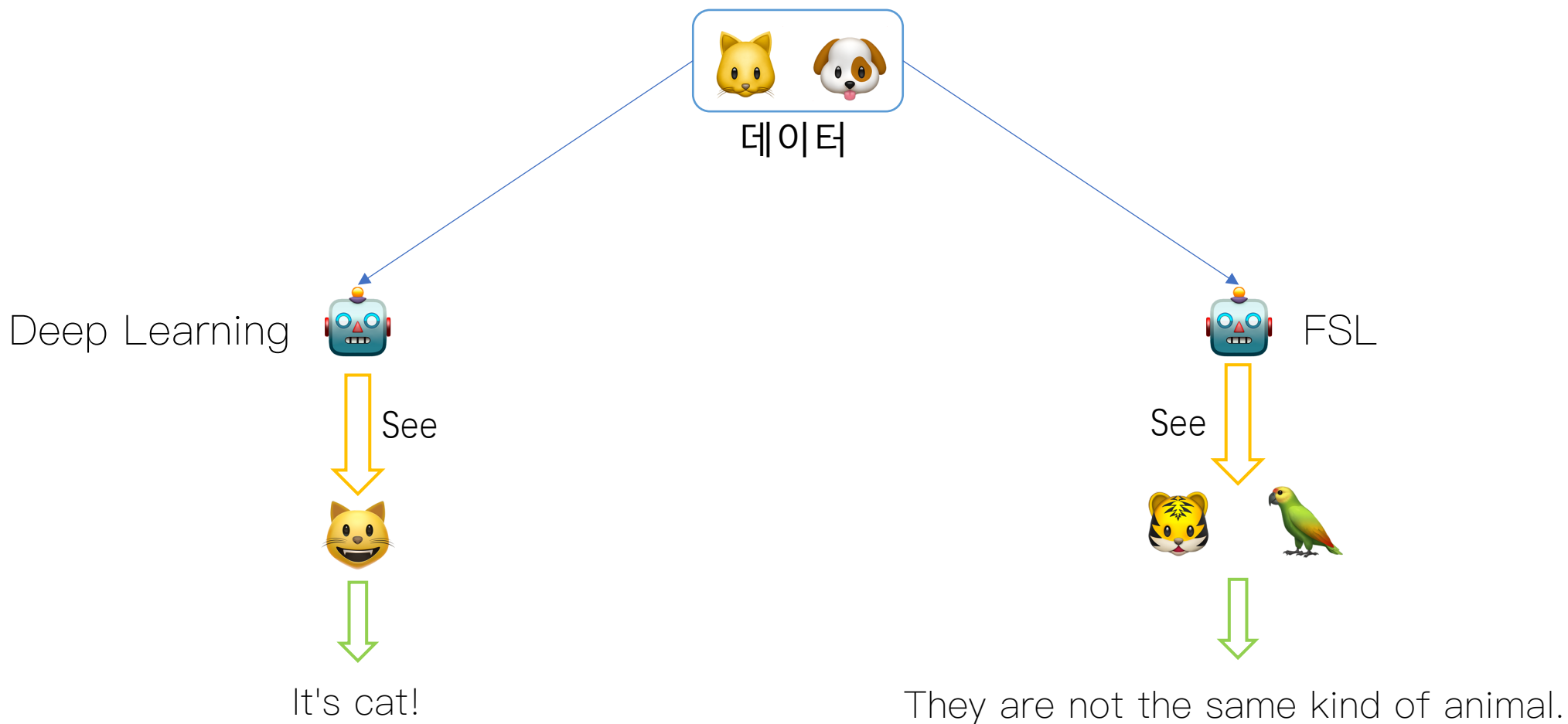


Few shot learning with electrocardiogram(ECG)
signal dataset

Few shot learning 무엇일까?

퓨샷 러닝은 많은 양의 데이터를 사용하는 일반적인 관행과 달리 매우 적은 양의 훈련 데이터로 학습 모델에 공급하는 관행을 나타낸다.



Type of few shot learning approaches

- *Data Augmentation Methods*

Augmentation methods based on GANs.(e.g. medical field)

- *Metrics Based Methods*

A. Siamese Neural Network(2015)

B. Matching Network(2016)

C. Prototypical Network(2017)

- *Models Based Methods*

A. Neural Turing Machine(2014)

B. Memory Augmented Neural Networks(2016)

C. Meta Networks(2017)

- *Optimization Based Methods*

A. Model Agnostic Meta Learning(MAML) 2017

B. LSTM Meta Learner(2016)

Other approaches for few shot learning

Semi-Supervised Learning(2009)

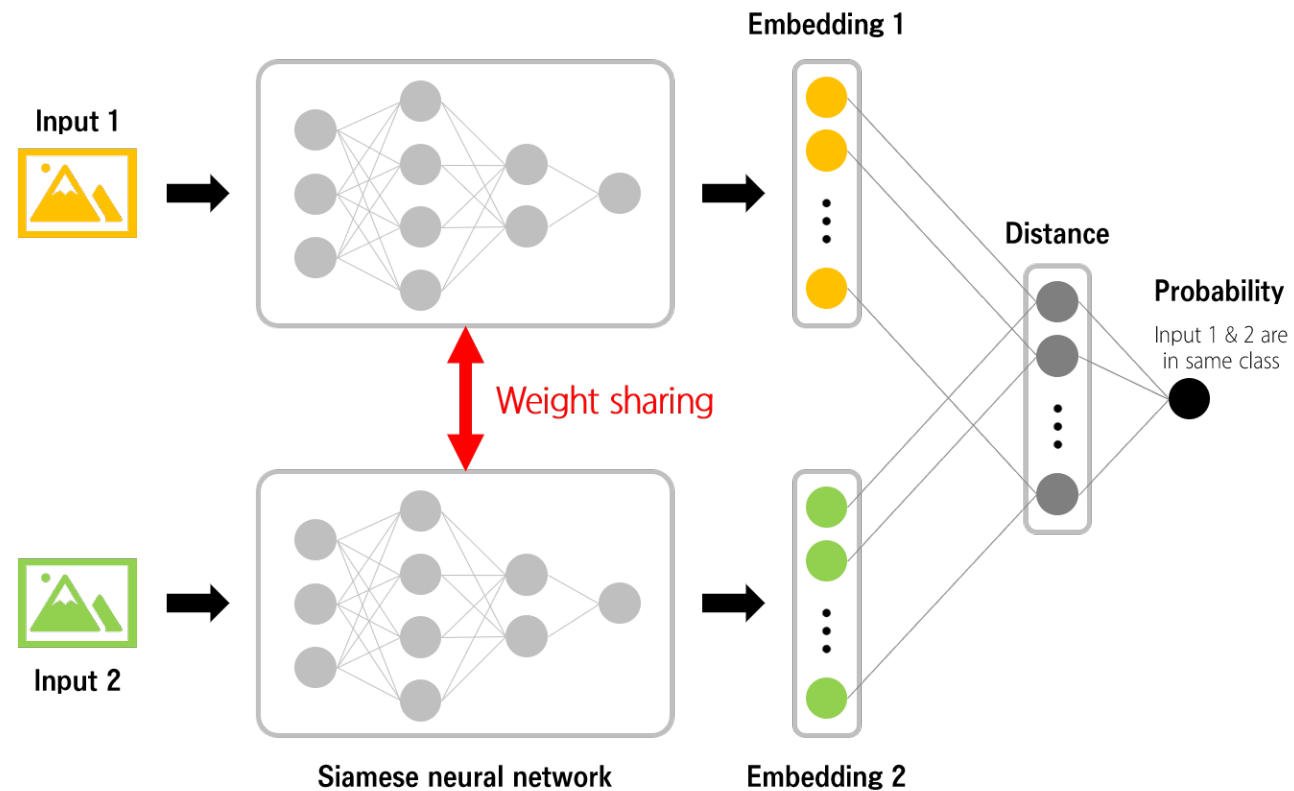
Imbalanced Learning(2017)

Transfer Learning(2009)

Siamese Neural Network(삼 신경망)

두 네트워크의 구조가 서로 닮아있으며, 더 나아가 weight를 공유하다.

삼 신경망 구조



Dataset format for Siamese Neural Network

e.g. MNIST dataset

Data format

Label format

(9 , 9)

1

(9 , 7)

0

(3 , 6)

0

Electrocardiogram dataset(ECG)

ECG는 UCR time series classification archive 가운데 하나인 데이터셋이다.

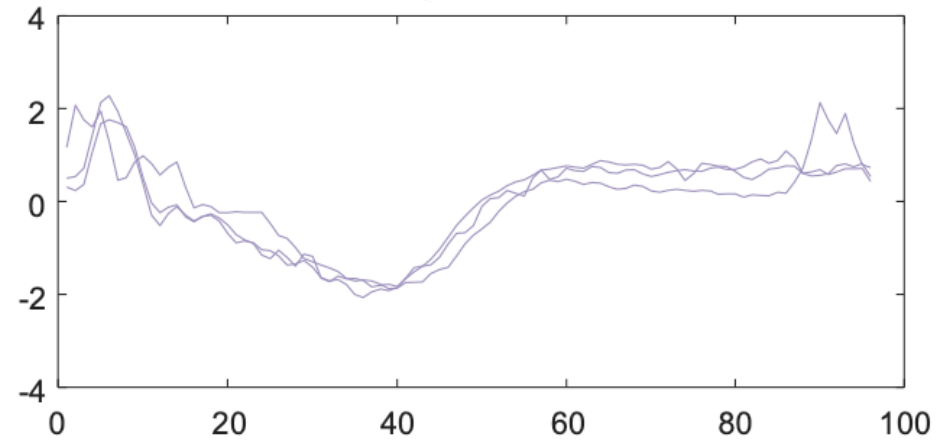
UCR time series classification archive는 128개의 서로 다른 time series 데이터 셋으로 구성된다.

Dataset Name	Size	Length	No. of Classes
ECG200	200	96	2
ECG5000	5000	140	5
ECGFiveDays	884	136	2
TwoLeadECG	1162	82	2
MIT-BIH	21892	187	5

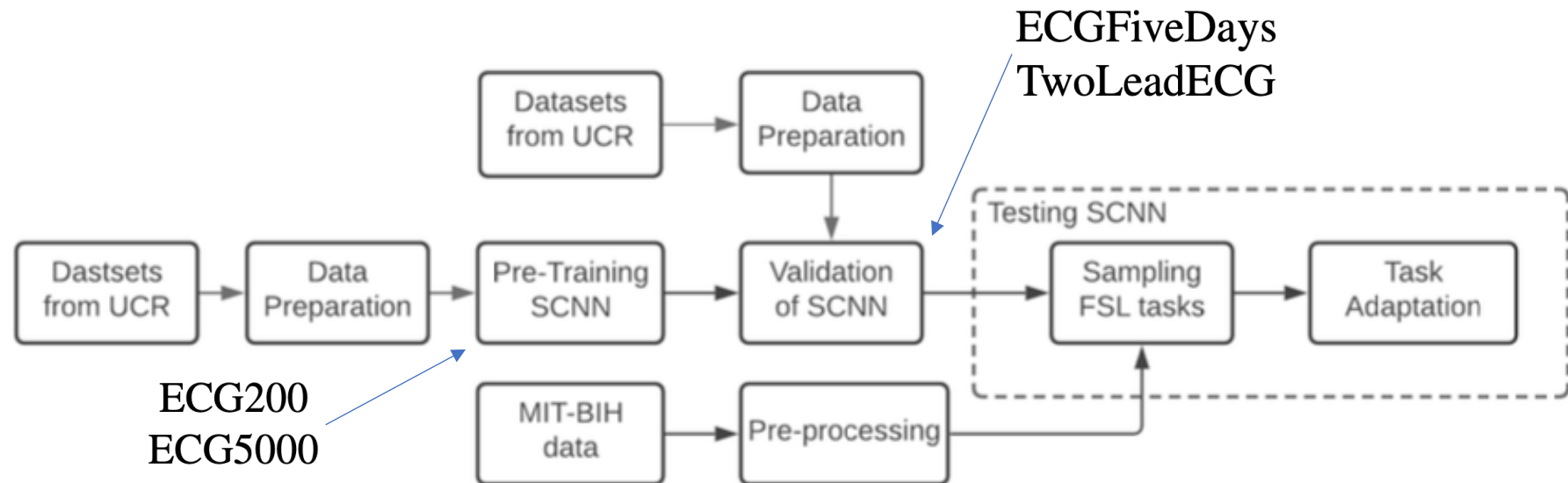
추출: Similarity Learning based Few Shot Learning for ECG Time Series Classification

데이터 & 실험

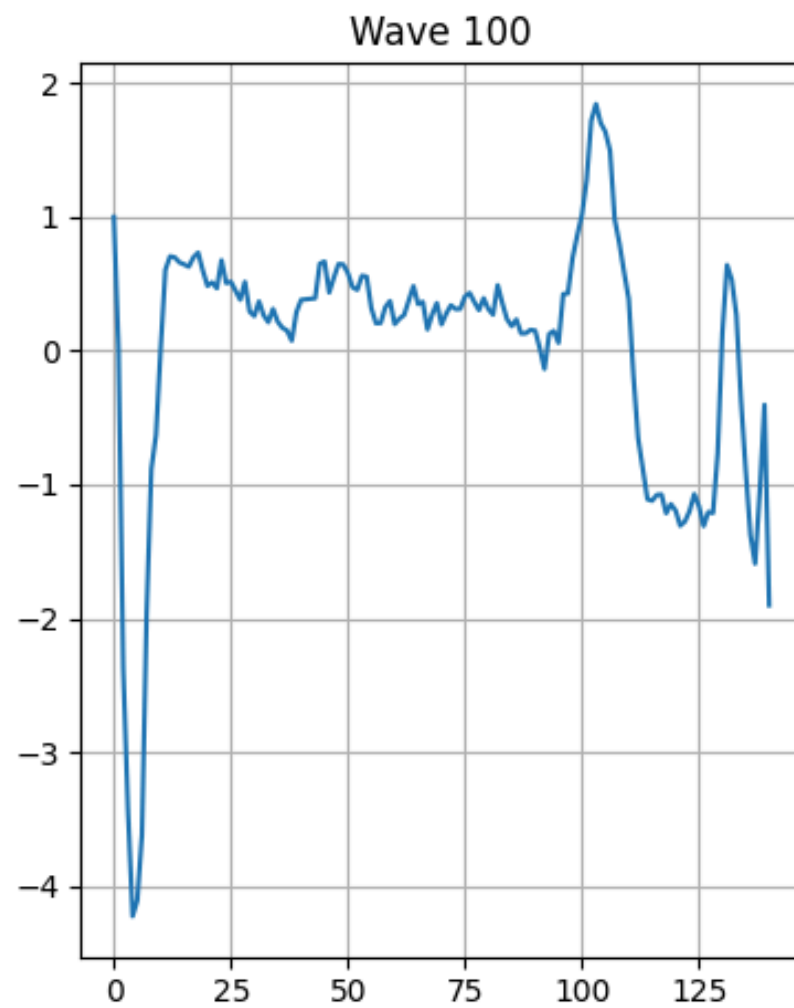
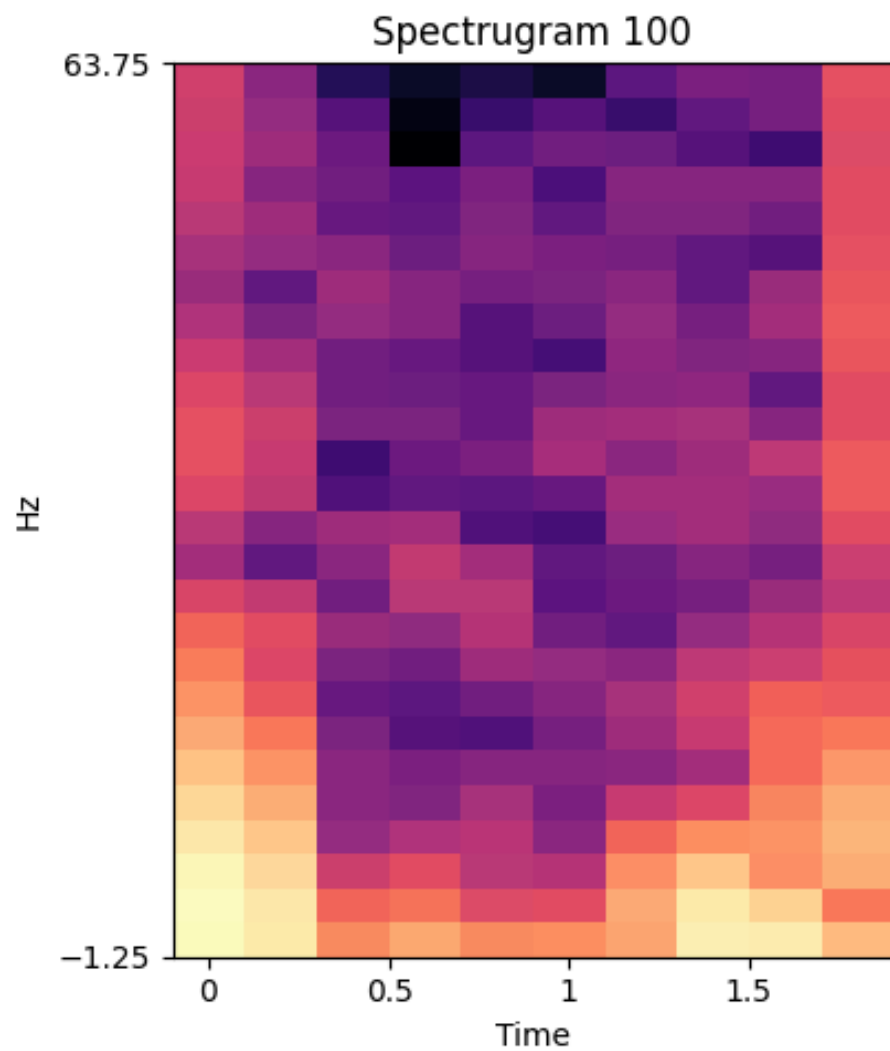
데이터 모양



논문 실험 과정



제 사용한 데이터 모양임



논문 실험 과정을 따라 얻은 실험 결과임(time series data)

Pre-Training
SCNN

ECG 200 and ECG 5000

Loss Accuracy

Training	0.0731	0.9728
Validation	0.1726	0.9350
Testing	0.2804	0.9078

Validation
of SCNN

Two Lead ECG and ECG Five days

Fine-tuning Loss Accuracy

Training	0.0860	0.9688
Validation	0.0252	1.0000
Testing	0.3581	0.8639

Testing
SCNN

MIT-BIH

Loss Accuracy

Evaluation	0.6932	0.5060
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Share trained weights

Share trained weights

실험 1(Spectrogram data)

<div>Pre-Training SCNN</div>			<div>Validation of SCNN</div>			
ECG 200 and ECG 5000			Two Lead ECG and ECG Five days			
	Loss	Accuracy	Fine-tuning		Loss	Accuracy
Training	0.0486	0.9436	Share trained weights	Training	0.1609	0.7796
Validation	0.0456	0.9462		Validation	0.1045	0.8722
Testing	0.0570	0.9258		Testing	0.1013	0.8700
<div>Testing SCNN</div>			Share trained weights			
MIT-BIH						
	Loss	Accuracy				
Evaluation	6.6839	0.5252				

실험 2(Spectrogram)

Pre-Training SCNN			Validation of SCNN		
ECG 200 (Epochs:50)			MIT-BIH (Epochs:50 & Epochs:30)		
	Loss	Accuracy	Fine-tuning	Loss(50 &30)	Accuracy (50 &30)
Training	0.0303	0.9726	Training	0.1046 & 0.1356	0.9013 & 0.8372
Validation	0.0558	0.9329	Validation	0.1422 & 0.1456	0.7975 & 0.7955
Testing	0.0523	0.9418	Testing	0.1641 & 0.1607	0.7669 & 0.7584
			ECG 200 Testing	0.2912 & 0.2883	0.4597 & 0.4913
Validation of SCNN					
MIT-BIH & ECG200 (Epochs:30)					
	Loss	Accuracy		Loss	Accuracy
Training	0.1076	0.8671			
Validation	0.1356	0.8184	ECG200 Testing	0.0899	0.8933
Testing	0.1569	0.7774	MIT-BIH Testing	0.1871	0.7262