Research Portfolio

Daejin Kim

2020 - 2022
Computer Vision
Time Series Forecasting
Model Compression

김대진
Daejin Kim

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카이스트 김재철AI대학원 DAVIAN 연구실 (지도 교수: 주재걸)에서 석사 과정에 재학 중입니다.
생성 모델과 시각화 기법, 그리고 시계열 및 교통 예측 연구를 진행하고 있습니다.

Education

Korea Advanced Institute of Science and Technology — **Mar 2021 – Feb 2023 (Expected)**
Master's student in DAVIAN Laboratory (Advisor : Jaegul Choo) — **GPA:** 4.3/4.3

Sungkyunkwan University — **Mar 2017 – Feb 2021**
Undergraduate research student in DIALLab Laboratory (Advisor: Jongwuk Lee) — **Major GPA:** 4.39/4.5
Bachelor of Computer Science and Engineering — (Great honor)

Work experience

NAVER WEBTOON Corp. — **Nov 2022 –**
Internship at NAVER WEBTOON AI Research Lab

Publications (C: peer-reviewed conference, * = equal contributions)

[C4] WaveBound: Dynamic Error Bounds for Stable Time Series Forecasting
Youngin Cho*, **Daejin Kim*,** Dongmin Kim, Mohammad Azam Khan, and Jaegul Choo
*Conference on Neural Information Processing Systems (**NeurIPS**), 2022, Accepted.*

[C3] Mining Multi-Label Samples from Single Positive Labels
Youngin Cho*, **Daejin Kim*,** Mohammad Azam Khan, and Jaegul Choo
*Conference on Neural Information Processing Systems (**NeurIPS**) , 2022, Accepted.*

[C2] Residual Correction in Real-Time Traffic Forecasting
Daejin Kim*, Youngin Cho*, Dongmin Kim, Cheonbok Park, and Jaegul Choo
*ACM International Conference on Information and Knowledge Management (**CIKM**), 2022, Accepted.*

[C1] Not Just Compete, but Collaborate: Local Image-to-Image Translation via Cooperative Mask Prediction
Daejin Kim, Mohammad Azam Khan, and Jaegul Choo
*IEEE Conference on Computer Vision and Pattern Recognition (**CVPR**), 2021, Accepted.*

DAVIAN
Data and Visual Analytics Lab

davian.kaist.ac.kr
경기도 성남시 분당구 성남대로331번길 8

주재걸

Associate Professor
KAIST AI

- **박사**, 2013 Georgia Tech, Computational Science and Eng.
- **석사**, 2009 Georgia Tech, Electrical and Computer Eng.
- **학사**, 2001 서울대학교, 전기공학부

Jaegul Choo

davian.kaist.ac.kr

Conference Publications

- **2022:** 1 PAKDD, 1 ICLR, 1 WWW, 1 SIGIR, 1 EuroVis, 4 ECCV, 1 CIKM, 3 NeurIPS, 2 EMNLP
- **2021:** 3 CVPR (1 Oral), 3 ICCV (2 Oral) 3 ACL (1 Long, 1 Short, 1 Findings), 1 NAACL, 2 EMNLP (1 Short, 1 Findings), 1 NeurIPS (Oral), 1 AAAI, 1 CSCW, 1 ICASSP, 1 ACML
- **2020:** 3 CVPR, 1 ICLR, 1 ICML, 1 CIKM, 1 BMVC (Oral), 1 IEEE VIS
- **2019:** 2 CVPR (1 Oral), 1 AAAI, 1 BMVC (Spotlight), 1 EMNLP, 1 CIKM, 1 CHI, 1 IEEE VIS Short, 1 EuroVis
- **2018:** 1 CVPR (Oral), 1 ECCV, 1 EMNLP, 1 WWW, 1 IJCAI, 1 CHI, 1 IEEE VIS, 1 EuroVis

Selected Publications by Areas

Image Generation and Translation (user-driven, multi-task, multi-domain)

- VITON-HD: High-Resolution Virtual Try-On via Misalignment-Aware Normalization, **CVPR'21**
- Reference-based Sketch Image Colorization using Augmented-Self Reference, **CVPR'20**
- Image-to-Image Translation via Group-wise Deep Whitening and Coloring, **CVPR'19**, *Oral paper (Top 5.5%)*
- StarGAN: Unified GANs for Multi-Domain Image Translation, **CVPR'18**, *Oral paper (Top 2%)*

Natural Language Understanding and Generation

- Restoring and Mining the Records of the Joseon Dynasty via Neural Language Modeling and Machine Translation, **NAACL'21**
- NeurQuRI: Neural Question Requirement Inspector for Answerability Prediction in Machine Reading Comprehension, **ICLR'20**
- Paraphrase Diversification using Counterfactual Debiasing, **AAAI'19**

Text and Social Media Mining

- ST-GRAT: Spatio-Temporal Graph Attention Network for Traffic Forecasting, **CIKM'20**
- Recommender System via Sequential and Global Preference via Attention Mechanism and Topic Modeling, **CIKM'19**
- TopicOnTiles: Tile-Based Spatio-Temporal Event Analytics via Exclusive Topic Modeling on Social Media, **CHI'18**

Visual Analytics (image, text, sequence analysis)

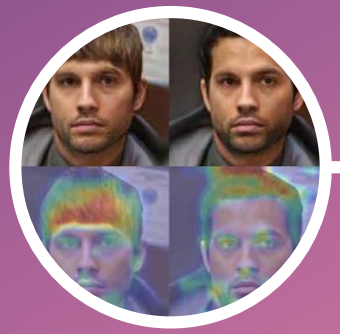
- HyperTendril: Visual Analytics for User-Driven Hyperparameter Optimization of Deep Neural Networks, **IEEE VIS'20**
- SANVis: Visual Analytics for Understanding Self-Attention Networks, **IEEE VIS'19 Short**
- AILA: Attentive Interactive Labeling Assistant for Document Classification through Deep Neural Networks, **CHI'19**
- RetainVis: Visual Analytics with Interpretable and Interactive RNNs on Electronic Medical Records, IEEE **VIS'18**

KAIST

2020 - 2022

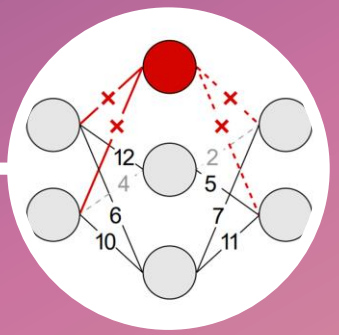
Research

2020



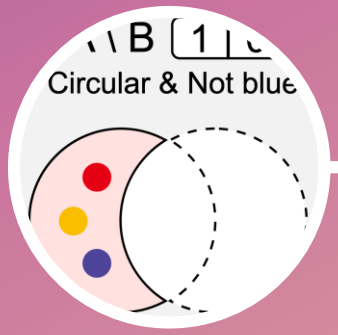
Not just Compete, but Collaborate:
Local Image-to-Image Translation via Cooperative Mask Prediction

CVPR 2021



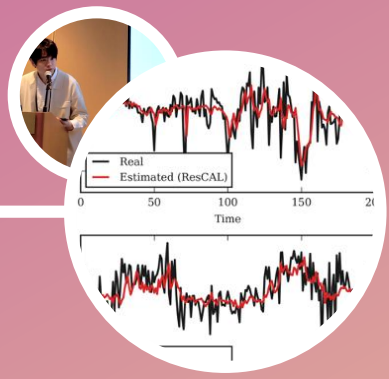
Your Lottery Ticket is Damaged:
Towards All-Alive Pruning for Extremely Sparse Networks

2021



Mining Multi-Label Samples from Single Positive Labels

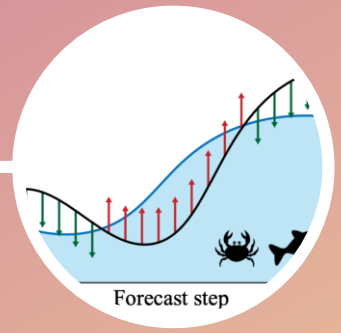
NeurIPS 2022



Residual Correction in Real-Time Traffic Forecasting

CIKM 2022

2022



WaveBound:
Dynamic Error Bounds fo
Stable Time Series Forecasting

NeurIPS 2022

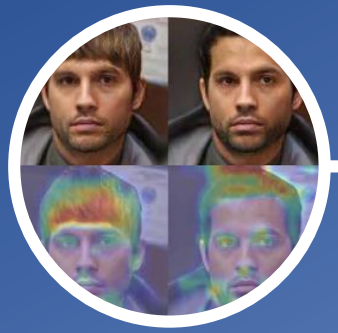
Research in Computer Vision

Image-to-Image Translation
Conditional Generation
Explainable AI

2020

Not just Compete, but Collaborate:
Local Image-to-Image Translation via Cooperative Mask Prediction

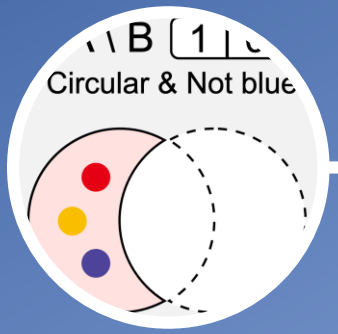
CVPR 2021



2021

Mining Multi-Label Samples from Single Positive Labels

NeurIPS 2022

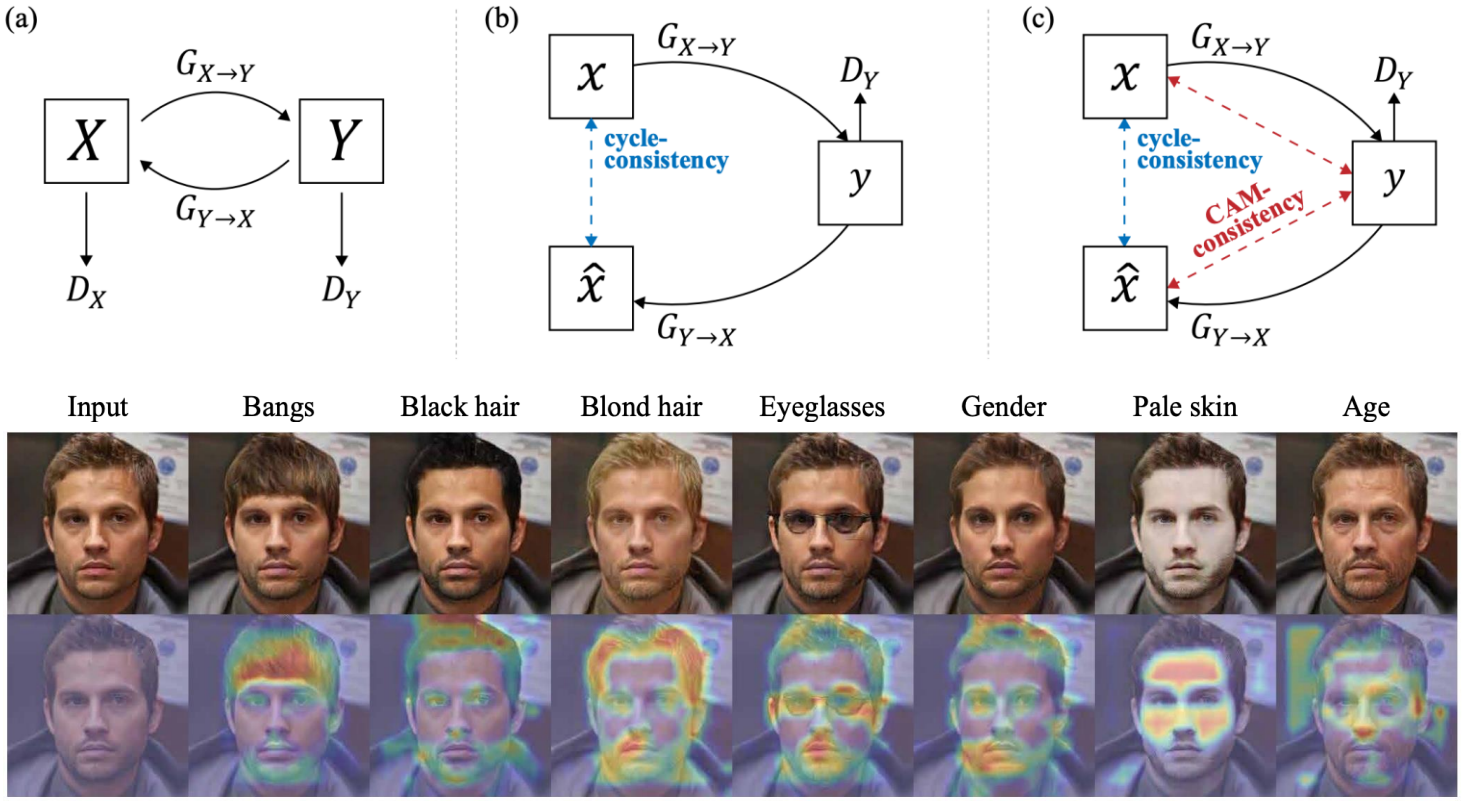


2022

Not just Compete, but Collaborate:
Local Image-to-Image Translation via Cooperative Mask Prediction

Daejin Kim, Mohammad Azam Khan, and Jaegul Choo

CVPR 2021 **GANs** **CAM**



- StarGAN, AttGAN과 같은 기존 facial editing 모델들은 원하는 부위만을 수정하지 못하고 주변 배경, 혹은 관련된 다른 부위를 같이 변경한다는 한계점을 지님 (머리색 변환 시 배경색도 변환하는 등).
- $X \to Y$ 의 변환 과정에서 ground truth가 없는 Y 에 대한 제약을 주기 위해, 시각화 기법인 Grad-CAM을 이용하여 변환된 부위를 예측하고, 해당 부위 외에는 유지하도록 하는 loss를 제시하였음.
- Discriminator의 Grad-CAM을 이용하며, generator와 Grad-CAM 모두 부위를 정확히 판별하는 방향으로 학습됨.

thecvf.com

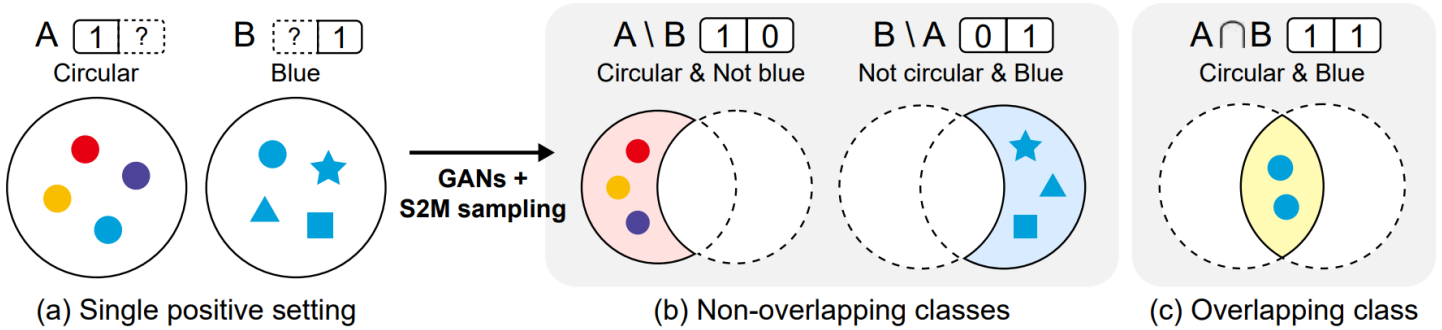
Mining Multi-Label Samples from Single Positive Labels

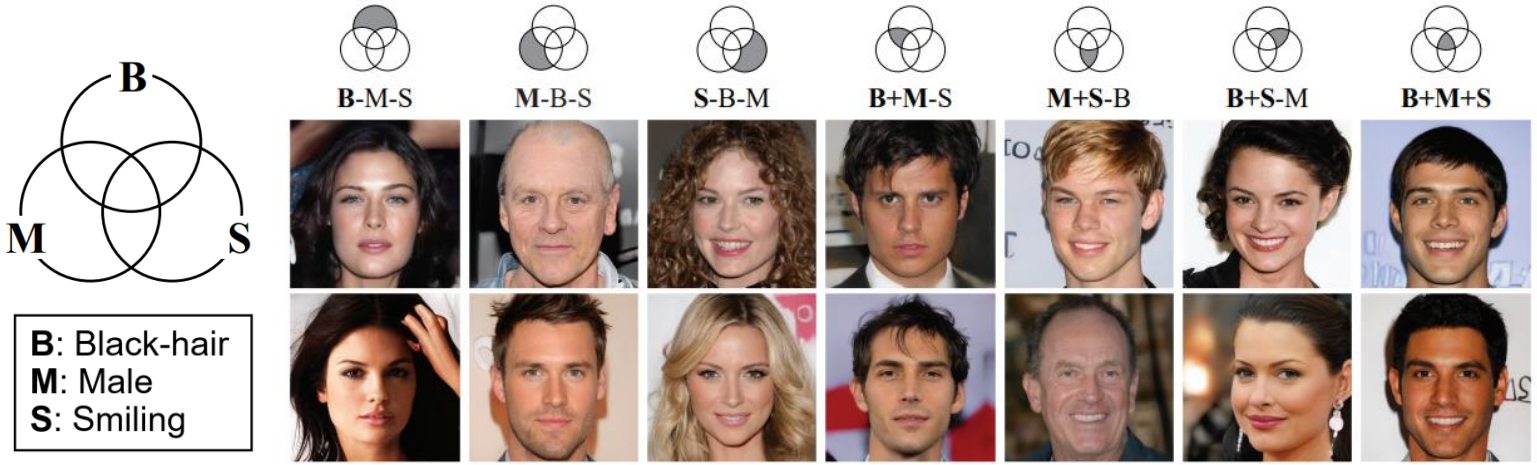
Youngin Cho*, **Daejin Kim***, Mohammad Azam Khan, and Jaegul Choo (*equal contributions)

NeurIPS 2022

GANs

MCMC Sampling





- "남자"의 이미지와 "검은 머리"의 이미지가 따로 수집된 경우, "검은 머리 남자"는 어떻게 생성할 수 있는가?
- 기존 conditional generation task에서는, 각 데이터마다 단일 레이블로만 명시된 경우 (*e.g.*, $\mathbf{A}, \mathbf{B}$), 해당 레이블들이 조합된 조건(*e.g.*, $\mathbf{A} \cap \mathbf{B}, \mathbf{A} \backslash \mathbf{B}, \cdots$)을 가지는 이미지를 생성하는 것이 거의 불가능하였음.
- Discriminator Rejection Sampling, MH-GAN 등의 연구에서 착안하여, 다중 레이블로 정의될 수 있는 데이터를 classifier의 logit과 Markov Chain Monte Carlo (MCMC) sampling을 이용하여 생성될 수 있도록 하였음.

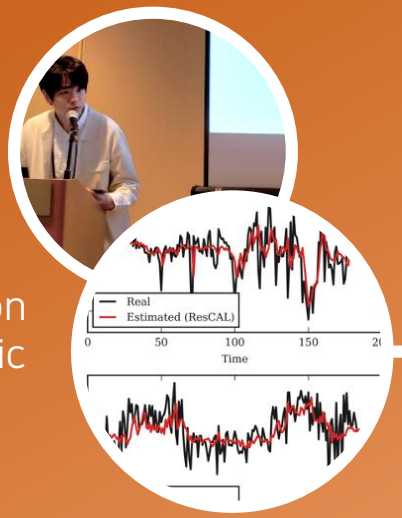
arxiv.org

Research in Time Series Forecasting

Traffic Forecasting
Time Series Forecasting
Residual Diagnostics

2020

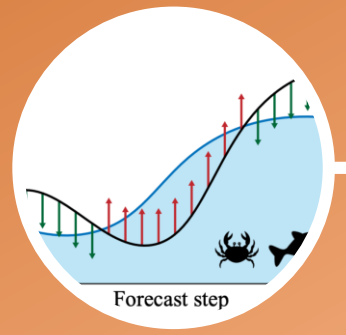
2021



Residual Correction in Real-Time Traffic Forecasting

CIKM 2022

2022



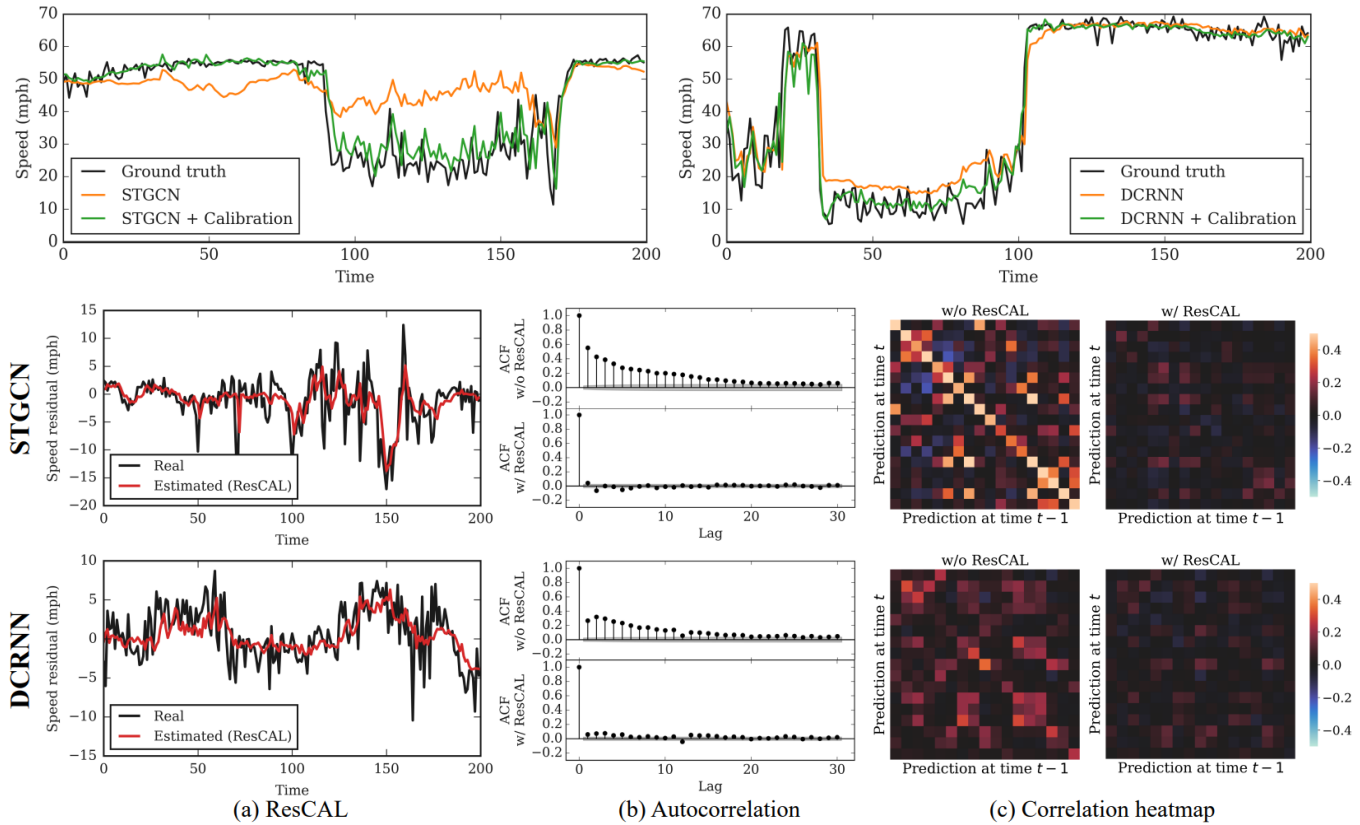
WaveBound:
Dynamic Error Bounds fo
Stable Time Series Forecasting

NeurIPS 2022

Residual Correction in Real-Time Traffic Forecasting

Daejin Kim*, Youngin Cho*, Dongmin Kim, and Jaegul Choo
(*equal contributions)

CIKM 2022 **Traffic Forecasting** **Residual Diagnostics**



(a) ResCAL (b) Autocorrelation (c) Correlation heatmap

- 시계열 예측 분야에서, 관측값에서 예측값을 뺀 residual에는 예측 불가능한 noise만 존재해야 함.
- 시계열 예측 모델의 평가에서 예측 시점에 따른 residual의 correlation을 측정한 residual autocorrelation은 모델이 아직 포착하지 못한 "예측 가능한 값"이 있는지 파악하기 위해 사용됨.
- 최근 딥러닝 기반의 교통 예측 모델에서 특정 노드의 residual이 해당 노드, 그리고 주변 도로의 이전 residual과 correlate 되어있는 것을 확인하고, residual만을 예측하는 모듈을 제시하여 correlation을 제거함과 동시에 예측 성능을 높임.

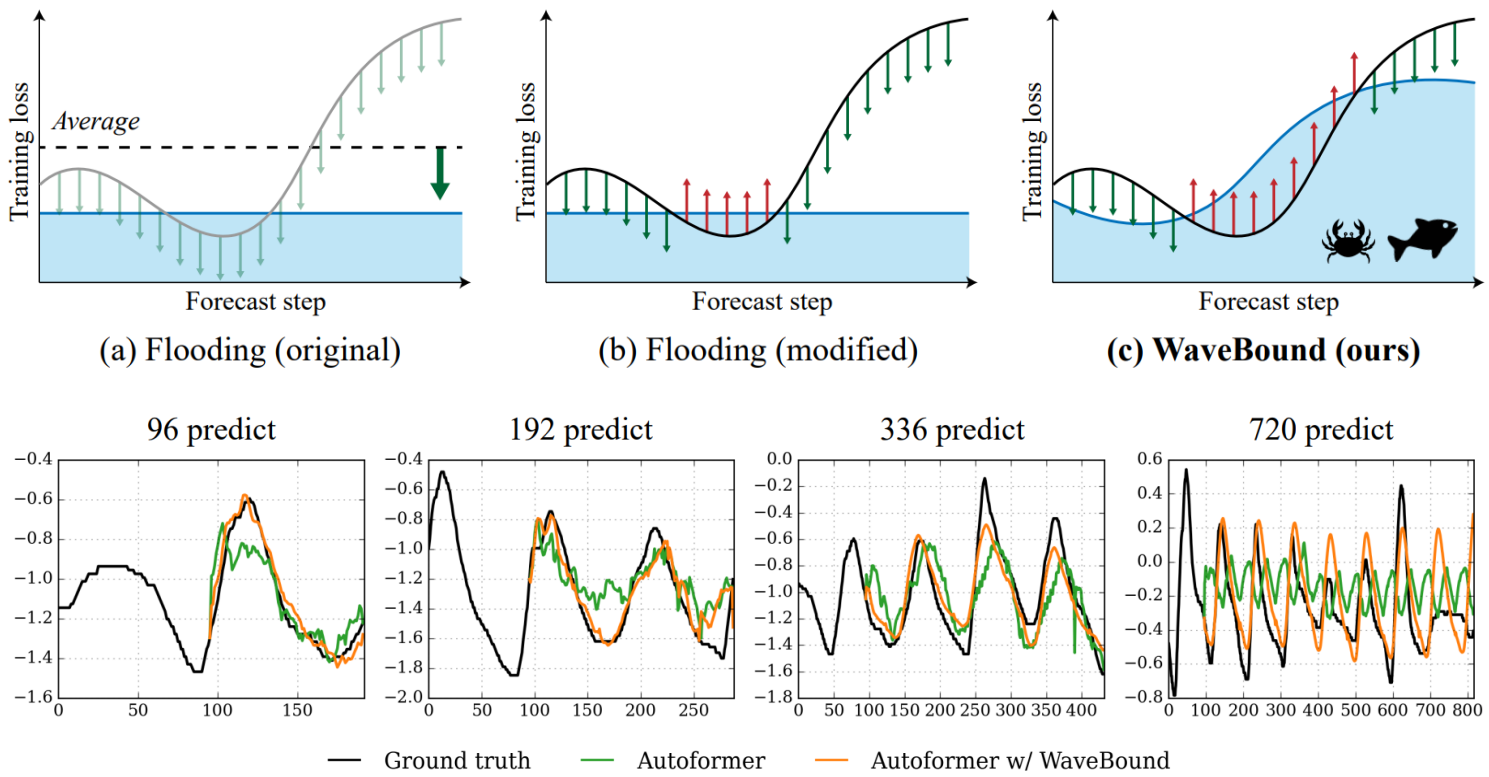
arxiv.org

WaveBound:
Dynamic Error Bounds for Stable Time Series Forecasting

Youngin Cho*, **Daejin Kim***,
Mohammad Azam Khan,
Dongmin Kim, and Jaegul Choo
(*equal contributions)

NeurIPS 2022 **Overfitting**

Time Series Forecasting



- 최근의 딥러닝 기반 시계열 예측 모델은 데이터에 overfitting되어 해당 노이즈에 크게 영향을 받는 경향을 보임.
- 이미지 분류에서는 학습 데이터를 완전히 memorize하는 것을 방지하기 위해 training loss를 특정 값 이하로 떨어지지 않도록 하는 flooding regularization이 제시된 바 있음.
- Flooding regularization에 착안하여, 시계열 데이터에서 exponential moving average로 업데이트 되는 보조 모델이 적절한 error bound를 매 iteration마다 제공하도록 하여 시계열 예측 모델의 overfitting을 방지하도록 하였음.

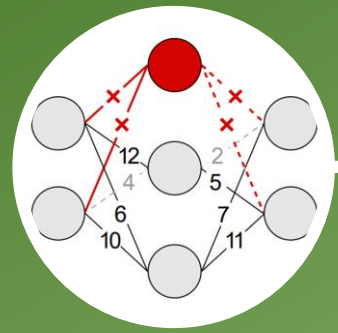
arxiv.org

Research in **Model Compression**

Network Pruning
Unstructured Pruning
Lottery Ticket Hypothesis

2020

Your Lottery Ticket is Damaged:
Towards All-Alive Pruning for Extremely Sparse Networks



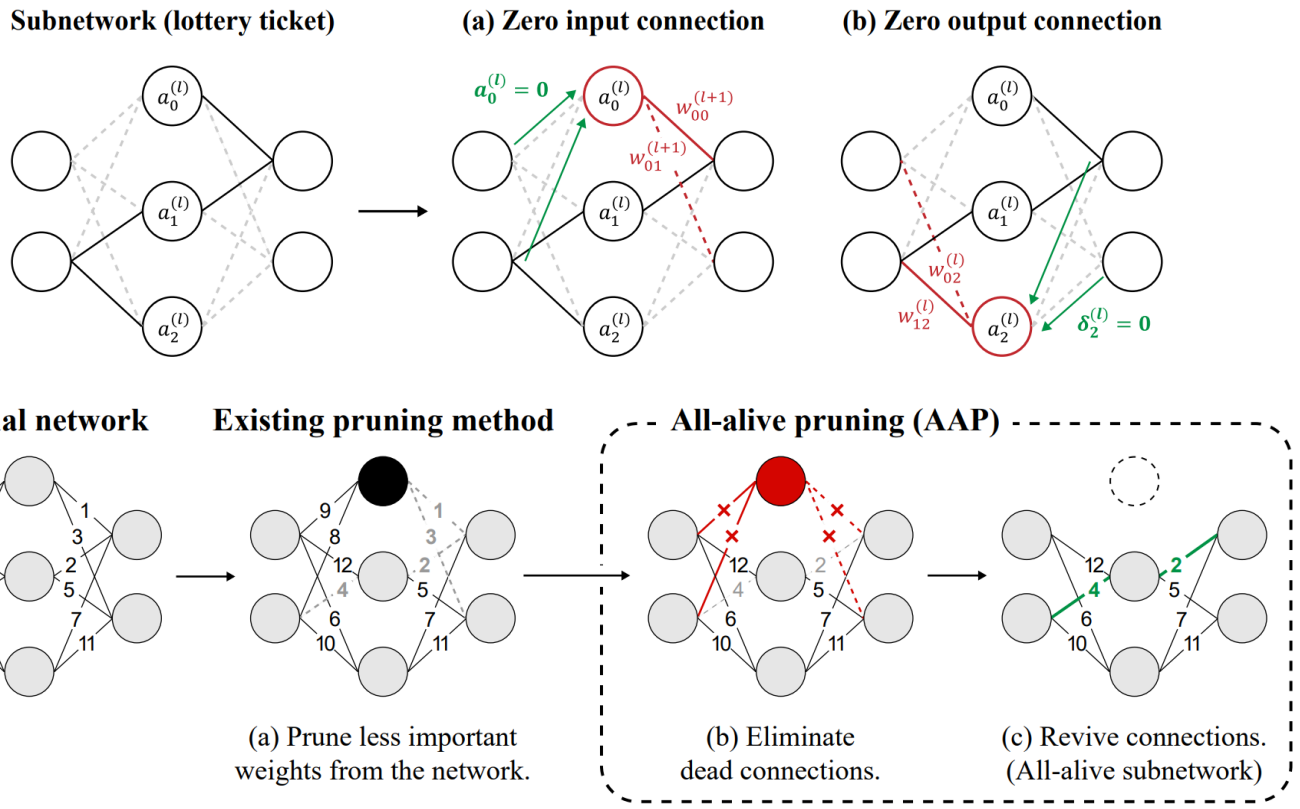
2021

2022

Your Lottery Ticket is Damaged:
Towards All-Alive Pruning for Extremely Sparse Networks

Daejin Kim, Min-Soo Kim , Hyunjung Shim , Jongwuk Lee

Under Review **Compression** **Unstructured Pruning**



- Network pruning 기법 중 unstructured pruning은 network 내의 가중치마다 saliency score를 예상하여, 가장 높은 saliency score를 가지는 가중치만을 남기는 식으로 sparsity를 확보함 (대표적인 score metric은 가중치의 절댓값).
- 기존의 magnitude pruning, SNIP, 그리고 LAP와 같은 메서드로 pruning을 진행할 경우, 입력, 혹은 출력단의 가중치가 모두 제거되어 학습에 전혀 사용될 수 없는 neuron이 발생하는 것을 확인함.
- 해당 neuron들을 gradient로 판별하고 제거함으로써, 같은 sparsity에서 모델이 더 많은 학습 가능한 가중치를 가질 수 있도록 하였음.