DCASE 2016

CONVOLUTIONAL NEURAL NETWORKS FOR ACOUSTIC SCENE CLASSIFICATION

Michele Valenti[1] (valenti.michele.w@gmail.com),

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Outline

- Introduction
- Our system
- Training modes
- Results
- Challenge ranking

Introduction

What is “acoustic scene classification”?

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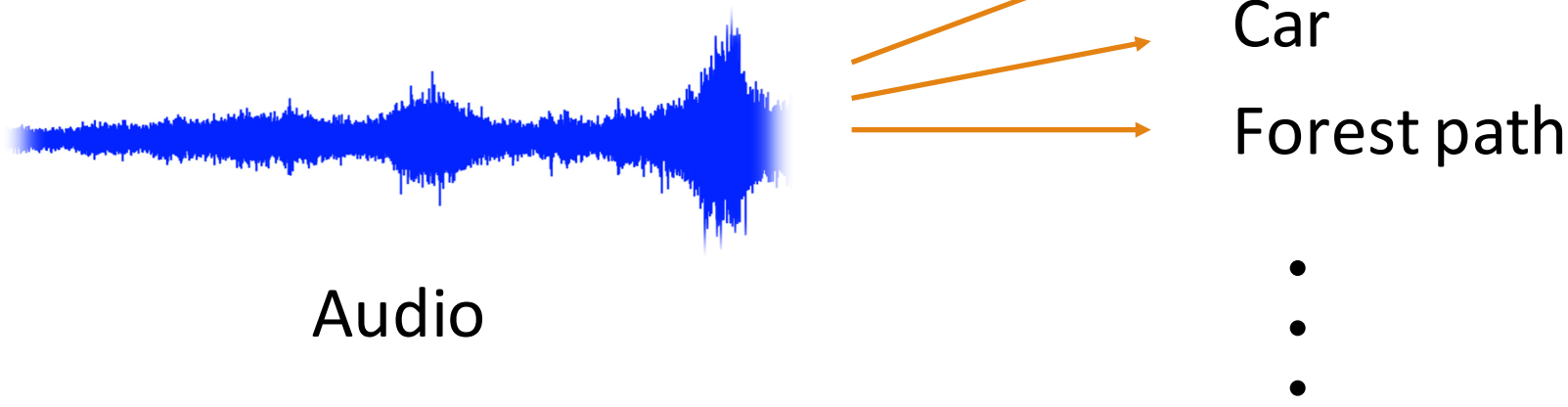
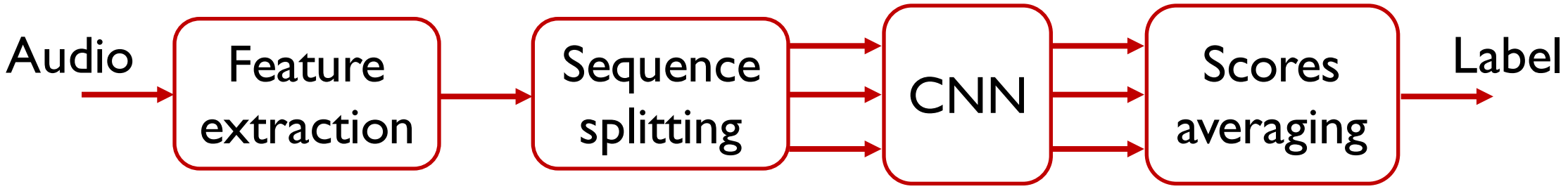
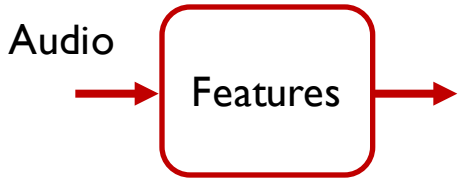


Our system

Overview



Our system



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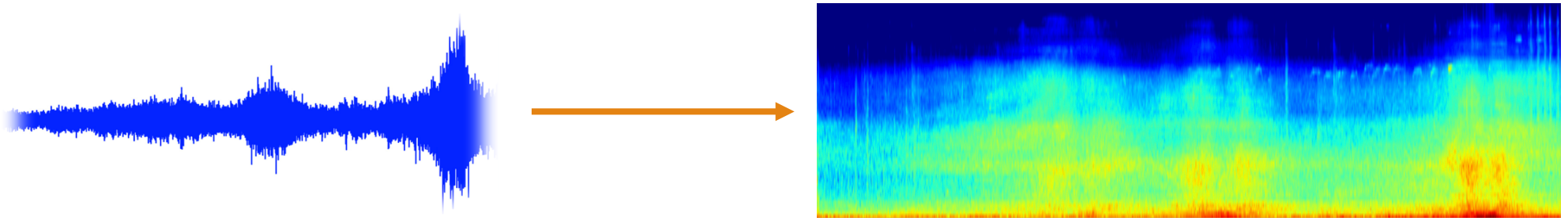
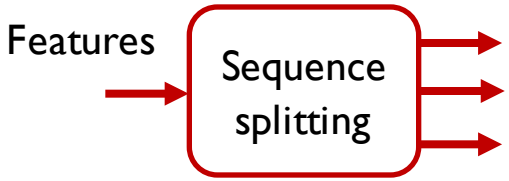


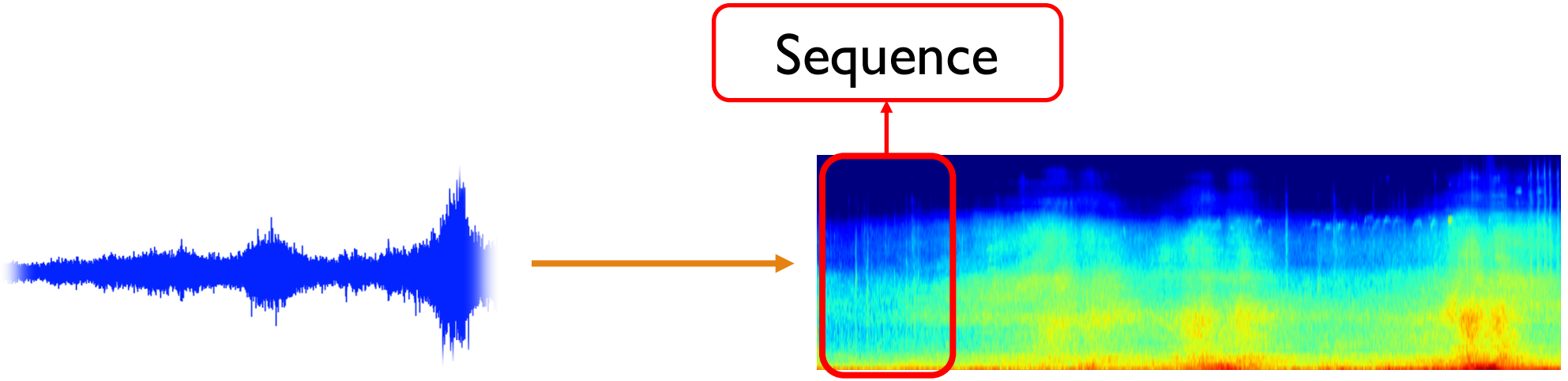
Raw audio

Log-mel spectrogram

Our system



Sequence splitting

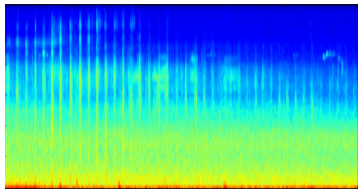


Raw audio segment

Log-mel spectrogram

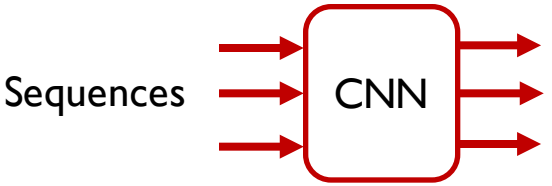
Our system

Convolutional neural network

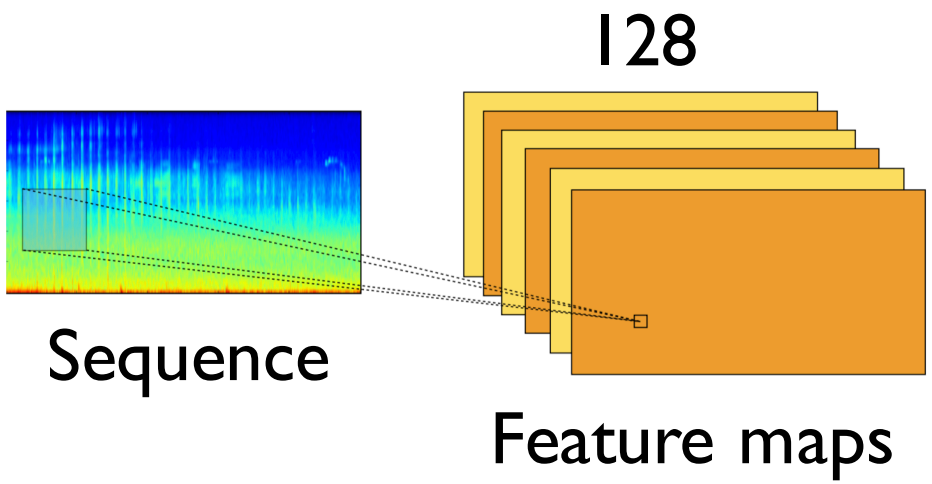


Sequence

Our system



Convolutional neural network



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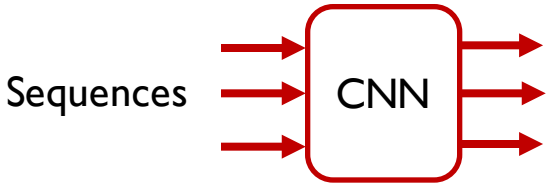
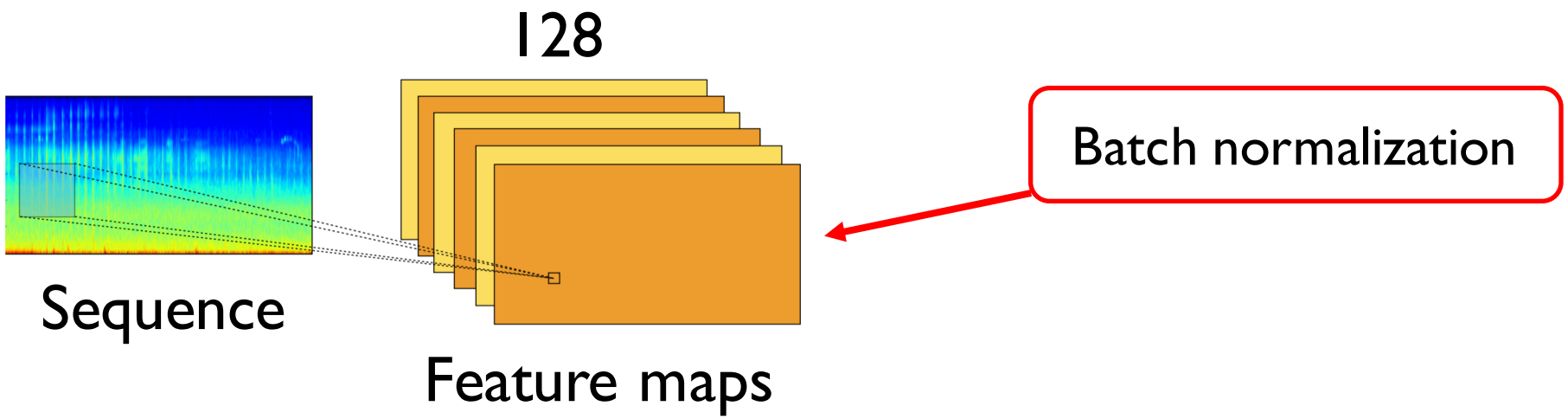


Convolutional neural network



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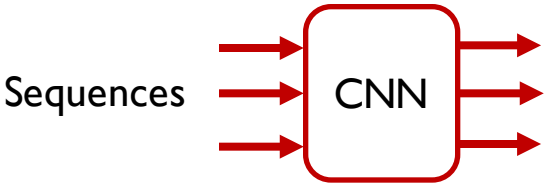

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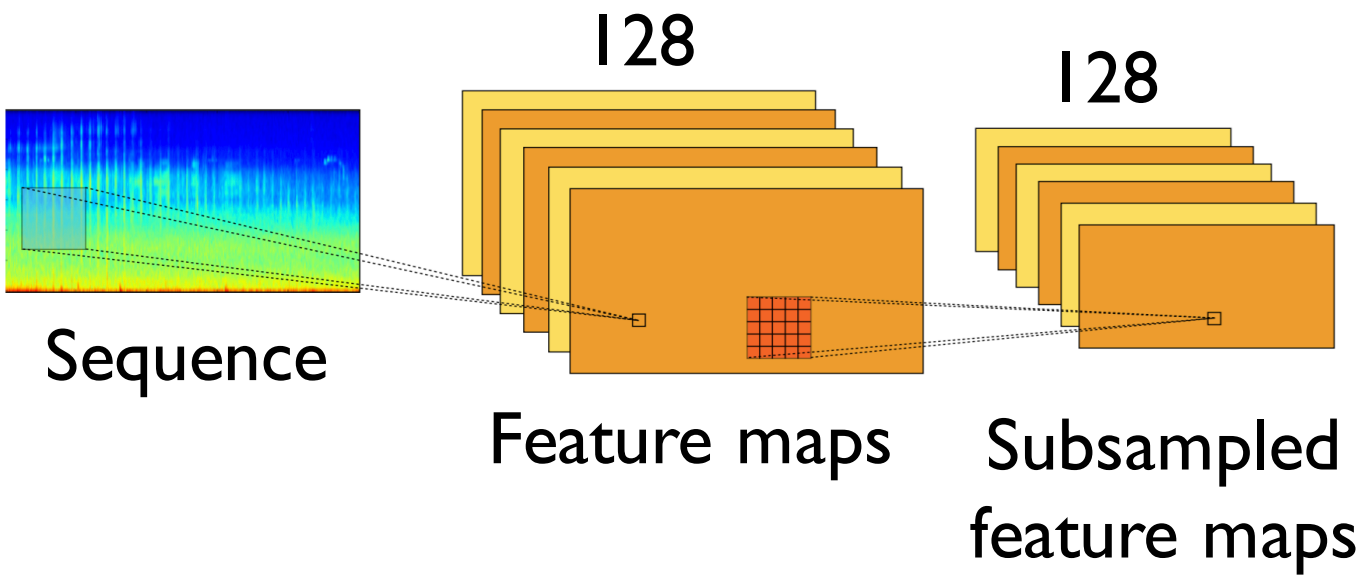

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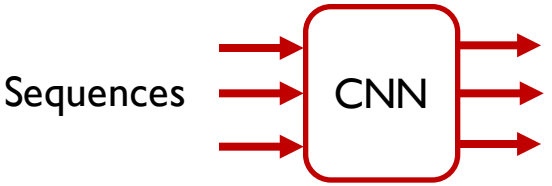

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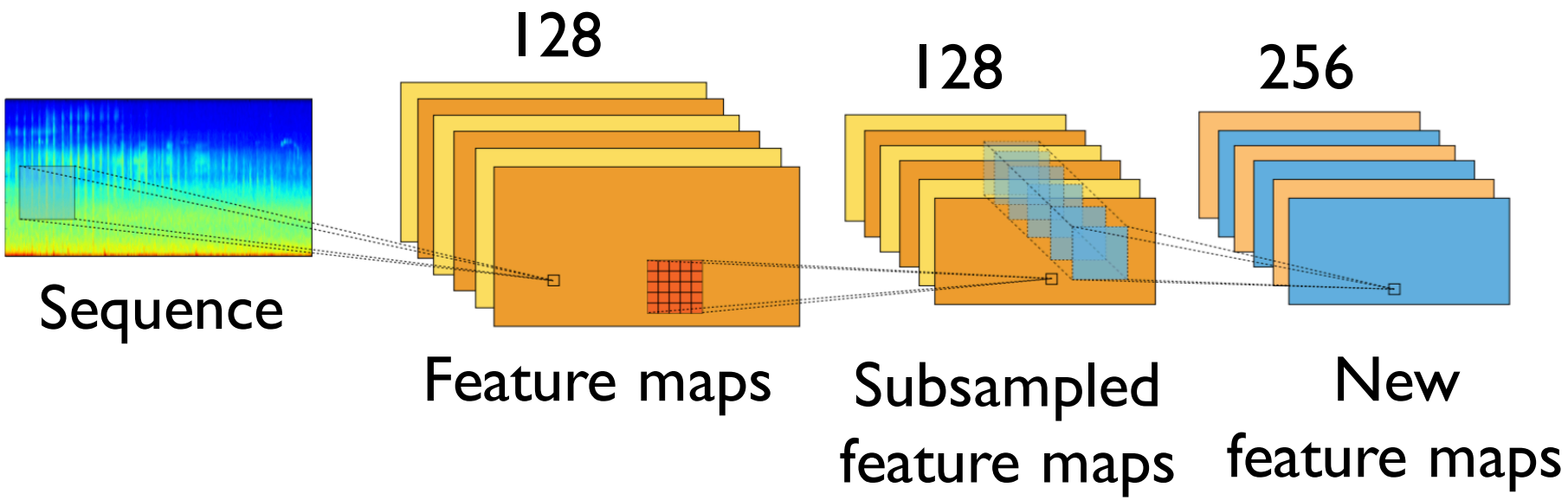

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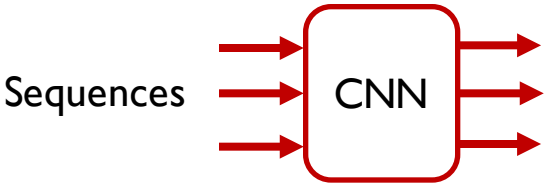

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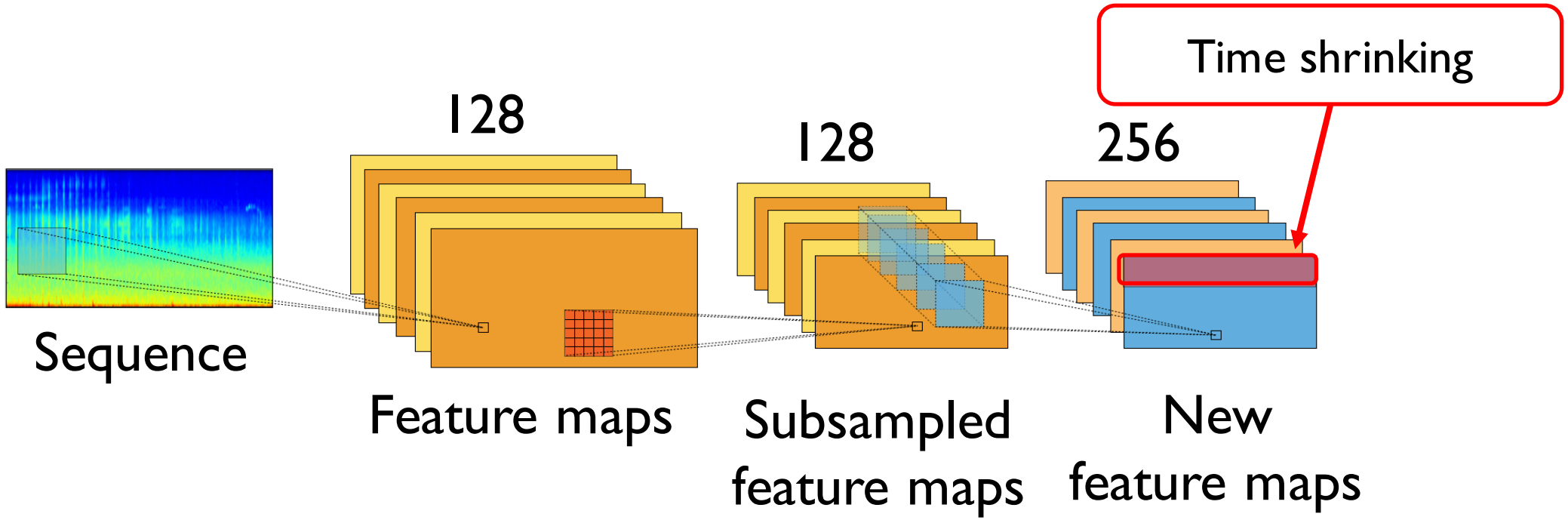

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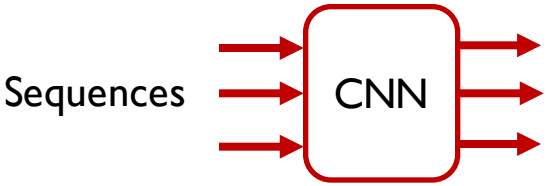

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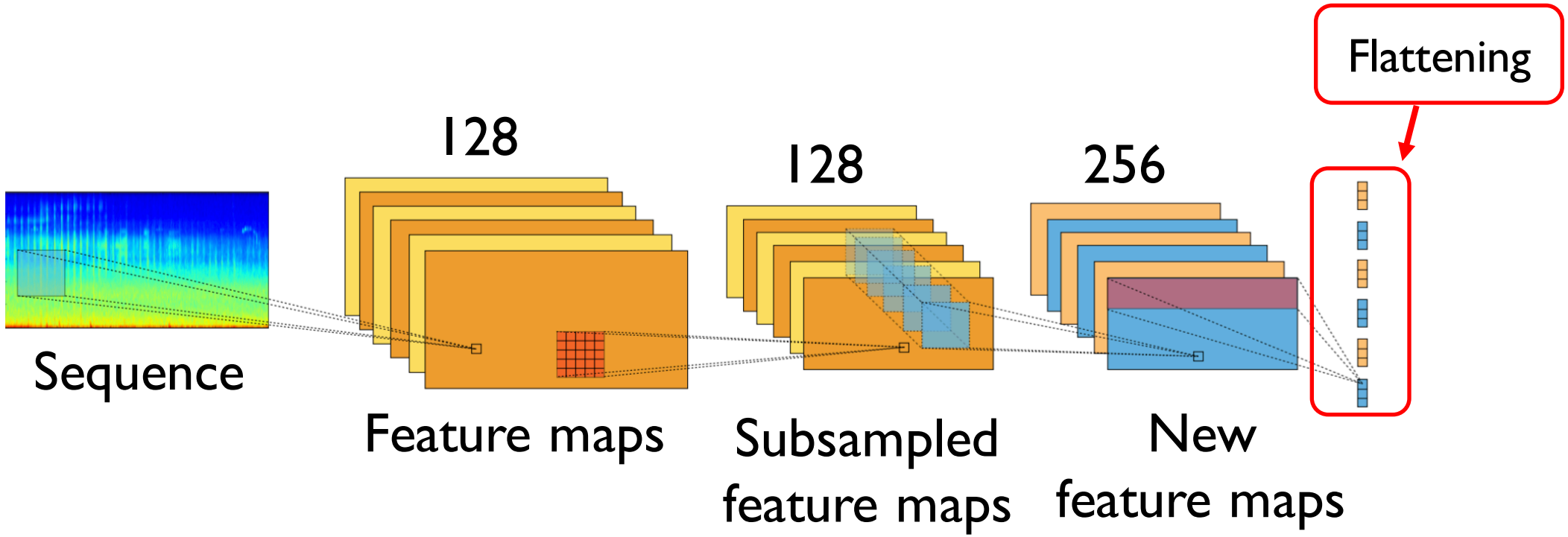

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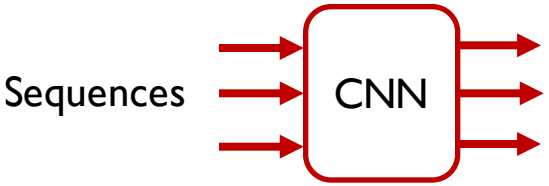
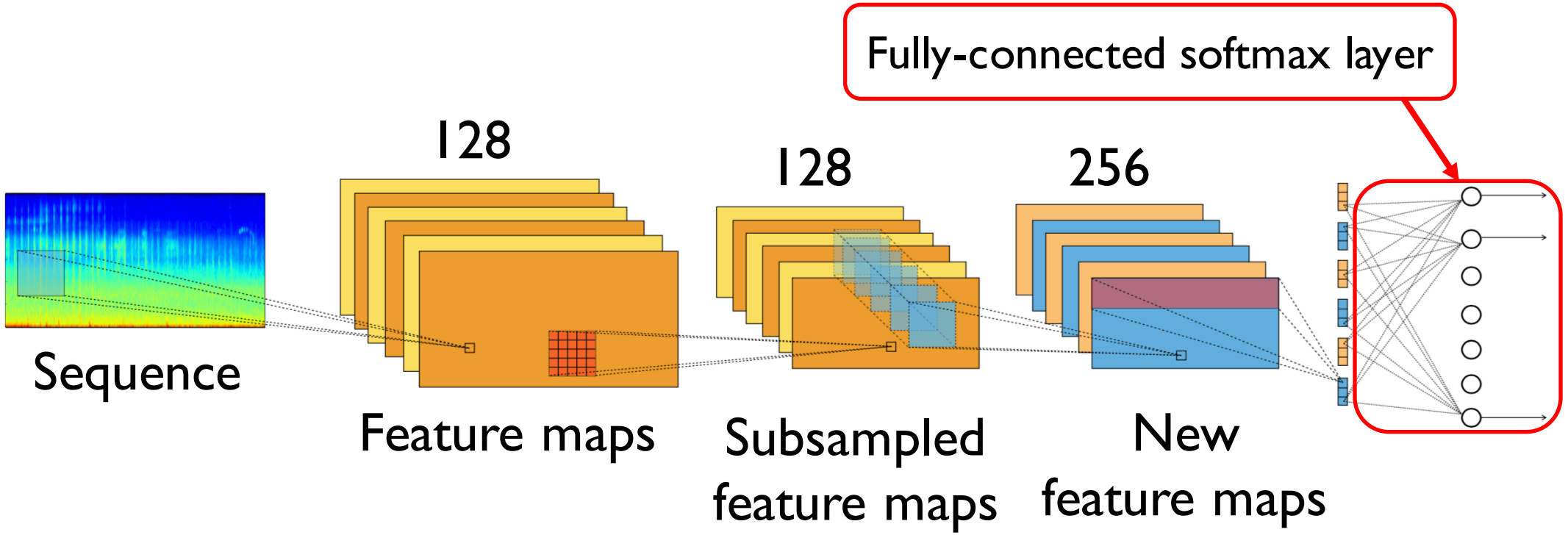


Convolutional neural network



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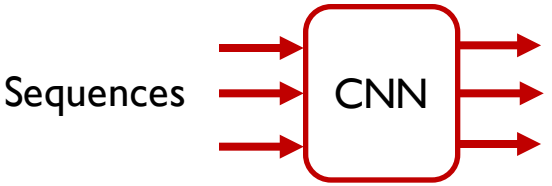

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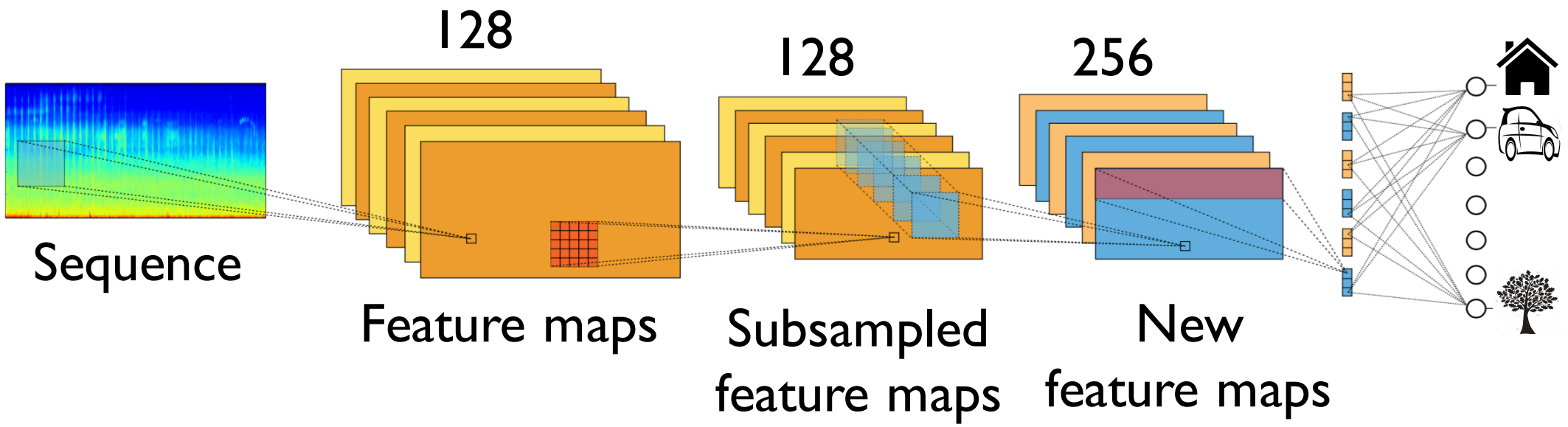

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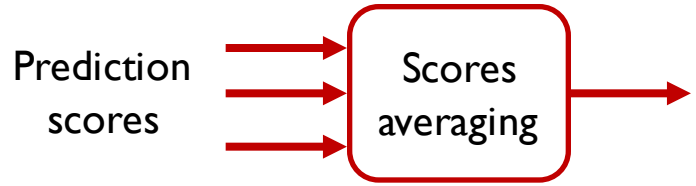
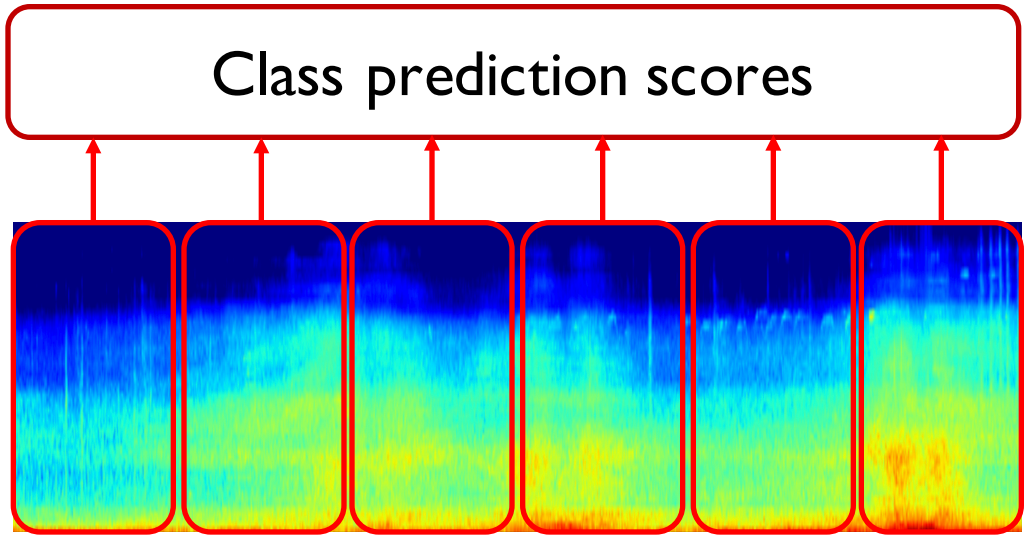


Scores averaging



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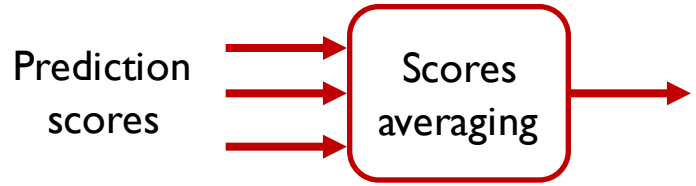

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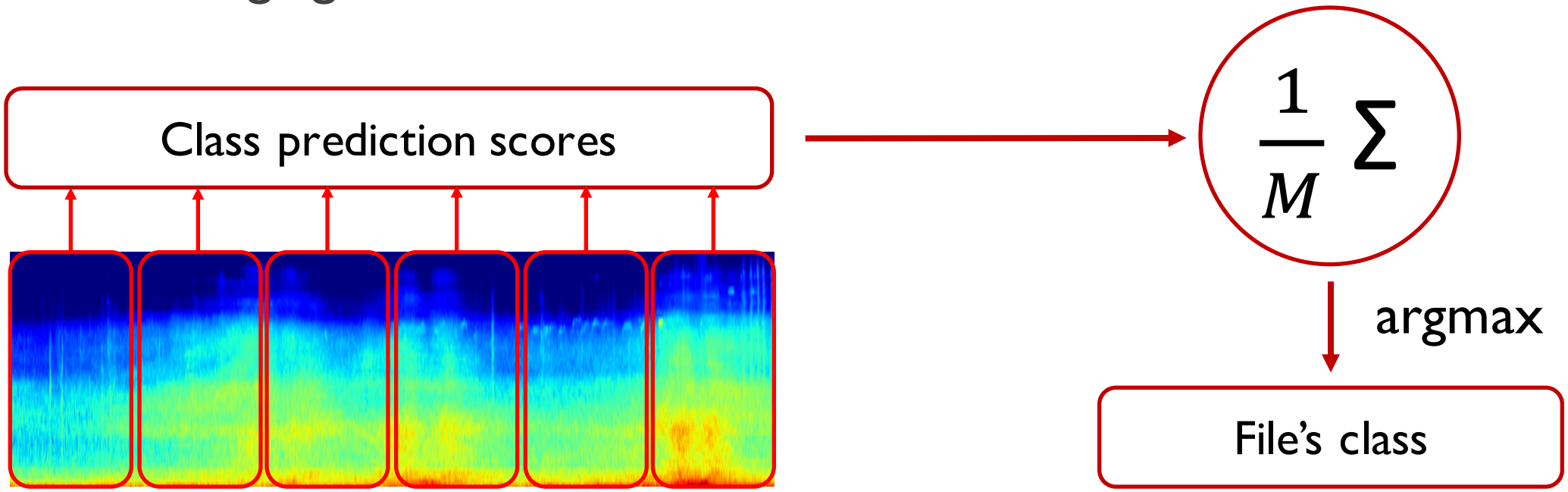
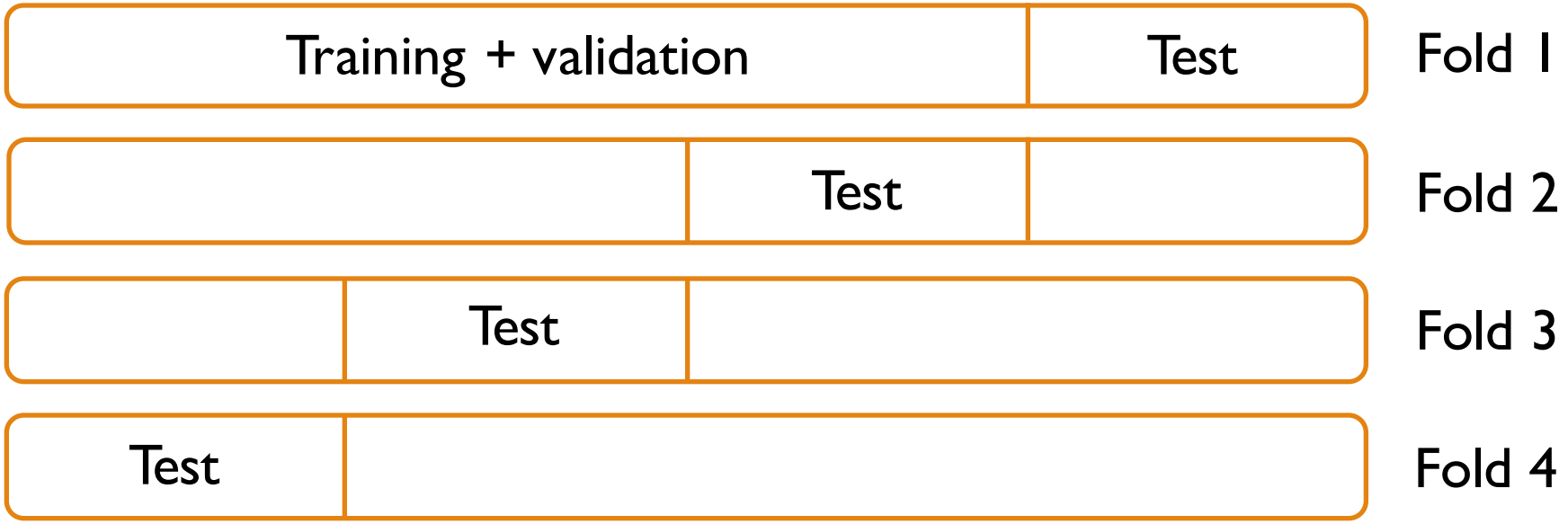


Training

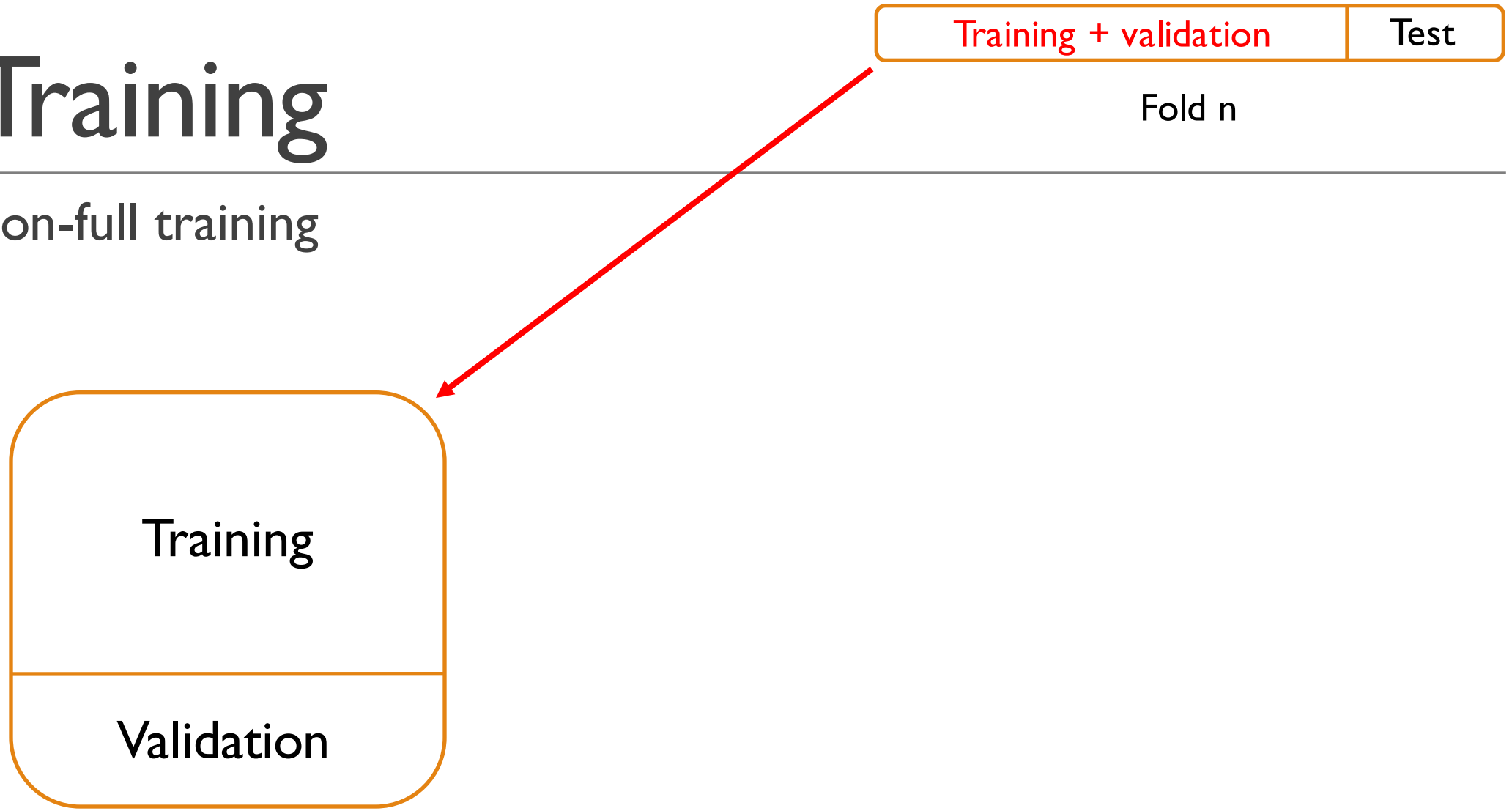
Training

Cross-validation setup



Training

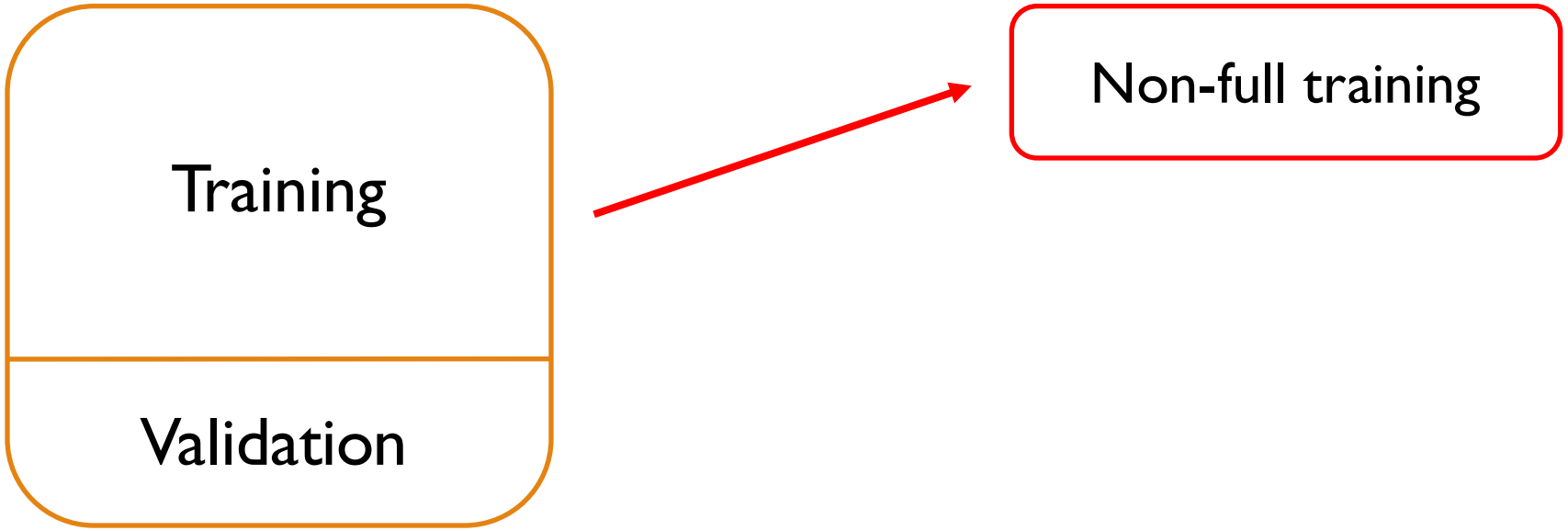
Non-full training



Training

Fold n

Non-full training

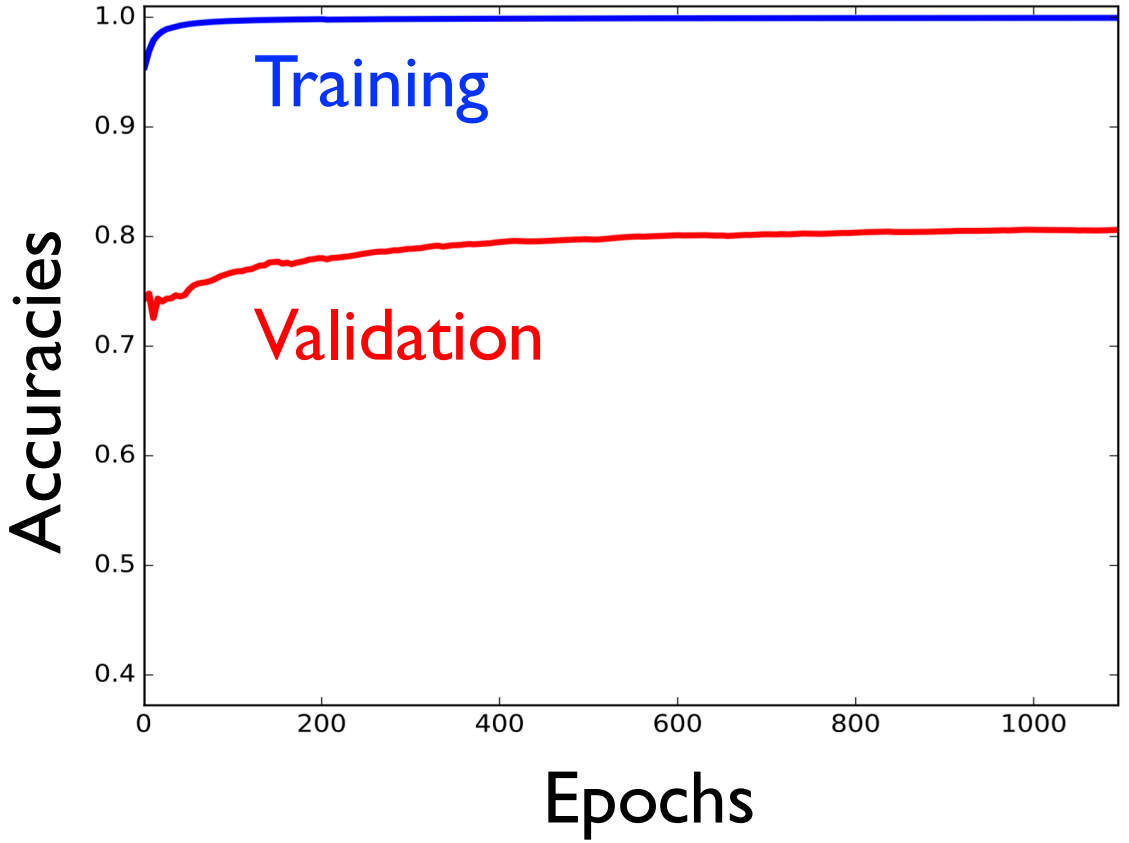


Training

Training + validation	Test

Fold n

Non-full training

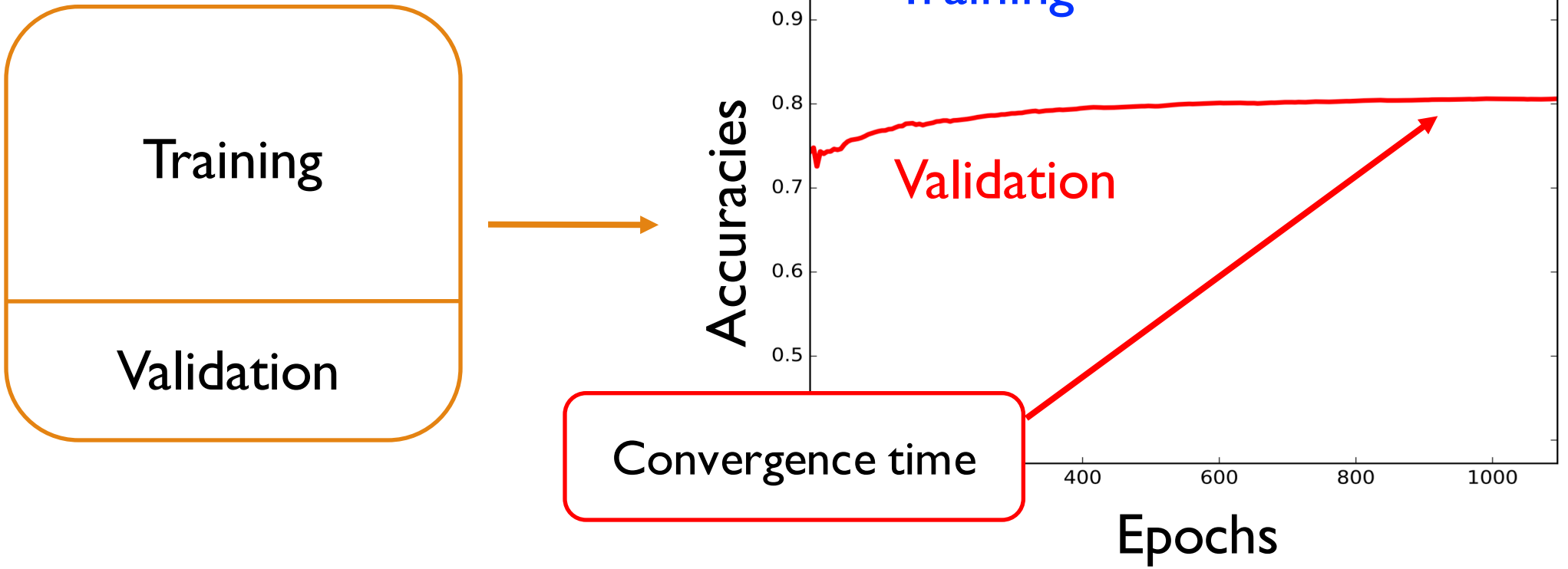


Training

Training + validation	Test

Fold n

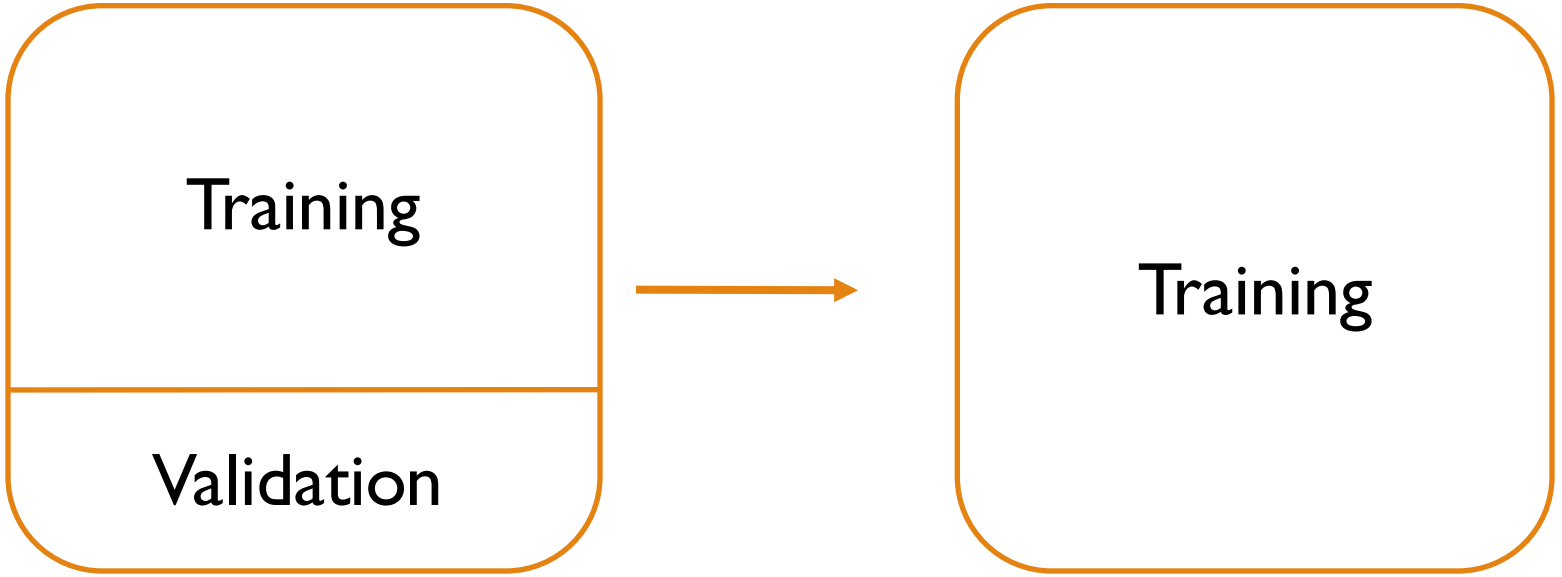
Non-full training



Training

Fold n

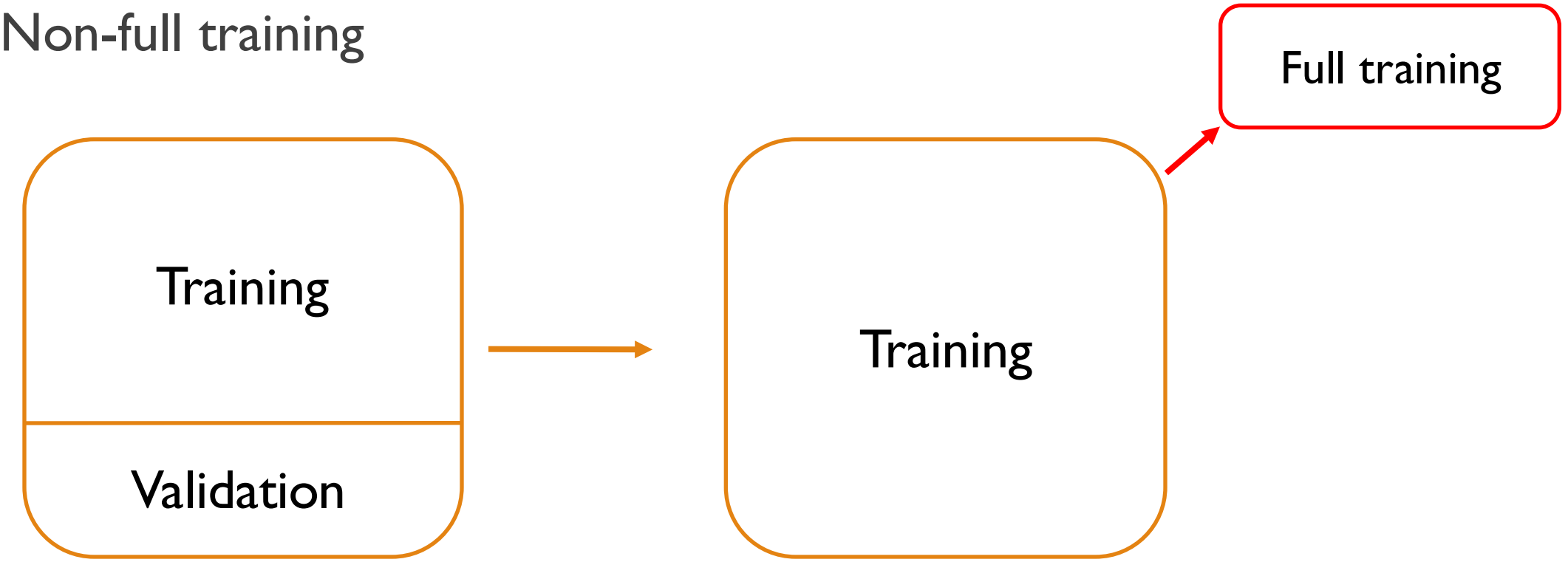
Non-full training



Training

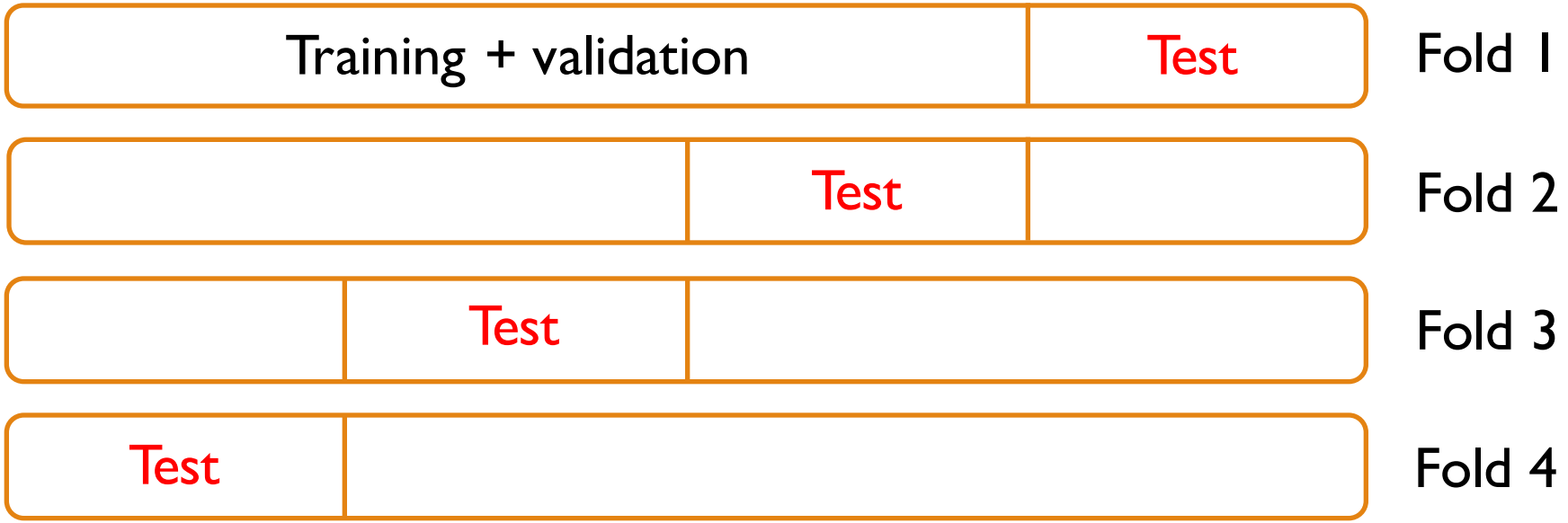
Fold n

Non-full training



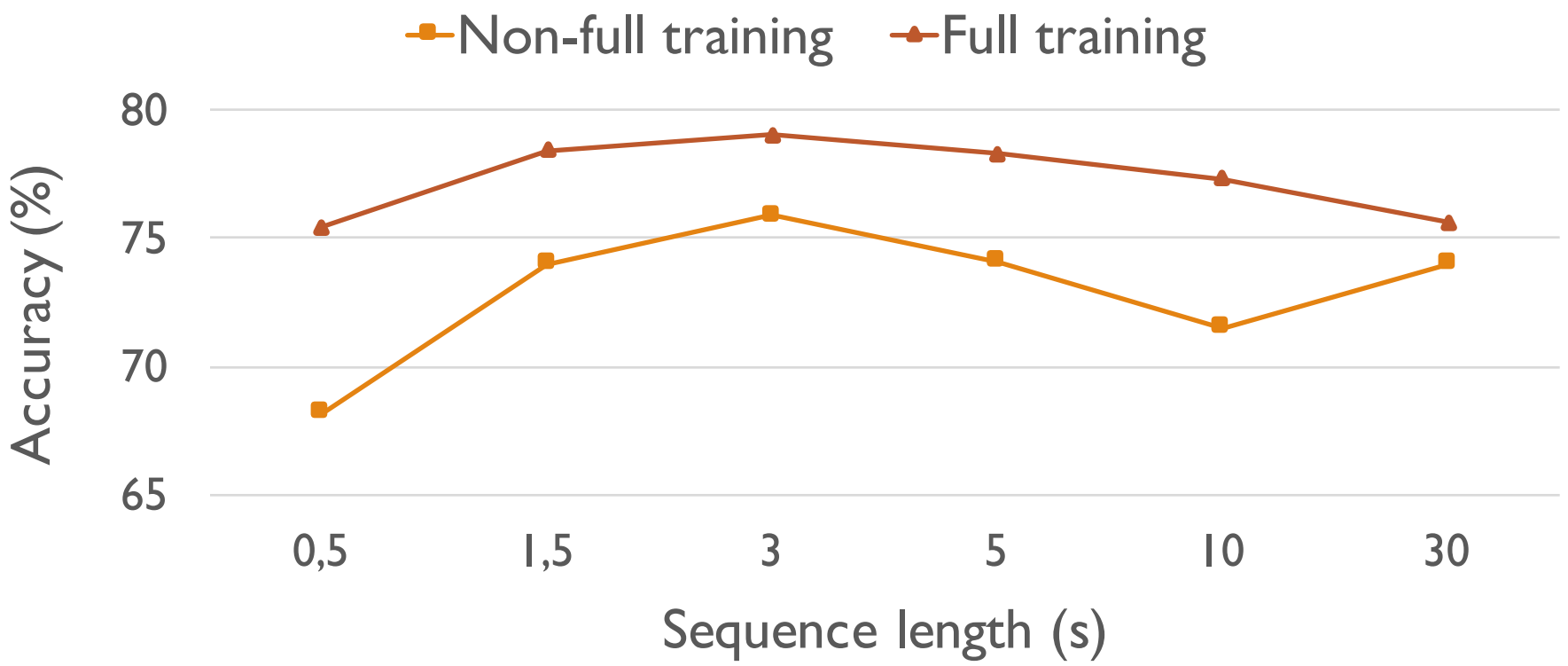
Results

Test data



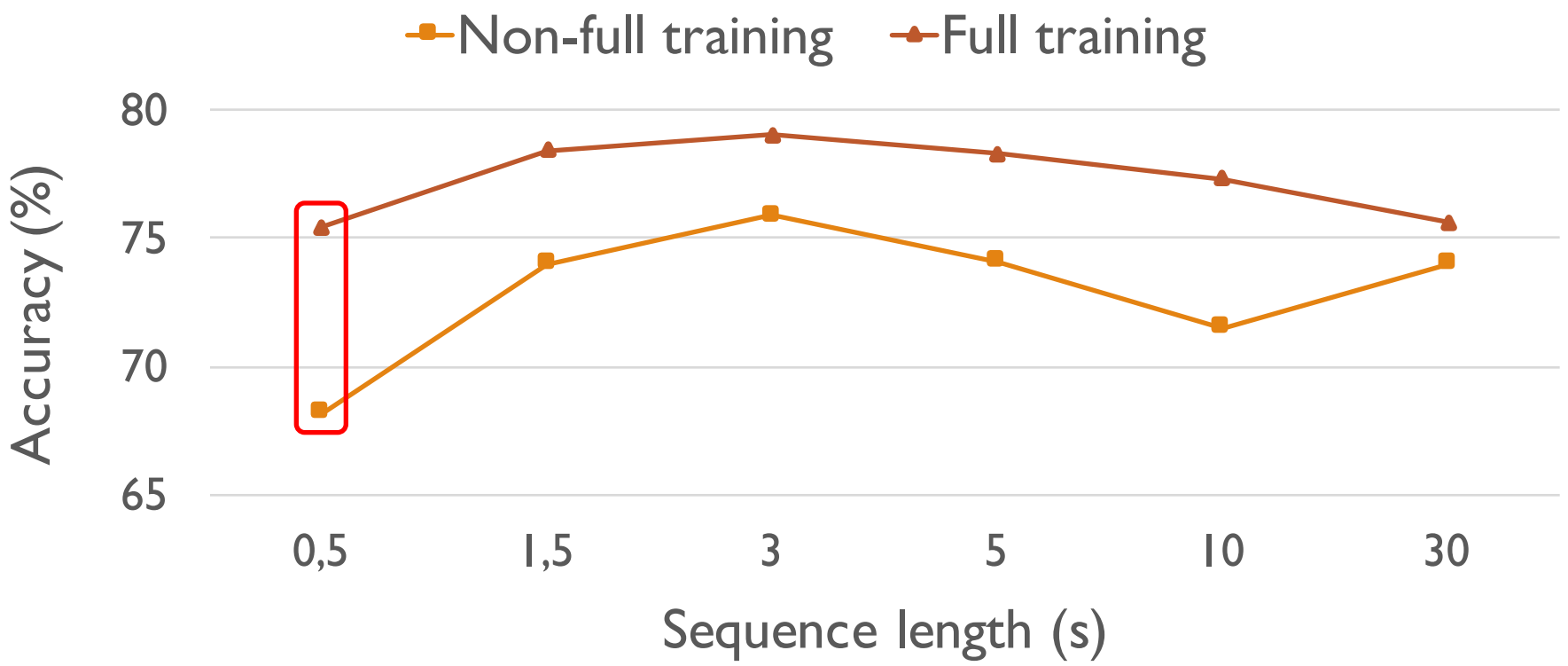
Results

Sequence length



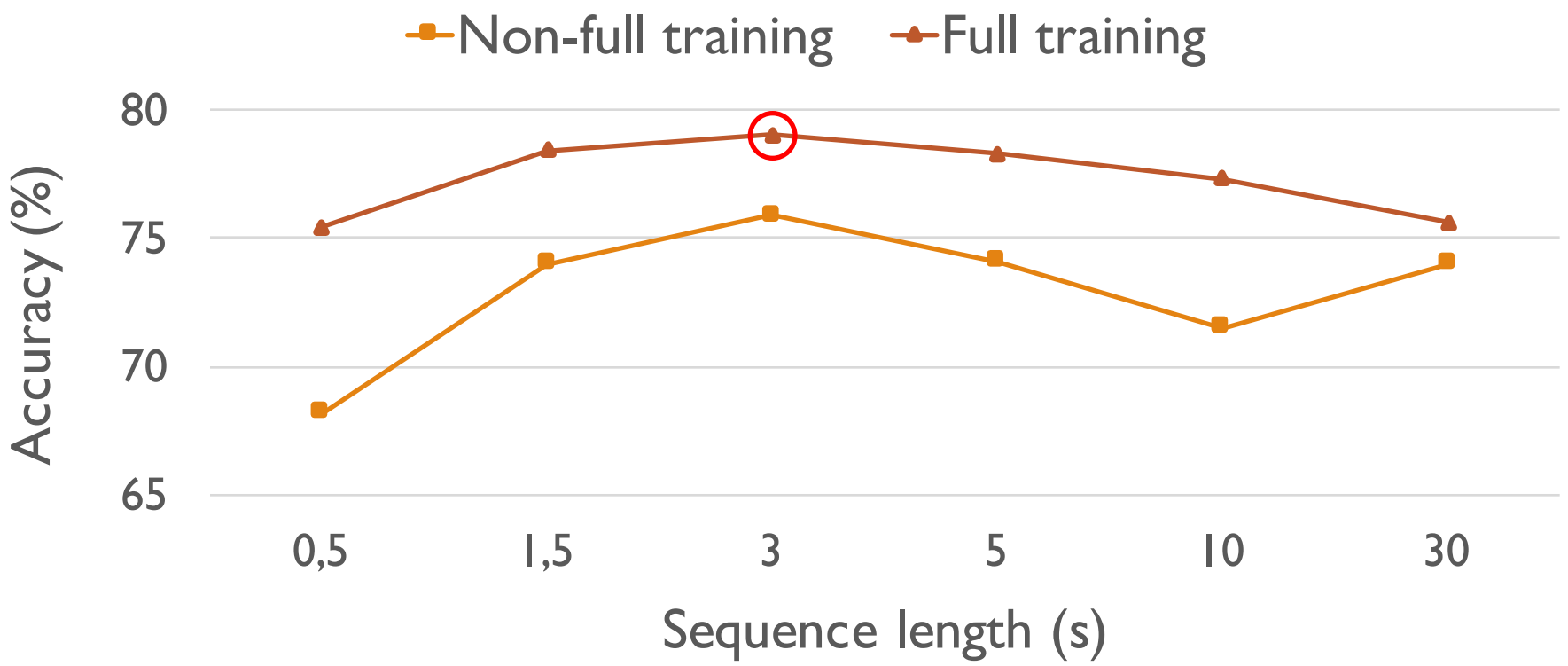
Results

Sequence length



Results

Sequence length



Results

Class accuracies

Class	Accuracy (%)
Beach	75.6
Bus	76.9
Café/Restaurant	74.4
Car	91.0
City center	93.6
Forest path	96.2
Grocery store	88.5
Home	80.8

Class	Accuracy (%)
Library	66.6
Metro station	96.2
Office	97.4
Park	59.0
Residential area	73.1
Train	46.2
Tram	78.2

Results

Class accuracies

Class	Accuracy (%)
Beach	75.6
Bus	76.9
Café/Restaurant	74.4
Car	91.0
City center	93.6
Forest path	96.2
Grocery store	88.5
Home	80.8

Class	Accuracy (%)
Library	66.6
Metro station	96.2
Office	34.6% Residential area
Park	59.0
Residential area	73.1
Train	46.2
Tram	29.5% Bus

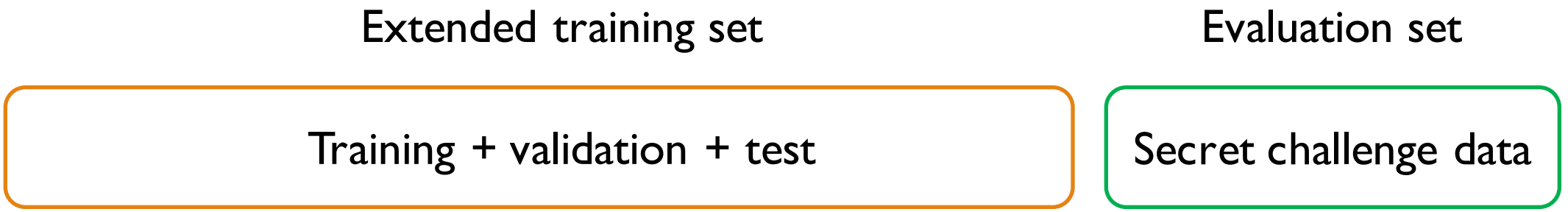
Results

Other classifiers

System	Sequence length (s)	Accuracy (%)	
		Non-full training	Full training
Baseline GMM (MFCC)	-	-	72.6
Two-layer CNN (MFCC)	5	67.7	72.6
Two-layer MLP (log-mel)	-	66.6	69.3
One-layer CNN (log-mel)	3	70.3	74.8
Two-layer CNN (log-mel)	**3**	**75.9**	**79.0**

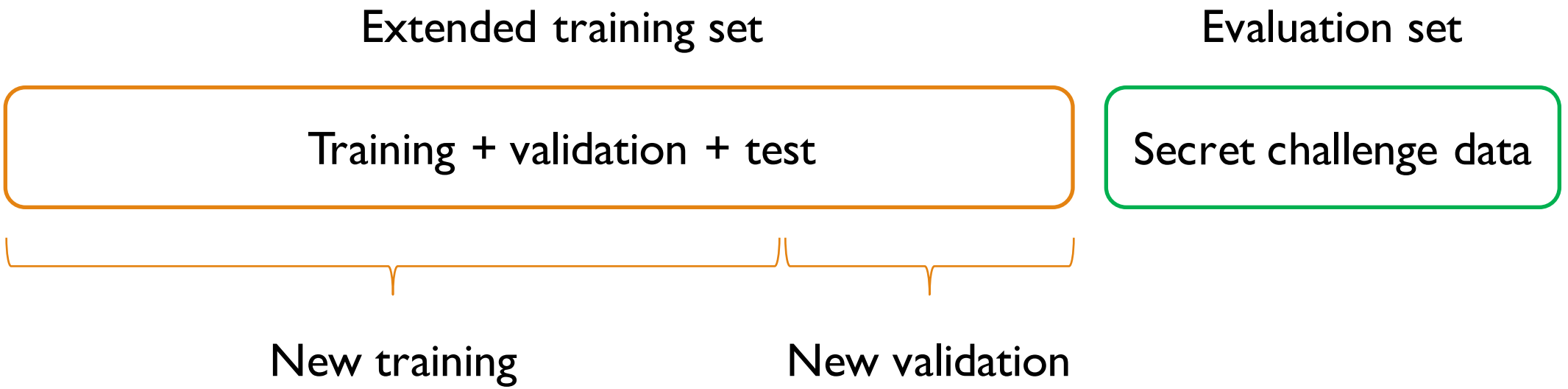
Challenge ranking

Final training



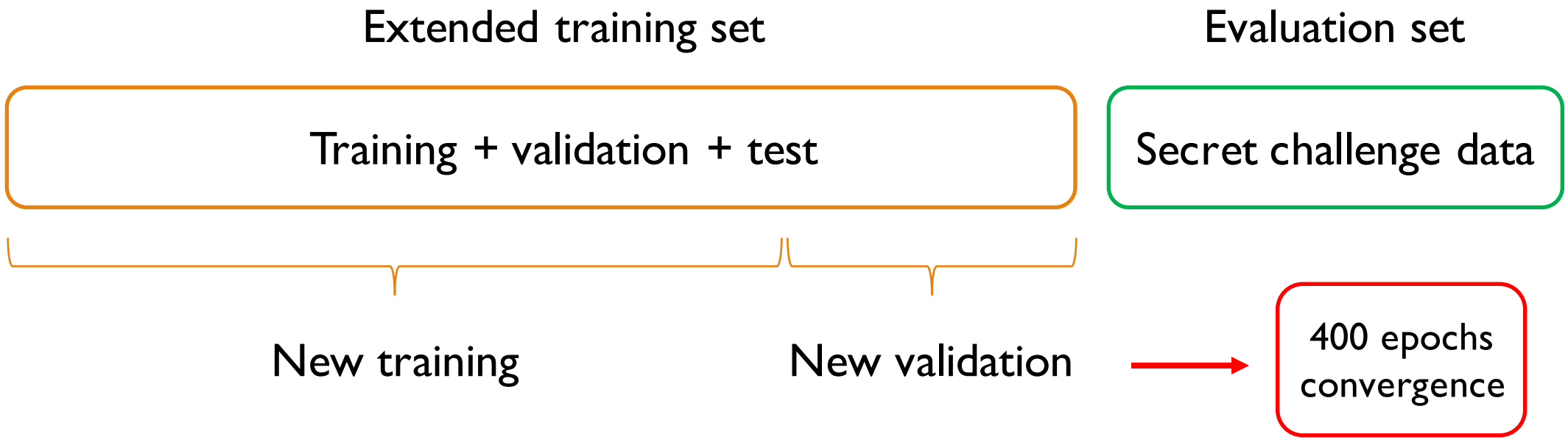
Challenge ranking

Final training



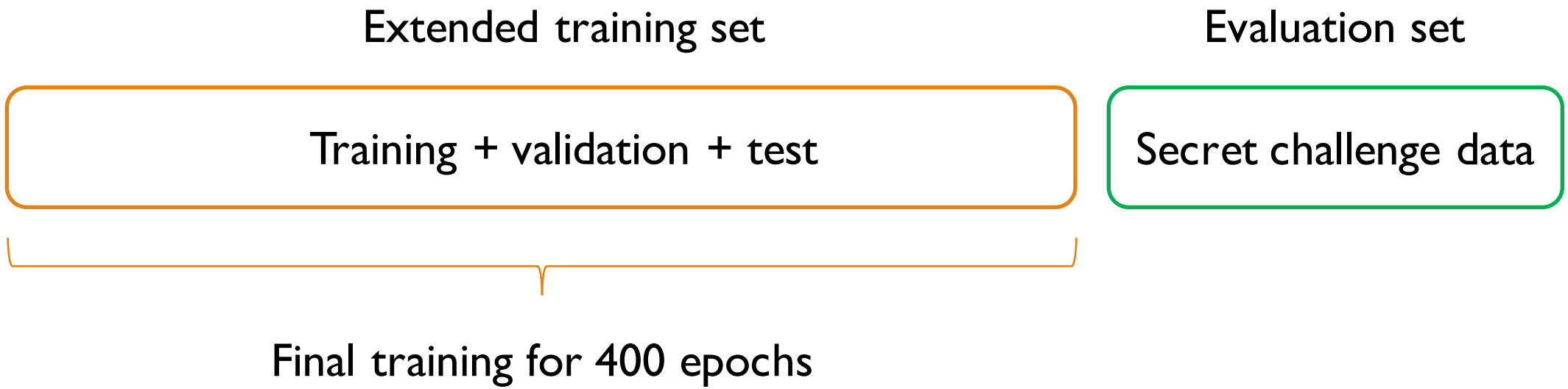
Challenge ranking

Final training

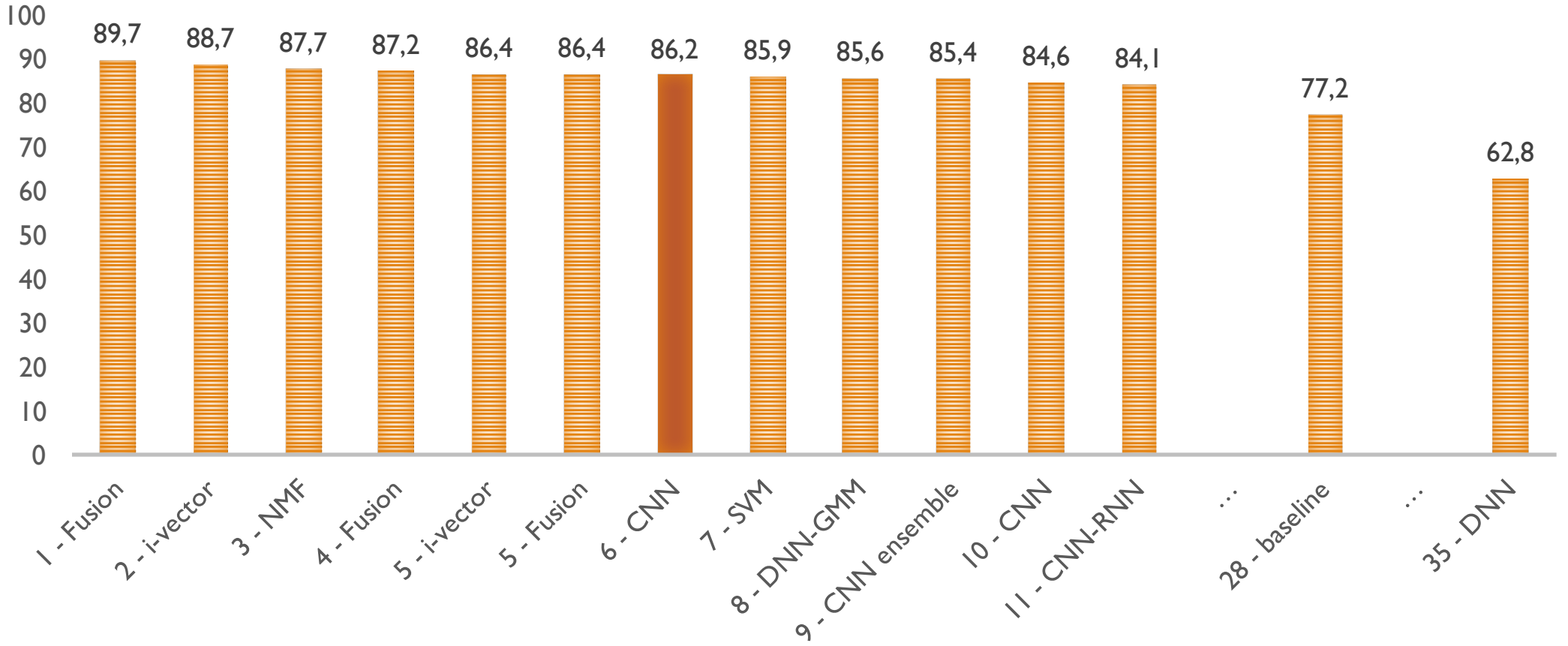


Challenge ranking

Final training



Challenge ranking



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[2]Tampere University of Technology, Finland

Results

Feature comparison

System	Sequence length (s)	Accuracy (%)	
		Non-full training	Full training
Two-layer CNN (MFCC)	5	67.7	72.6
Two-layer CNN (log-mel)	5	74.1	78.3