PSY9511: Seminar 7

Deep learning for computer vision tasks

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Outline

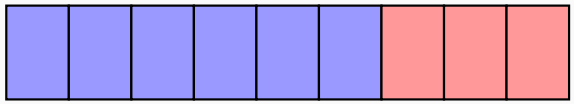
1. Exercise 4
2. Deep learning
    - Motivation
    - (Deep) neural networks
    - Training procedure
3. Convolutional neural networks for computer vision

Weekly exercises

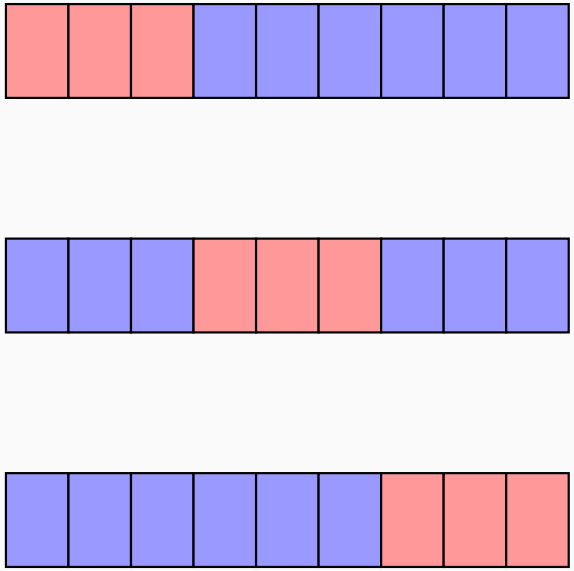
- The weekly exercises are **mandatory**
- The deadlines are **strict**

Validation procedures

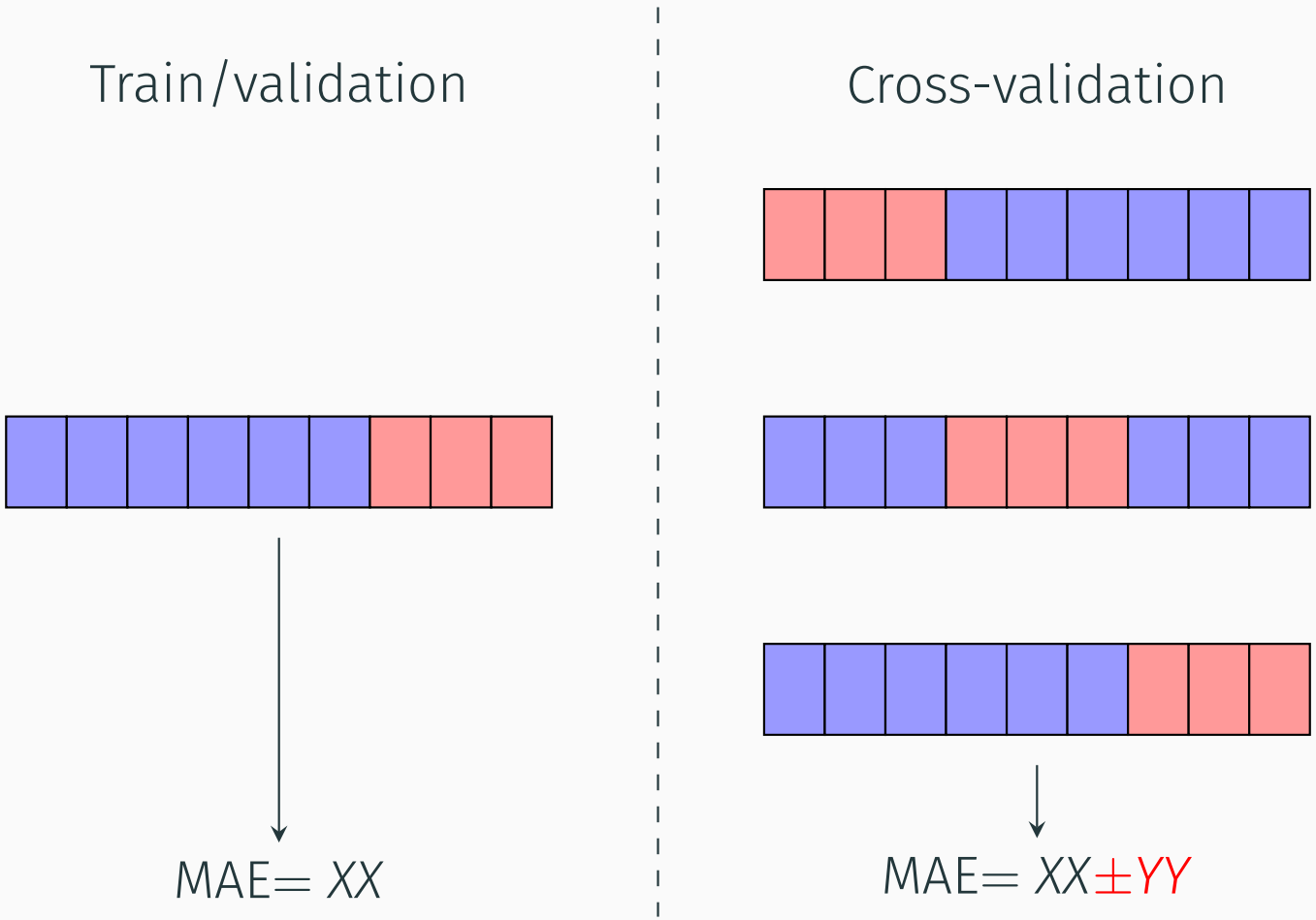
Train/validation



Cross-validation



Validation procedures



Deep learning

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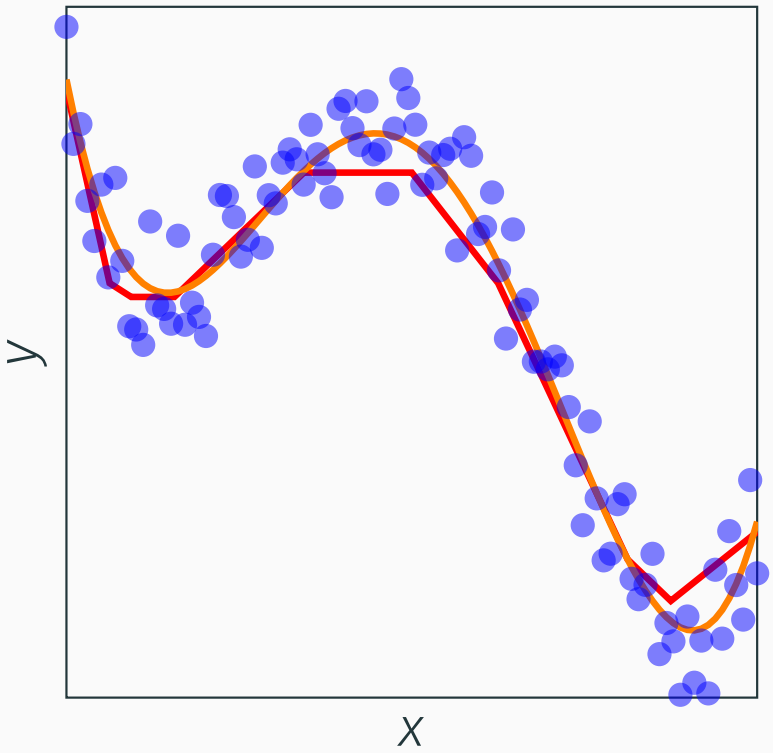
Deep learning: The conundrum

Splines: A smooth curve implemented via piecewise polynomial functions

Neural networks: A piecewise linear function implemented as a hierarchy of artificial neurons



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- Requires us to carefully balance the complexity of the function

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Deep learning: The conundrum

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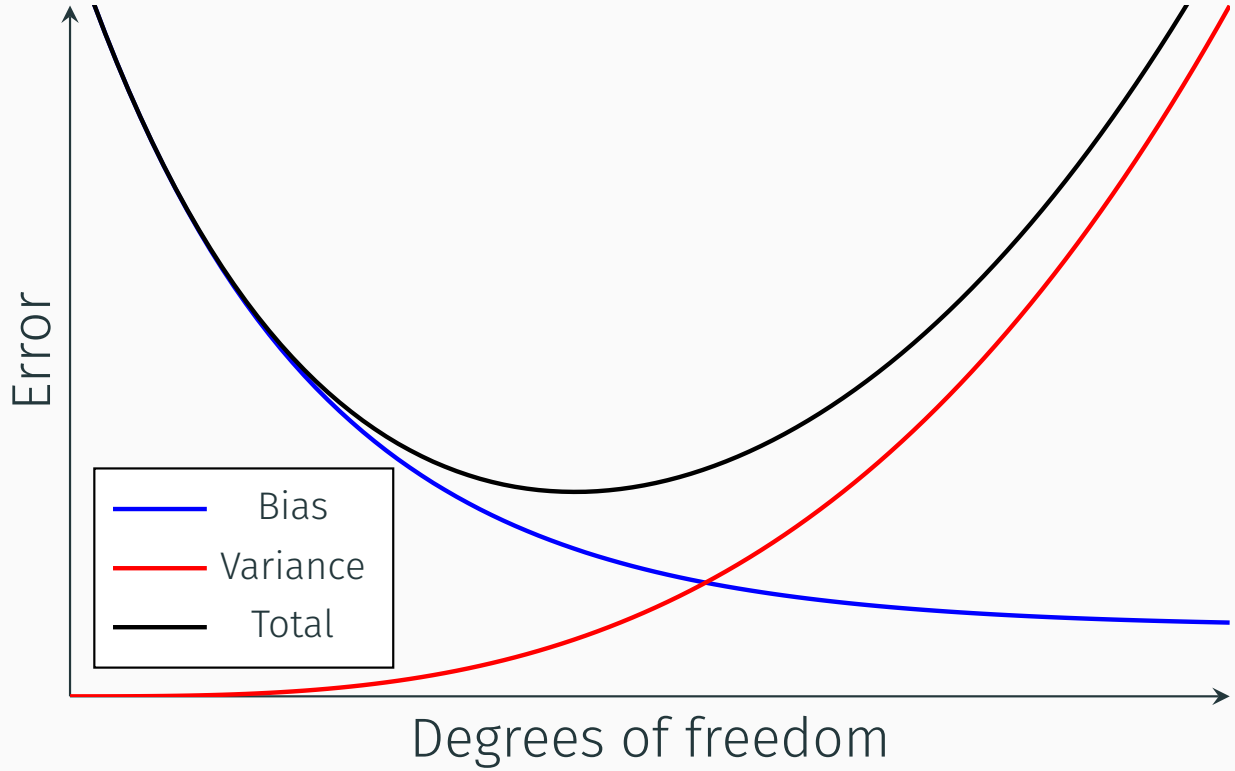
- Requires us to carefully balance the complexity of the function

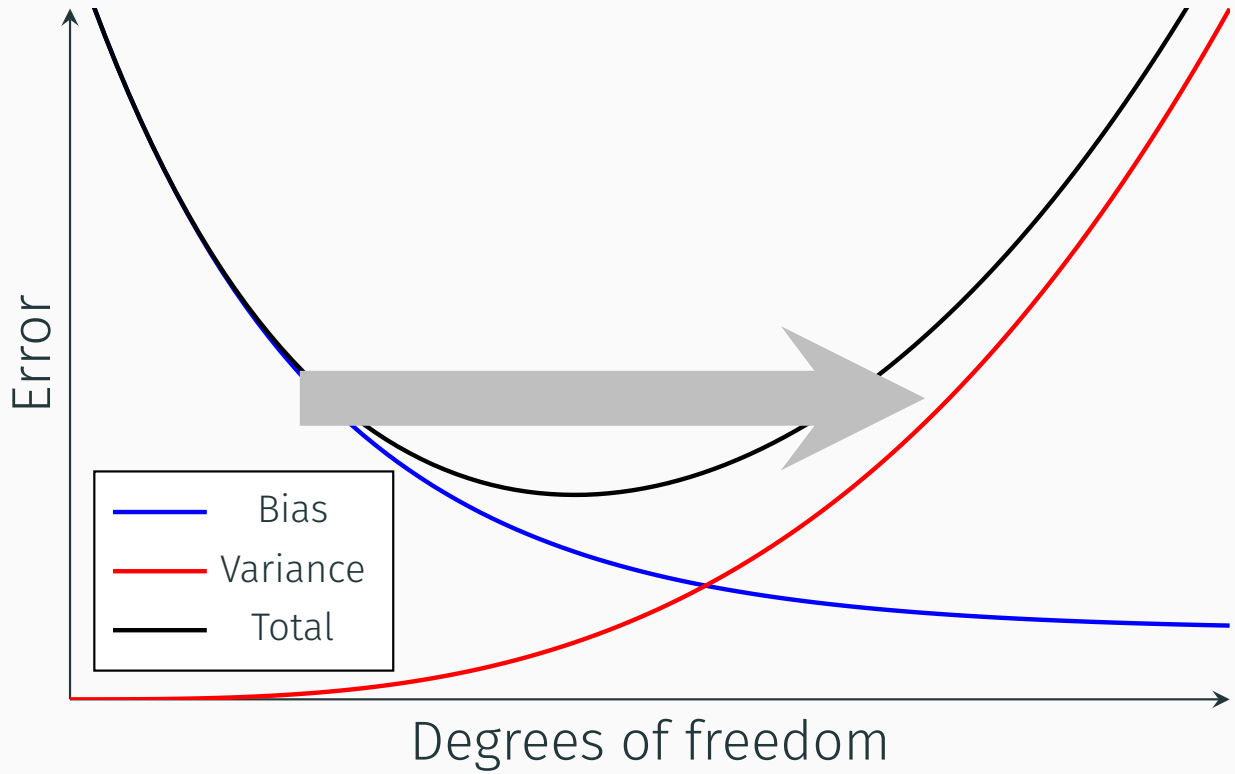
Neural networks: A piecewise linear function implemented as a hierarchy of artificial neurons

- Overparameterization 🥳

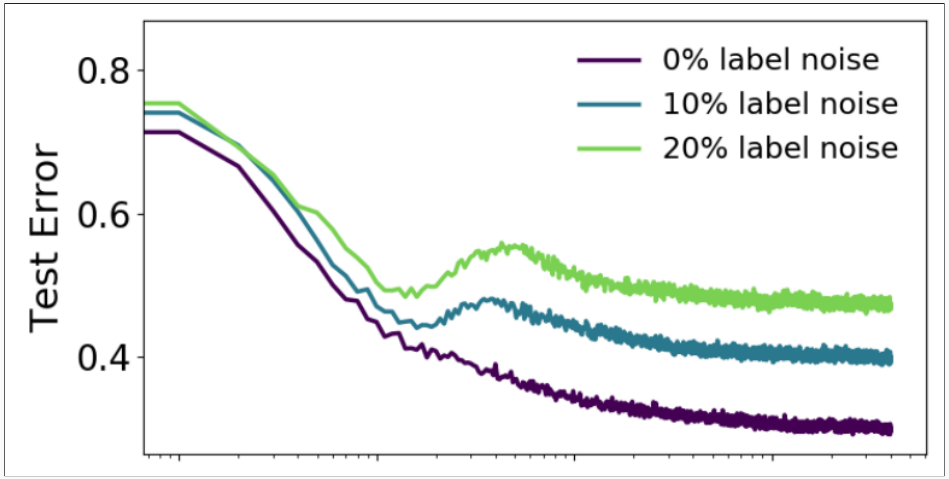
Deep learning: The conundrum

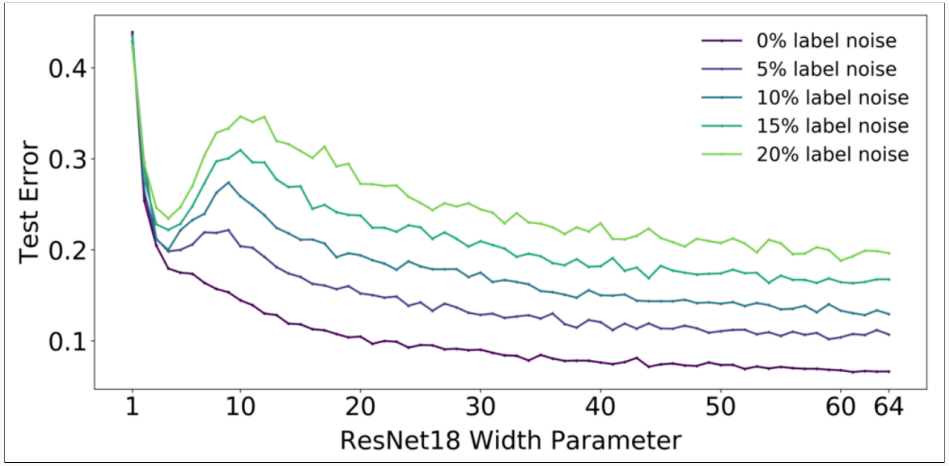


Deep learning: The conundrum

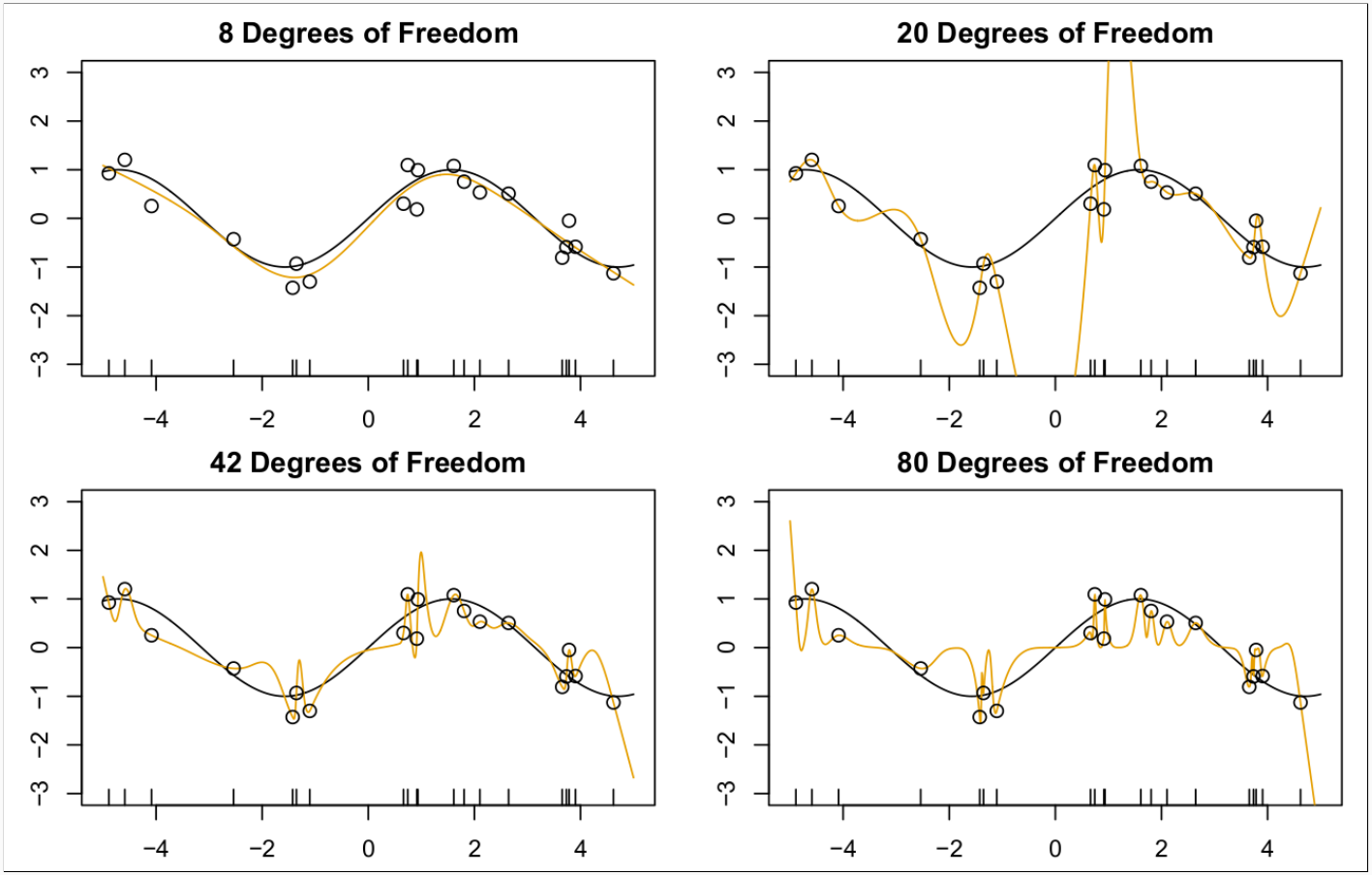


Deep learning: The conundrum





Deep learning: The conundrum



Deep learning: The conundrum

Overparameterization: Deep artificial neural networks generally have far more parameters than necessary (and often more than the number of data points)

- At face value, it is surprising that this does not yield severe overfitting
- However, it can be shown that functions generally calm down as they become more complex after having perfectly fitted the training data
- **Only works for some types of models**

Deep learning: Regularization