

## 1. Reading

Neural Networks and Deep Learning, A Textbook. Charu C. Aggarwal

Chapter 1

1.2, (1.3)

Chapter 2

2.5, (2.2)

## 2. Autoencoder by PyTorch

### 3. Autoencoder for ADL

Architecture

- $10 - n_z - 10$ ,  $n_z = 1, 2, 3$
- $10 - n - n_z - n - 10$ ,  $n_z = 1, 2, 3$ ,  $n = 5, 10, 20$

Activation

- ReLU, TanH, ...

Training setting

- 80% training, 20% testing
- Or other settings.

Training methods

- SGD, Adam, ...

Number of epochs

Comparison of model fitness

Interpretation

- Scatter plots of inputs vs codes
- Means of codes grouped by input level
- Correlation between of inputs vs codes
- Gradient of codes respect to inputs.
- Labels for codes

## 4. Factor analysis

statsmodels.multivariate.factor (or scikit-learn)

principal component method, maximum likelihood method

varimax rotation, oblimin rotation

1 factor, 2-factors (3-factors)

Loadings plot

Comparison of model fitness

Labels for factors

## 5. Principal component analysis

statsmodels.multivariate.pca (or scikit-learn)

1 pc, 2 pcs, 3 pcs

Comparison of model fitness

Labels for components

## 6. Repeat (1) and (2) based on one-hot values.

7. Predict care givers' depression    **original, AE (continuous+onehot), FA, PCFA**  
G2c as output                                    **Draw AUROC (train+valid)**  
All original items as inputs  
Build a supervised deep learning (Binary Classifier)

G2c as output  
Codes for moods and behaviours and other covariates.  
Build a supervised deep learning (Binary Classifier)

8. Simulation                    **only AE part**  
1-, 2-, 3-factor model  
Mixture