◆ 2015 - 2024

PORTFOLIO

Yujee Song

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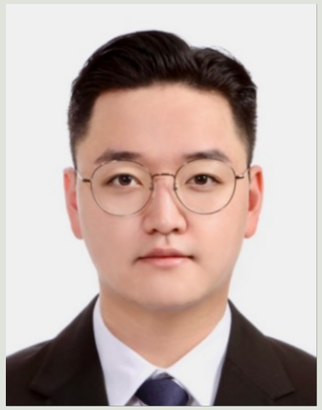
Overview

PROFILE



NAME Yujee Song

EDUCATION

2023 - Present
POSTECH
MSc. in Artificial Intelligence
- Class President, GSAI

2020 - 2022
Chung-Ang University
BSc. in CSE
- Summa Cum Laude

2015 - 2017
UC Irvine
BSc. in CSE

HONORS

2015 - 2017 • Dean's list, 5 times

2019 - 2022 • Dean's list, 2 times

2022 • Summa Cum Laude

2024 • ICLR 2024, 1 paper

2024 - present • Student body president

RESEARCH INTEREST

- Time Series Analysis
- Dynamical System Modeling
- Generative Modeling
- Graph Machine Learning

Contents

Education

2023 - Present

POSTECH

MSc. in Artificial Intelligence

- Medical Information Processing (MIP) Lab
- **Supervised by Prof. Won Hwa Kim**
- **Research Interests :**
  - Time Series Analysis
  - Dynamical System Modeling
  - Generative Model
  - Graph Machine Learning

2015 - 2017

UC Irvine

BSc. in Computer Science & Engineering

- GPA : 3.61 / 4.0
- Dean's Honors List, 5 out of 6 time

2020 - 2022

Chung-Ang Univ

BSc. in Computer Science & Engineering

- GPA : 4.47 / 4.50
- Academic Achivement Award, 2 out of 3 times
- Summa Cum Laude

Honors

2024	Paper Accepted at International Conference of Learnign Representation (**ICLR**) 2024
2024 - Present	**Class President**, Graduate School of Artificial Intelligence
2022	**Summa Cum Laude**, Chung-Ang Univ.
2021	Excellence Award, Chung-Ang Univ. Engineering Conference
2021	Academic Scholarship / **Dean's List**
2020 - 2021	Articial Intelligence Club
2020	Academic Scholarship / **Dean's List**
2017	**Dean's Honor List**, 2 times
2016	**Dean's Honor List**, 2 times
2015	**Deans' Honor List**

Research Experience

Feb 2023 - Present
Pohang, Korea

Medical Information Processing Lab, POSTECH
- Advisor: Prof. Won Hwa Kim
- Research on:
  - **Time series analysis**
  - **Medical data** processing
  - AD diagnosis
  - Graph machine learning
  - Medical image generation

Oct 2022 - Nov 2022
Seoul, Korea

Big Data Analytics and Learning, Yeonsei Univ.
- Advisor: Prof. Noseong Park
- Research on:
  - **Differential equation** based **time series analysis**

Feb 2022 - Aug 2022
Seoul, Korea

Computer Vision and Machine Leaning Lab, Chung-Ang Univ.
- Advisor: Prof. Junseok Kwon
- Research on:
  - **Dynamical system modeling**

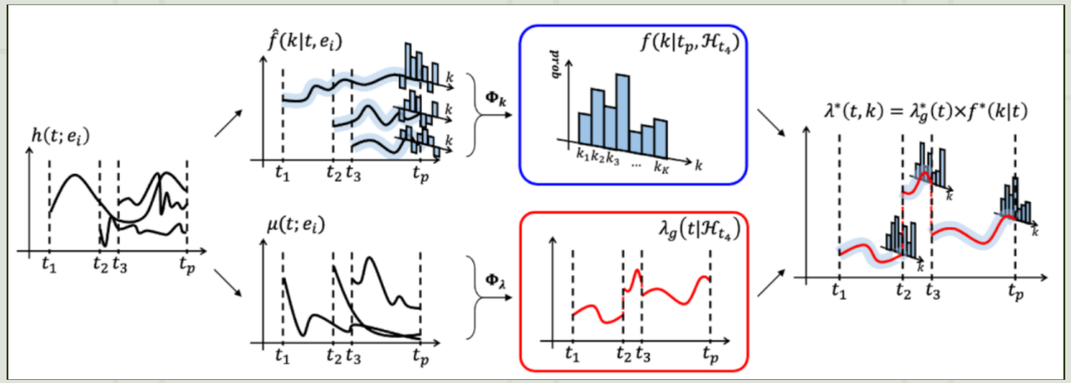
Jun 2021 - Aug 2021
Seoul, Korea

Computer Vision and Machine Leaning Lab, Chung-Ang Univ.
- Advisor: Prof. Junseok Kwon
- Research on:
  - Contrastive Learning
  - Computer vision

Publication

Decoupled Marked Temporal Point Process using Neural ODEs (ICLR 2024)

Yujee Song, Donghyun LEE, Rui Meng, Won Hwa Kim

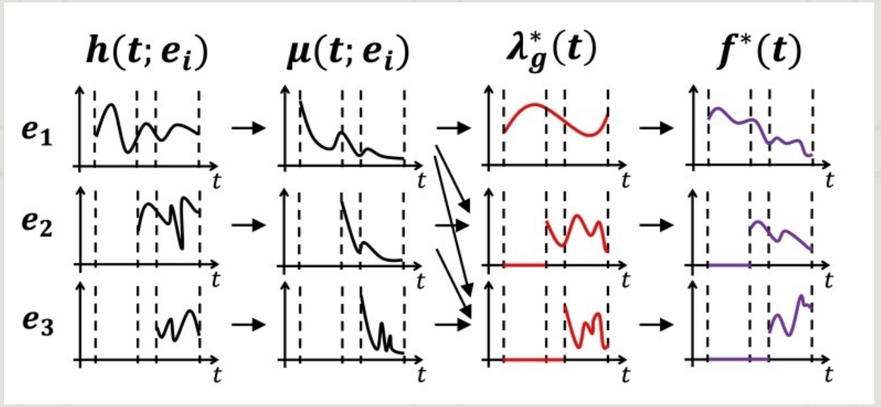


Problem Definition

Modeling Marked Temporal Point Process (MTPP) has been s successfully handled. However, interpretability of the dependencies among events are difficult to be obtained.

Method

We propose a novel framework Dec-ODE, which characterizes MTPP using **decoupled hidden state dynamics driven by Neural ODEs.** Also, utilizing the characteristics of ODEs, our framework can be trained and estimate important characteristics **efficiently**.



Result

Dec-ODE offers interpretable results, while showing comparable or better results in various metrics compared to state-of-the-art methods. This demonstrating that Dec-ODE successfully models the complex dynamics of MTPP with independently propagated influence functions.

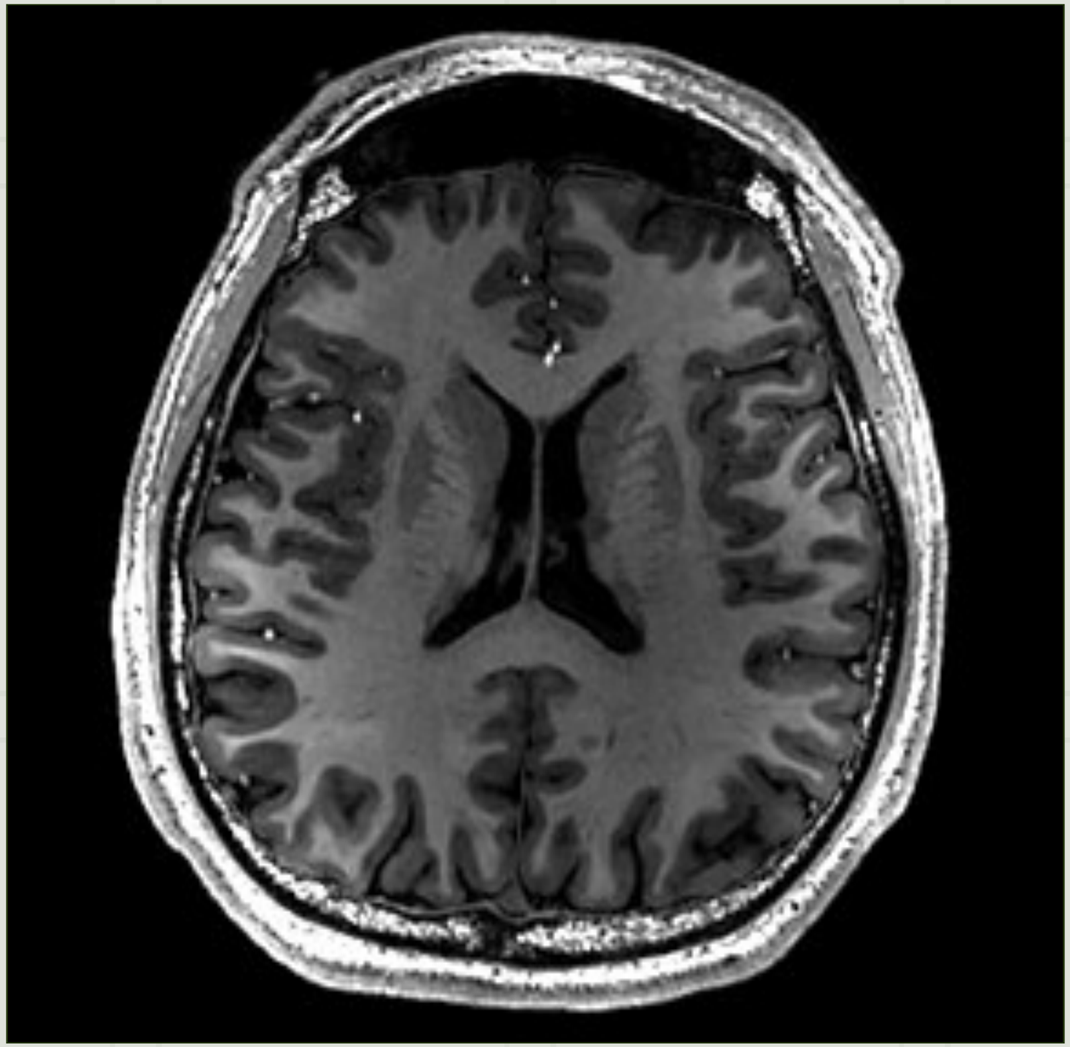
Conclusion

Dec-ODE provides explainability to the modeling of MTPP, which suggests significant potential for MTPP related applications such as out-of-distribution detection and survival analysis.

Publication

Brain MRI Image Generation using Genetic Information (under review)

co-author



Problem Definition

Utilizing genetic information to generate more realiable brain MRI image.

Tasks

- Validating possible approaches
- Baseline experiment
- Researching related work
- Implementing comparison metrics

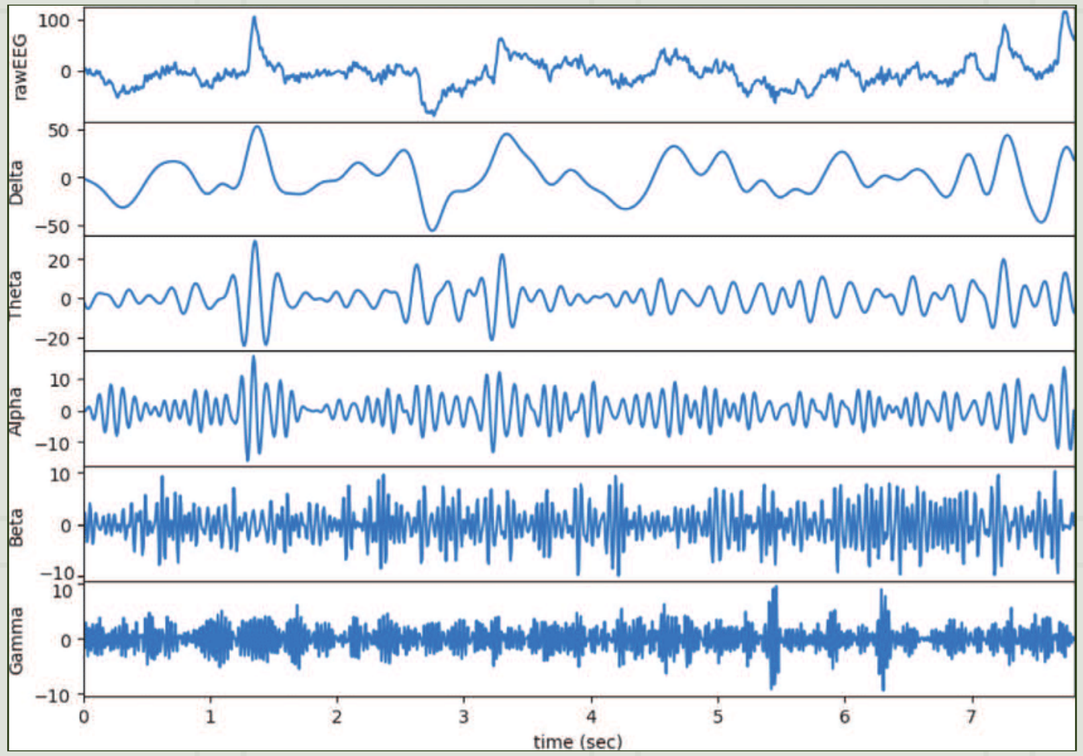
Result

Our approach was able to generate brain MRI images with comparable or better results under various metrics. It is currently under-review.

Projects

Alzheimer's Disease (AD) Diagnosis using Brain Signal

Jul 2023 - Nov 2023



Joint Research with Korea Institute of Oriental Medicine (KIOM)

Goals

- Diagnosing AD from two-channle resting EEG, and ERP signals.
- 4-way classification: Normal (CN), Early Mild cognitive impairment (EMCI), Late Mild cognitive impairment (LMCI), and Alzheimer's Disease (AD)

Tasks

- Propose methodologies and their development.
- Data processing.

Tools

- Python
- Pytorch
- Scikit-learn

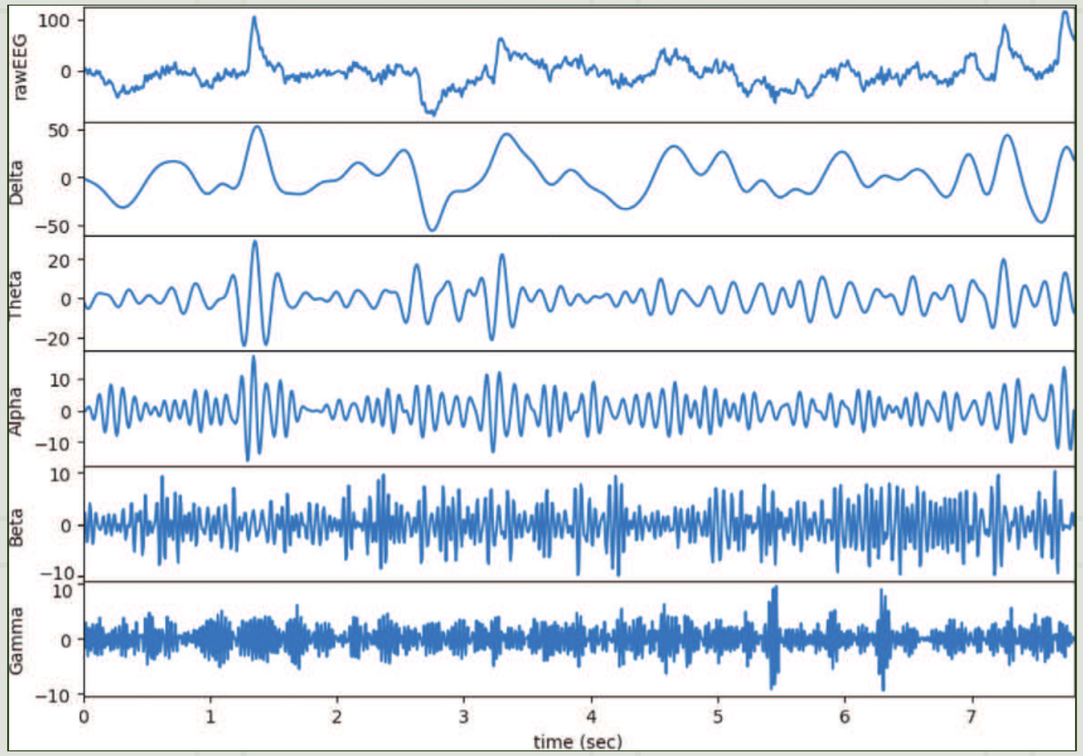
Results

- Comparable results (ACC, AUC) to the currently used diagnostic methods.
- We have concluded that the number of samples were not enough to make a fair comparison.
- Only using 2 channels of EEG signals were not enough to collect suitable information to classify EMCI from CN since the symptoms of development of AD occurs at different regions.

Projects

Alzheimer's Disease (AD) Diagnosis using Brain Signal

Jul 2023 - Nov 2023



Propsed Approaches

- Data processing
  - Filtering signals in fequecy domain
  - Slicing signals with a fixed size window
  - Tokenize each window using neural network such as CNN
- Variations of implemented model architecture
  - RNN
  - CNN
  - Transformer
  - Combinations of above
  - Total of 9 different models were implemented.

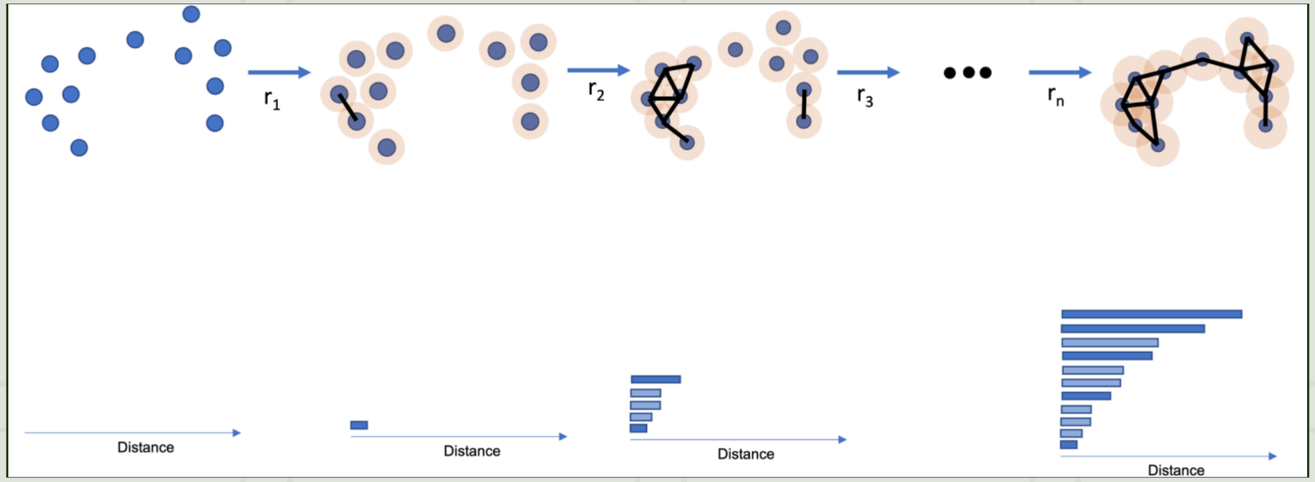
Gain from the project

- Experience with handling real life biomedical signal
- Solve how to mitigate noise that intrisically exist in biomedical signals
- Construct model architecture for time series with varying length
- How to successfully work in a joint research

Projects

Graph Generation using Topological Data Analysis (TDA)

Feb 2024 - Present



Goals

- Analyzing how incorporating TDA affects graph generation.
- Exploring various ways to adapt features extracted uinsg TDA into existing graph generation methods, especially graph diffusion models.

Tasks

- Propose novel methodologies and their development.
- Modify state-of-the-art methods for comparison.
- Data processing.

Tools

- Python
- Pytorch
- Pytorch Lightning

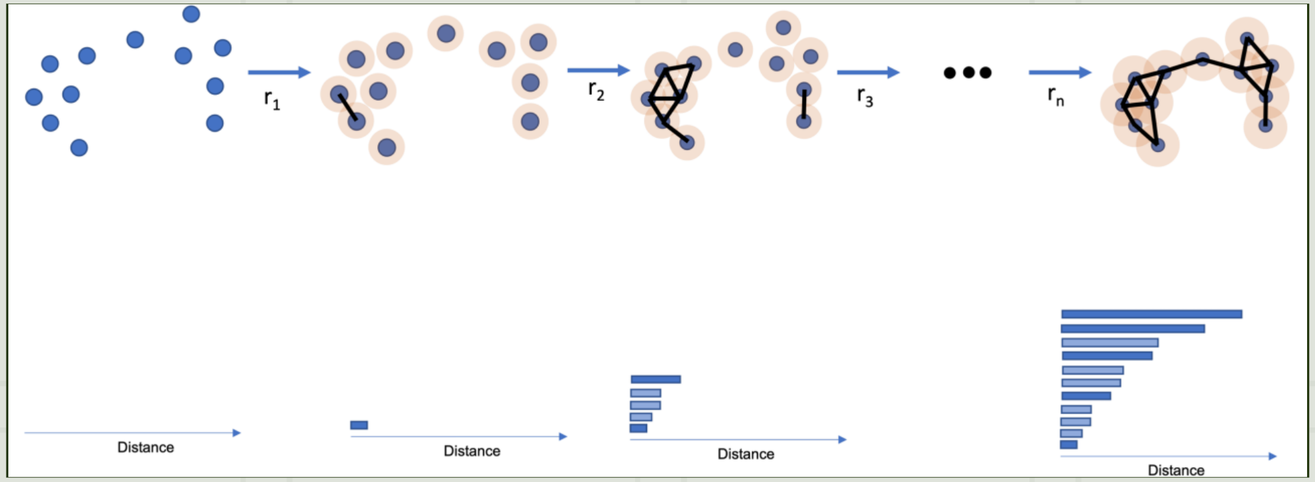
Results

- Improvement in terms of conventional benchmark metrics.
- On going project.

Projects

Graph Generation using Topological Data Analysis (TDA)

Feb 2024 - Present



Detailed Tasks

- On going development
  - Graph attention neural network suitable for topological features
  - TDA feature generation module
- Modified following methods for comparison
  - GDSS
  - Digress
- Modified folloinwg methods to run on brain network dataset
  - GFL
  - GDSS
  - Digress
- Data processing
  - Extracting TDA features from graph
    - Persistence Barcodes
    - Persistence Betti number

Thank you for your time

ML Research Portfolio

by Yujee Song

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