

# Data Splits and Neural Network Performance Evaluation

Course 3, Module 3, Lesson 4

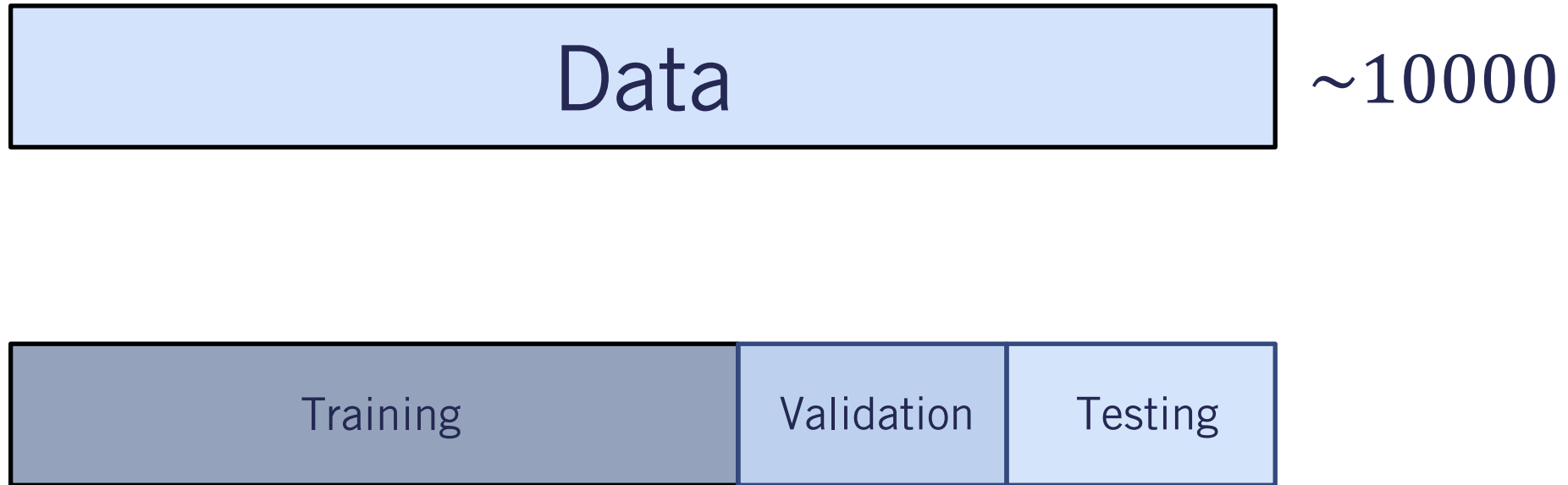


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# Learning Objectives

- Learn how to split a dataset for an unbiased estimate of performance
- Learn how to improve the performance of neural network by observing the difference in performance on the various data splits.

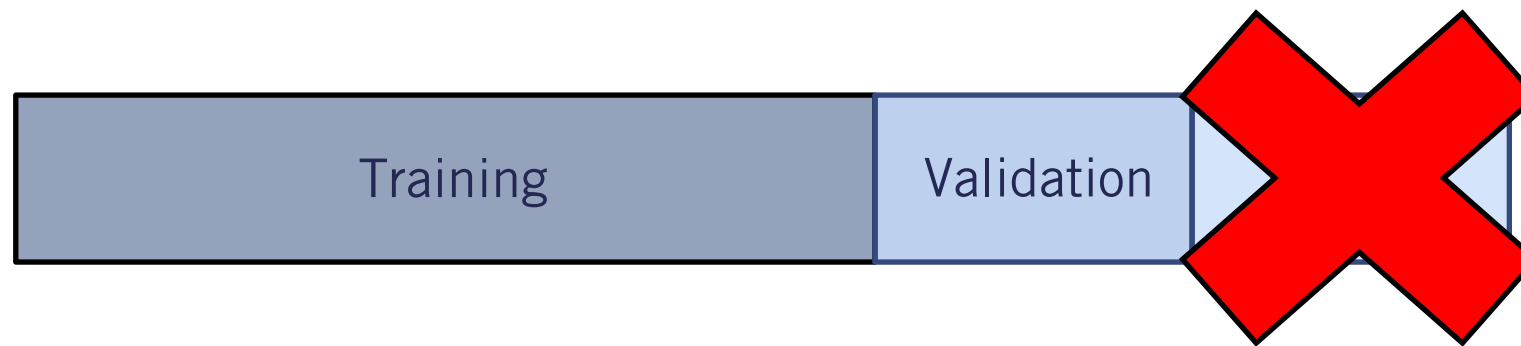
# Data Splits



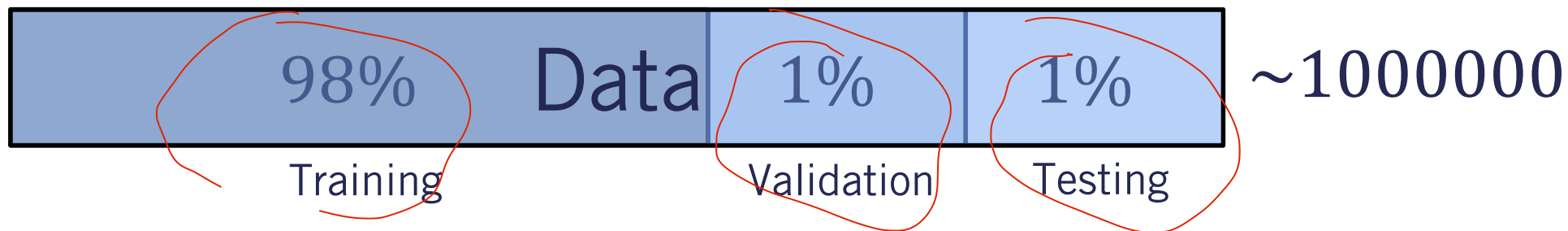
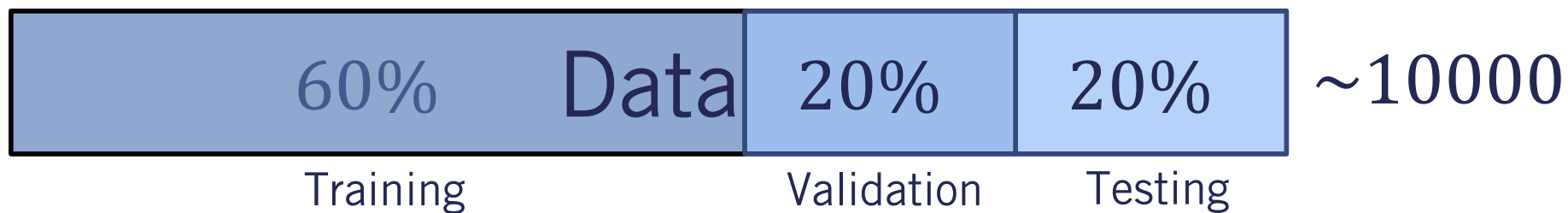
# Data Splits

- **Training Split:** used to minimize the Loss Function
- **Validation Split:** used to choose best **hyperparameters**, such as the learning rate, number of layers, etc.
- **Test Split:** the neural network **never observes** this set. The developer **never** uses this set in the design process

*not learned  
during  
training.*



# Data Splits




# Behavior of Split Specific Loss Functions

	6000	2000	2000	~10000
	Training	Validation	Testing	
	$J(\theta)_{train}$	$J(\theta)_{val}$	$J(\theta)_{test}$	$J(\theta)_{Minimum}$
Good Estimator	0.21	0.25	0.30	0.18
Underfitting	1.9	1.9	2.1	
Overfitting	0.21	2.05	2.1	

*loss function*

*generalization gap*

# Reducing the Effect of Underfitting/Overfitting

- **Underfitting:** (Training loss is high)
  - Train longer
  - More layers or more parameters per layer
  - Change architecture
-  **Overfitting:** (Generalization gap is large)
  - More training data
  - Regularization
  - Change architecture

# Summary

- A dataset should be split to a training, a validation and a test split
- Observing the performance on each of these splits helps in determining why a neural network is not performing well in the real world
- **Underfitting:** Train longer or use a larger neural network
- **Overfitting: Regularization**