
# Deep learning based Feature Selection Study

Sanghyuck Lee

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# To DO List

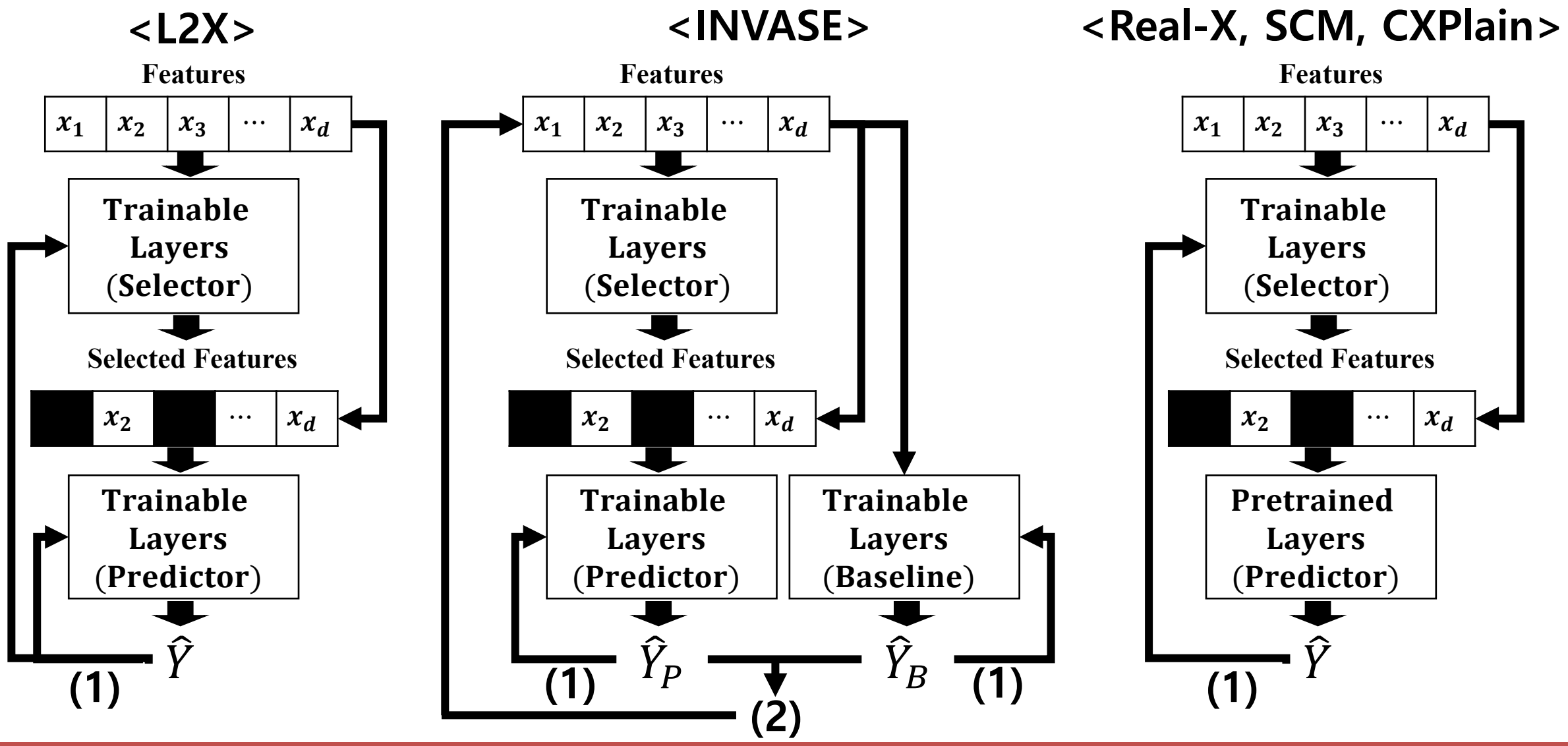
➢Last Week

- Study Related Works
- 갑상선 연구 보고 : Activity 추론이 얼마나 어려운지 확인

➢This Week

- Related Works Study and Implementation
- 갑상선 연구 보고 : 2 classes 실험 및 시각화

# L2X vs INVASE vs Real-X, SCM, CXPlain



# To-do

| Model | Dataset Modality |
|---|---|
| L2X | Synthetic, Text, **Image (MNIST)** |
| INVASE | Synthetic, Tabular, **CIFAR-10(In my study)** |
| Real-X | Synthetic, **Image (MNIST, Chest X-Rays)** |
| SCM | **Image (MNIST, FMNIST, CIFAR-10)** |
| Cxplain | **Image (MNIST, ImageNet)** |

**MNIST, CIFAR-10, ImageNet Experiments**
**(To- do)**

# 75 Benchmark Image Datasets

## To Find Complex Image Datasets, Ascending Datasets by Top SOTA model Accuracy

| Popular Rank | Dataset | Accuracy |
|---|---|---|
| 69 | Red MiniImageNet 80% label noise | 35.50 |
| 72 | ImageNet-Sketch | 39.10 |
| 68 | Red MiniImageNet 60% label noise | 45.10 |
| 67 | Red MiniImageNet 40% label noise | 48.06 |
| 66 | Red MiniImageNet 20% label noise | 51.42 |
| 75 | Places365-Standard | 60.30 |
| 34 | JFT-300M | 60.62 |
| 65 | CIFAR-100, 60% Symmetric Noise | 64.60 |
| 22 | Places205 | 66.80 |
| 44 | Tiny-ImageNet | 67.67 |
| 59 | ArtDL | 70.25 |
| 56 | ImageNet-10 | 72.90 |
| 9 | Clothing1M | 75.19 |
| 15 | DF20 - Mini | 75.85 |
| 51 | CIFAR-100, 40% Symmetric Noise | 75.91 |
| 47 | DTD | 76.60 |
| 19 | WebVision-1000 | 79.30 |
| 10 | VTAB-1k | 79.99 |
| 23 | ObjectNet | 80.00 |
| 27 | Tiered ImageNet 5-way (5-shot) | 80.15 |
| 16 | DF20 | 80.45 |
| 11 | mini WebVision 1.0 | 81.47 |
| 35 | Clothing1M (using clean data) | 81.50 |
| 37 | CelebA 64x64 | 82.00 |
| 60 | PASCAL VOC 2007 | 83.00 |

| Popular Rank | Dataset | Accuracy |
|---|---|---|
| 24 | iNaturalist | 83.40 |
| 74 | Chaoyang | 83.40 |
| 17 | ImageNet V2 | 84.00 |
| 30 | Tiny ImageNet Classification | 84.65 |
| 45 | X-ray Images on MURA | 84.72 |
| 31 | ObjectNet (Bounding Box) | 85.10 |
| 12 | iNaturalist 2018 | 86.80 |
| 57 | LabelMe | 87.12 |
| 18 | iNaturalist 2019 | 88.30 |
| 33 | MAMe | 88.95 |
| 38 | Food-101 | 89.30 |
| 40 | Food-101N | 90.39 |
| **1** | **ImageNet** | **90.88** |
| 29 | EMNIST-Balanced | 91.05 |
| 7 | ImageNet ReaL | 91.12 |
| 50 | CIFAR-10, 60% Symmetric Noise | 91.30 |
| 36 | CUB | 92.95 |
| 64 | Sports10 | 93.42 |
| 54 | iCassava'19 | 93.68 |
| 25 | CINIC-10 | 94.30 |
| 52 | MultiMNIST | 94.80 |
| 21 | Oxford-IIIT Pets | 94.90 |
| 58 | Surrey ASL | 94.90 |
| 49 | CIFAR-10, 40% Symmetric Noise | 95.37 |
| 55 | cifar-10,4000 | 95.80 |

| Popular Rank | Dataset | Accuracy |
|---|---|---|
| 26 | EMNIST-Letters | 95.88 |
| 3 | Cifar-100 | 96.08 |
| 14 | Stanford Cars | 96.32 |
| 73 | CIFAR-10 (with noisy labels) | 96.70 |
| 20 | Fashion-MNIST | 96.91 |
| 43 | Noisy MNIST (Contrast) | 97.25 |
| 48 | SIPaKMeD | 97.87 |
| 61 | MNIST-rot-12 | 98.13 |
| 63 | Herlev | 98.32 |
| 41 | Noisy MNIST (AWGN) | 98.43 |
| 46 | EuroSAT | 98.65 |
| 4 | STL-10 | 98.66 |
| 28 | smallNORB | 98.77 |
| 70 | SARS-COV-2 | 98.93 |
| 5 | SVHN | 99.10 |
| 13 | Kuzushiji-MNIST | 99.15 |
| 42 | Noisy MNIST (Motion) | 99.20 |
| 62 | MNIST-rot-12k (DA) | 99.29 |
| 32 | EMNIST-Digits | 99.43 |
| 71 | PlantVillage | 99.48 |
| **2** | **Cifar-10** | **99.50** |
| 39 | Imbalanced CUB-200-2011 | 99.60 |
| 53 | QMNIST | 99.67 |
| 8 | Flowers-102 | 99.76 |
| **6** | **MNIST** | **99.91** |

# Next Step

- 5 methods implementation **(L2X, INVASE, Real-X, SCM, CXPlain)**
- 3 dataset SOTA algorithm implementation **(MNIST, CIFAR-10, ImageNet)**

# 갑상선 연구 : 실험 1

**실험 1)**

- 데이터셋: Active / Inactive / Normal = 144 / **924** / 121
- 3 classes problem => (Active vs Rest) or (Active vs Inactive)

| | |
|---|---|
| 144 vs 1,045 | 144 vs 924 |
| 0.12 vs 0.88 | 0.13 vs 0.87 |

- INVASE Experiments: **VGGNet19 X (Baseline AUC 50~60%)**

**=> Optimizer, Learning Rate, Augmentation & Under-sampling vs Focal loss를 변경하며 실험 진행하였지만 실험 결과 좋지 않음.**

# 갑상선 연구 : 실험 2

**실험 2) Active vs Inactive 모델 탐색 (focal loss)**

- 실험 후보 모델 : AlexNet, DenseNet169, DenseNet264, EfficientNetB0, GoogLeNet, InceptionV2, MobileNetV3, ResNet50, ResNet101, ShuffleNet_v2_x1_0, ShuffleNet_v2_x2_0, VGGNet16, VGGNet19

| Model Name | AUC | Accuracy | Macro F1 | Train-Predction Time | AUC(2nd exp) |
|---|---|---|---|---|---|
| InceptionV2 | **85.32** | 86.92 | 69.35 | 0:12:51 | **62.34** |
| ResNet101 | 83.33 | 85.98 | 52.08 | 0:12:43 | **57.82** |
| DenseNet264 | 81.53 | 89.72 | 60.57 | 0:23:15 | **72.68** |
| ResNet50 | 80.49 | 86.92 | 57.54 | 0:07:58 | **64.34** |
| DenseNet169 | 78.88 | 21.50 | 21.49 | 0:17:20 | **66.55** |
| EfficientNetB0 | 74.05 | 87.85 | 53.4 | 0:13:39 | **62.93** |
| ShuffleNet_v2_x1_0 | 71.50 | 88.79 | 54.14 | 0:10:26 | **69.27** |
| ShuffleNet_v2_x2_0 | 67.61 | 48.60 | 43.55 | 0:10:48 | **62.7** |
| VGGNet19 | 67.23 | 89.72 | 47.29 | 0:08:43 | **48.3** |
| VGGNet16 | 60.98 | 89.72 | 47.29 | 0:07:59 | **72.22** |
| AlexNet | 57.86 | 89.72 | 47.29 | 0:03:41 | **59.98** |
| MobileNetV3 | 49.81 | 59.81 | 43.09 | 0:12:20 | **63.34** |
| GoogLeNet | 39.80 | 89.72 | 47.29 | 0:07:32 | **61.34** |

* 반복 실험 간 성능 변동이 큰 것으로 보임. => 현재 이슈

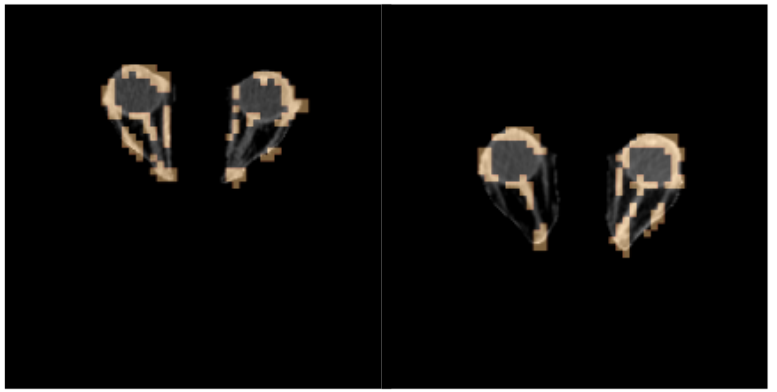
# 갑상선 연구 : 선택 특징 시각화

- SCM 사용 (정사각 패치 셀렉션)
- VGGNet19으로 예측한 3 classes 문제
- 반복 실험 변동 이슈 마찬가지로 존재
- INVASE는 동작X
    - ㄴ 이유는 단언 어려우나,

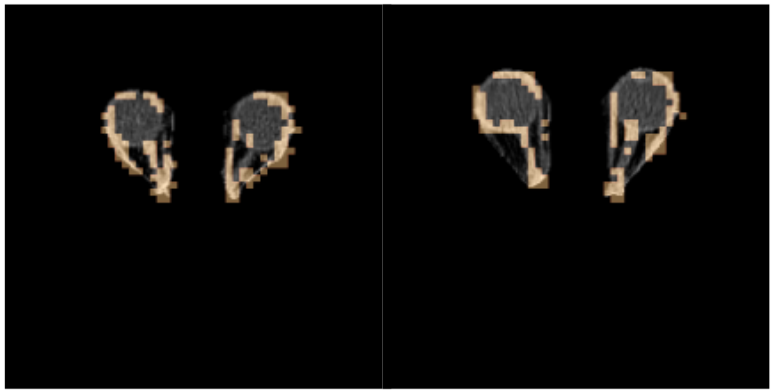
      Predictor 성능 부족,

      불필요한 특징을 AX3에서 크게 찾기 어려워서 등)

True Active



True Inactive



True Normal

# 갑상선 연구 : 추후 진행사항

- 내일 모레 (12/23 목) 이정규 교수님 미팅
- 데이터 스플릿 이슈 해결 필요 : 더 강건한 모델 제안 필요 ->SOTA 모델 구현
- 세그멘테이션 진행한 데이터에 대한 적절한 활용(INVASE 잘 동작할 수 있을지)
- 11 슬라이스 모두 사용하는 방식 제안 필요