



ZNN

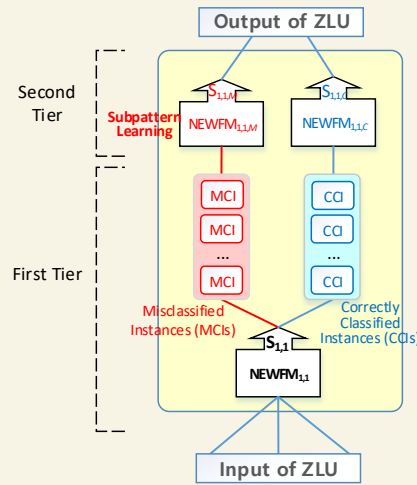


Zoom-in Neural Network

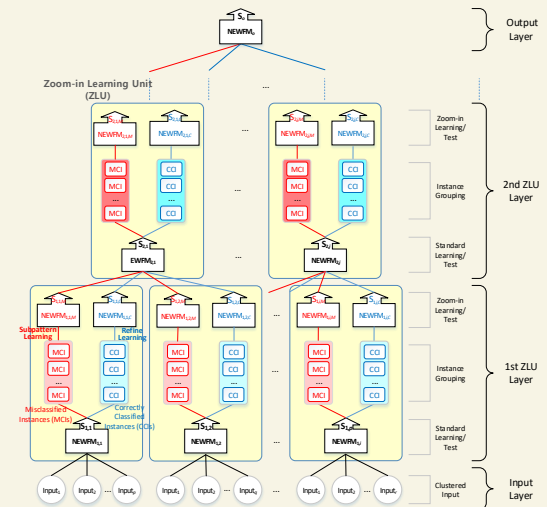




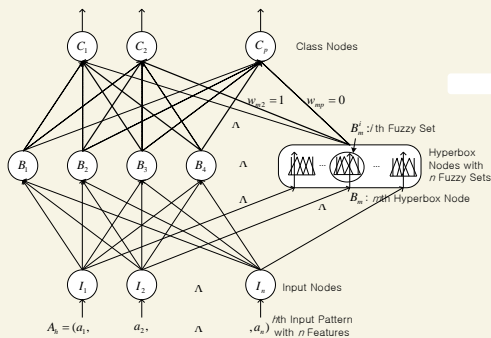
2. 특징추출 / 자동 특징선택



3. Zoom-in Learning Unit (ZLU)



4. Zoom-in Neural Network (ZNN)



1. NEWFM 가중퍼지신경망

ZNN

ZNN의 Layer 별 Parkinson's Disease Class 분류율

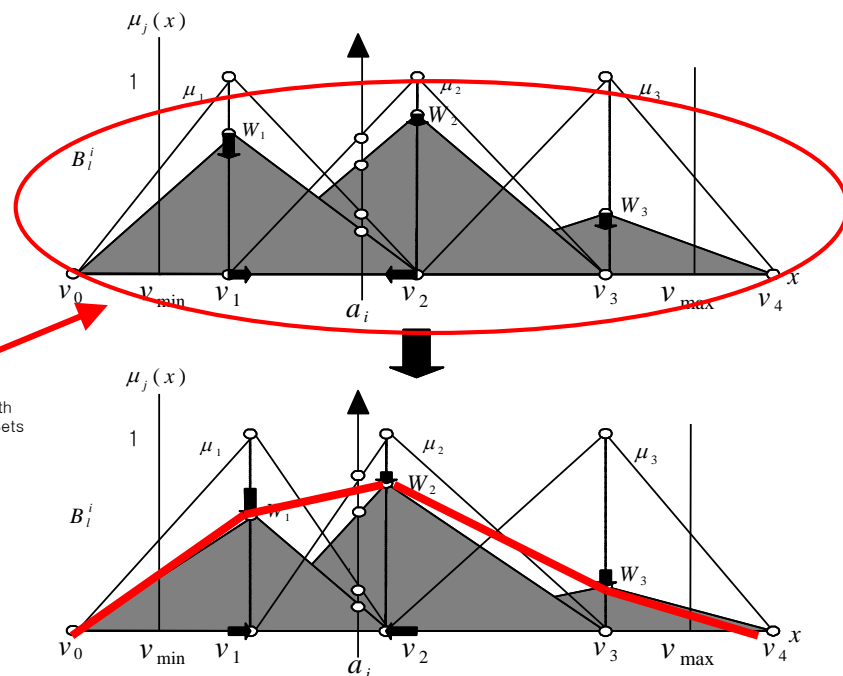
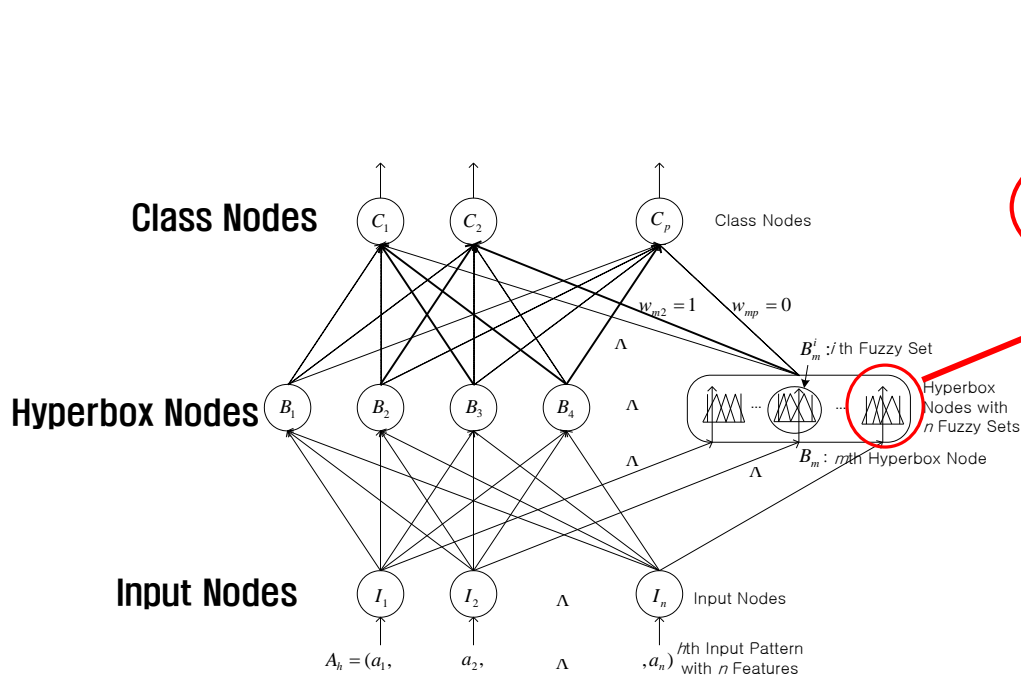
1st ZLU Layer	64.6 %
2nd ZLU Layer	85 %
Output Layer	97.5%

5. Parkinson's Disease Prediction Based on Vocal Tests

1 기반 기술 - NEWFM 고유 신경망 엔진



- 가중 퍼지신경망 - **가중퍼지함수** 이론 제시
(NEWFM, Neural Network with Weighted Fuzzy Membership Function)
- 자체 개발 고유** 퍼지신경망 모델
- 특징추출** 기능
- 2009.03 IEEE Trans. on Neural Networks 등 SCI급 20 여 편 게재

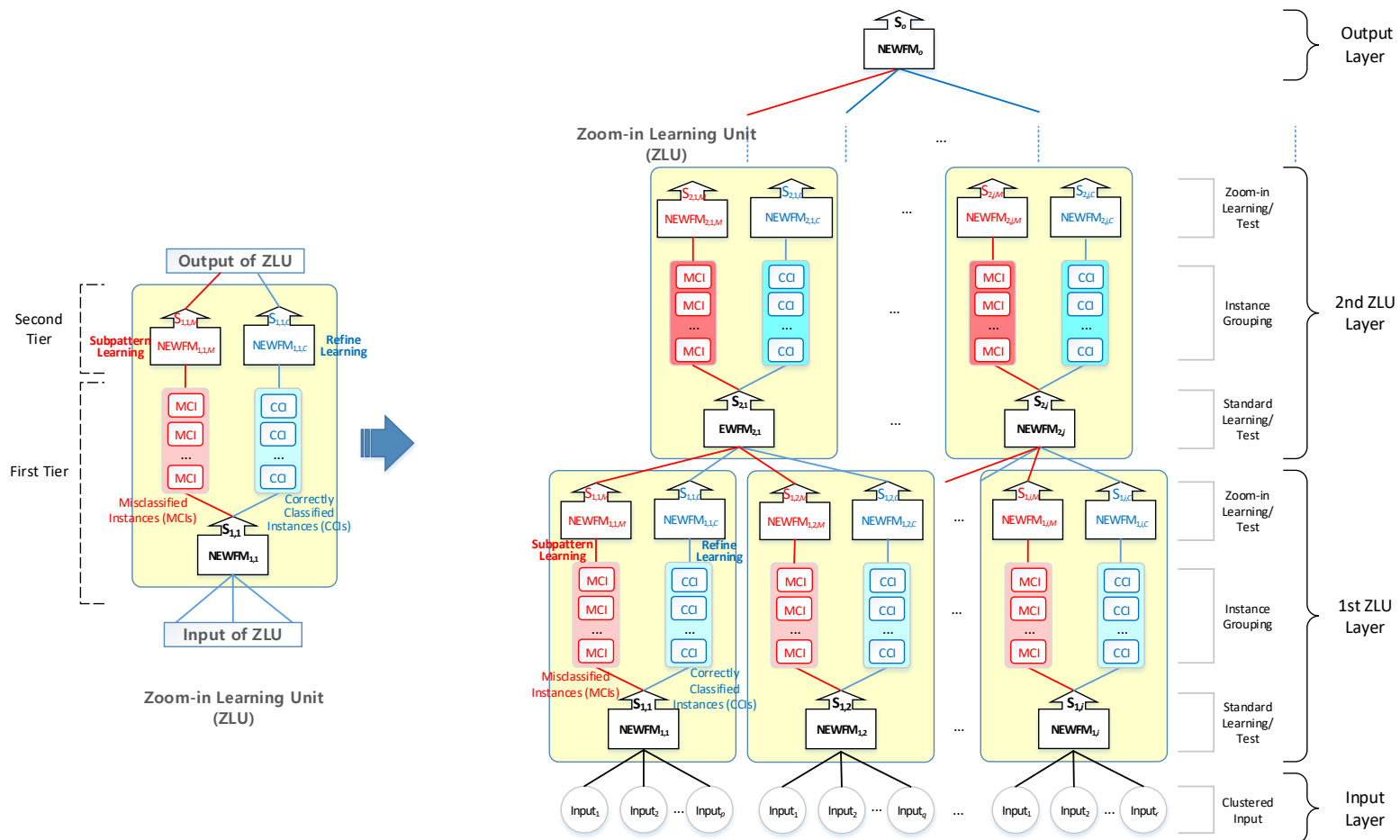


NEWFM의 구조와 학습

2

Zoom-in Neural Network (ZNN) 딥러닝 모델

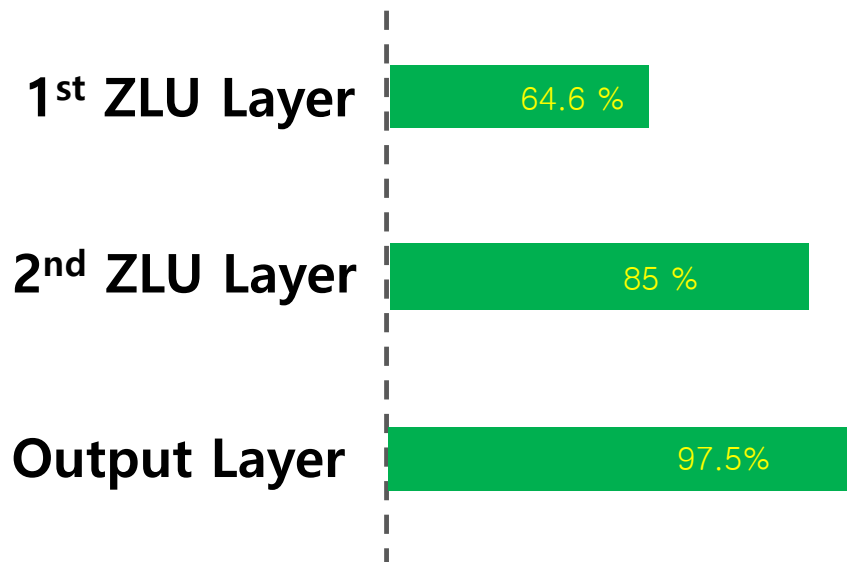
- ❖ NEWFM 기반 딥러닝 모델
- ❖ ZLU (Zoom-in Learning Unit) 조합에 의한 Feedforward 학습
- ❖ DARPA 차세대 AI 기술인 X-AI (설명 가능한 AI) Interface 구현



3 Parkinson's Disease Prediction Based on Vocal Tests by ZNN

- ❖ Data Set - Multiple Types of Sound Recordings on UCI Machine Learning Repository
- ❖ 모음 음성으로만 97.5% 진단
- ❖ "아리랑" 노래로 Parkinson's Disease 진단하는 앱 개발 예정

ZNN의 Layer 별 Parkinson's Disease Class 분류율

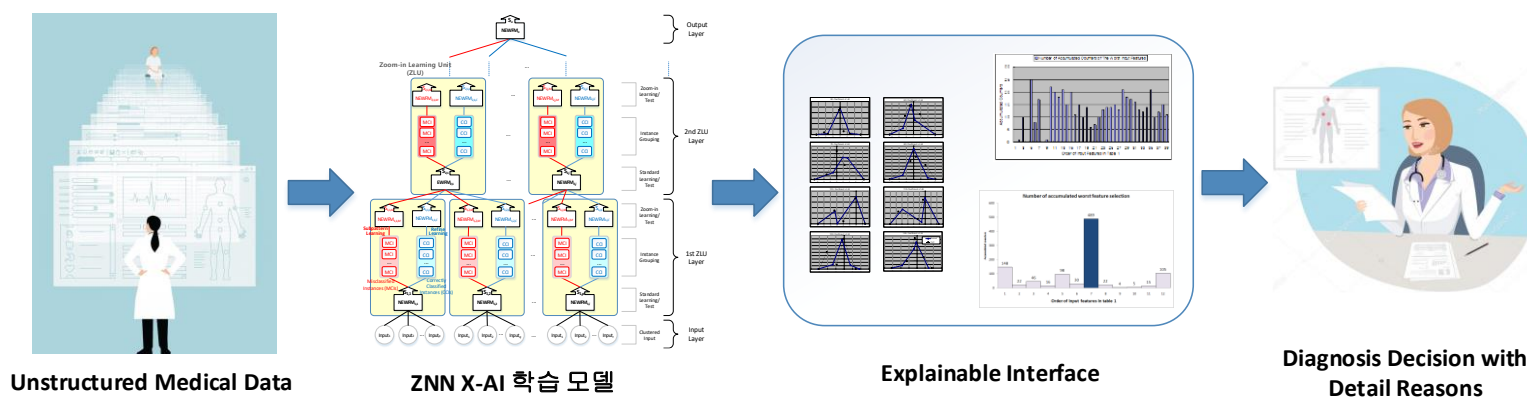


4 의료 원천기술 및 응용 by ZNN

- ❖ X-AI 의료 진단 원천기술 확보
- ❖ 질병의 상세한 원인 설명이 가능한 진단

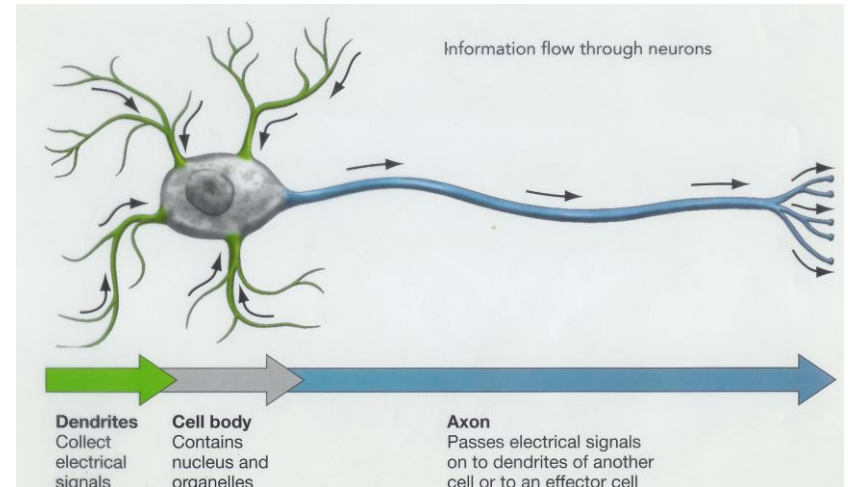
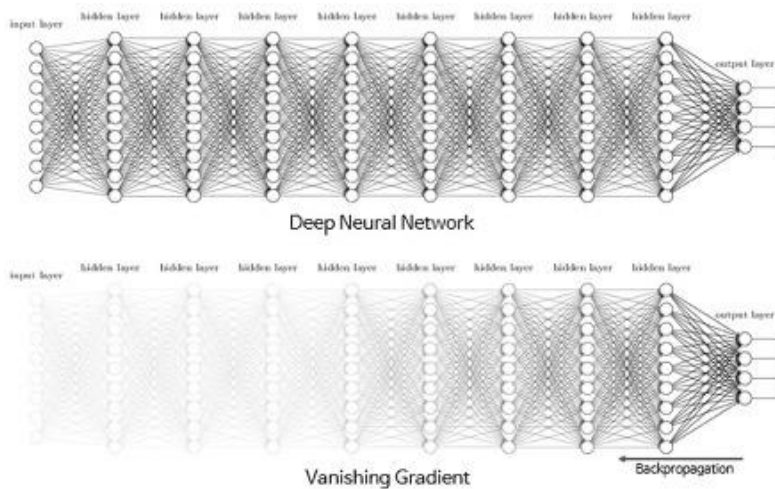
ZNN 의료 원천기술

- ➔ NEWFM(가중퍼지 신경망 모델) 기반 Zoom-in Neural Network 딥러닝 모델
- ➔ Overfitting을 줄이는 자동 Dropout 기능 구현
- ➔ 학습된 가중퍼지 소속함수로 X-AI Interface 구현



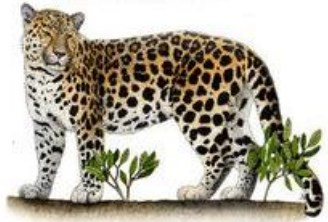
5 Impacts of ZNN

❖ Feedforward Training: No Backpropagation, No Vanishing Gradient Problem



- ❖ **Cell Body Learning** Rather Than Weight Learning
- ❖ Assembling **Zoom-in Learning Units (ZLUs)** for Customized Structured Architecture
- ❖ **Less Layers** : Not Deep Any More, Simple, Fast, Accurate
- ❖ Zoom-in **Refine Learning** and **Sub-pattern Learning** for each Layer

5.1 Classification of Cats And Leopards

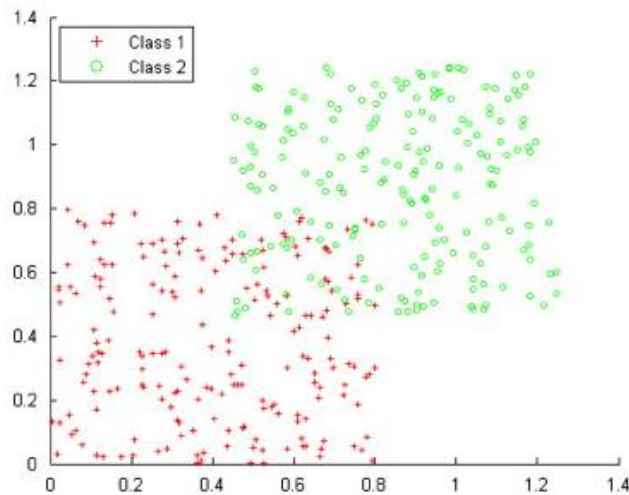


5.2 Classification of Sheepdogs And Mops

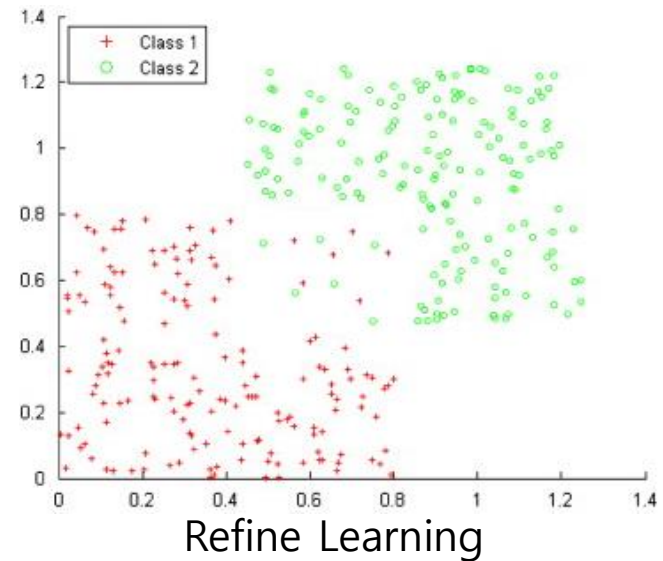


5.3 Classification of Circles And Rectangles

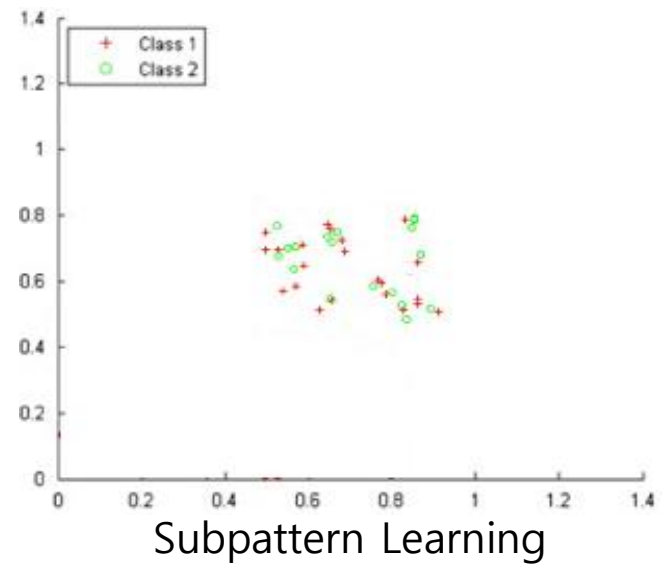
General Classification



Zoom-in Classification



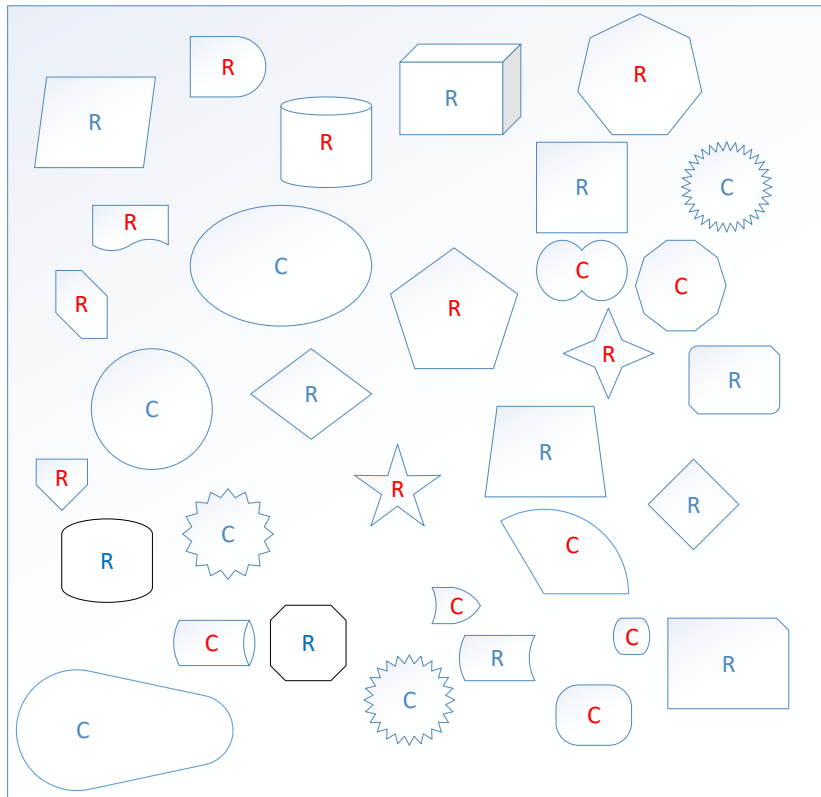
Refine Learning



Subpattern Learning

5.4 Classification of Circles And Rectangles

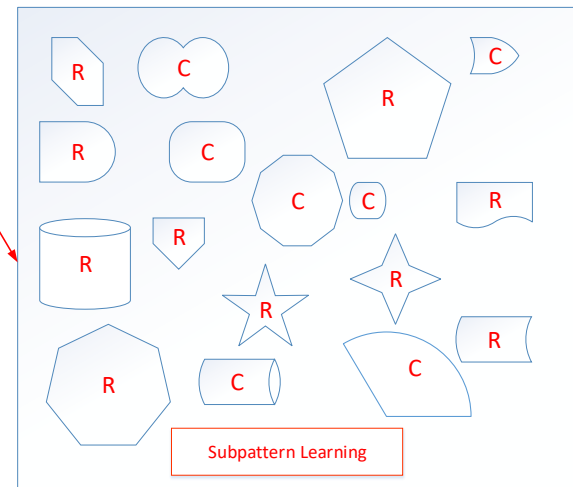
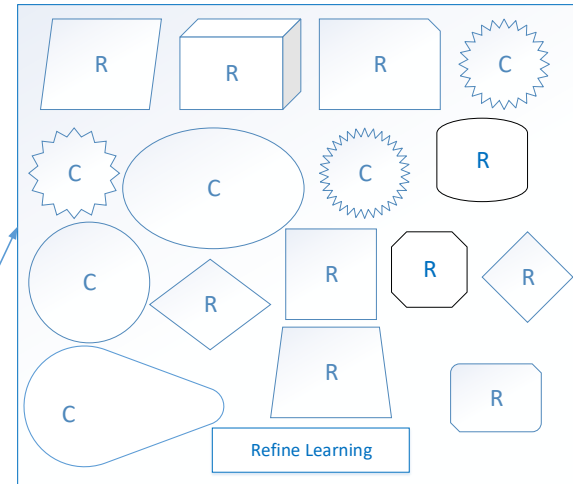
General Classification



Zoom-in Classification

Correctly Classified Instances (CCIs)

Misclassified Instances (MCIs)



6 X-AI를 위한 ZNN 딥러닝 모델 개발

- ❖ NEWFM 기반 Zoom-in Learning Unit (ZLU) 구축
- ❖ ZLU에 의한 패턴 추출 방안 연구
- ❖ ZLU 기반 Zoom-in Neural Network (ZNN) 딥러닝 모델 개발
- ❖ 자동 특징선택 및 Dropout 기능
- ❖ Explainable Interface 개발
- ❖ 의료 진단을 위한 Explainable ZNN 시스템 개발