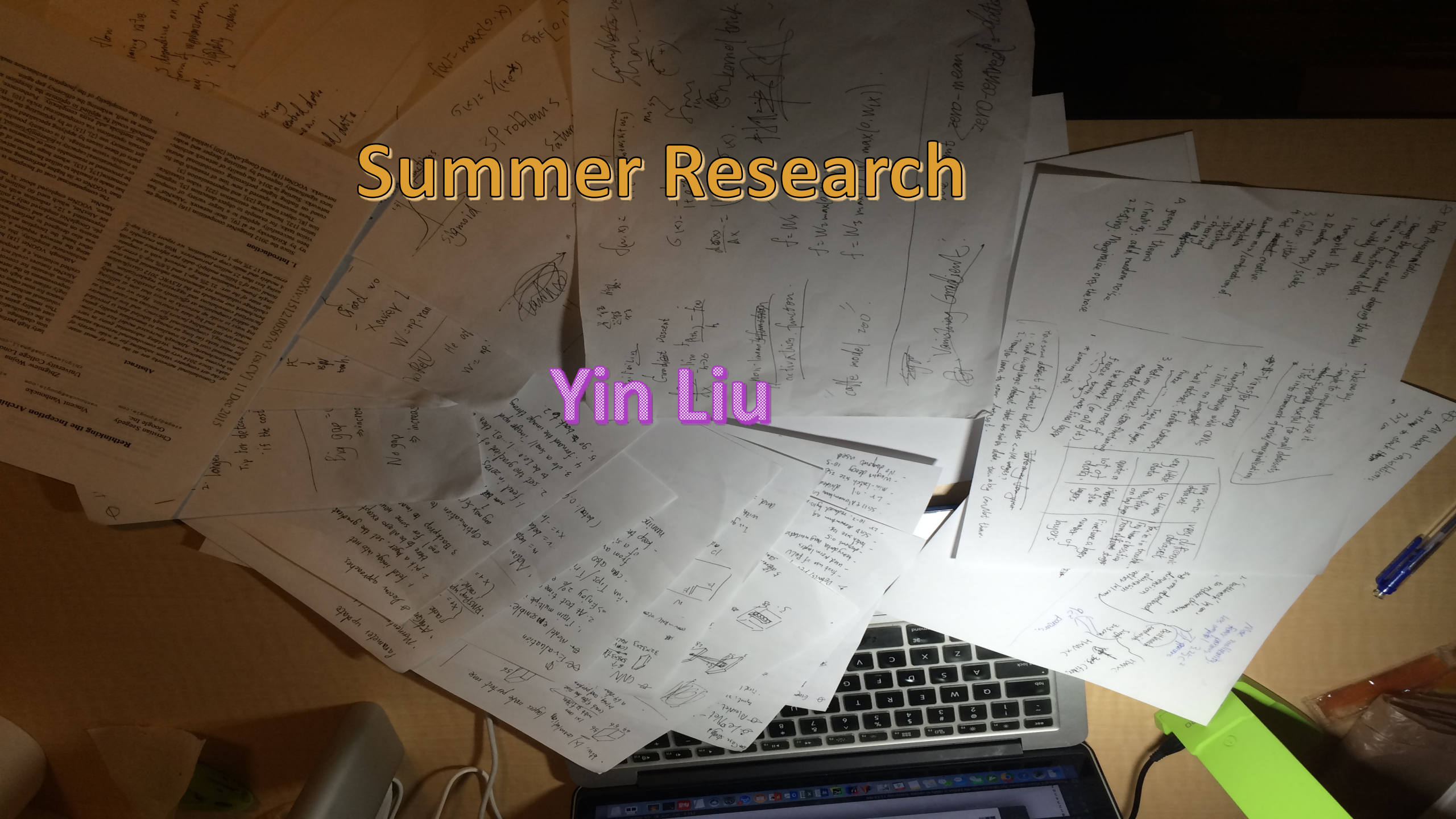

Summer Research
Yin Liu

I mainly worked on designing experiments to understand the generalization ability of deep neural networks with different architectures

- Traditional Conv Net
- ResNet
- DenseNet

Traditional ResNet DenseNet

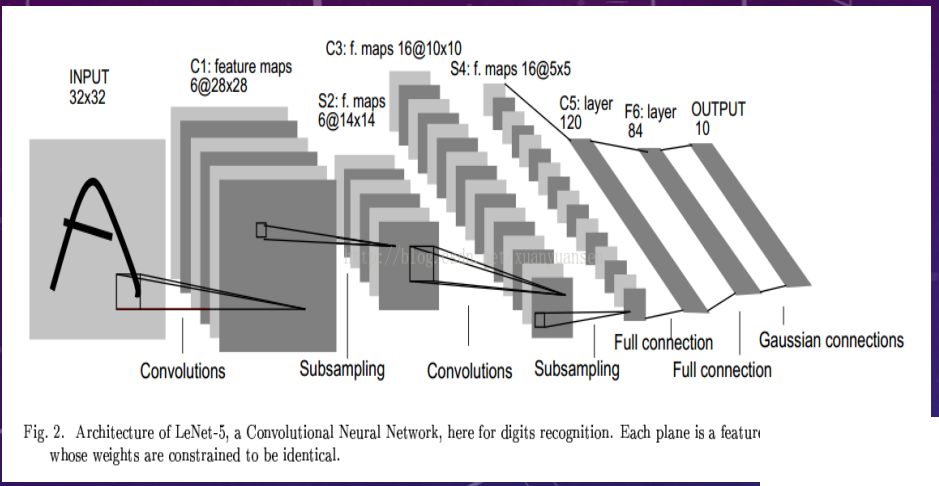
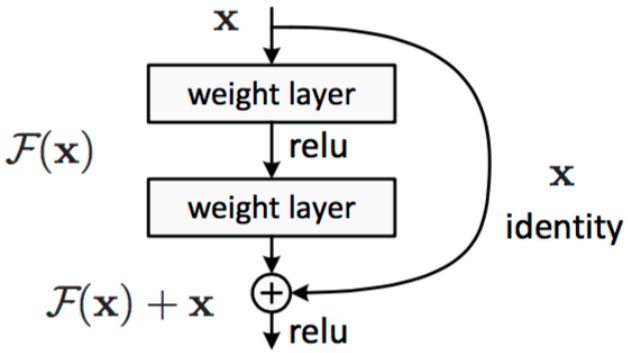
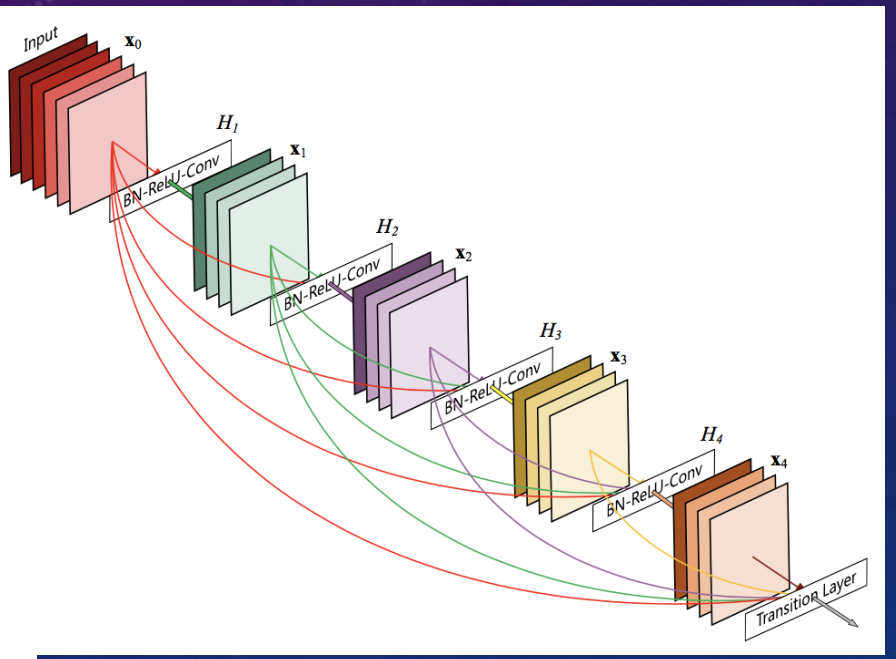


Fig. 2. Architecture of LeNet-5, a Convolutional Neural Network, here for digits recognition. Each plane is a featur
whose weights are constrained to be identical.





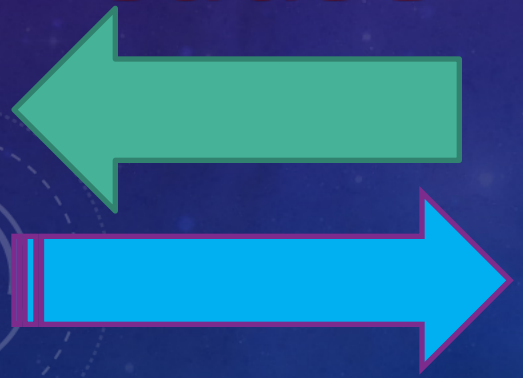
Weight Decay (to DenseNet)

$$L_\lambda(\mathbf{w}) = L(\mathbf{w}) + \lambda \|\mathbf{w}\|_2^2$$

Default mode: λ doesn't vary throughout the whole net.

Adjustment: make λ change gradually with depth of the same net

Cause

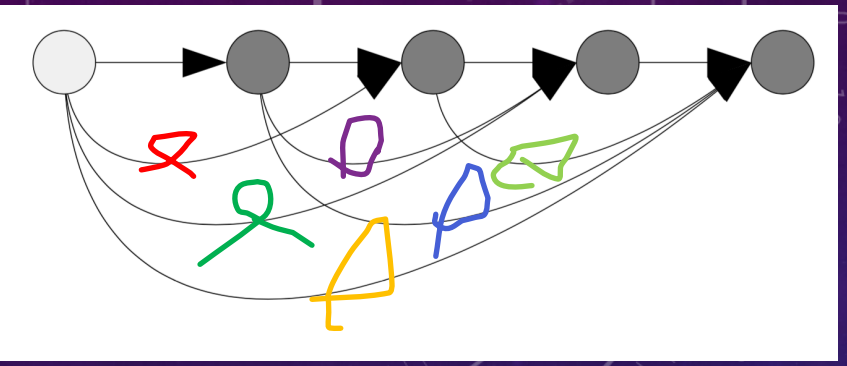


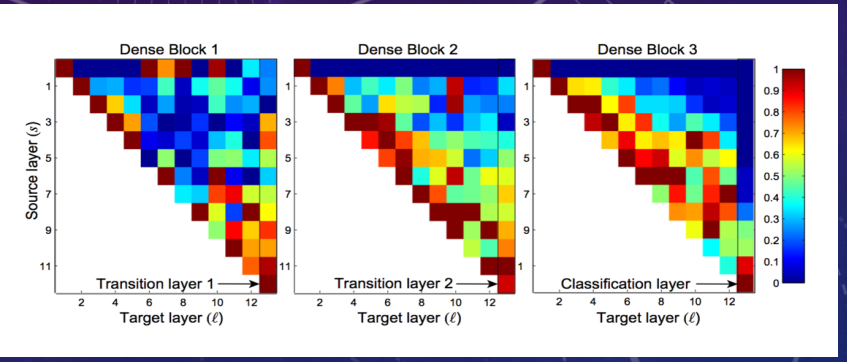
Experiment

I think there may exist some differences between low-level features and high-level features.

Weight Decay (to DenseNet)

Not an easy stuff:





What's the gradual form

- Linear?
- Exponential?
- Other form?

Which to base on?

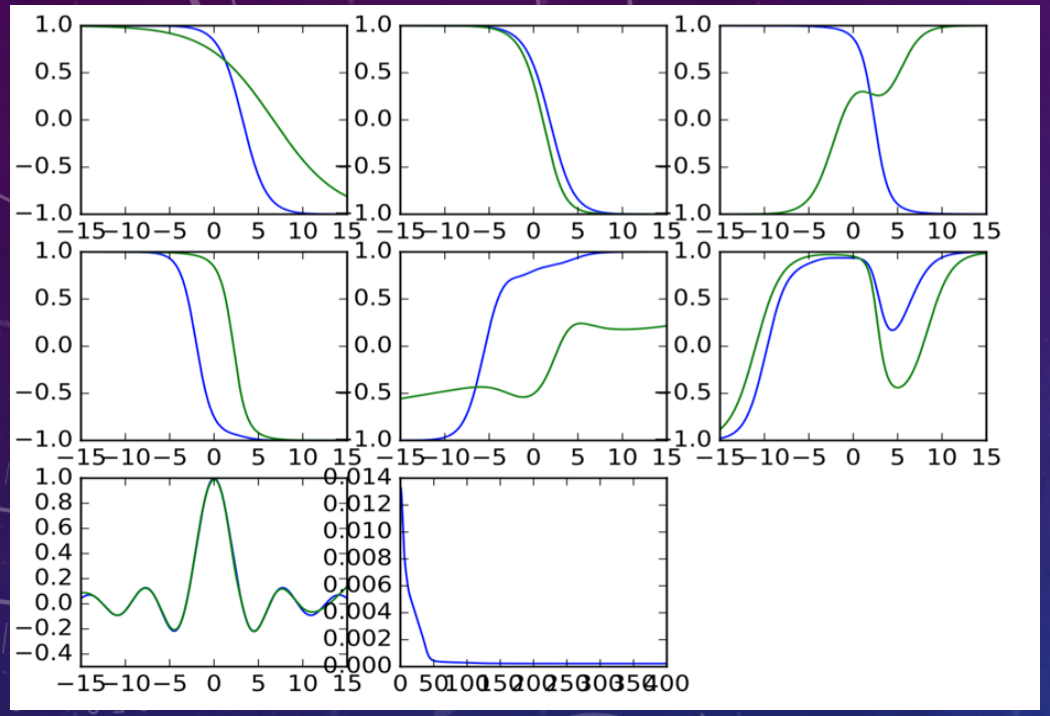
- Distance between two layers?
- Position of source layer?
- Position of target layer?

Which layers to modify?

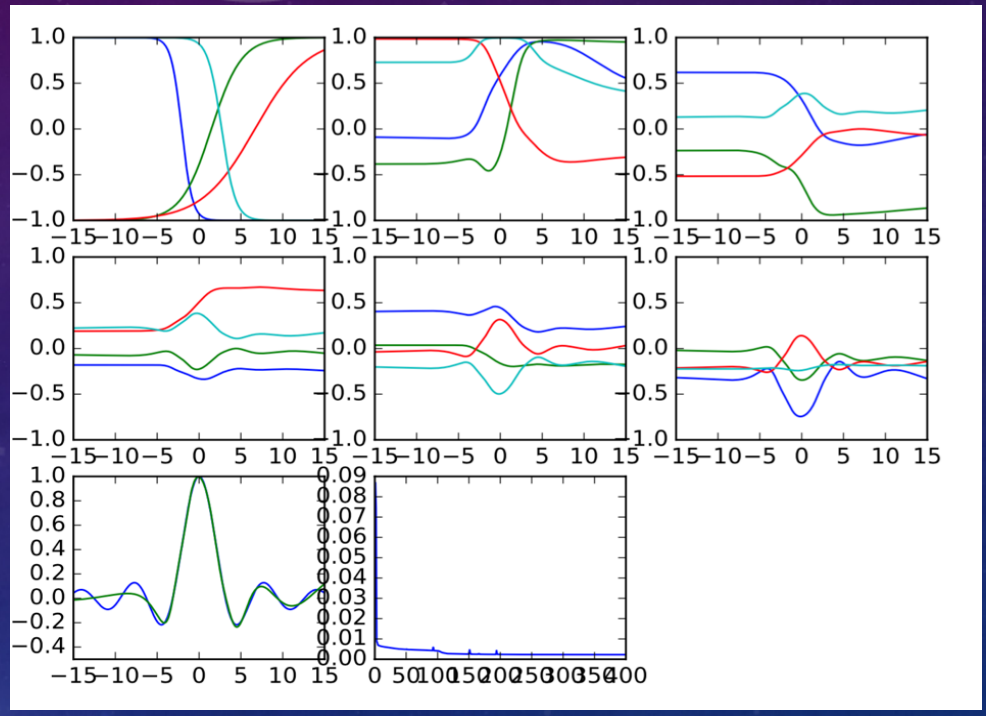
- Conv?
- Batchnorm?

I am still working on it…

Curve Fitting



Dense

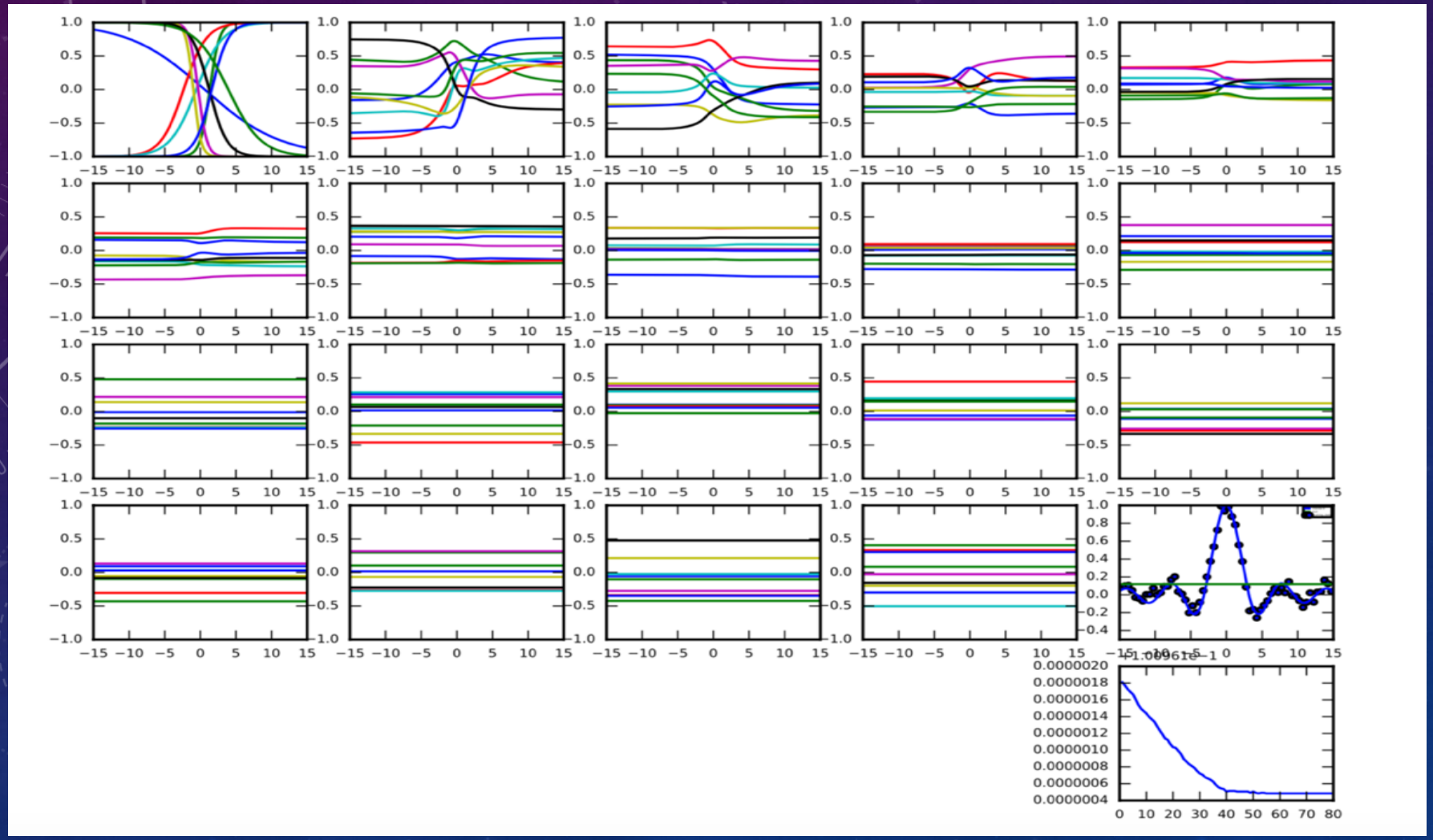


Plain

Curve Fitting

Traditional one

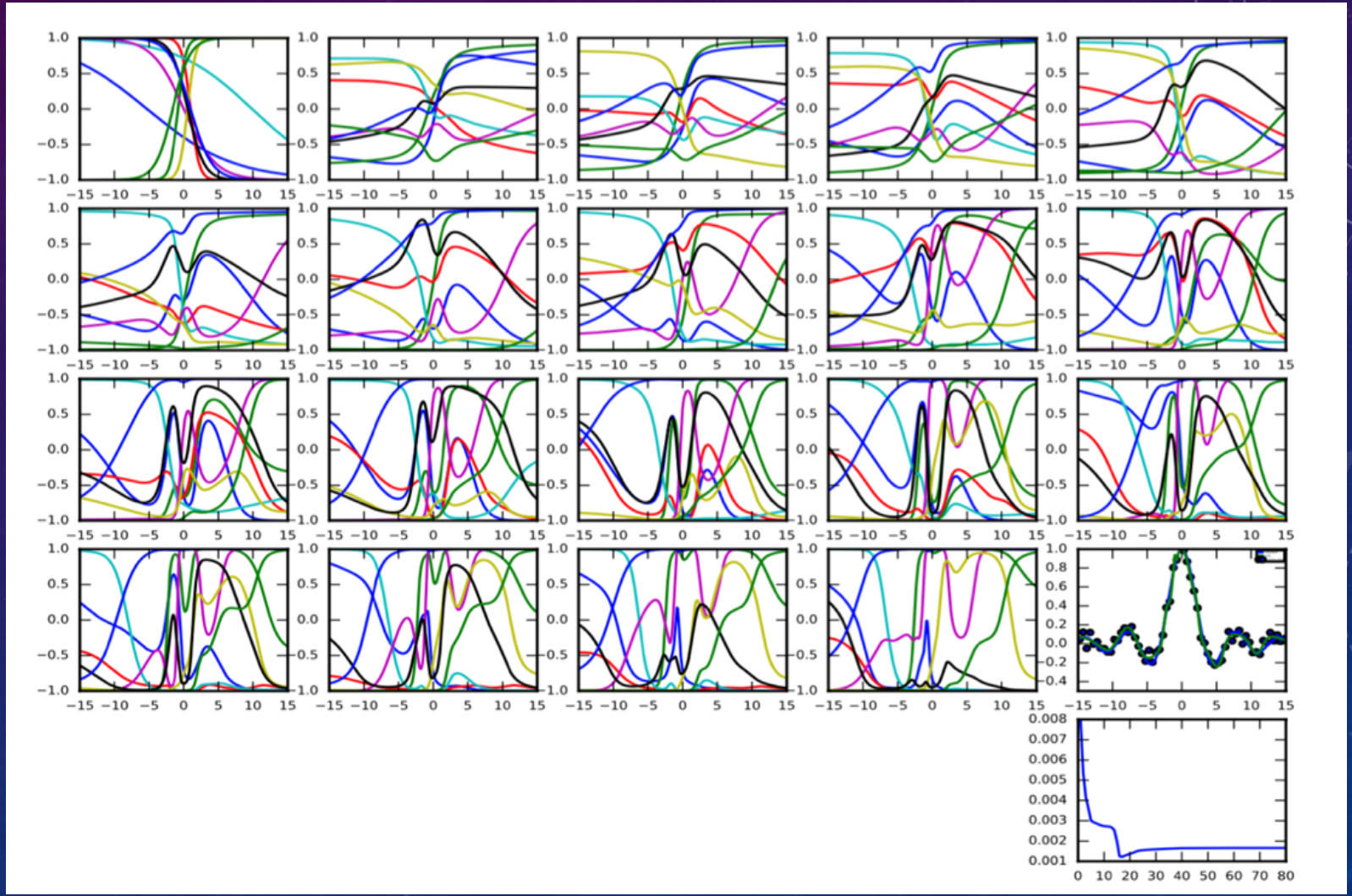
Worst, vanishing gradient



Curve Fitting

With Residual connection

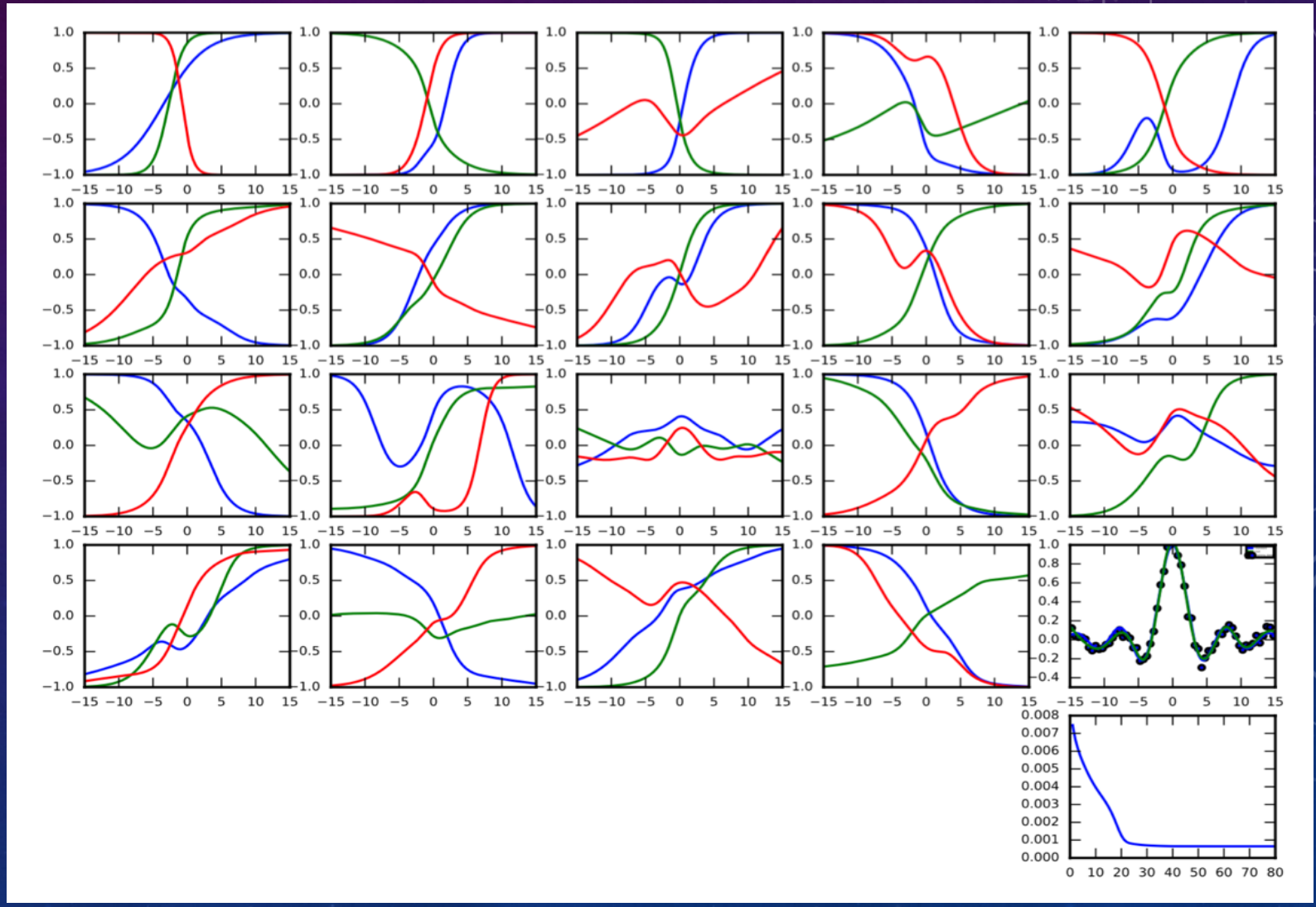
Complicated and more accurate than traditional one



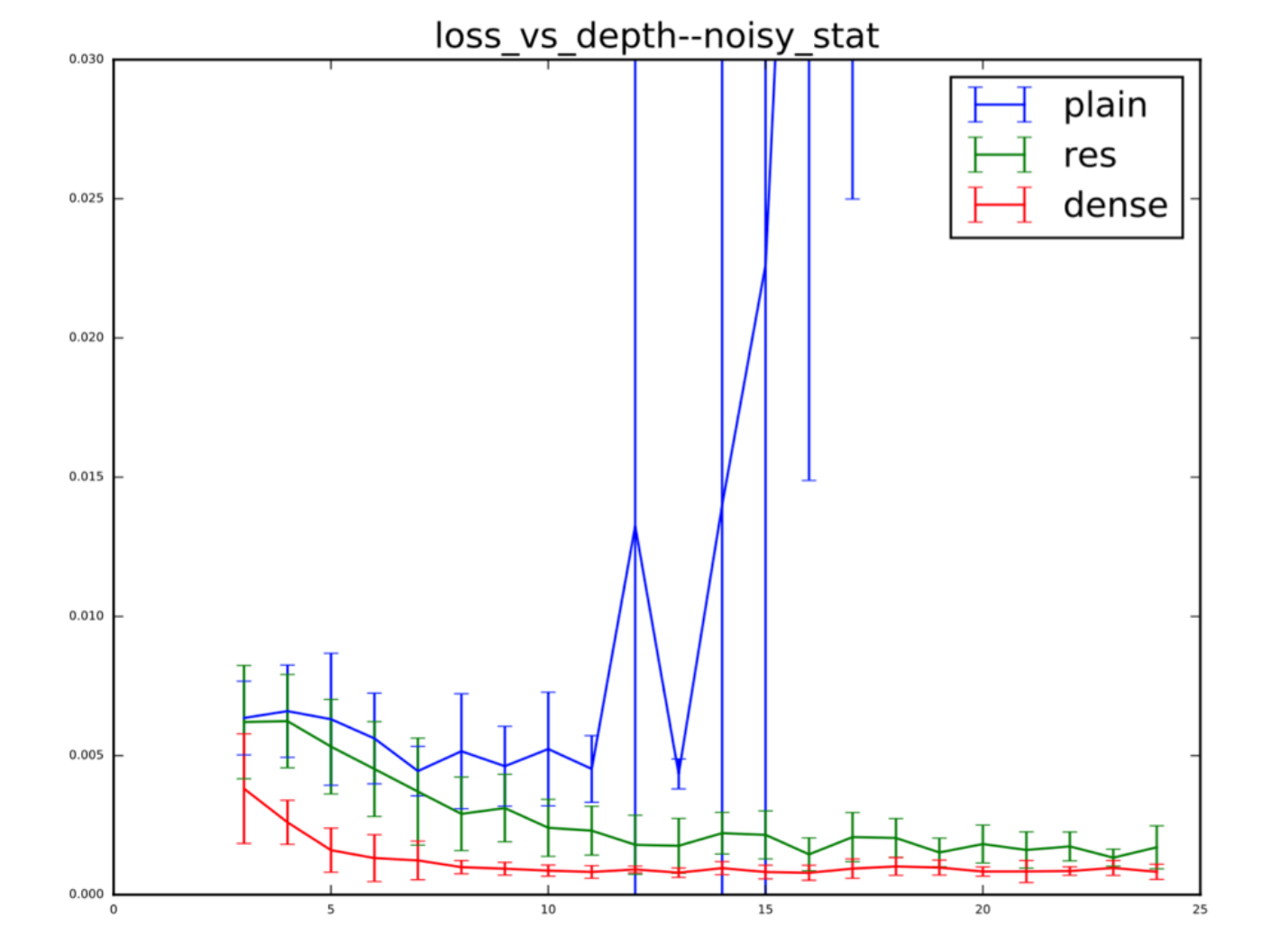
Curve Fitting

With dense connectios

Simple and accurate



Curve Fitting



Results

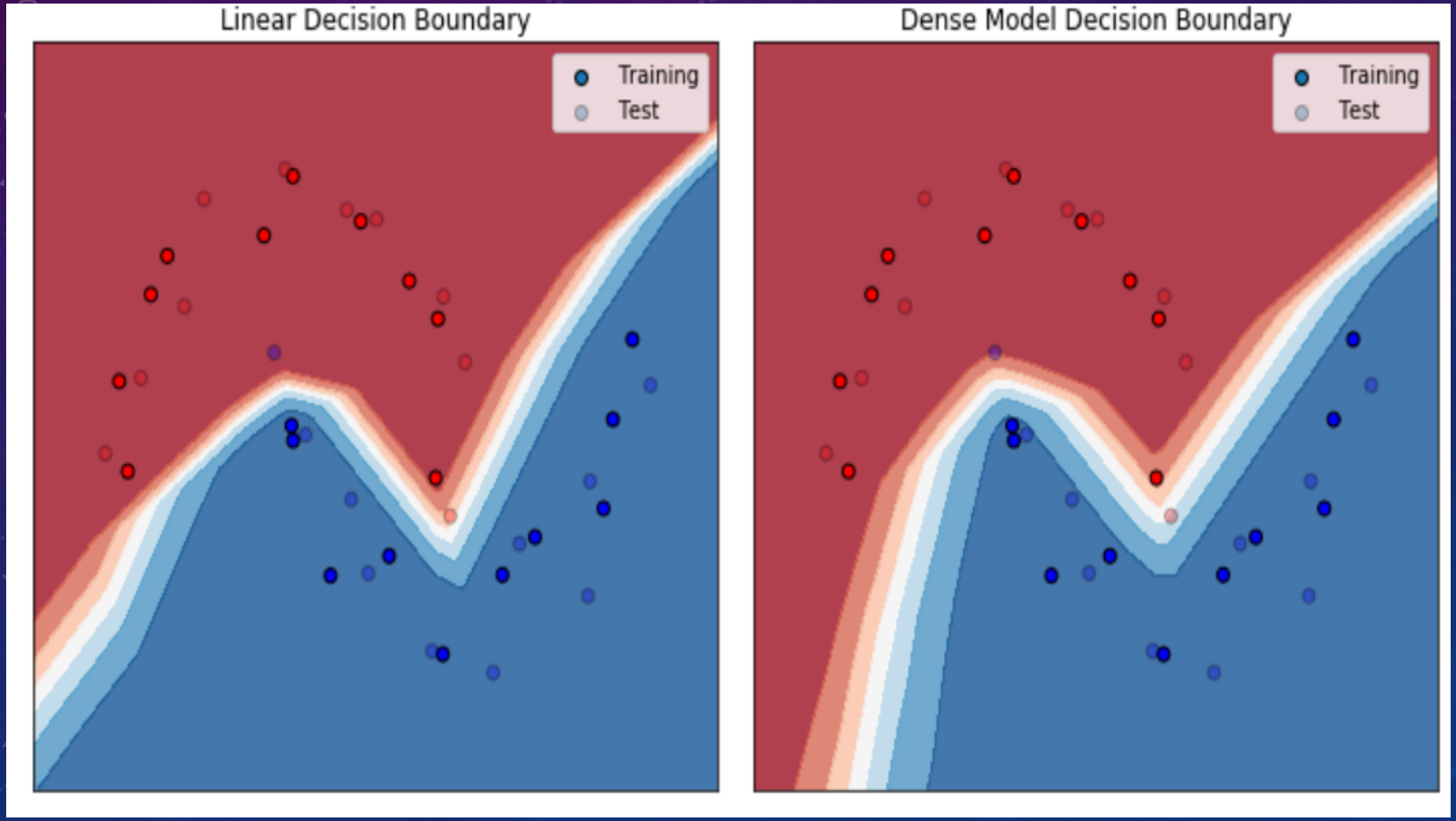
Simple output from each layer.

Net with dense connection can do the regression best.

I think we can rethink about this interesting architecture and its tremendous learning power.

2-dimension decision boundary

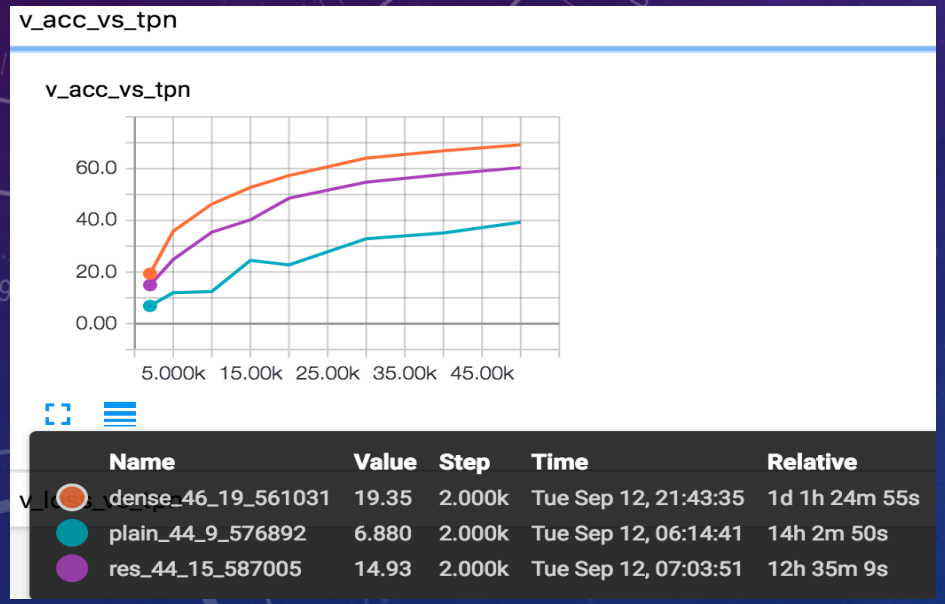
My partner’s work



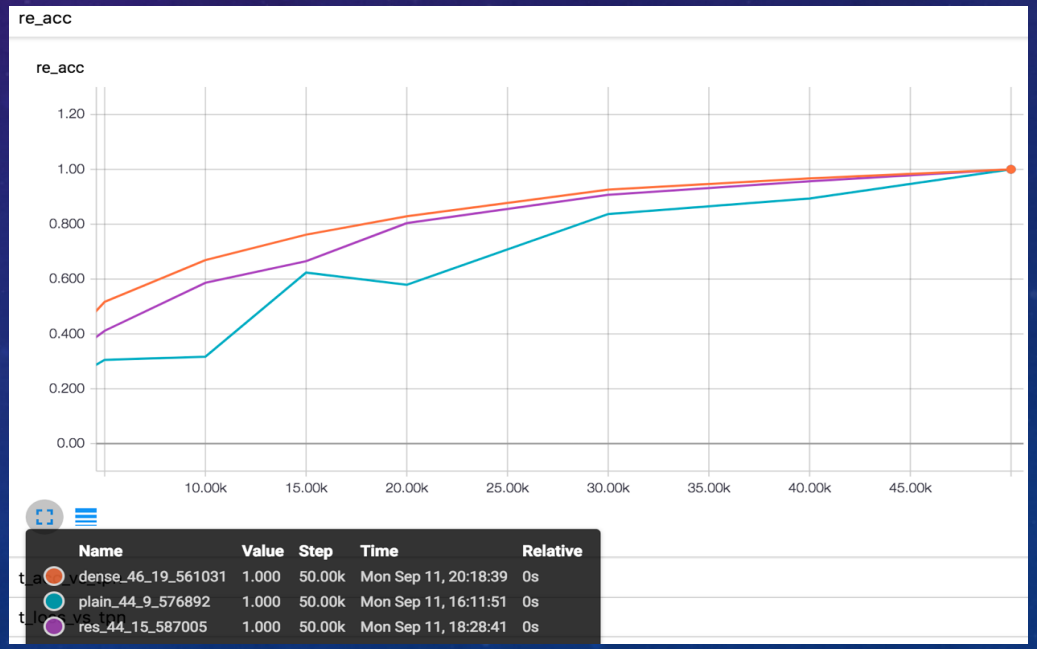
Findings when condition is bad

Insufficient training data

Absolute validation accuracy

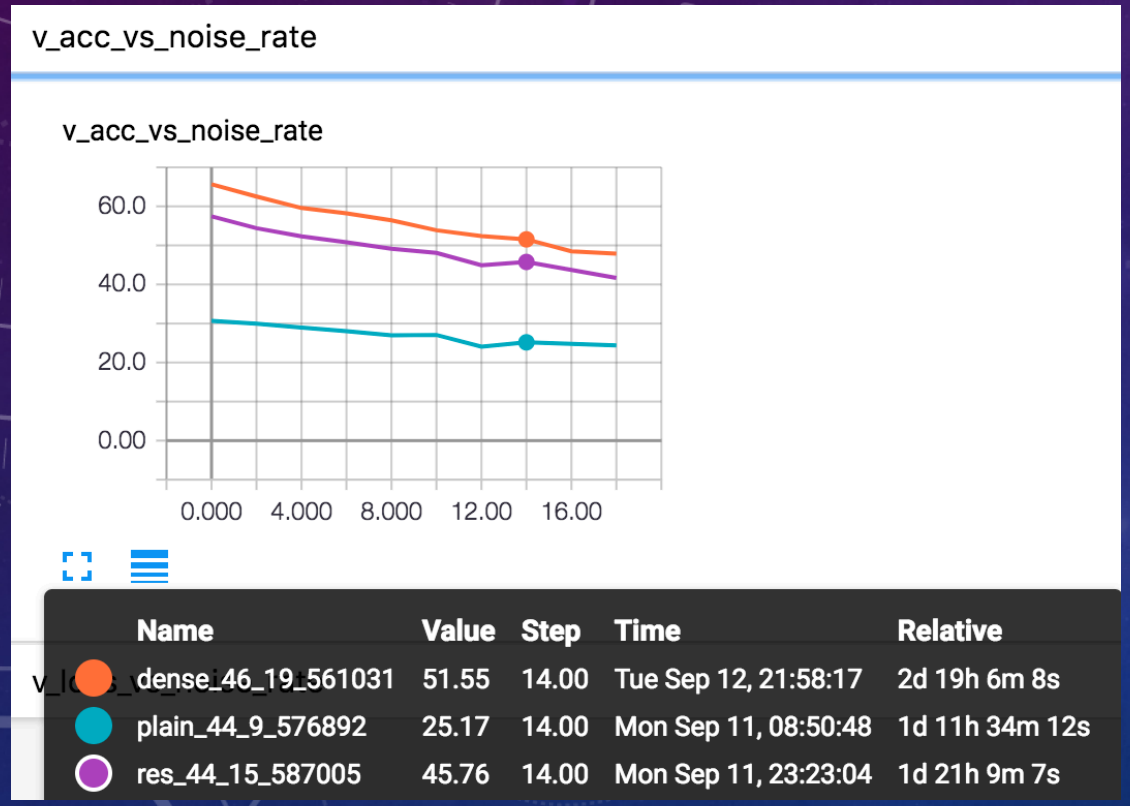


Relative



Findings when condition is bad

Noise



It is supposed to be like when doing relative comparison, the dense one will also be the best and the gap will exist with the increase of noise.

Thank you!