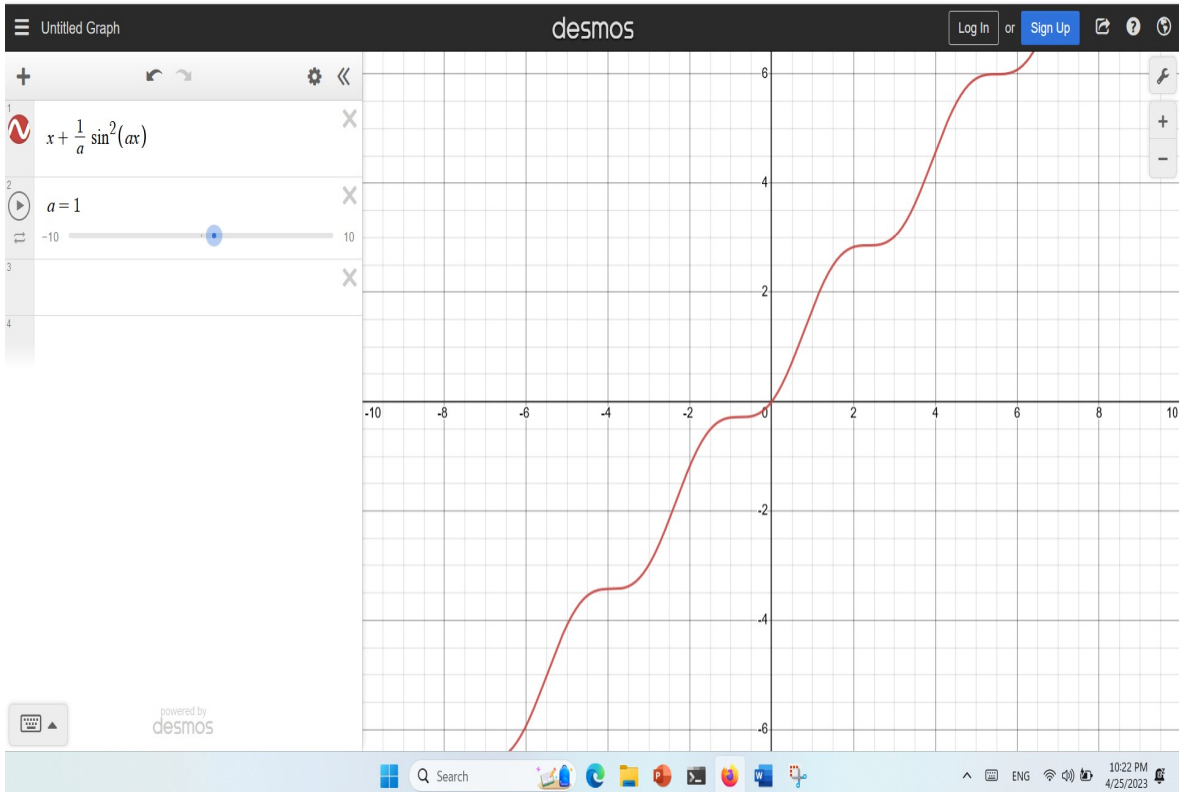
•Github Link - https://github.com/dipenpadhiyar/AML-reproducibility

Extrapolation experiments on several functions

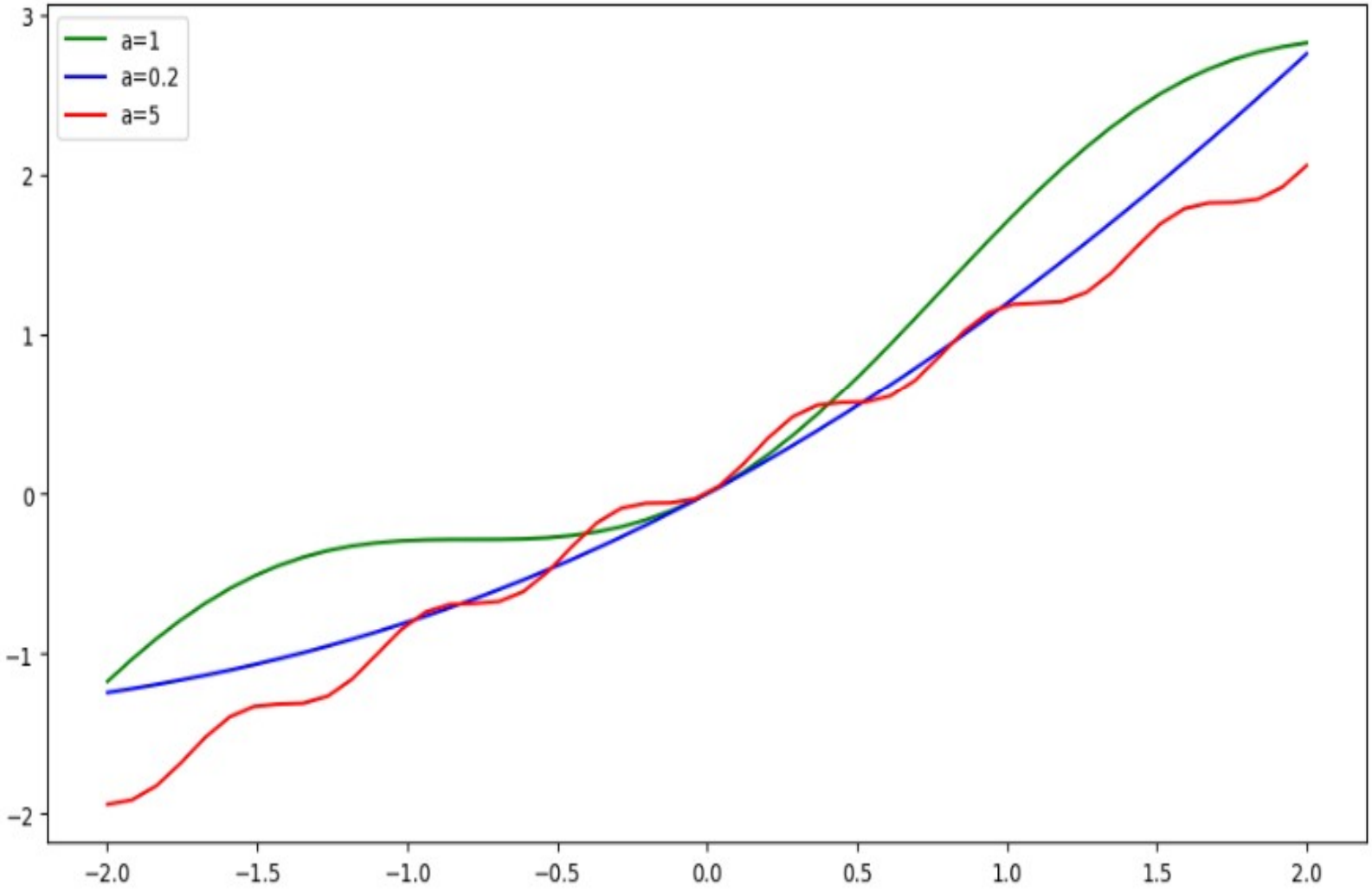


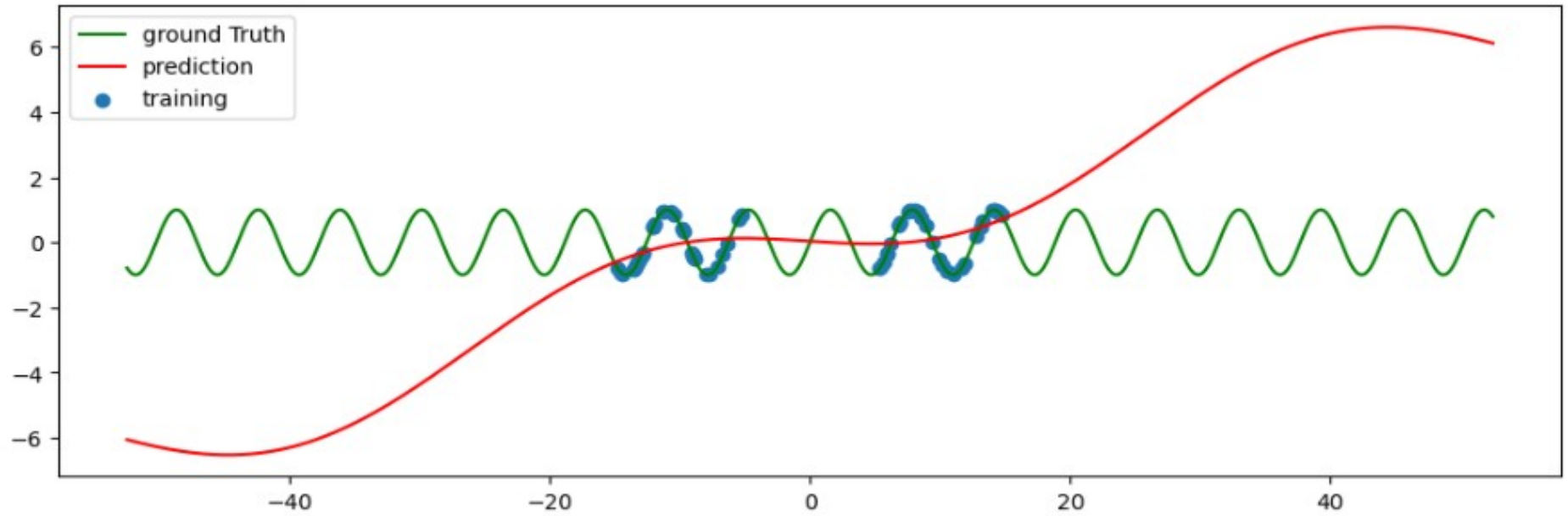
Snake Function

$$snake_a(x) := x + \frac{1}{a} sin^2(ax)$$



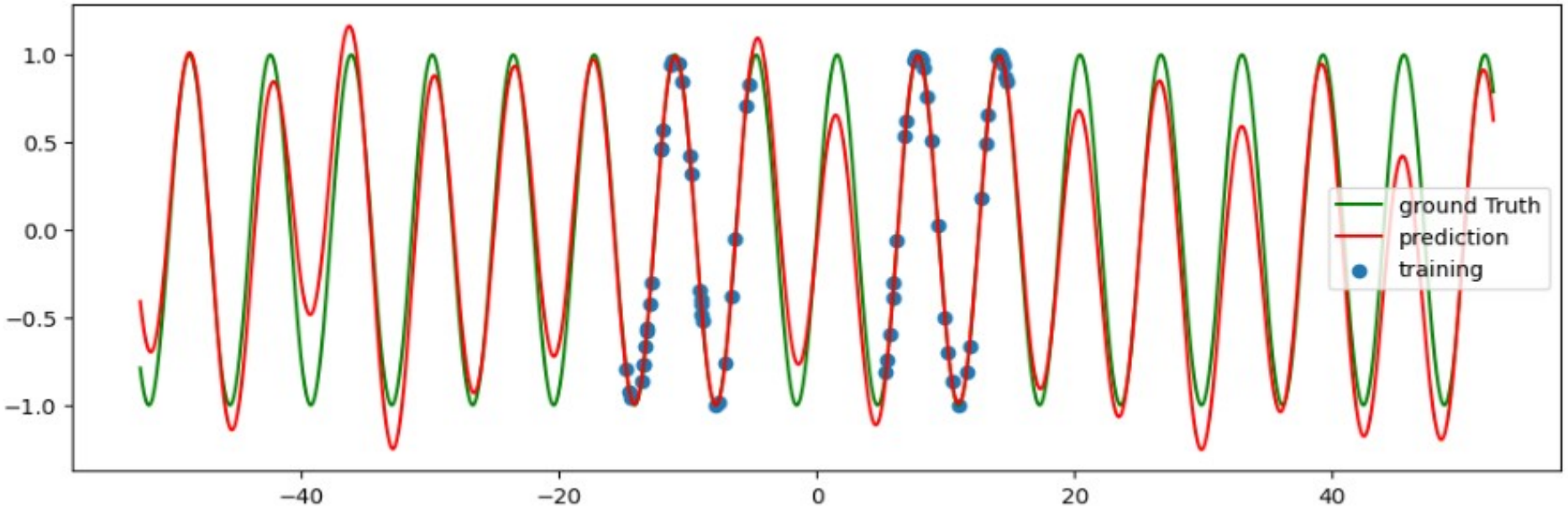
Snake_(hyperparameter-a)



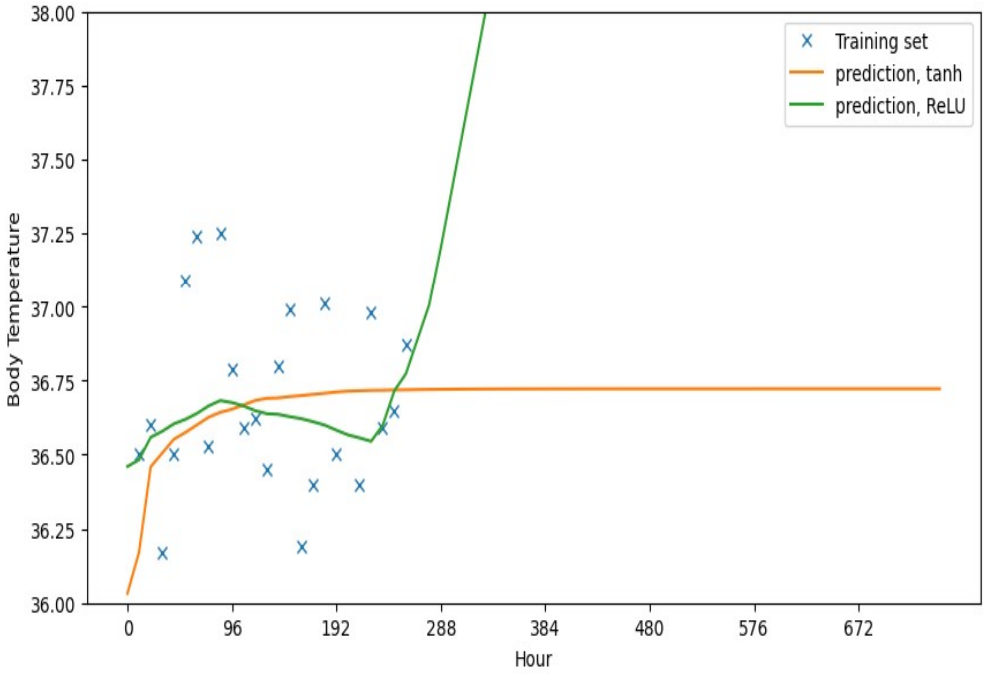


Sin function with Sin as Activation

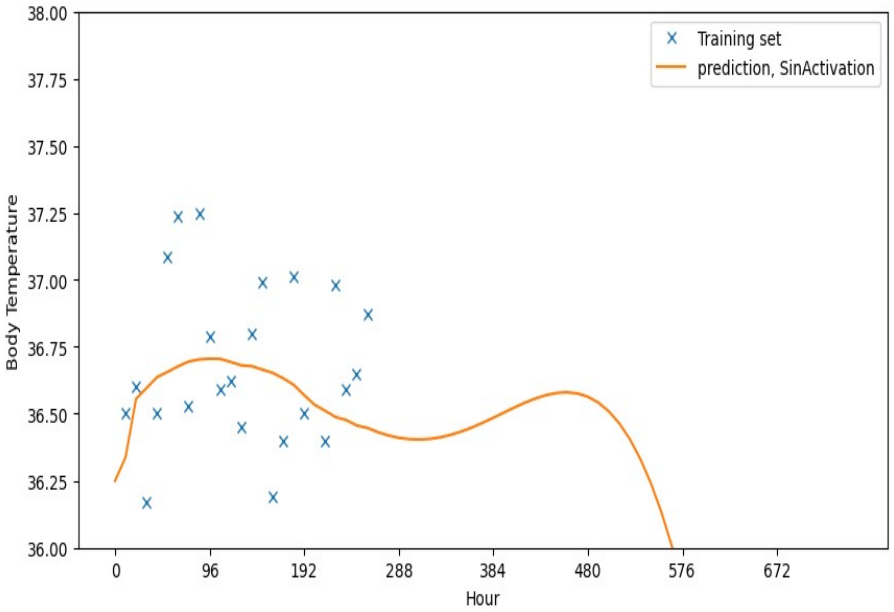
Sin function with Snake as Activation



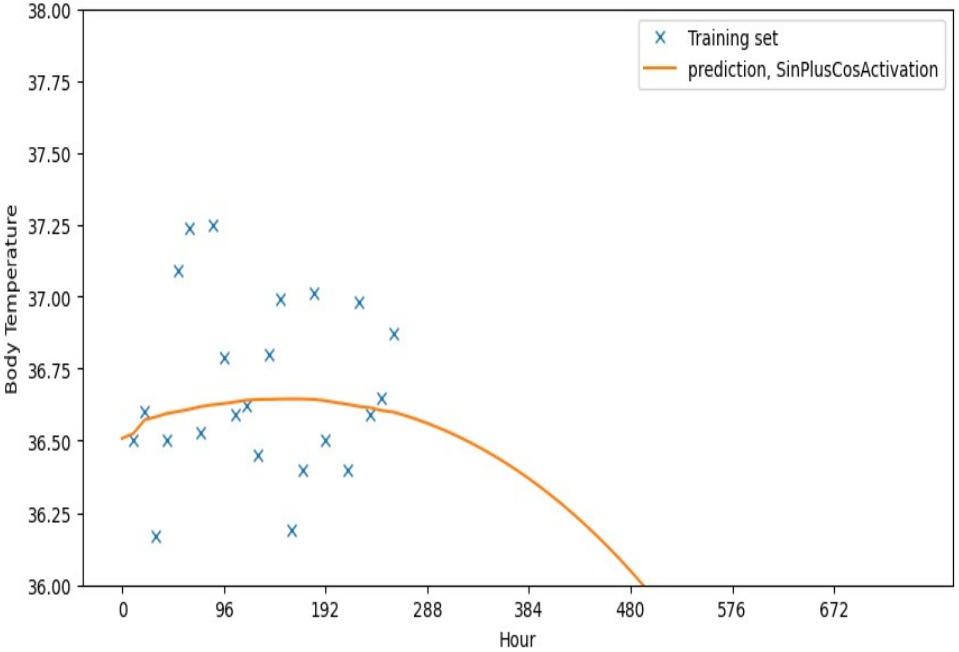
Body_temp_regre_scratch_keras



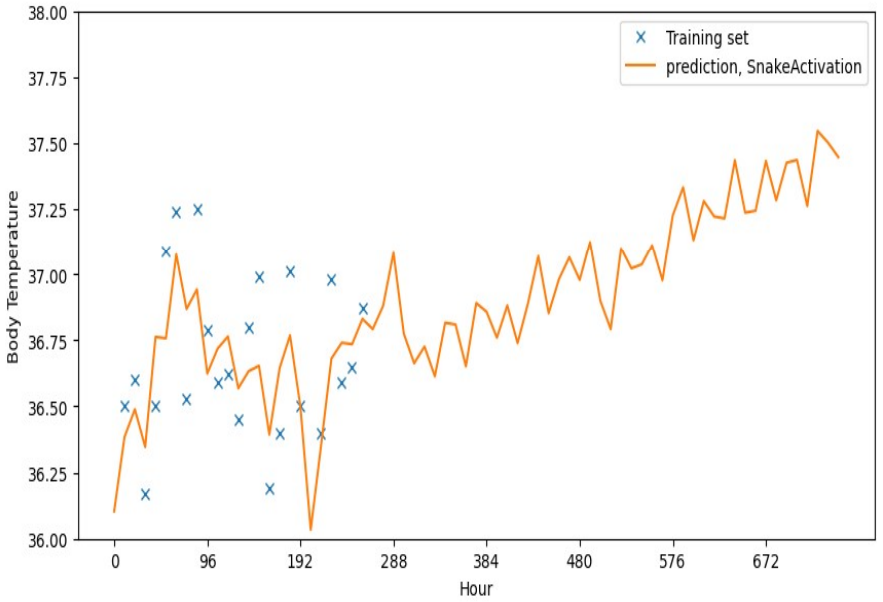
activations = ["tanh","relu"]
labels = ["tanh","ReLU"]



activations = ["SinActivation"]
labels = ["SinActivation"]

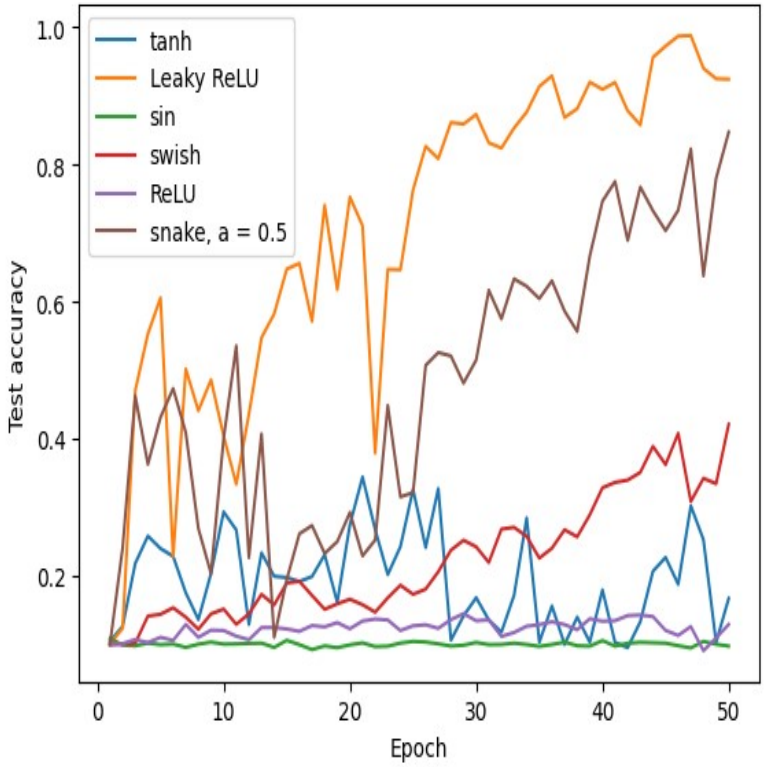


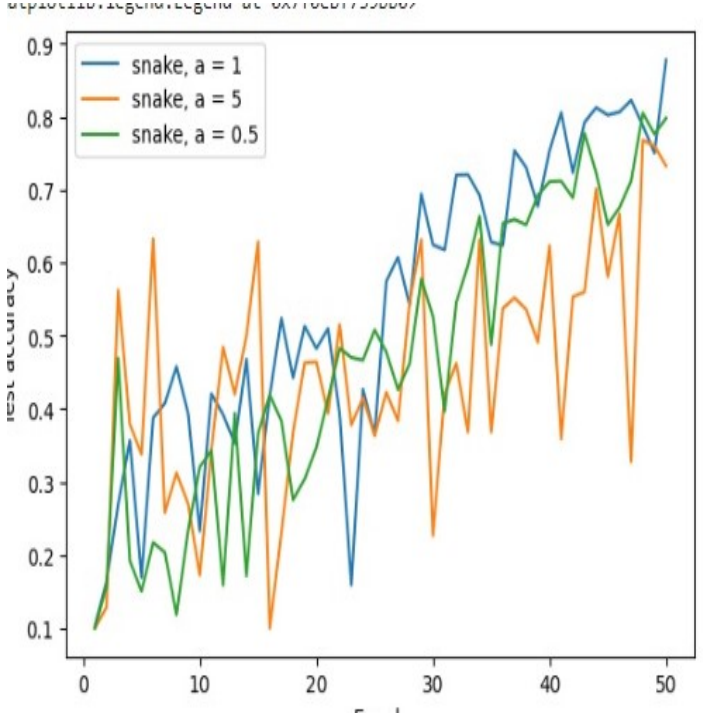
activations = ["SinPlusCosActivation"]
labels = ["SinPlusCosActivation"]



activations = ["SnakeActivation"]
labels = ["SnakeActivation"]

resnet50_cifar10





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