Juyoung Wang

Portfolio

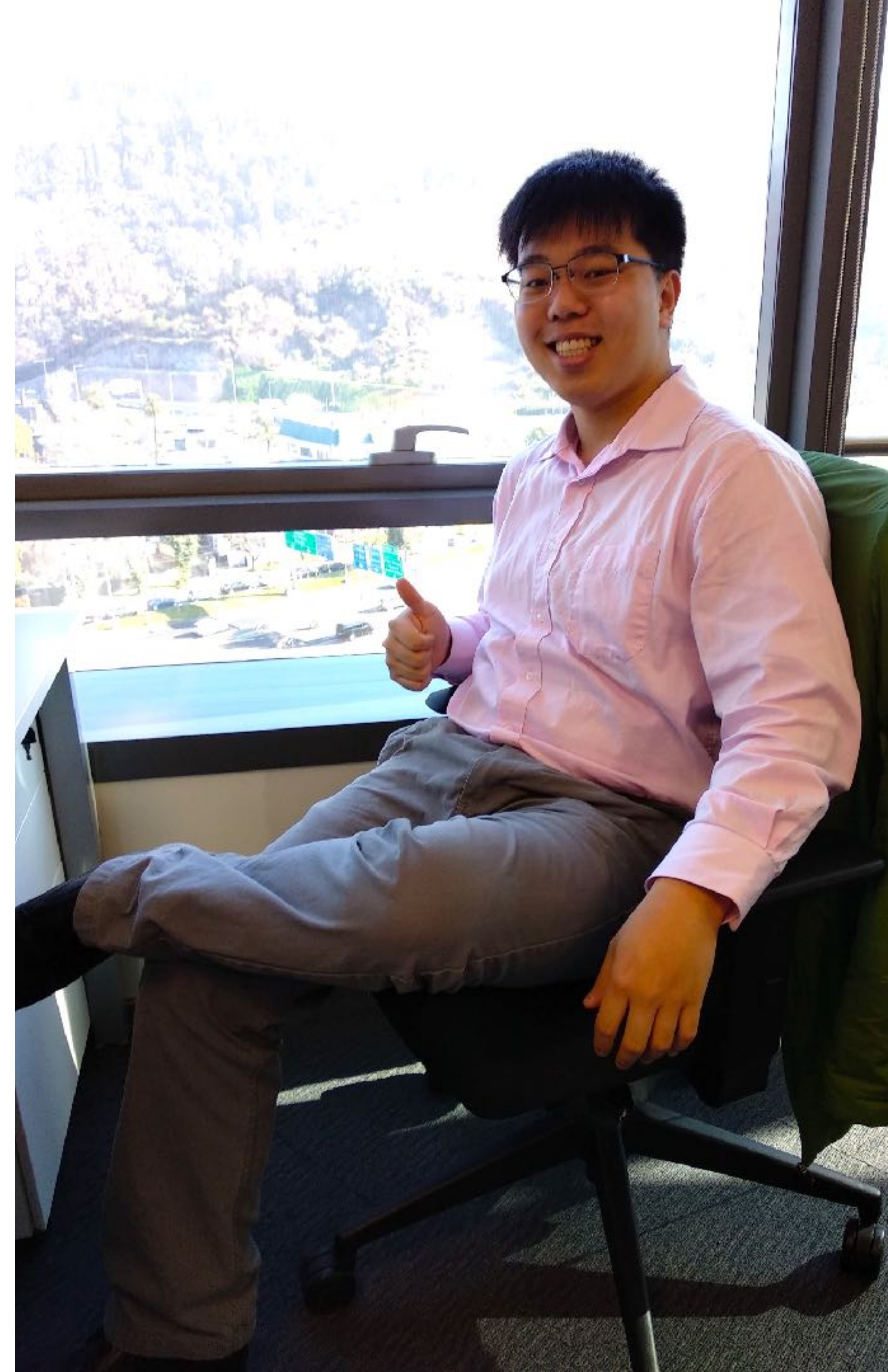# Who am I?
Professional backgrounds

Data scientist (Jul. 2018 - Nov. 2018)

- **Company**: The Bank of Nova Scotia, a.k.a. Scotiabank.

- **Job description**:

  - Manager-level position.

  - Directly hired while working as a consultant.

  - Worked on machine learning tool developments & data integration in bank amalgamation procedures.

- Left the position, as I was offered to pursue fully-funded masters degree at University of Toronto.

Data science consultant (Apr. 2018 - Jun. 2018)

- **Company**: Groupe SII.

- **Job description**:

  - Worked at business analytics team of Scotiabank.

Who am I?

Educational backgrounds

Ph.D. student in Industrial Engineering (2021 - Ongoing)

- University of Toronto.

- GPA: 3.9/4.0

M.A.Sc. in Industrial Engineering (2019 - 2021)

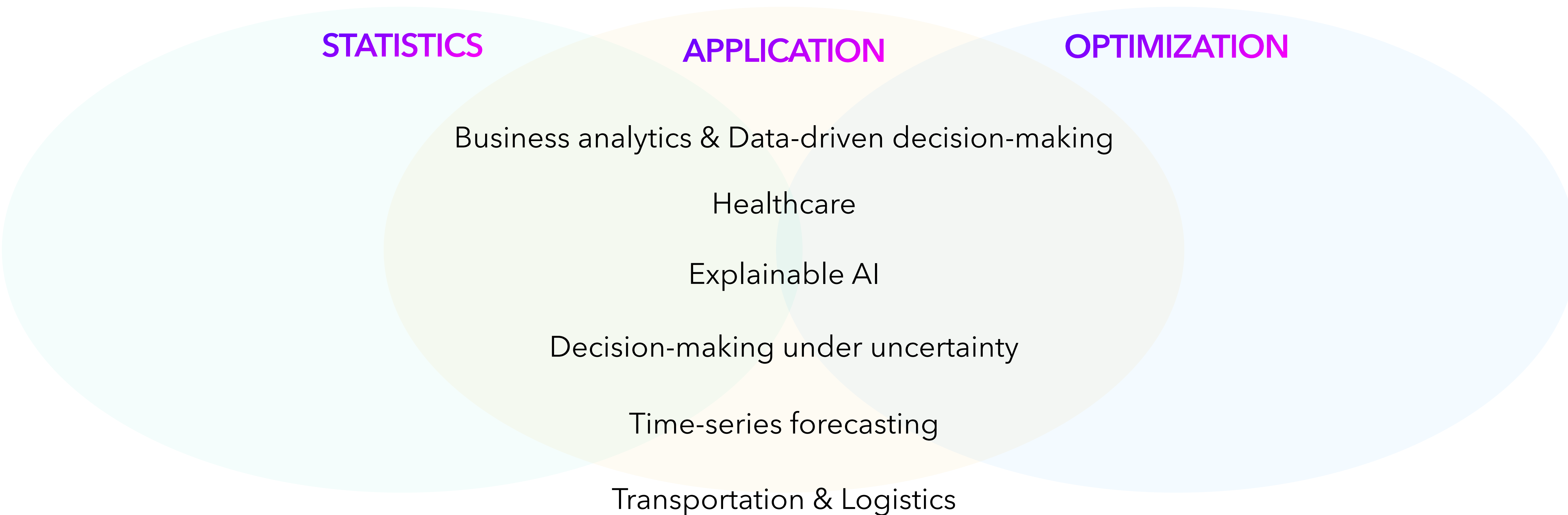- University of Toronto.

- GPA: 3.8/4.0

B.Sc. in Mathematical and Computational Engineering (2014 - 2017)

- Pontificia Universidad Católica de Chile
 (Top Latin American University (Both QS and Times ranking)).

- GPA: 3.7/4.0

What are my specialties?

STATISTICS   APPLICATION   OPTIMIZATION

Business analytics & Data-driven decision-making

Healthcare

Explainable AI

Decision-making under uncertainty

Time-series forecasting

Transportation & Logistics

I have worked in statistics, optimization, applied works, and their **intersection**.

# Business analytics: Transportation & Logistics
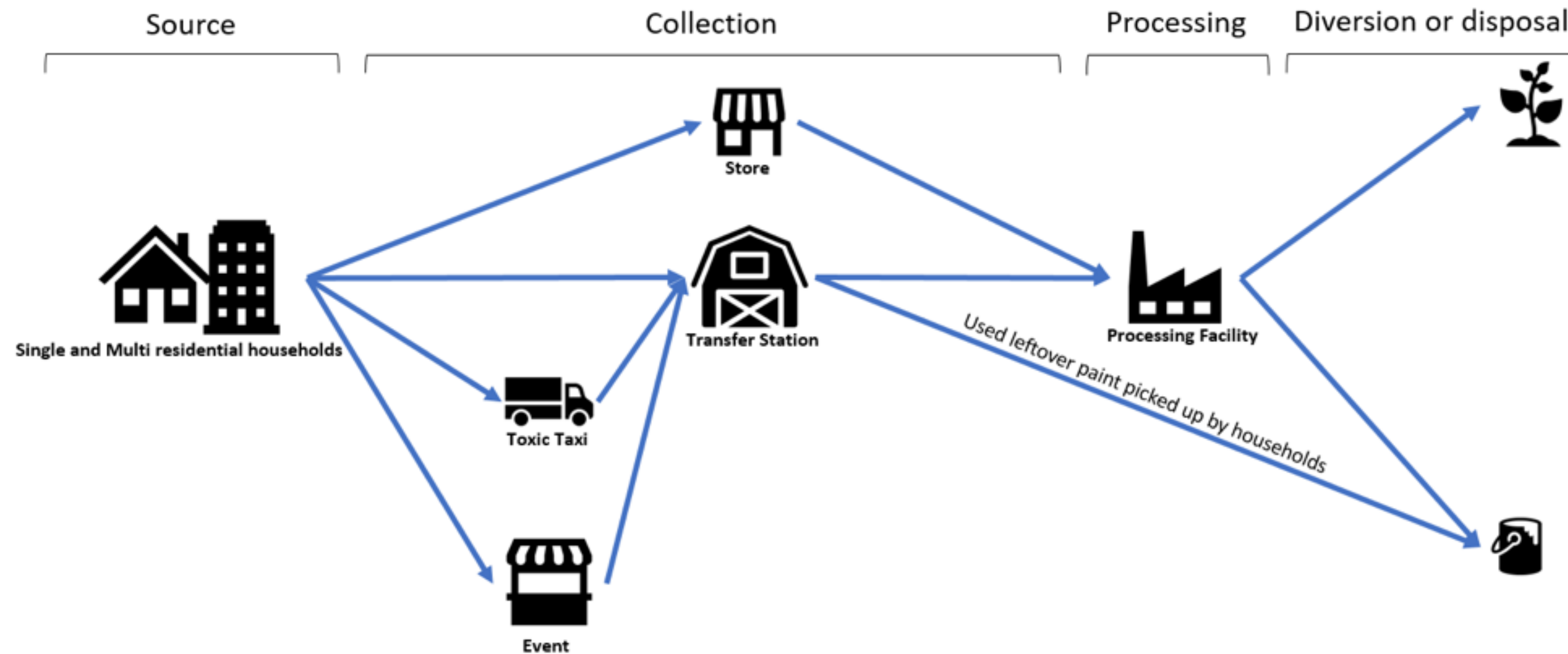
- Commonly, hazardous waste, paint waste in our case, is collected according to the diagram above.

- How to optimally build waste collection route, and how to optimally locate collection and processing centers?

Business analytics: Transportation & Logistics

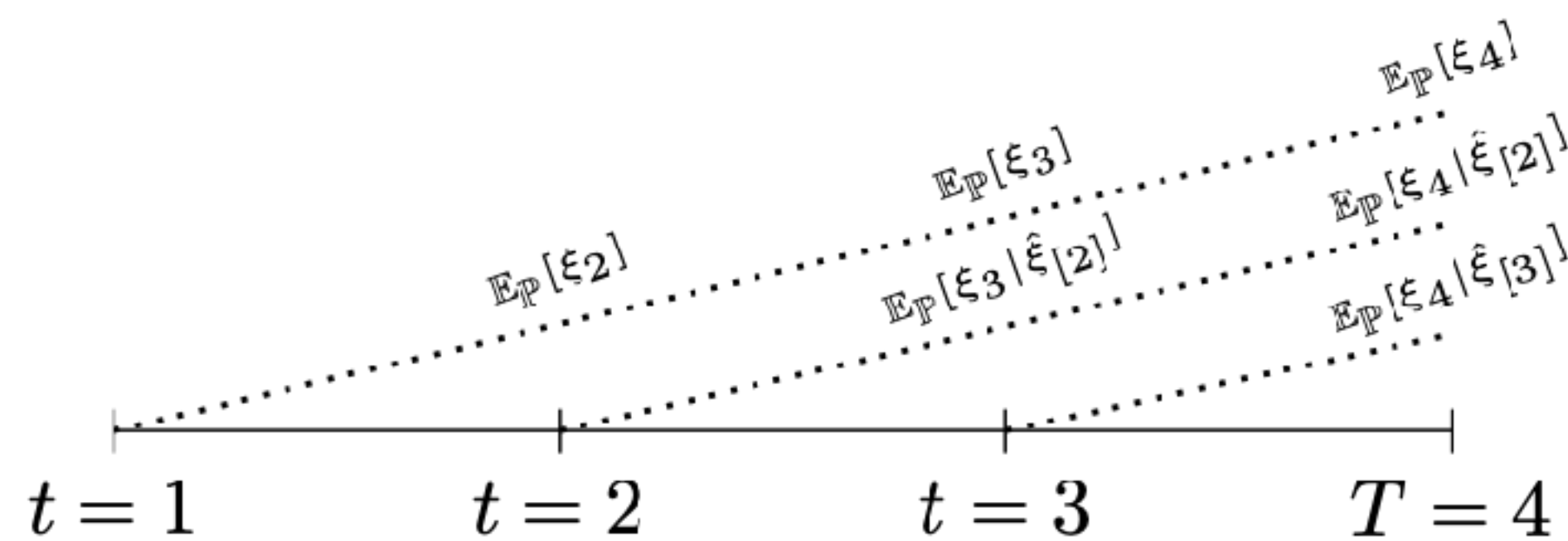- Using historical data, we built a sequential stochastic optimization model, and obtained:
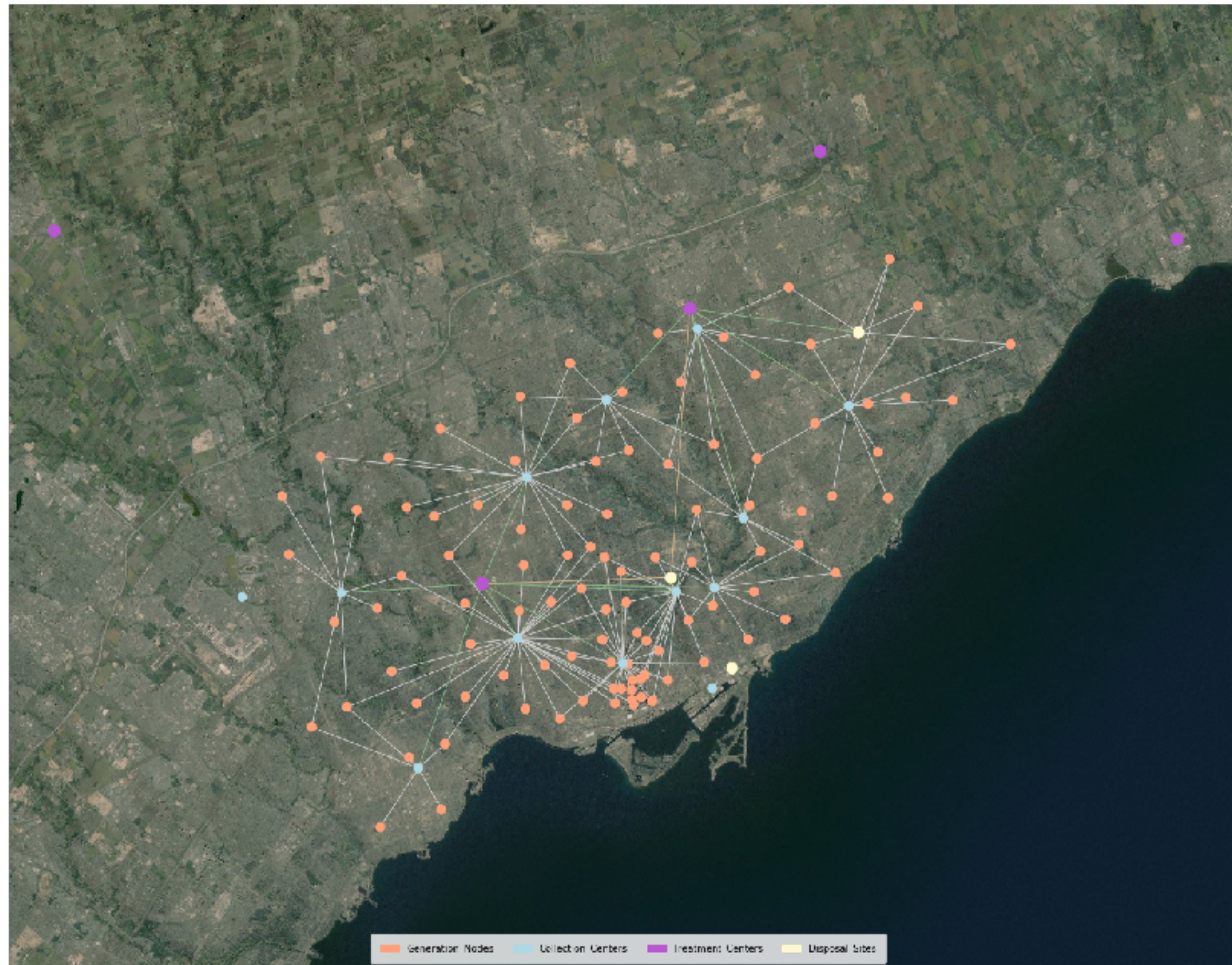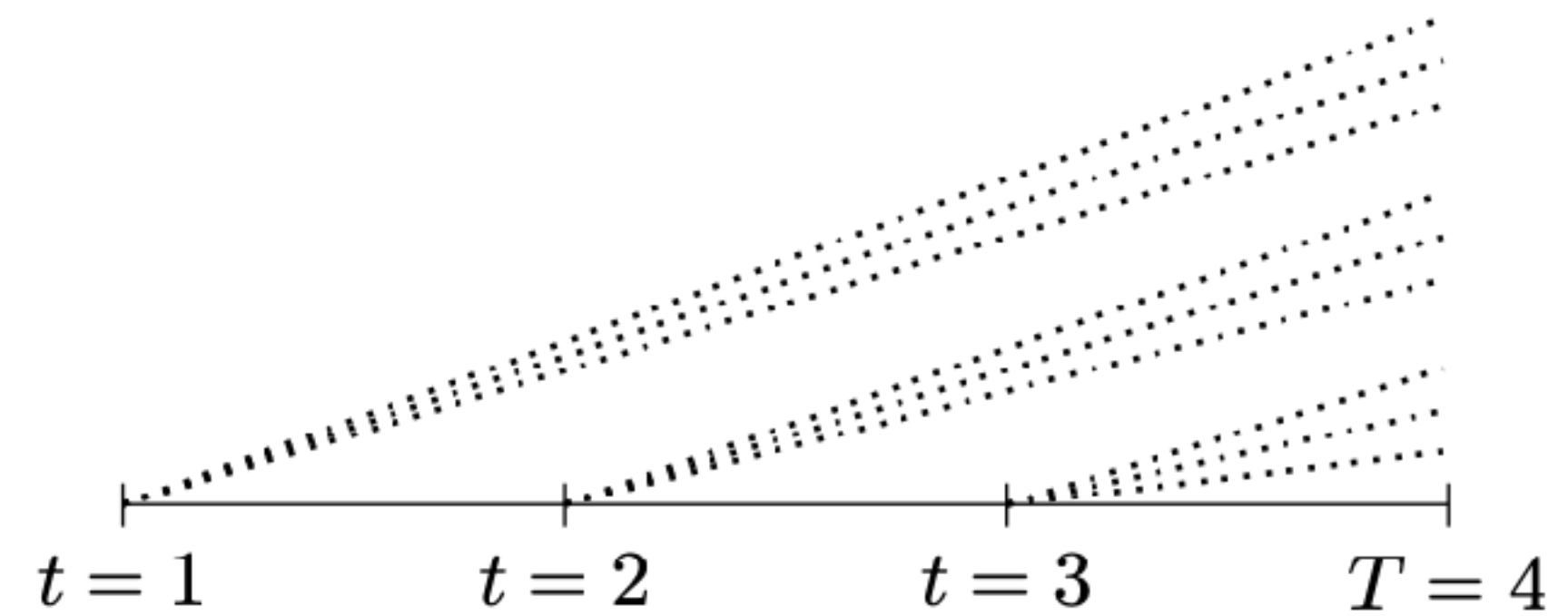

Minimum cost plan
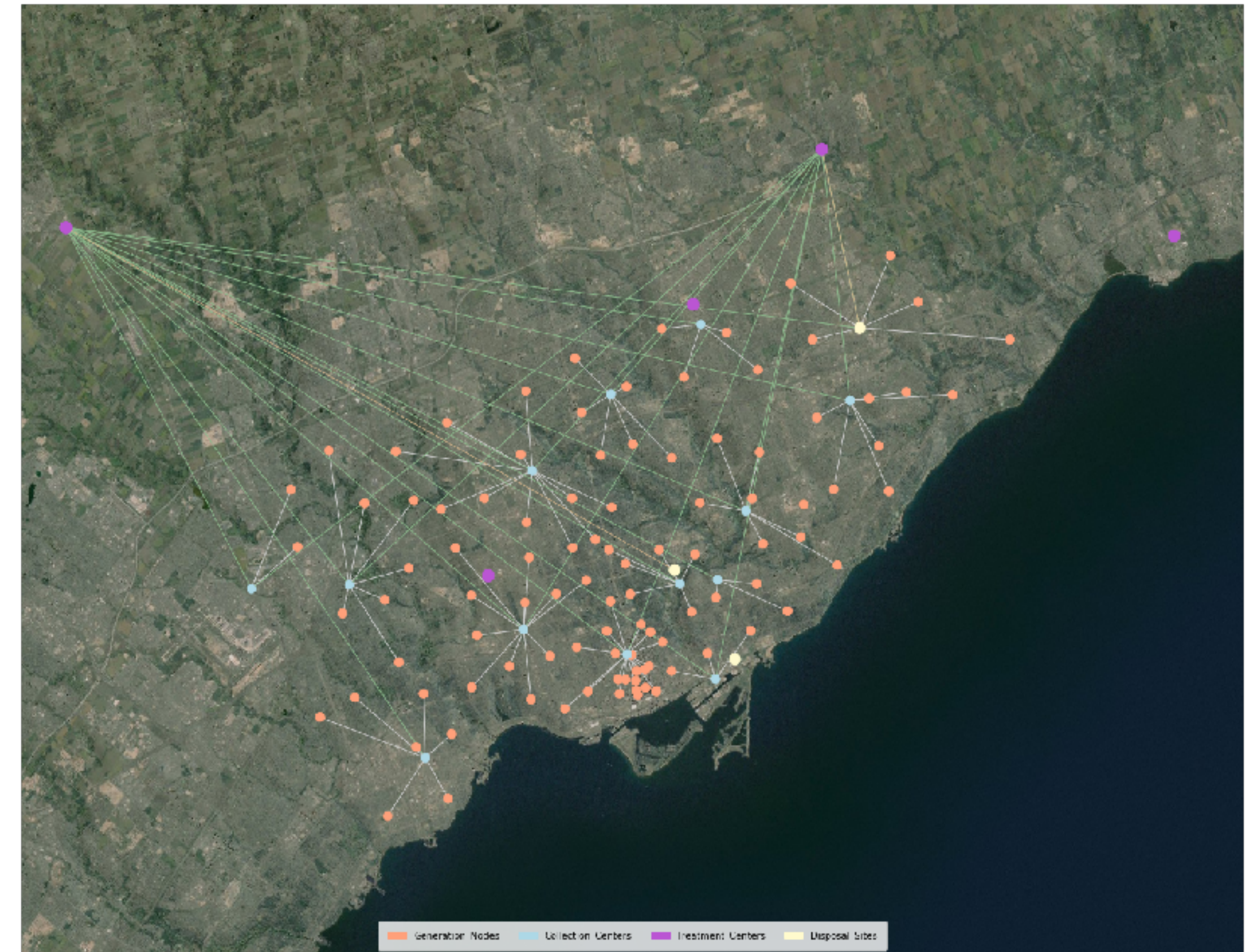
Maximum customer convenience plan

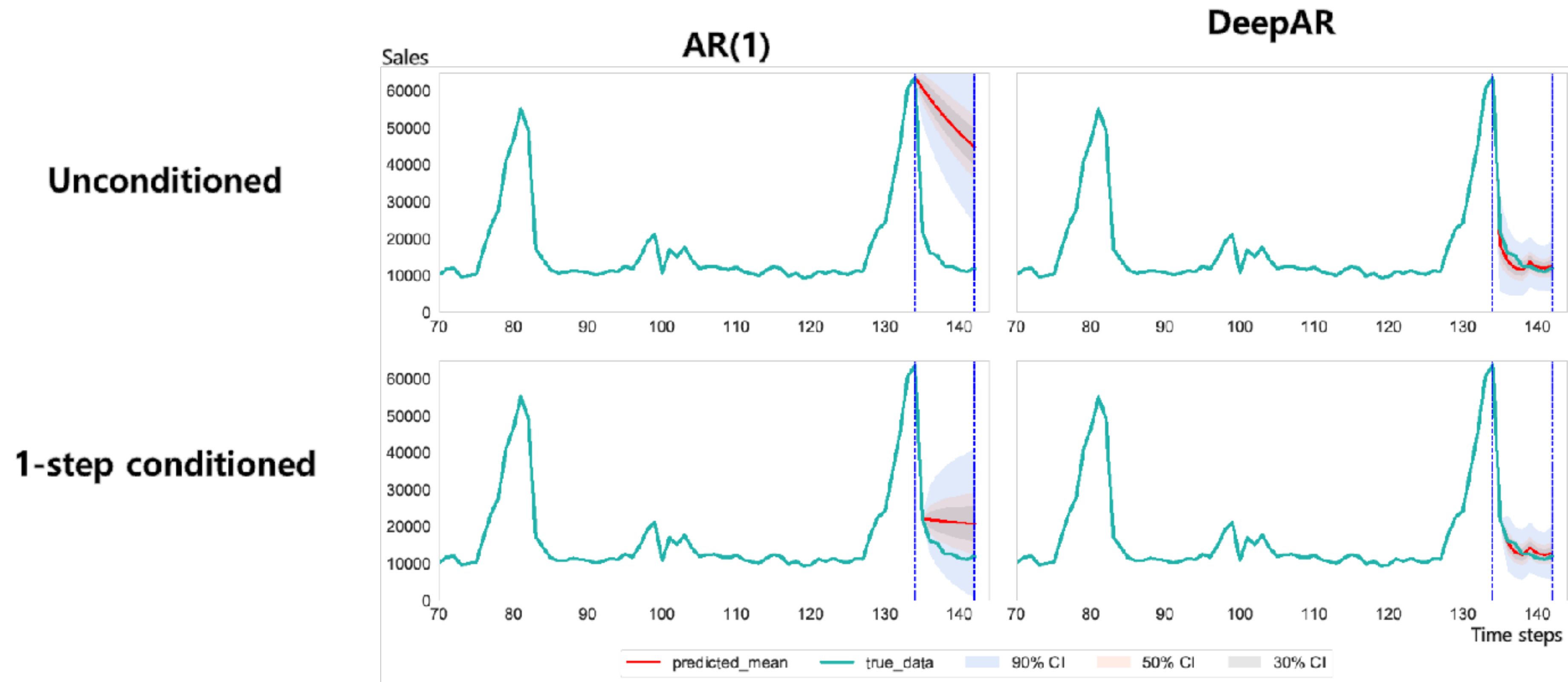# Business analytics: Lotsizing problem

Mean-value heuristics

Two-stage heuristics

- Commonly, randomness are replaced by their mean values, as this is the most computationally tractable way (see the left figure).

- However, simulation-based decision-making methods can greatly help profit maximization (see the right figure).

Business analytics: Lotsizing problem

- For the sake of simulation, we considered traditional ARIMA-based method, and Deep learning-based time-series forecasting method.

Business analytics: Lotsizing problem

- DeepAR_2SP is our ultimate approach.

- In the plot the lower is the better.

- Using advanced forecasting method with simulation-based optimization algorithm provided significant benefit on product demand forecast and profit maximization, for different planning horizons.
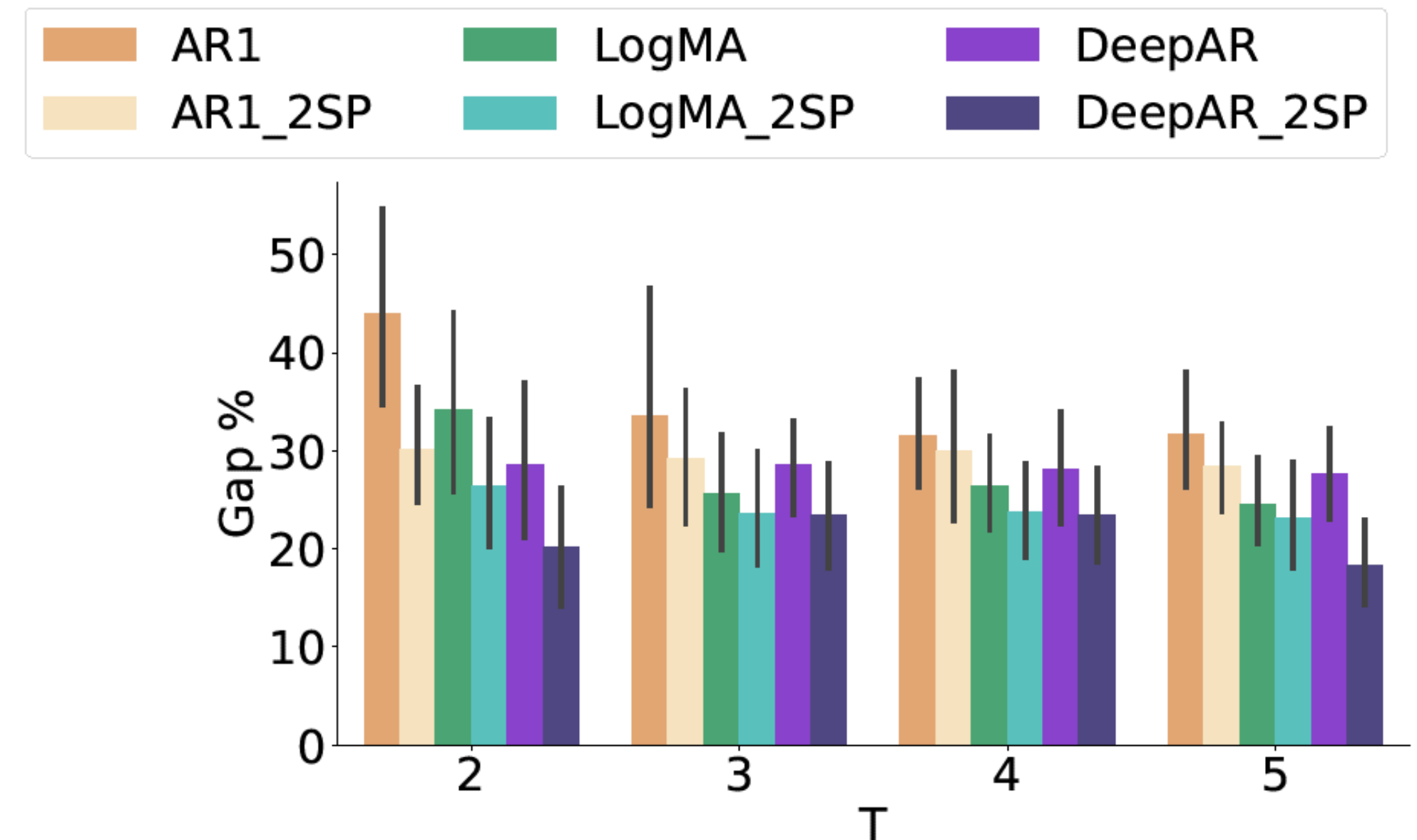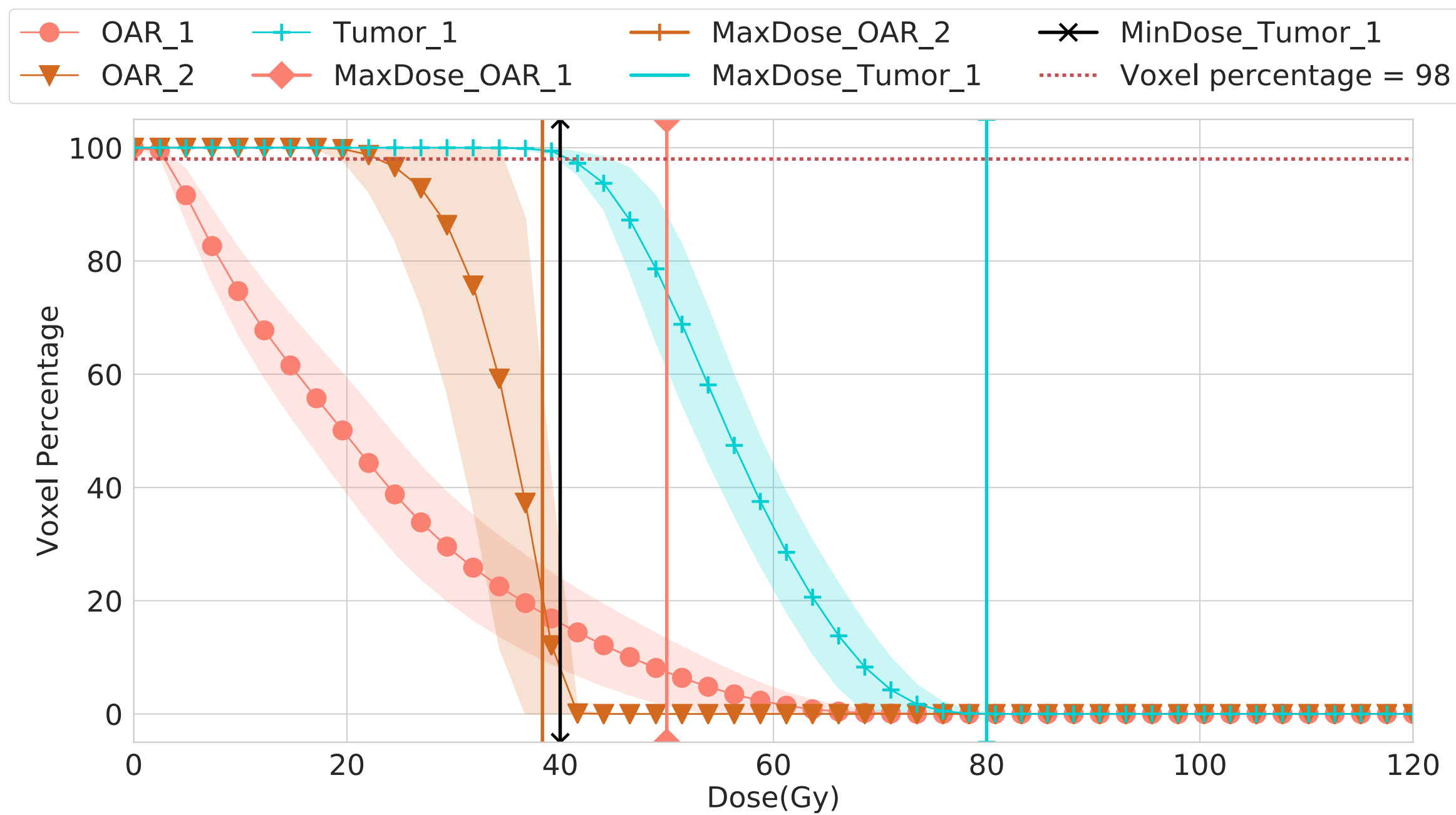
Healthcare

- Cancer is treated via radiation therapy.

- Patients' movement during prostate cancer treatment session can cause severe damage to organs, such as:
  - Rectum
  - Urinary bladder

- How to optimally send radiation beam, in order to maximize treatment quality, while minimizing damage to healthy tissues?
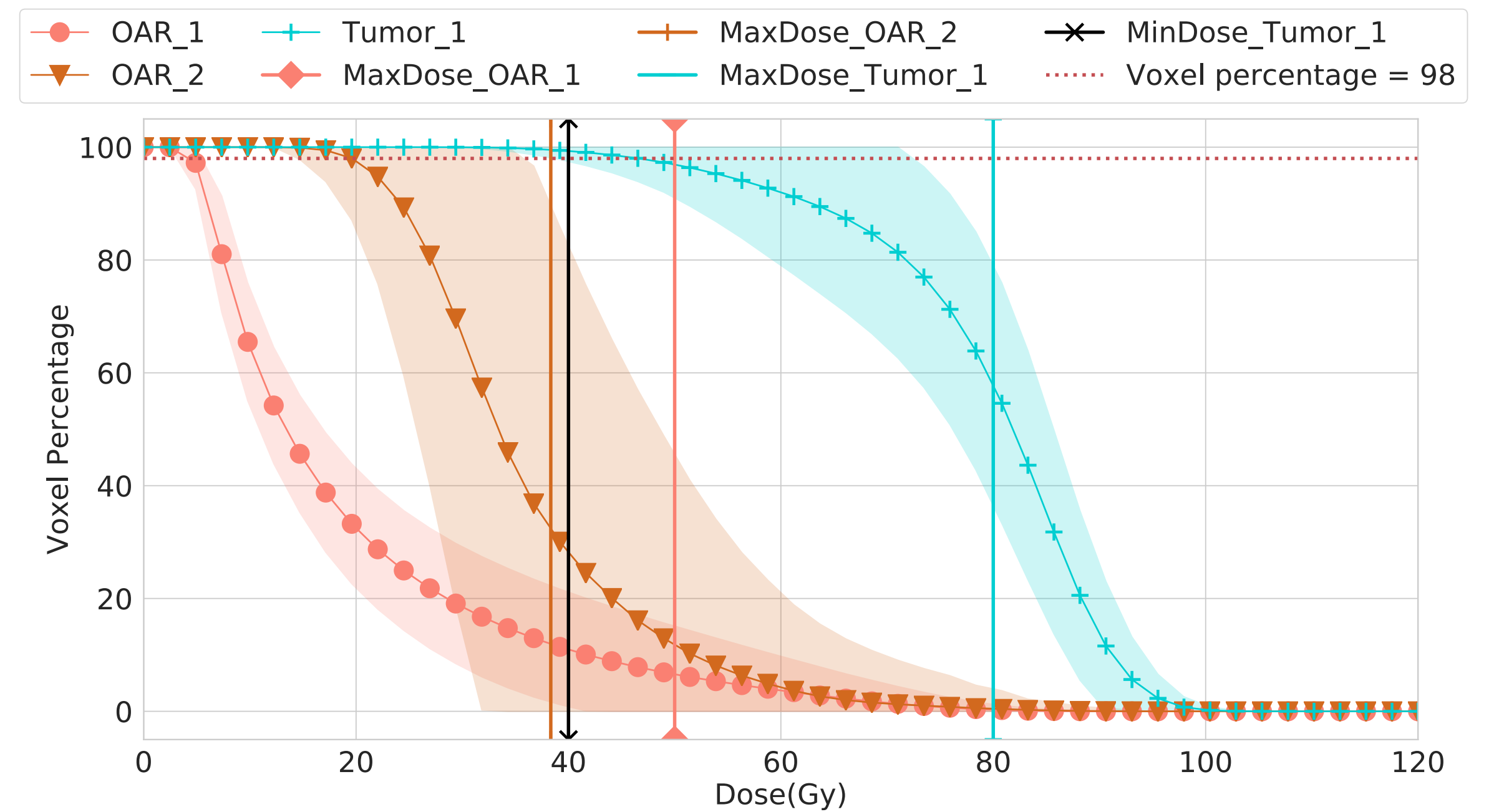
Healthcare

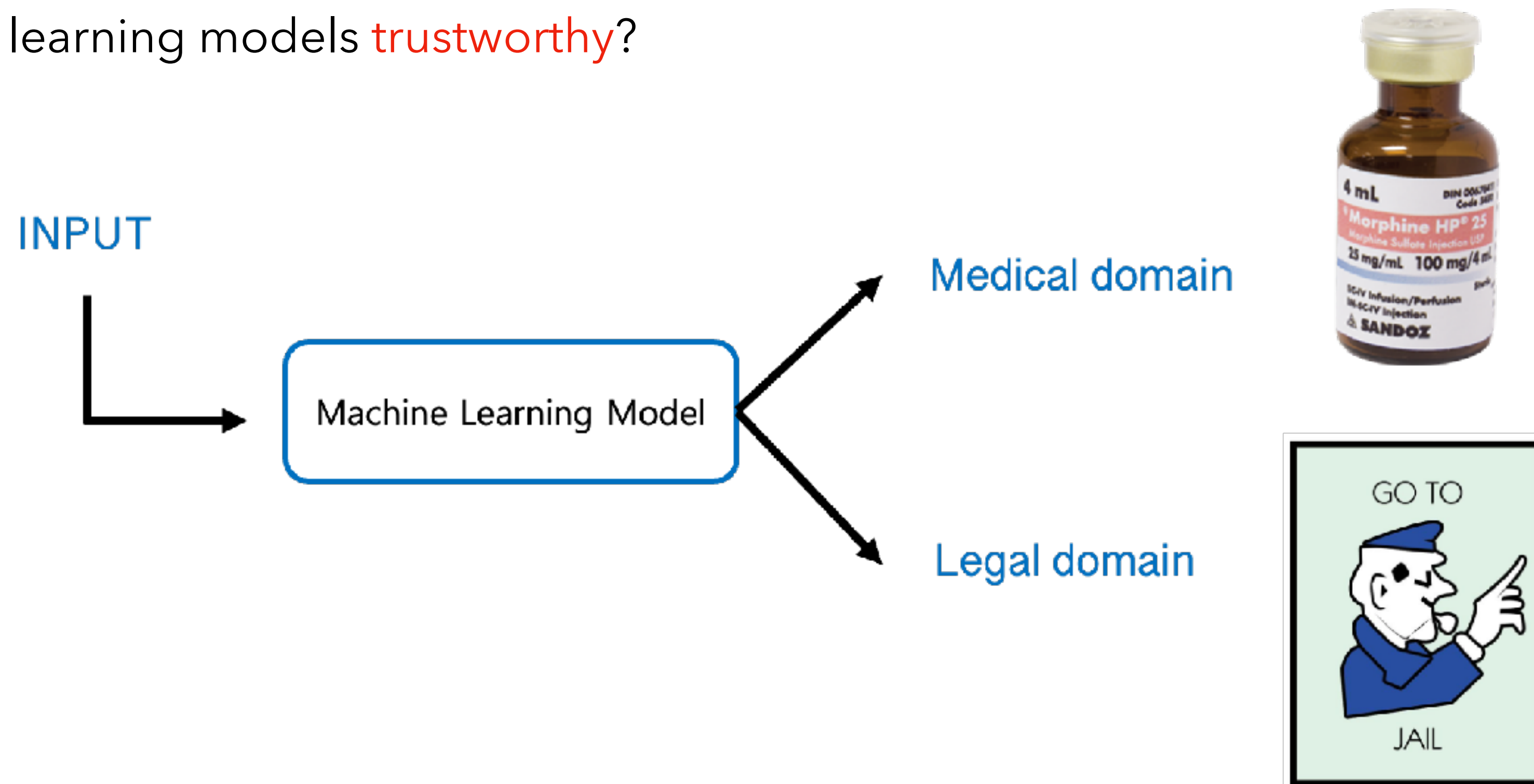- 30% damage reduction for one organ, and ∞% damage reduction for another organ.

- Our method produces treatment plan with significantly low variance, compared to the traditional one.

Explainable AI

- Are all machine learning models trustworthy?

- NO. There are several domains where "causality analysis" is necessary, e.g. we cannot inject dangerous drug to patient, without knowing why the machine learning model made such a decision.
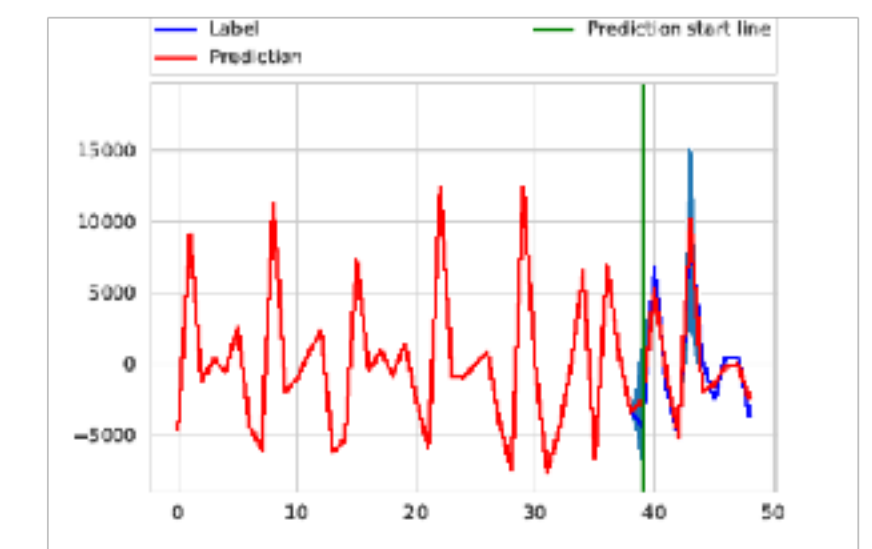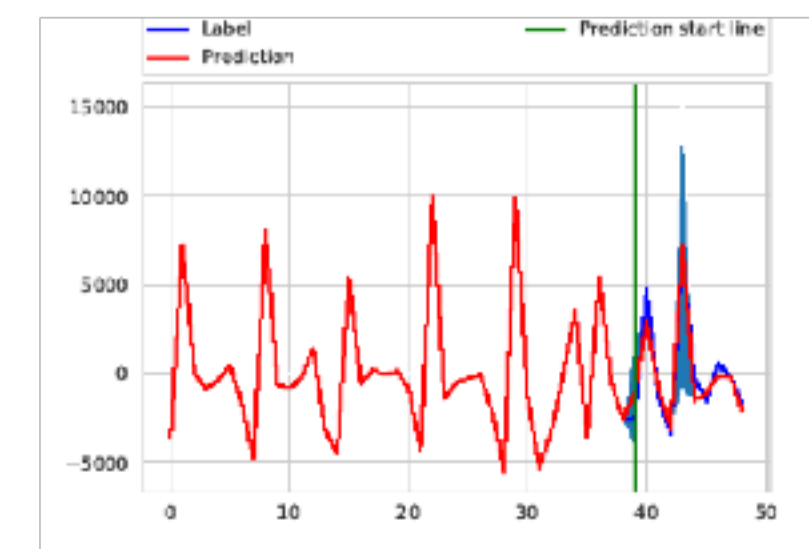
Explainable AI

- We developed a deep-learning-based time series model, which is interpretable, while achieving competitive performance to the state-of-the-art method, DeepAR.
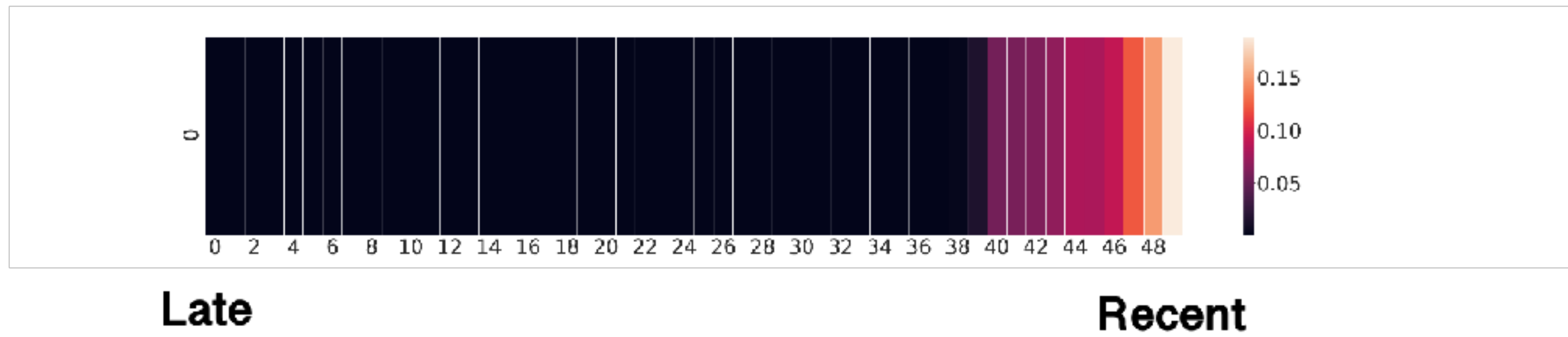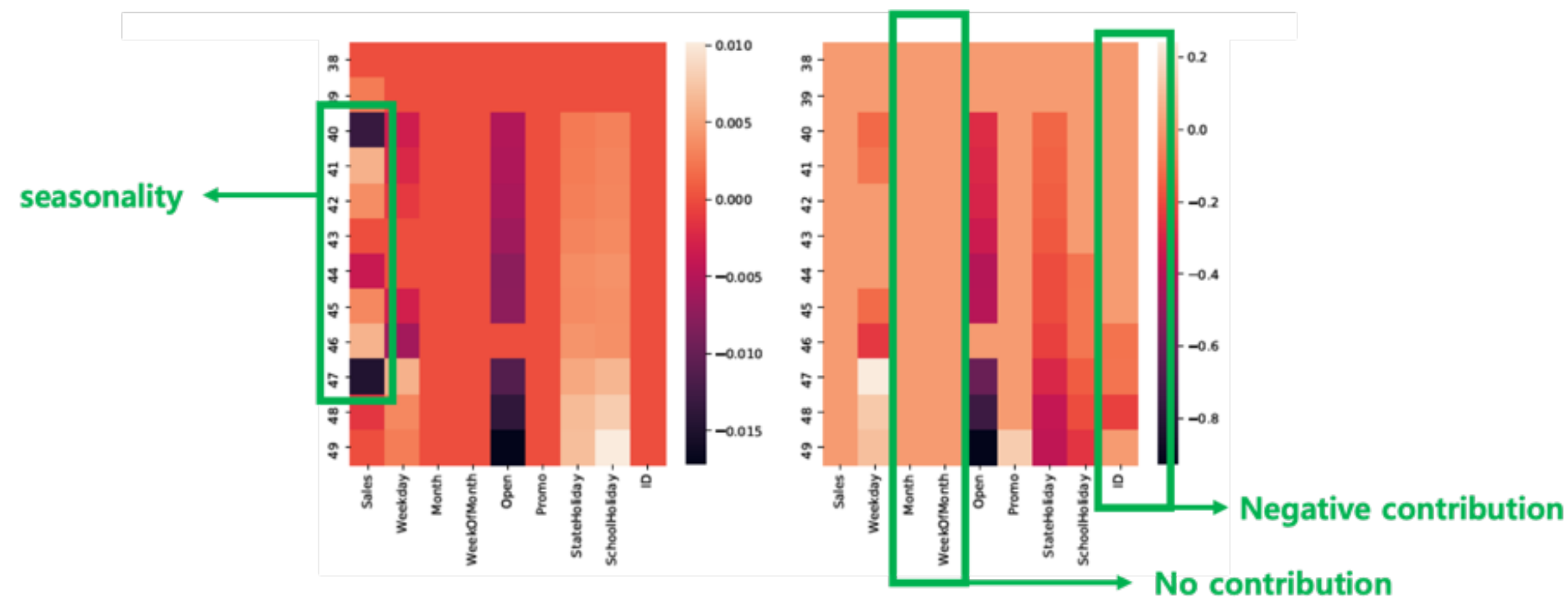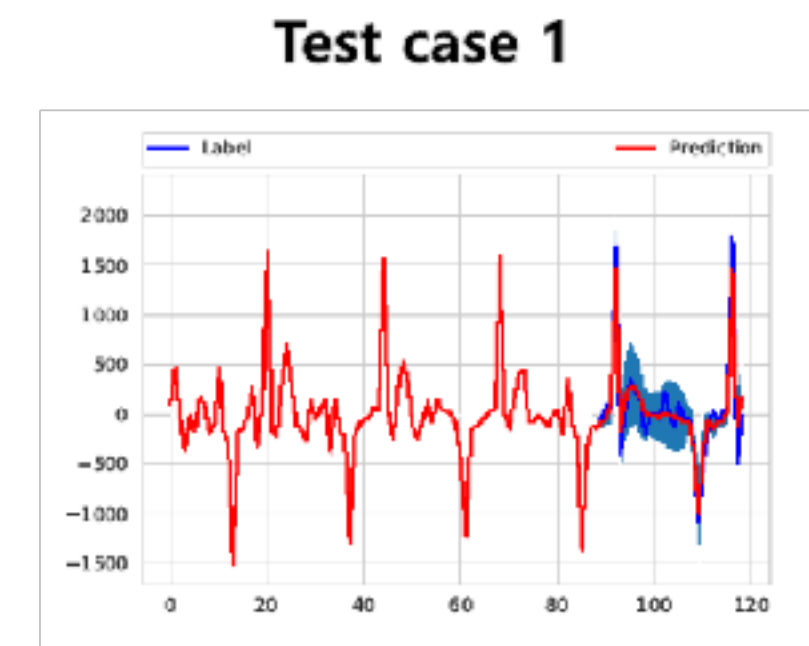
And there are other works I am not showing…

List of paper works

- Chi, C., Mohamed Aboussalah, A., Boutros Khalil, E., Wang, J. & Sherkat-Masoumi, Z. (2022). A Deep Reinforcement Learning Framework for Column Generation. Accepted at NeurIPS2022.

- Ozyegen, O., Wang, J. & Cevik, M. (2022). DANLIP: Deep Autoregressive Networks for Locally Interpretable Probabilistic Forecasting. To be submitted.

- Bodur, M., Cevik, M., Cire, A., Ruschin, M. & Wang, J. (alphabetical ordering by surnames) (2022). Multistage Stochastic Fractionated Intensity Modulated Radiation Therapy Planning. Major revision in Computers and Operations Research.

- Wang, J., Cevik, M., & Bodur, M. (2021). On the impact of deep learning-based time-series forecasts on multistage stochastic programming policies. INFOR: Information Systems and Operational Research, 1-32.

- Wang, J., Cevik, M., Amin, S. H., & Parsaee, A. A. (2021). Mixed-integer linear programming models for the paint waste management problem. Transportation Research Part E: Logistics and Transportation Review, 151, 102343.

- Wang, J. (2021). Multistage stochastic programming combined with deep learning-based time series forecasting: new methodologies and applications (Masters dissertation, University of Toronto (Canada)).

I spend my free time, doing

Bicycle tour

I spend my free time, doing

Music

(Piano, Clarinet, Drum, et cetera)

I spend my free time, doing

Music

(Piano, Clarinet, Drum, et cetera)