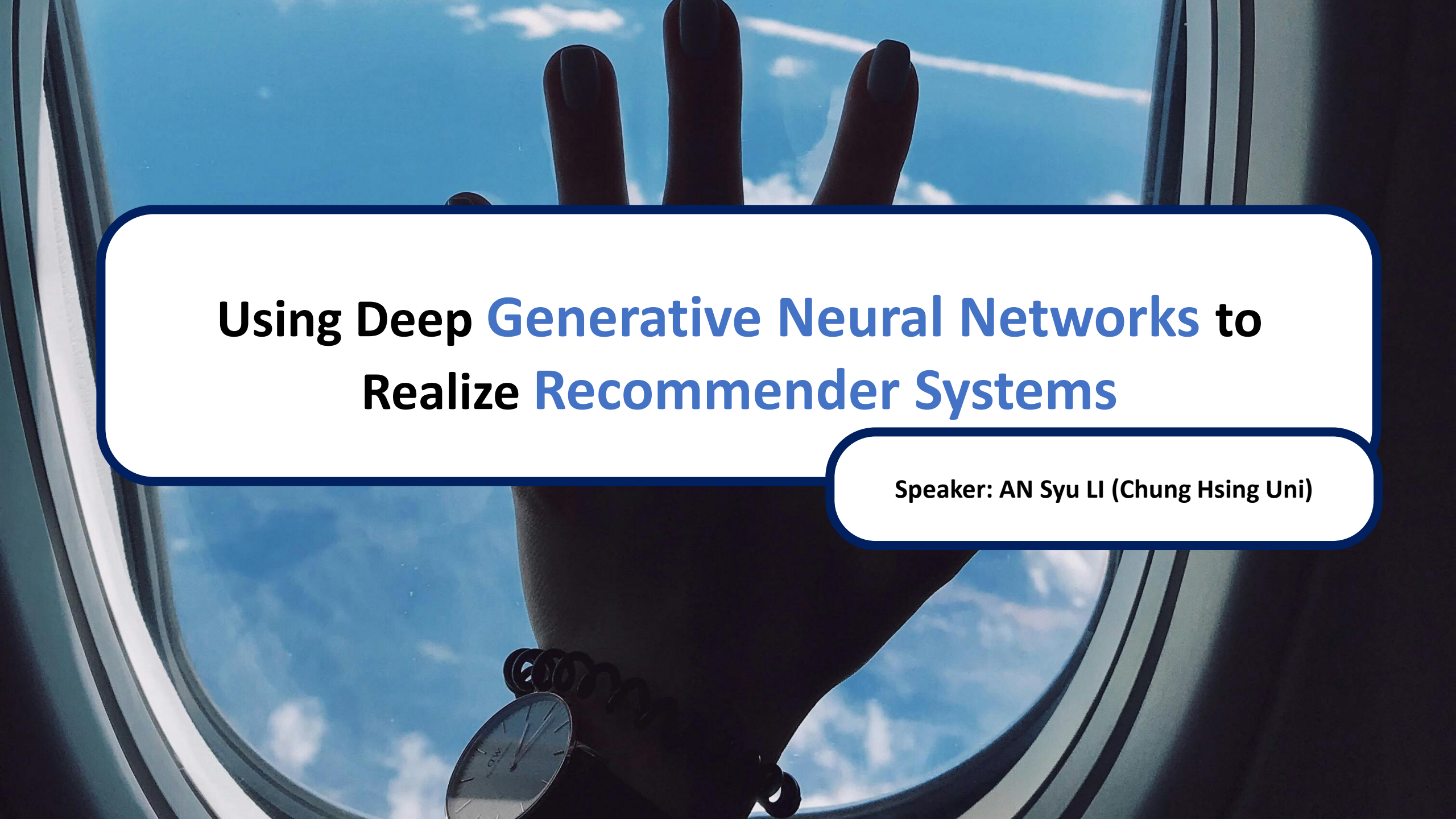


Using Deep Generative Neural Networks to Realize Recommender Systems

Speaker: AN Syu LI (Chung Hsing Uni)

Table of Contents

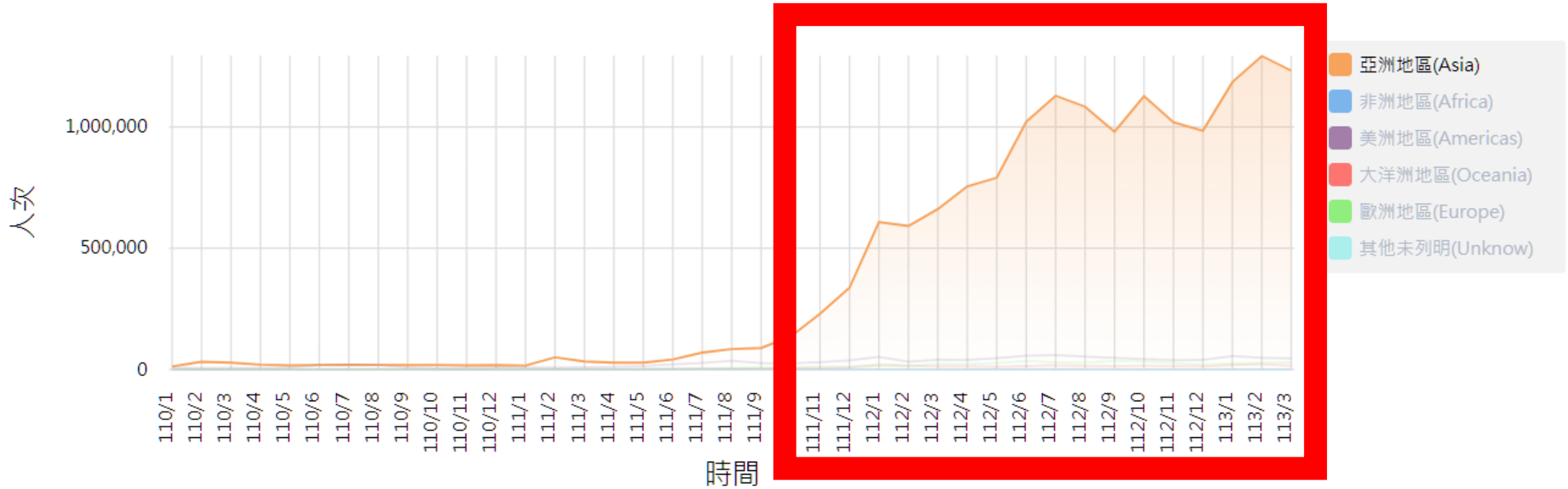
1. Introduction
2. Problems & Past Solutions
3. Methodology
4. Models
5. Experiments
6. Conclusion

Introduction

Why is my topic important?

- The high demand for travel

From Taiwan Tourism Administration https://stat.taiwan.net.tw/

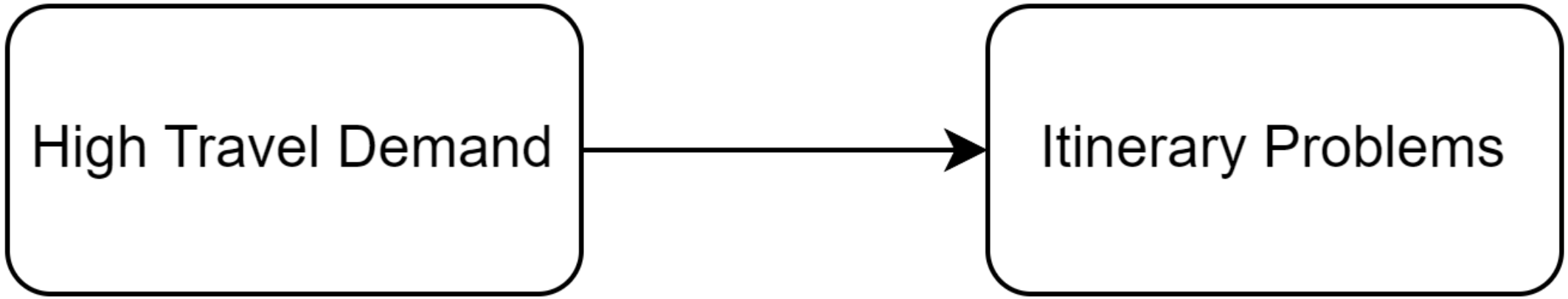


From Taiwan Tourism Administration https://stat.taiwan.net.tw/

In the post-pandemic era,

People are **eager to travel**

High Travel Demand

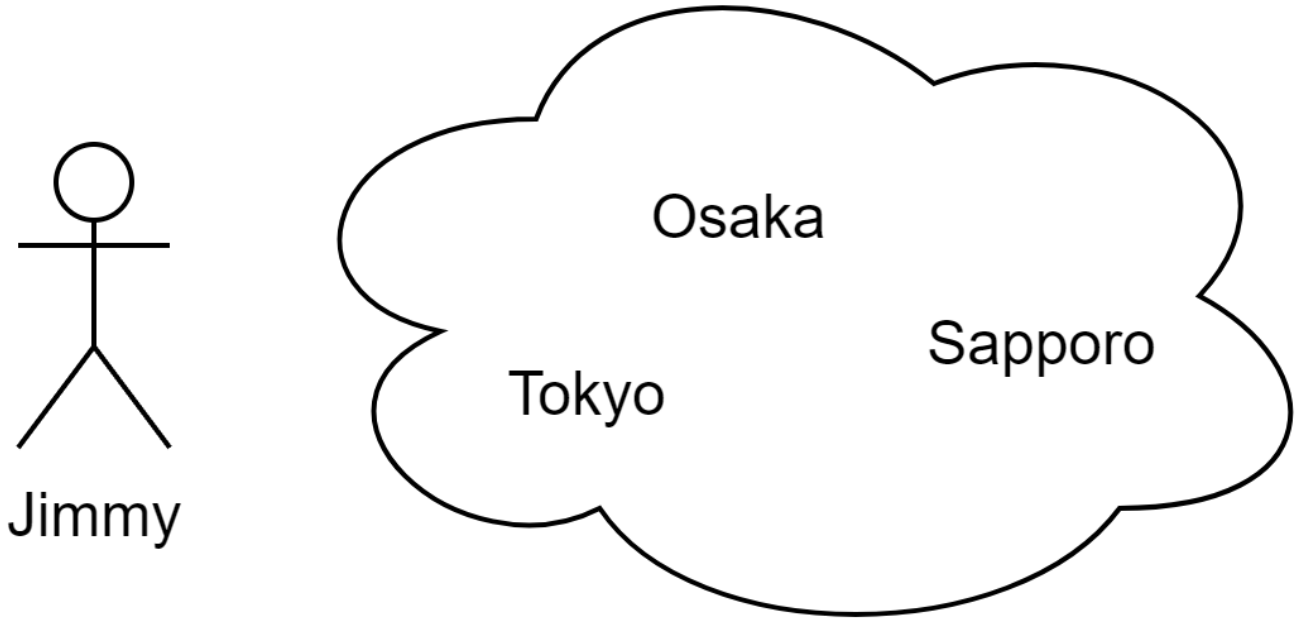

High Travel Demand
Itinerary Problems

Problems & Past Solutions

Trip planning is **time-consuming**

Trip planning is **time-consuming**

Past solution: Collaborative filtering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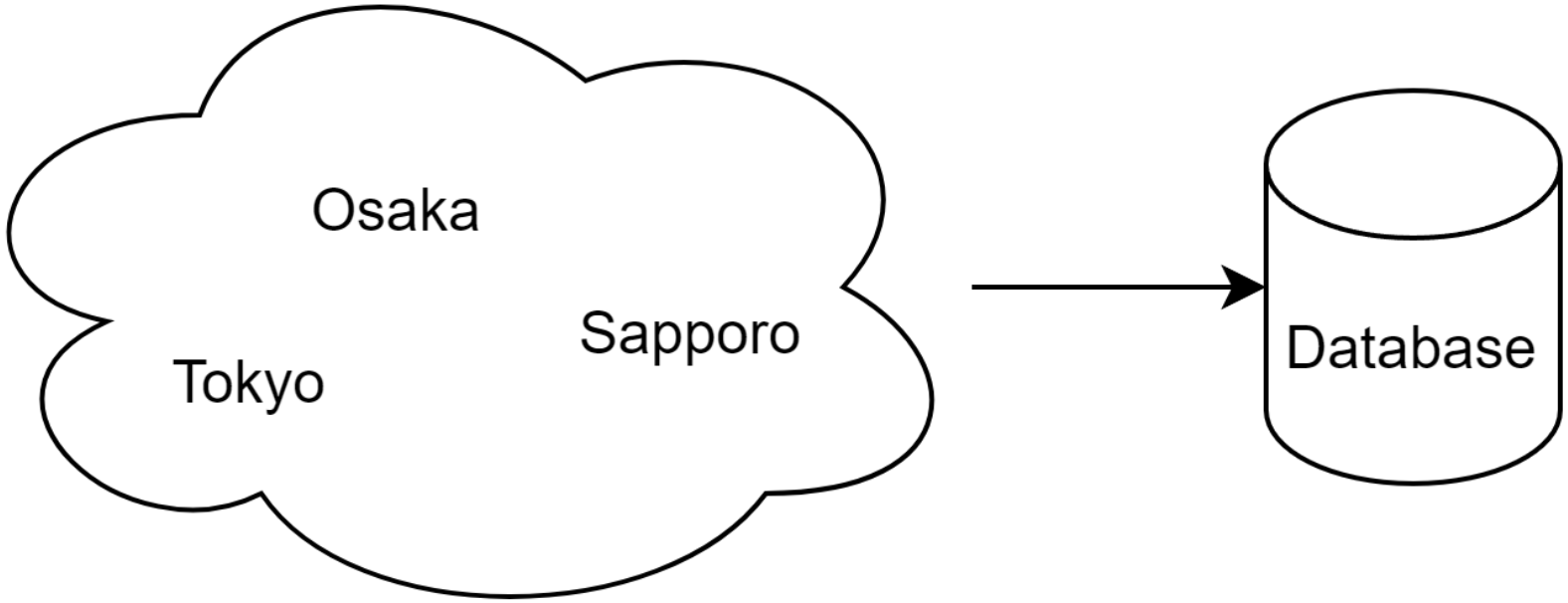
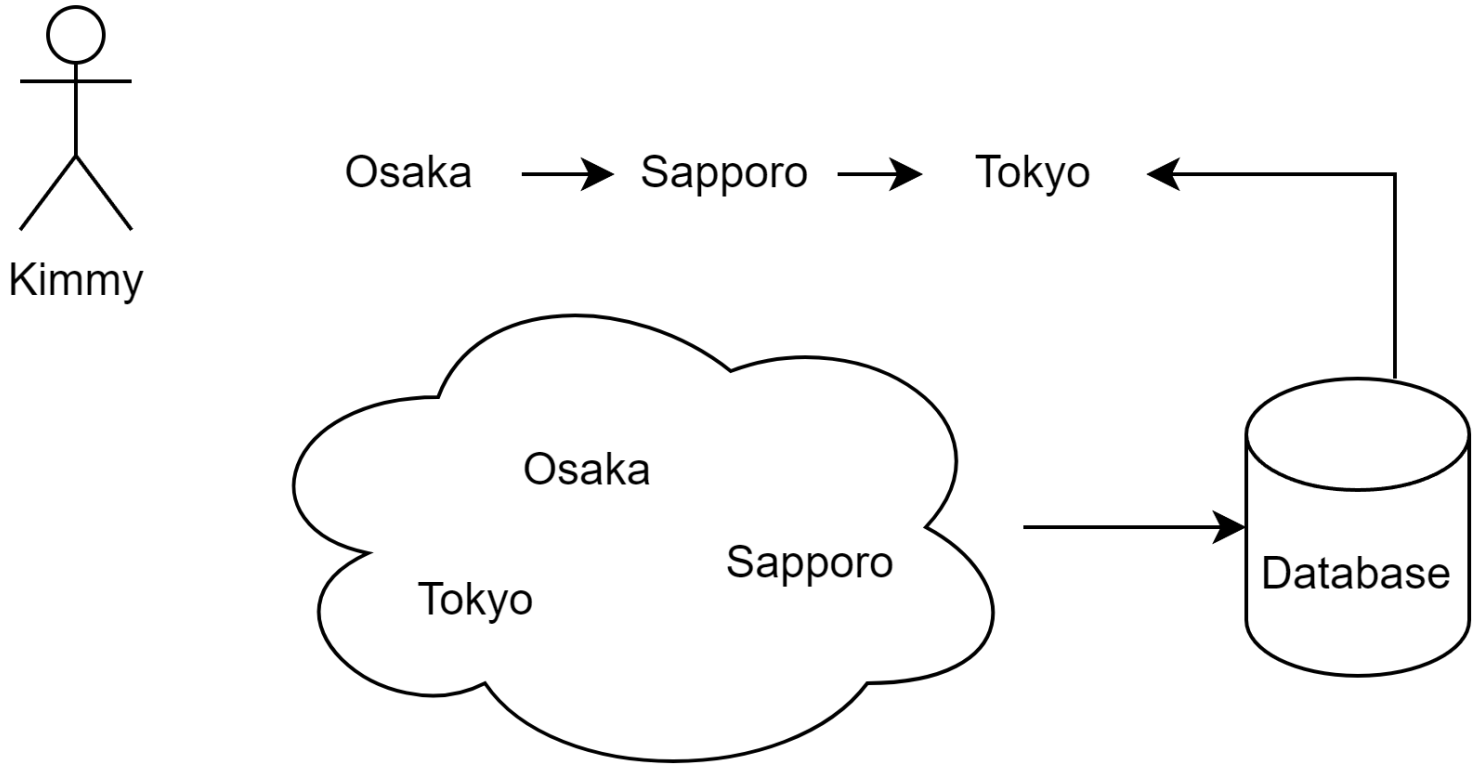
Osaka
Sapporo
Tokyo


Osaka
Sapporo
Tokyo
Database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Sapporo
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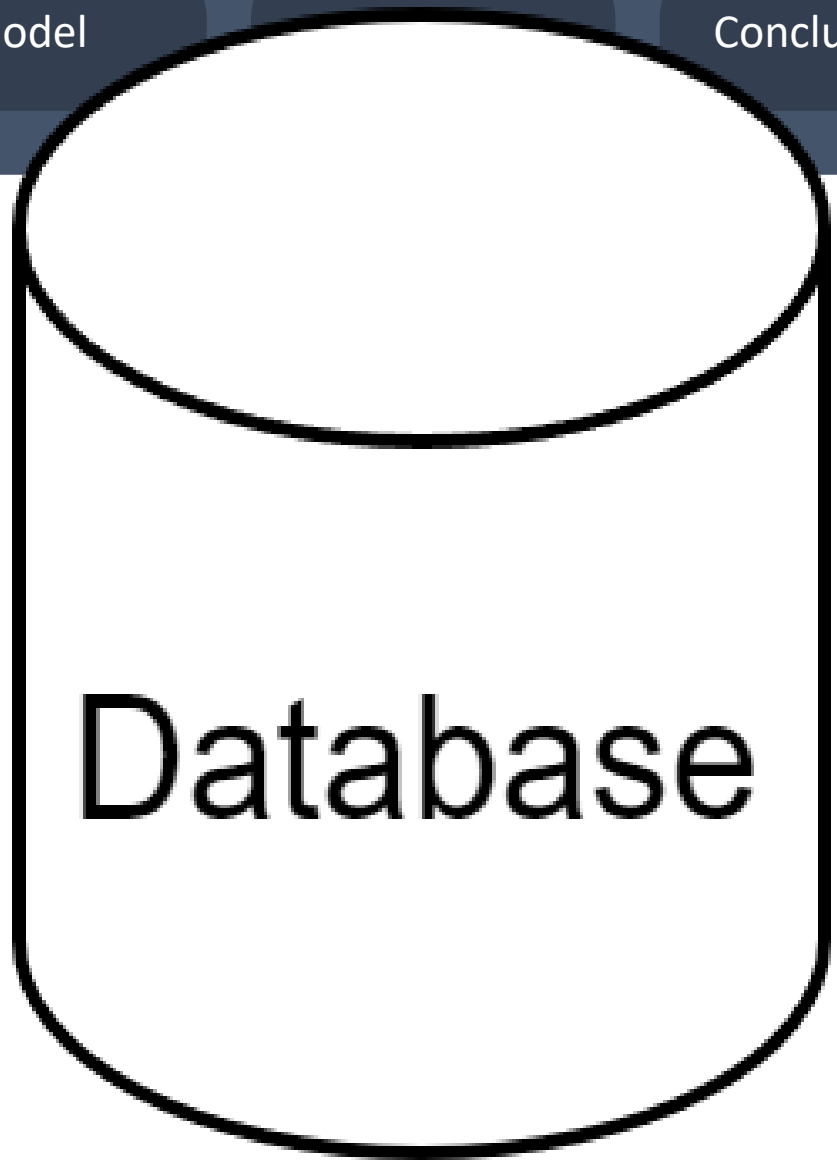
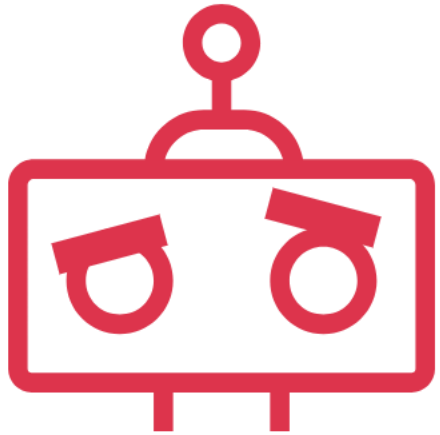
Osaka
Sapporo
Tokyo
Database


Osaka
Sapporo
Tokyo

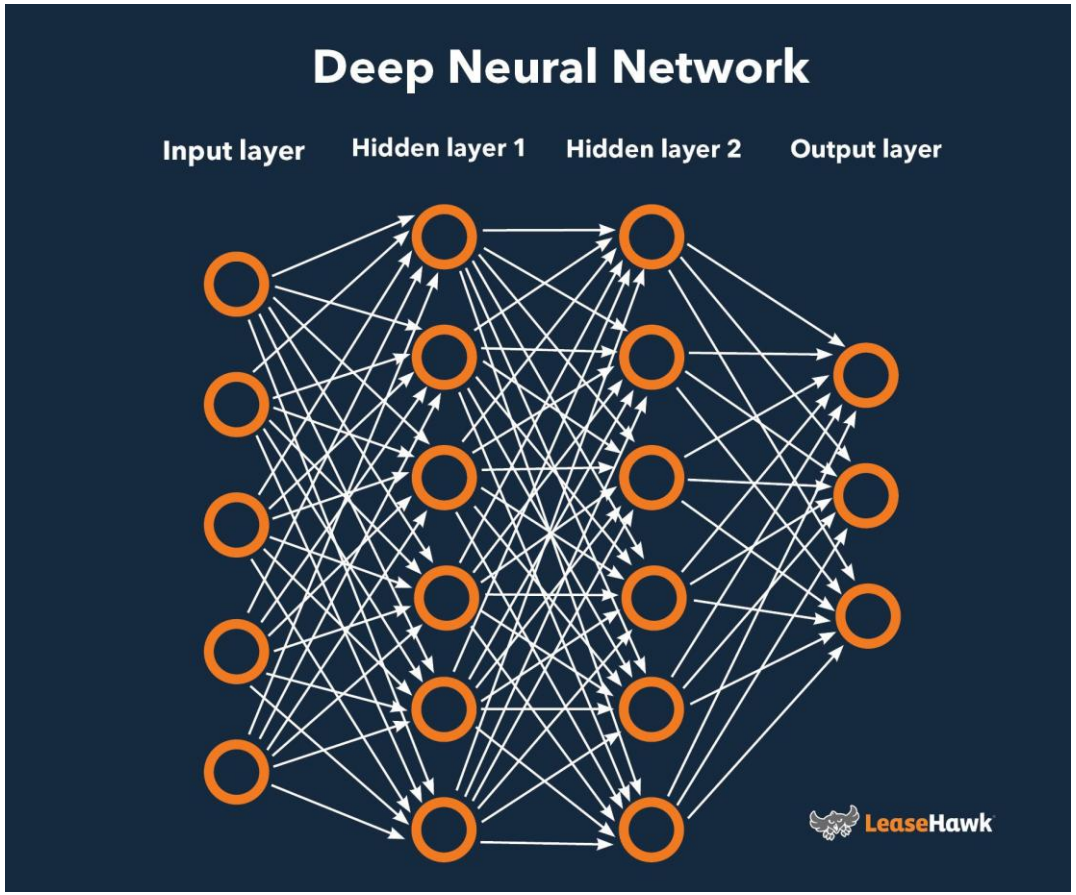
1. Low flexibility



1. Low flexibility
2. Poor Scalability

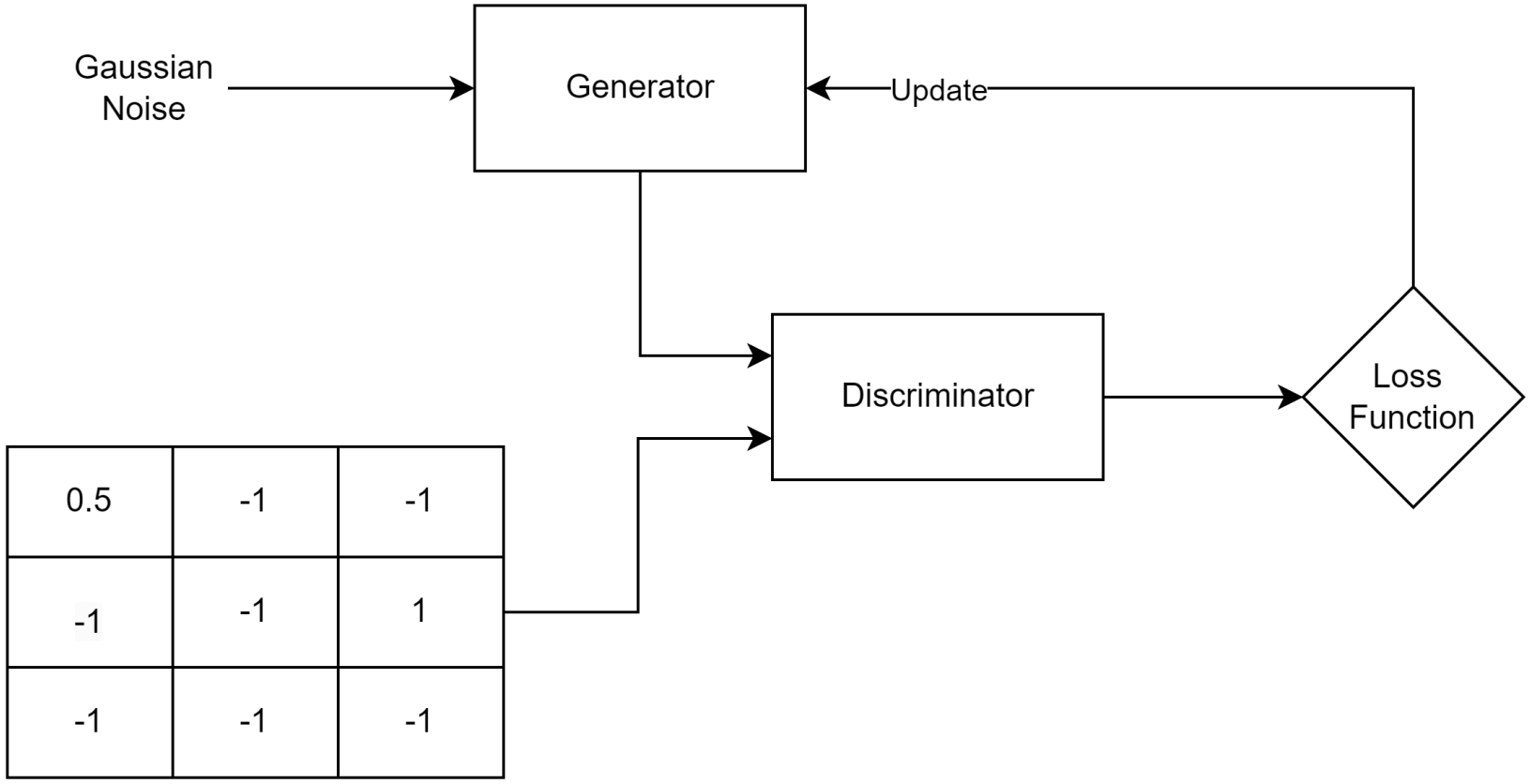


Deep Learning Solution!!

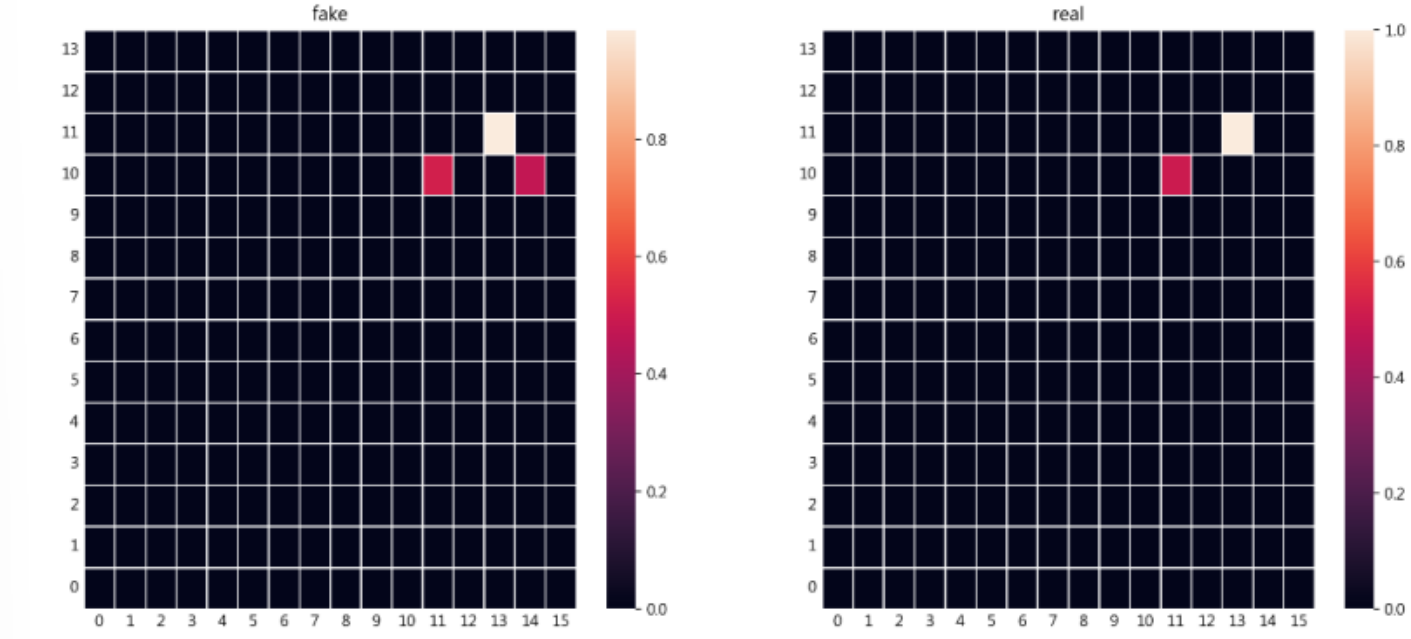


Your Guide to Understanding Artificial Intelligence (leasehawk.com)

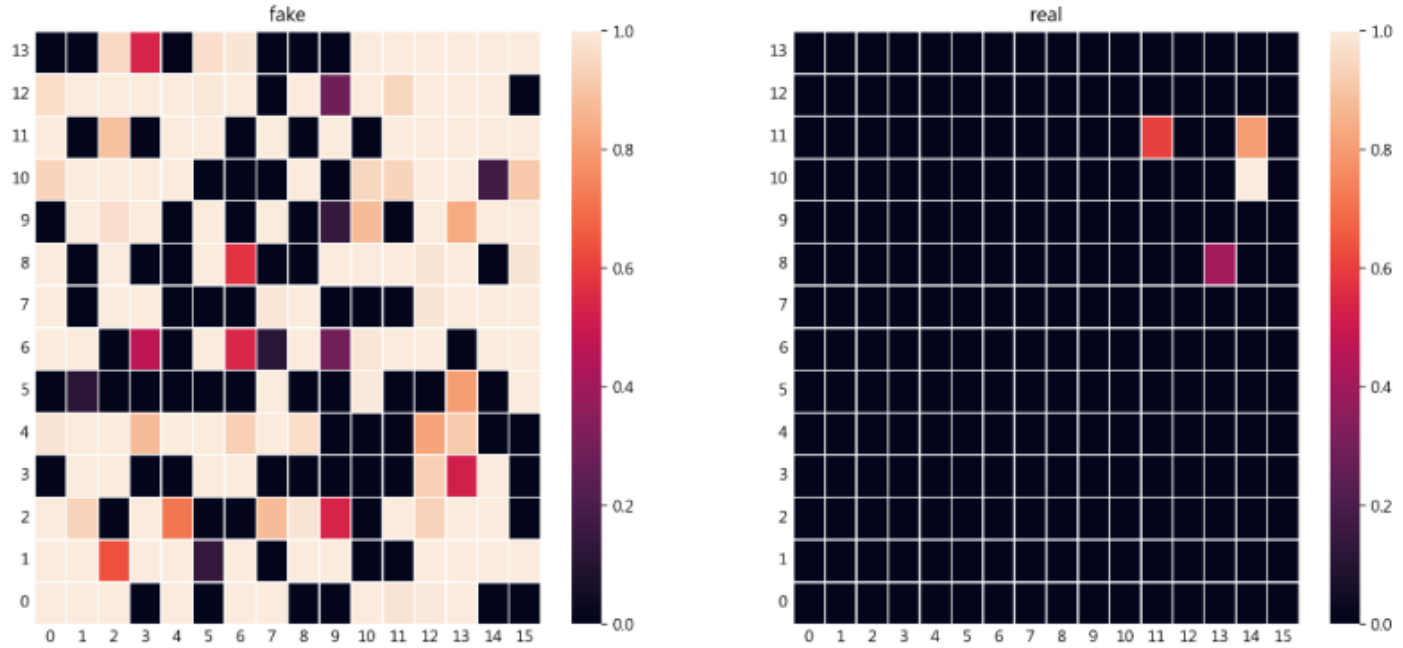
Mr. Chiu's proposed a GAN architecture to address this problem



Prediction from a Model proposed in Mr. Chiu's Essay

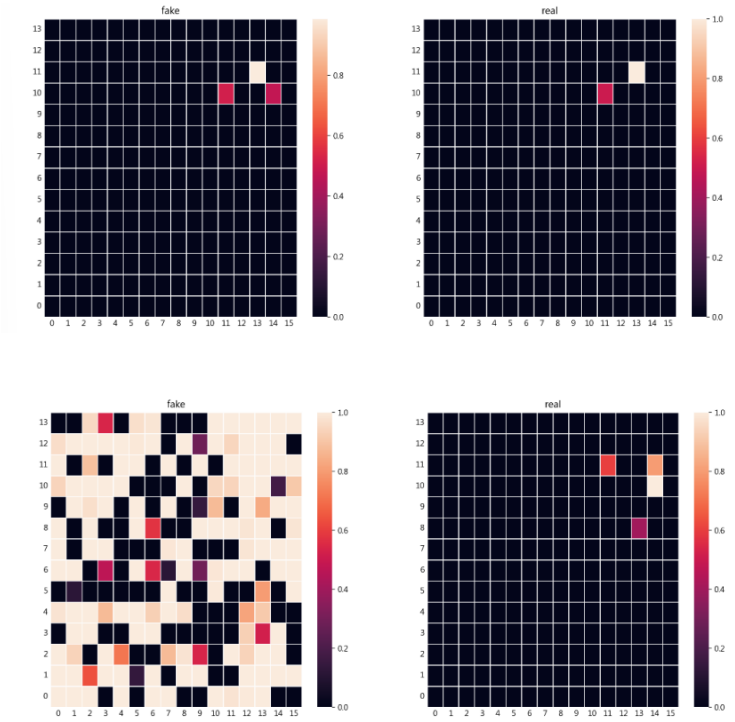


Prediction from a Model proposed in Mr. Chiu's Essay



1. Inconsistent result
2. Noisy output

Model Prediction from Mr. Chiu's Essay



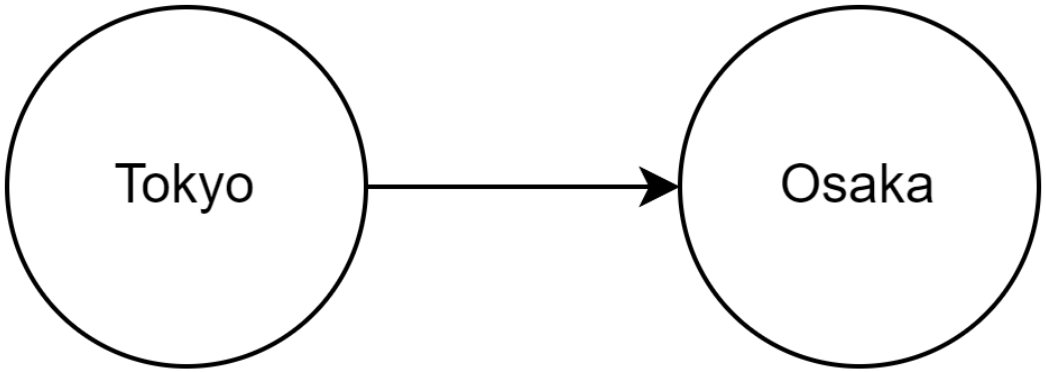
Objective:

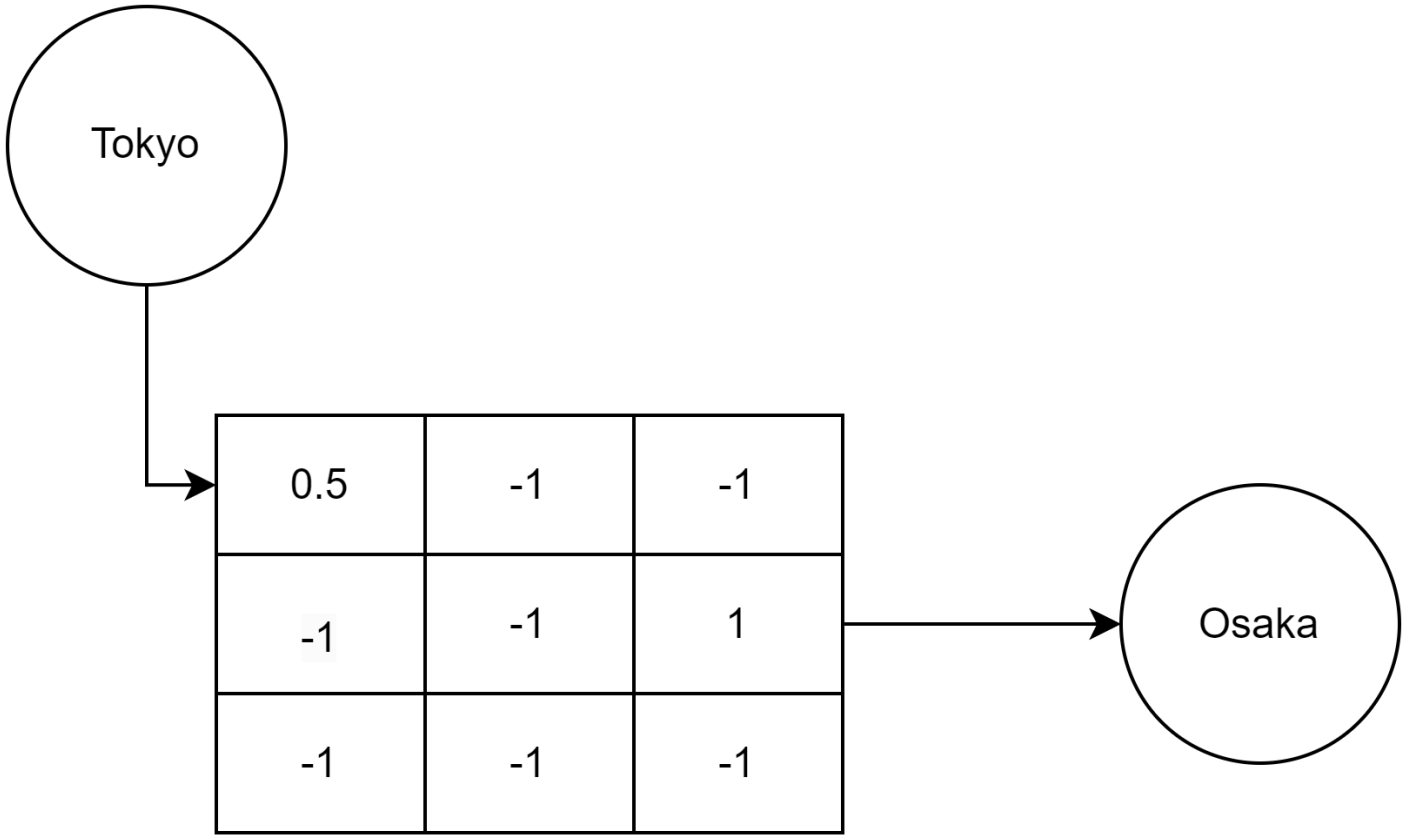
Build a better model and improve the

training procedure

Methodology

Dataset

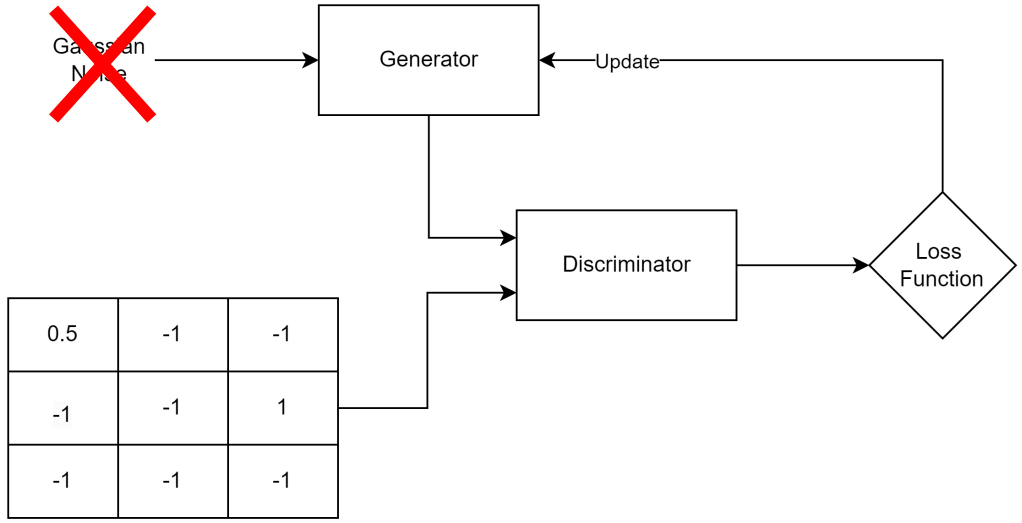

Tokyo
Osaka


Tokyo
0.5
-1
-1
-1
-1
1
-1
-1
-1
Osaka

Solutions to Past Problems

Problem 1: Inconsistent result

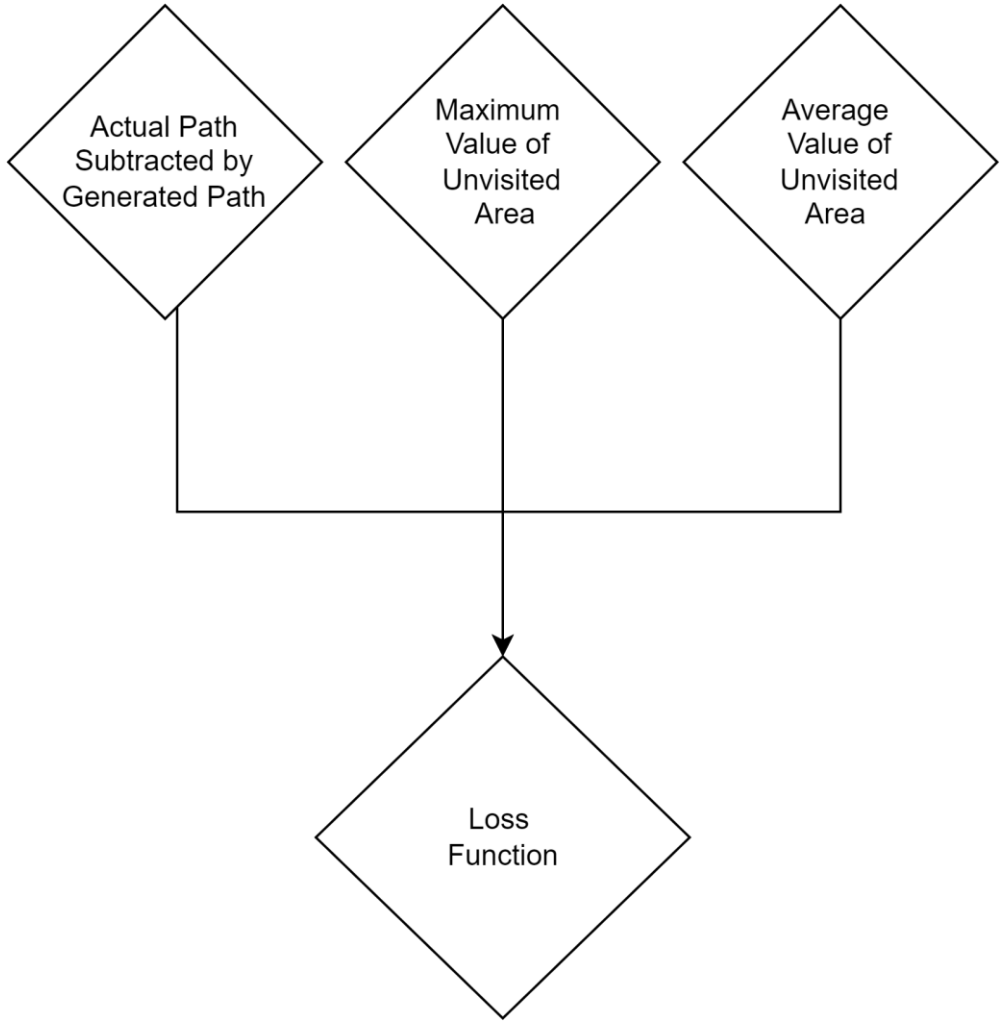
Solution: remove the Gaussian noise.

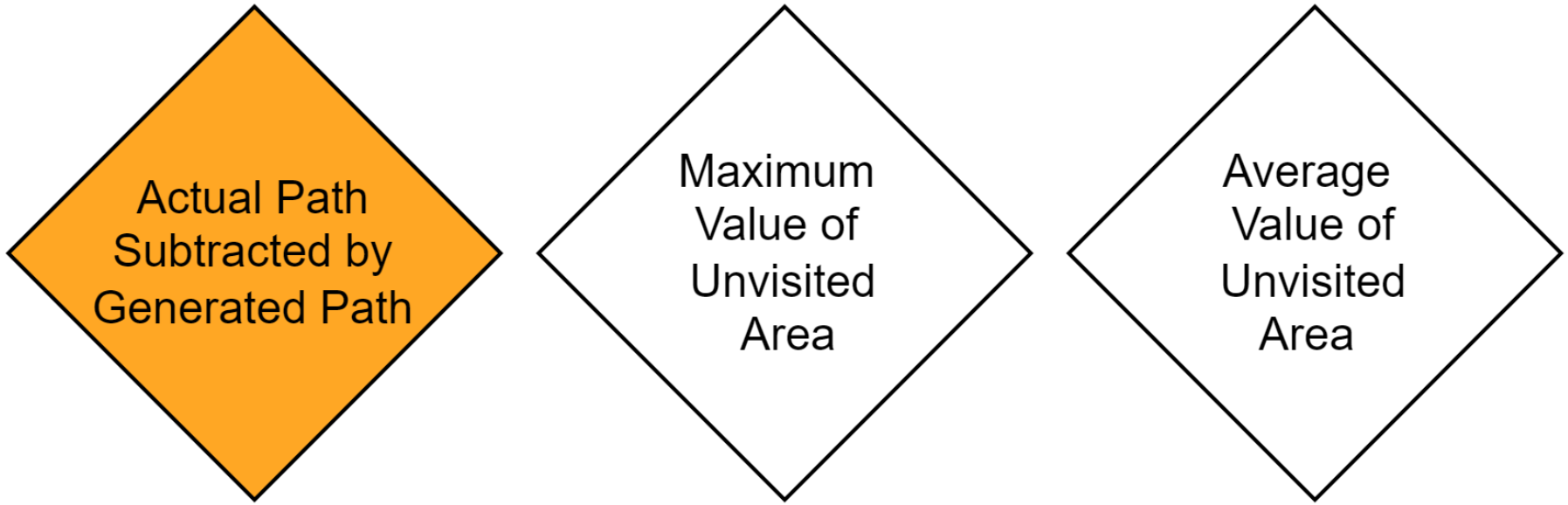


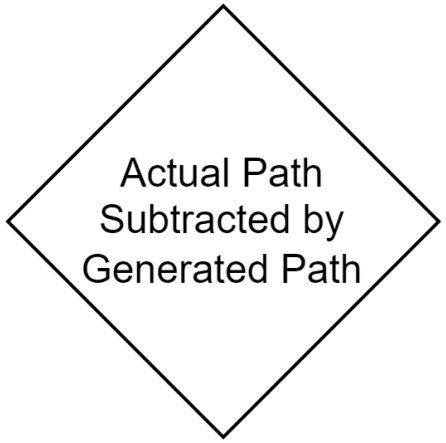
Problem 2: Noisy output

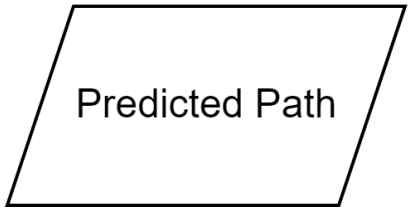
Solution: change the loss function and training procedure.

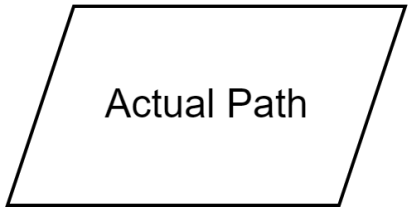
Original Loss Function


Actual Path Subtracted by Generated Path
Maximum Value of Unvisited Area
Average Value of Unvisited Area
Loss Function


Actual Path Subtracted by Generated Path
Maximum Value of Unvisited Area
Average Value of Unvisited Area

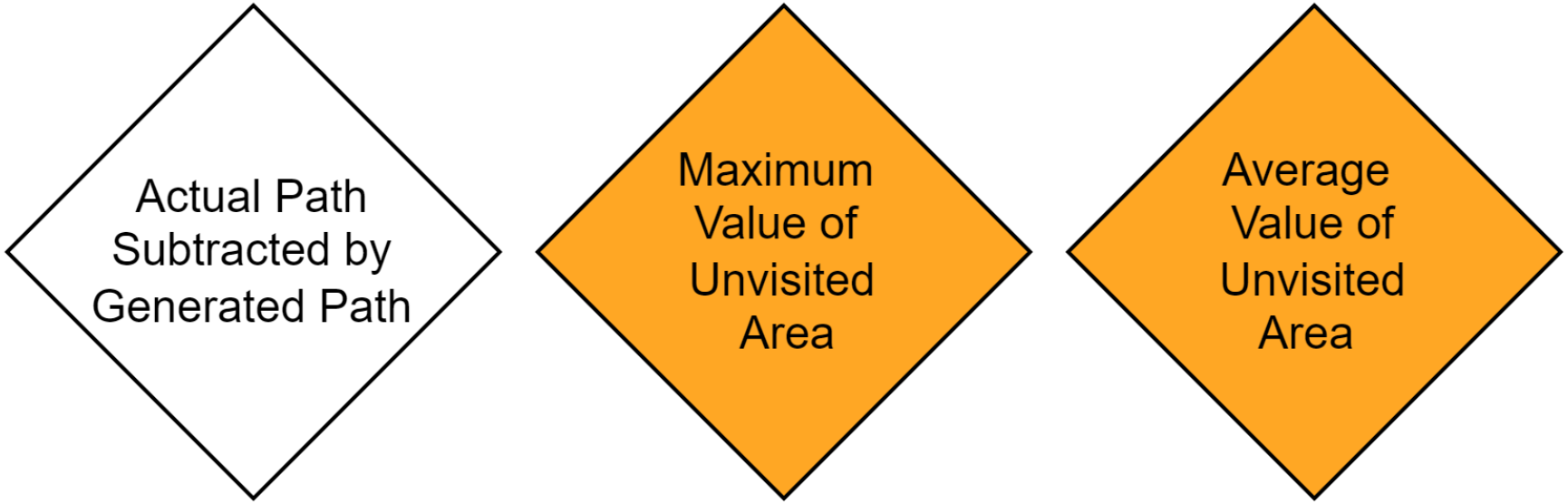






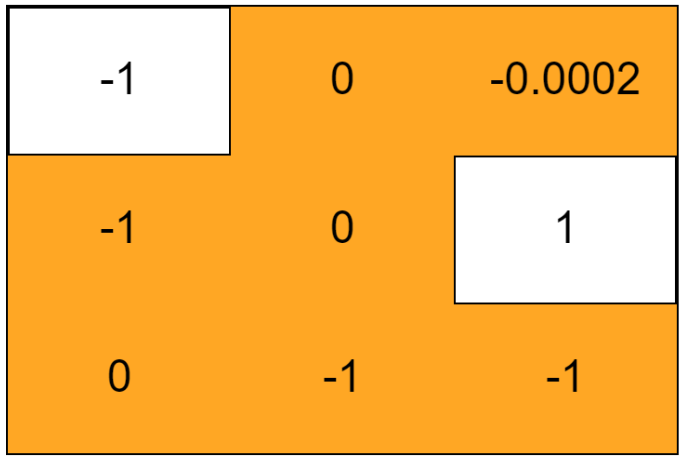
-1	0	-0.0002
-1	0	1
0	-1	-1

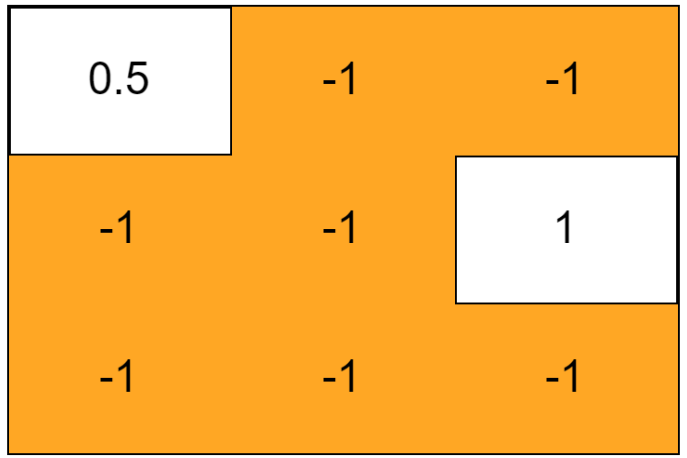
0.5	-1	-1
-1	-1	1
-1	-1	-1


Actual Path Subtracted by Generated Path
Maximum Value of Unvisited Area
Average Value of Unvisited Area

Predicted Path

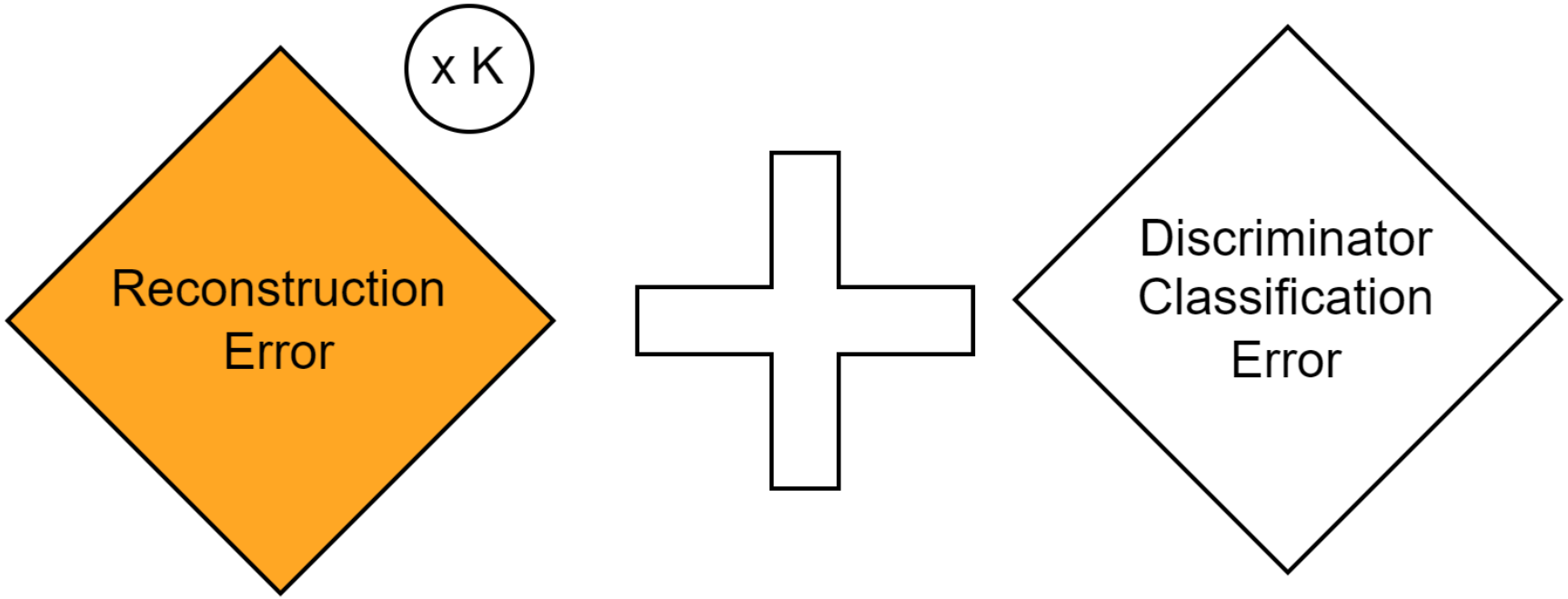
Actual Path





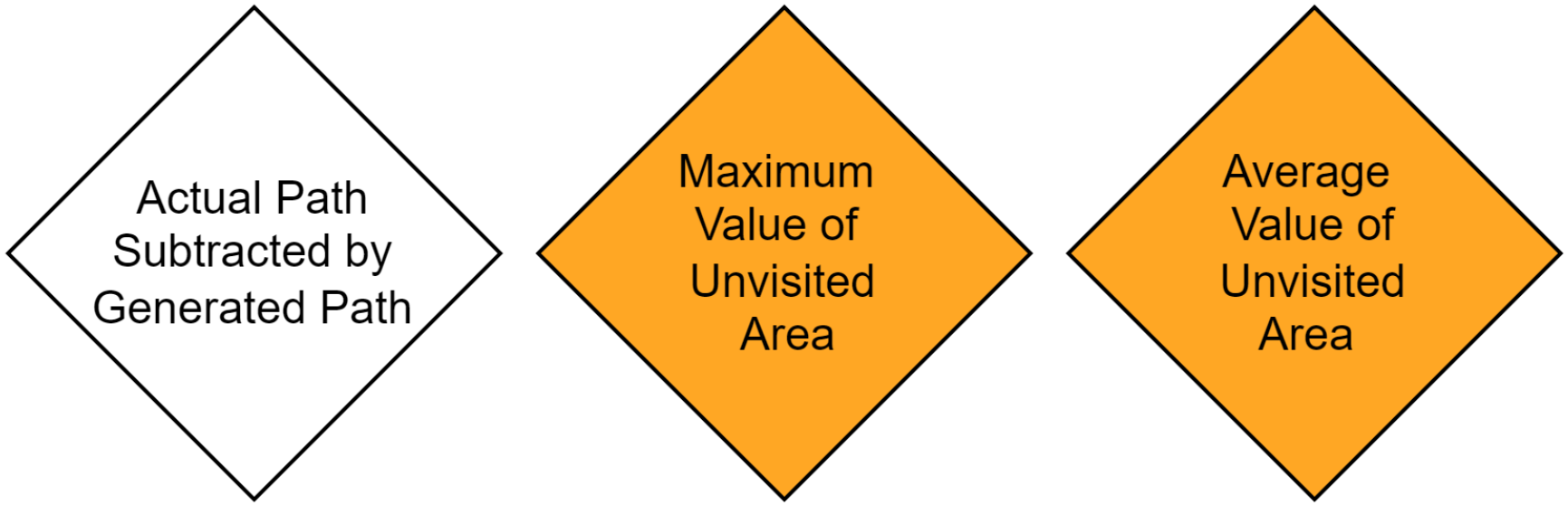
Our Loss Function

The clue is given to the generator

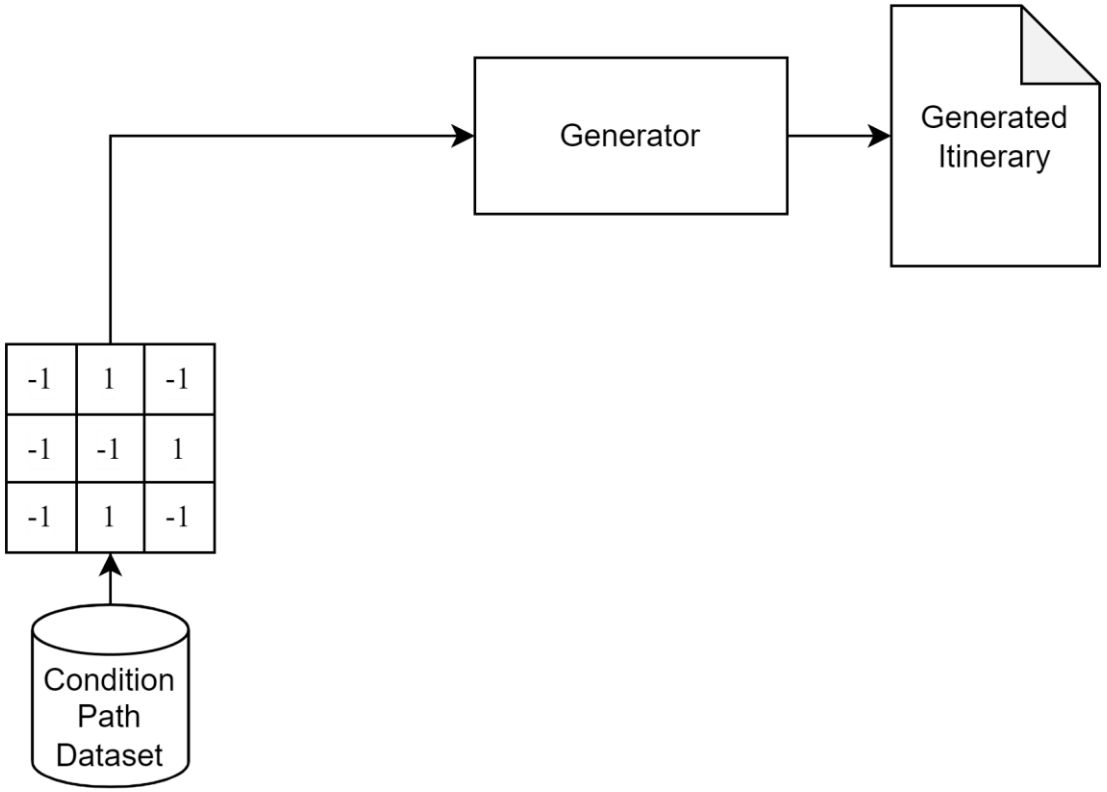


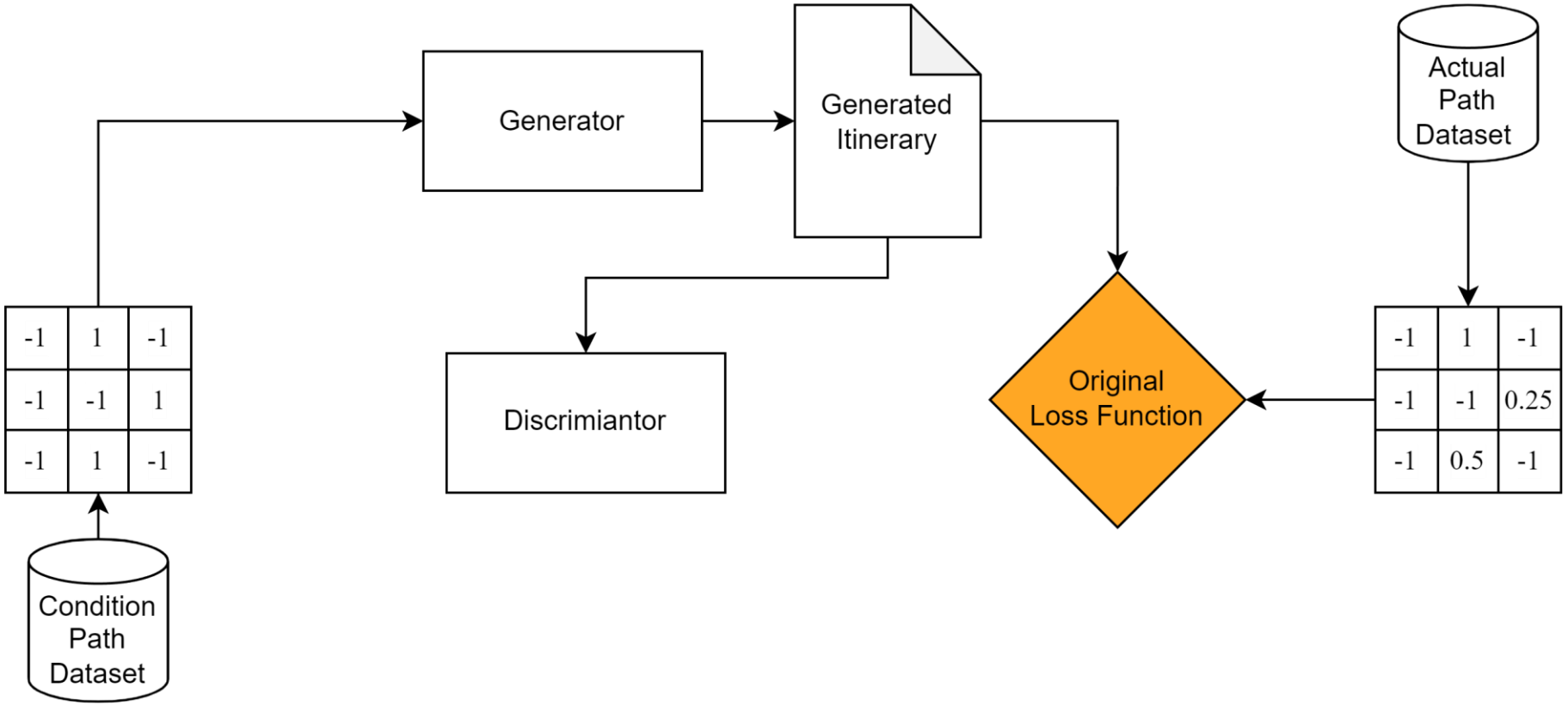
Why is the problem solved?

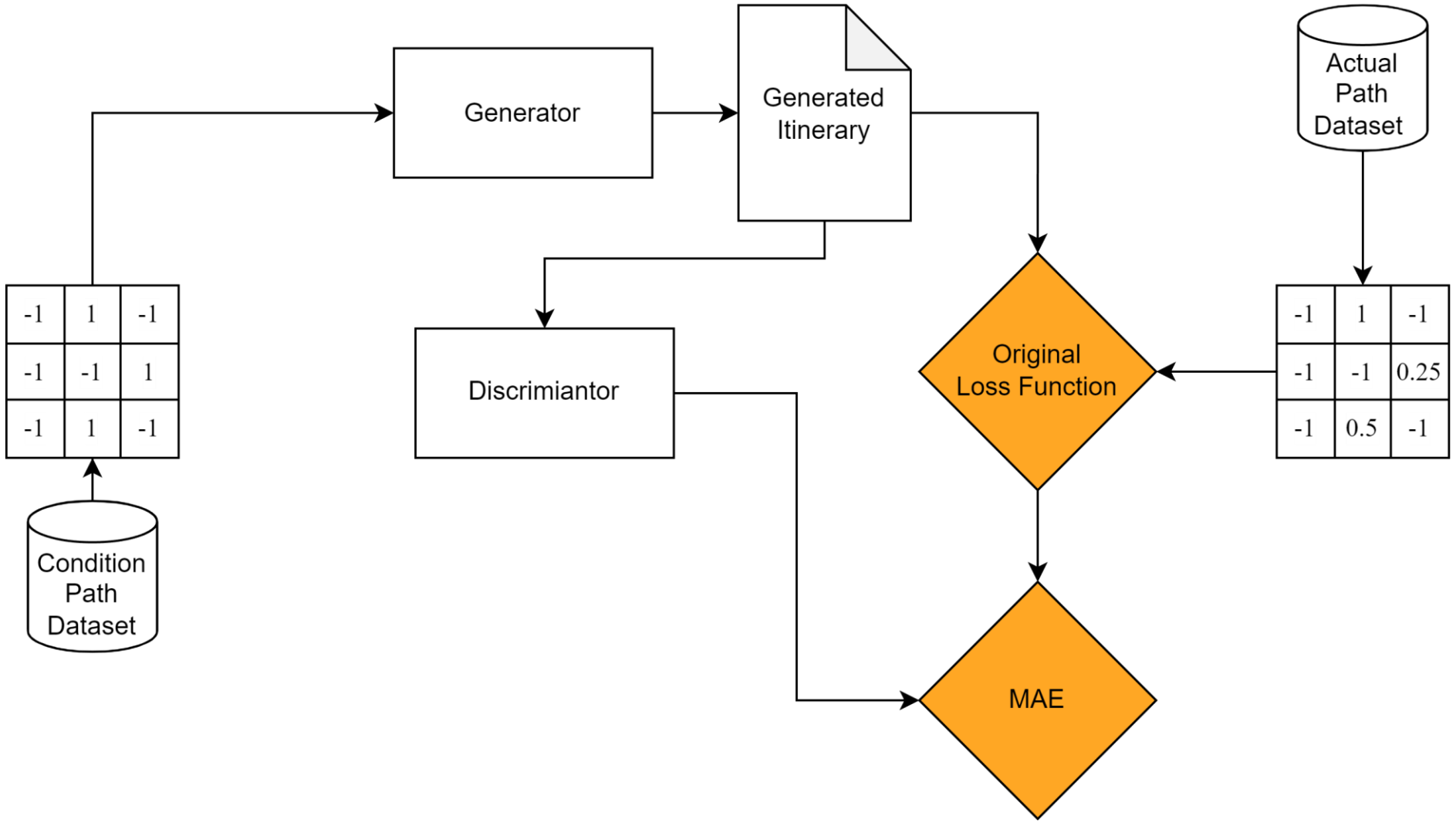
The clue is given by the discriminator!

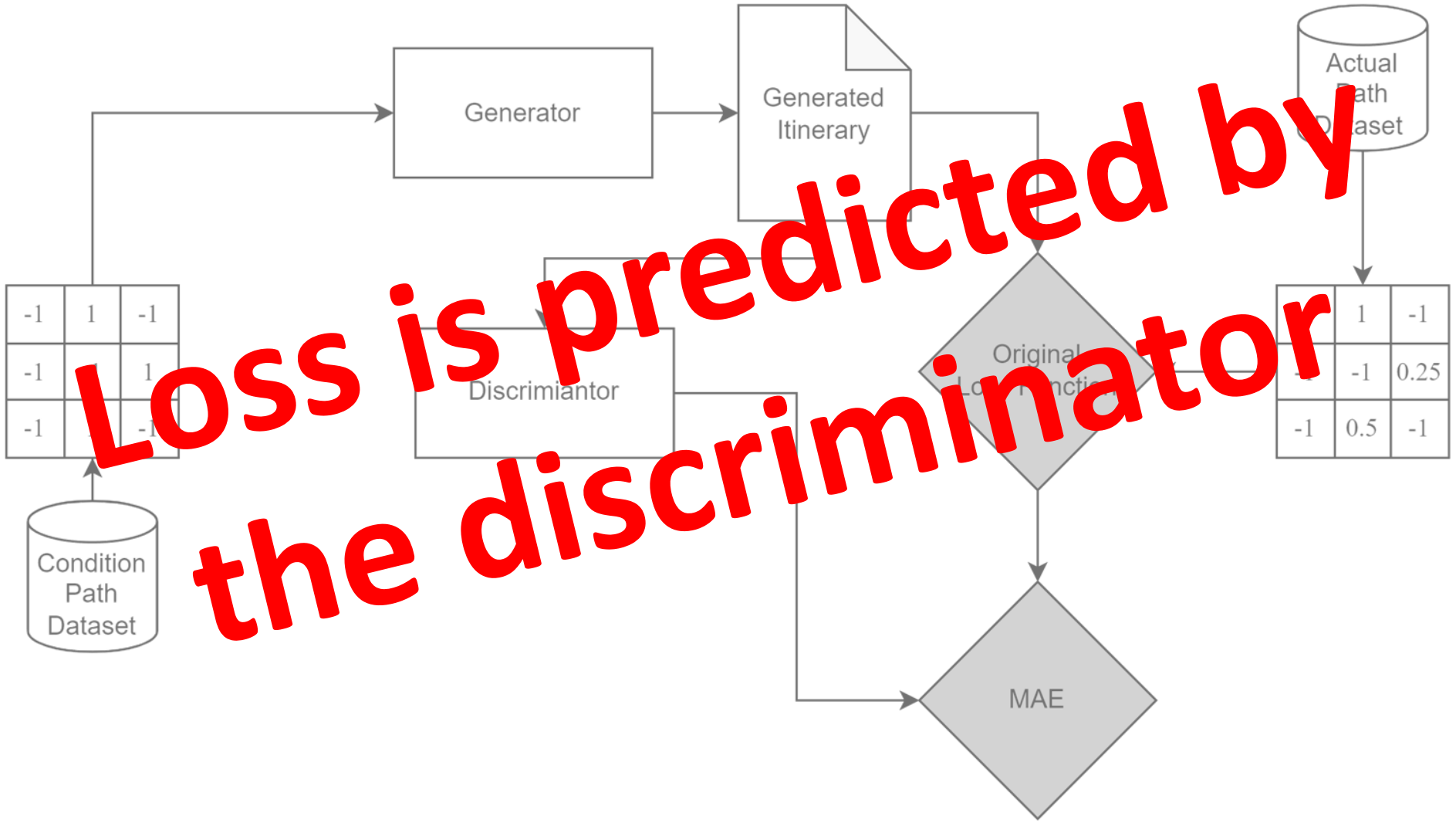


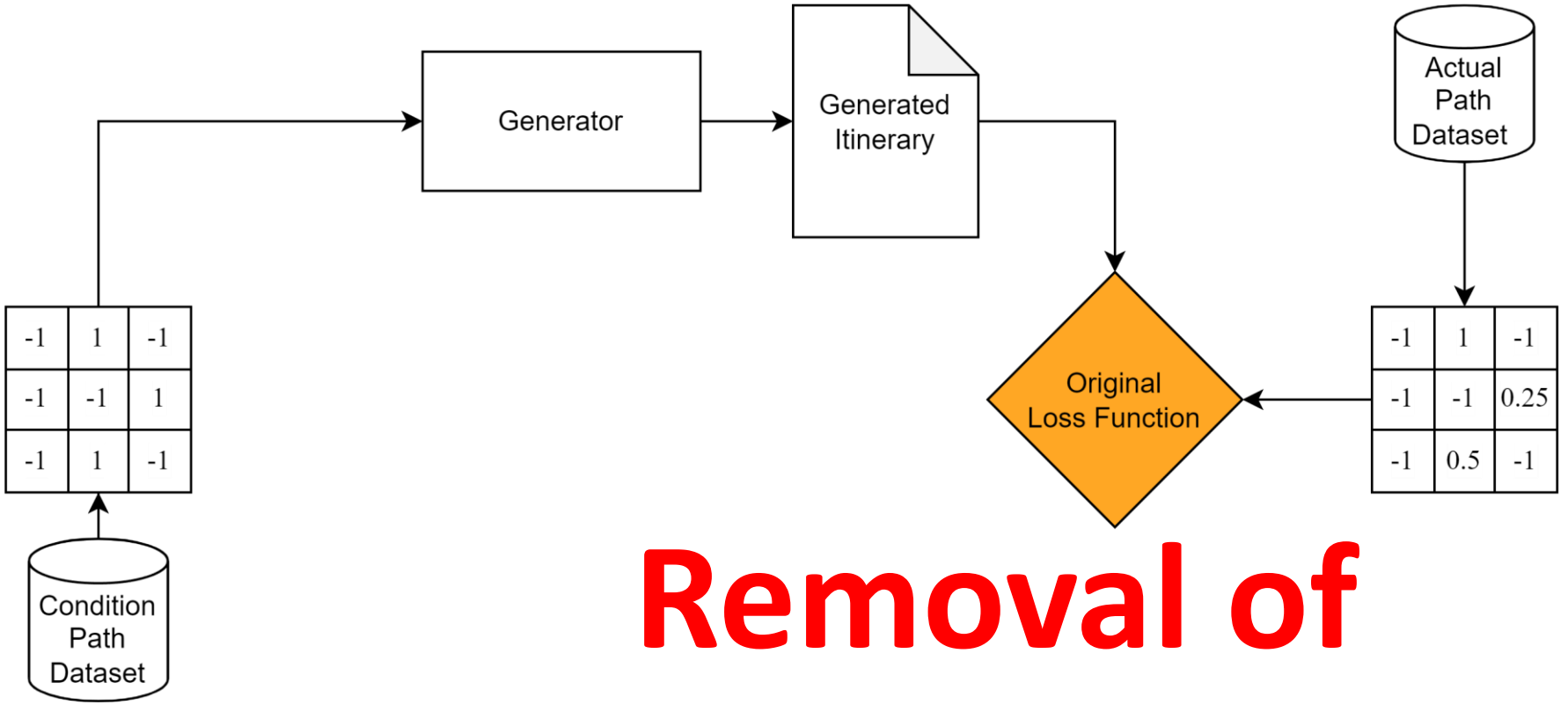
The instruction to the generator is given by the discriminator


Generator
Generated Itinerary
-1 1 -1
-1 -1 1
-1 1 -1
Condition Path Dataset


Generator
Generated Itinerary
Actual Path Dataset
Discrimiantor
Original Loss Function
Condition Path Dataset
-1 1 -1
-1 -1 1
-1 1 -1
-1 1 -1
-1 -1 0.25
-1 0.5 -1


Generator
Generated Itinerary
Actual Path Dataset
-1 1 -1
-1 -1 1
-1 1 -1
Discrimiantor
Original Loss Function
-1 1 -1
-1 -1 0.25
-1 0.5 -1
Condition Path Dataset
MAE

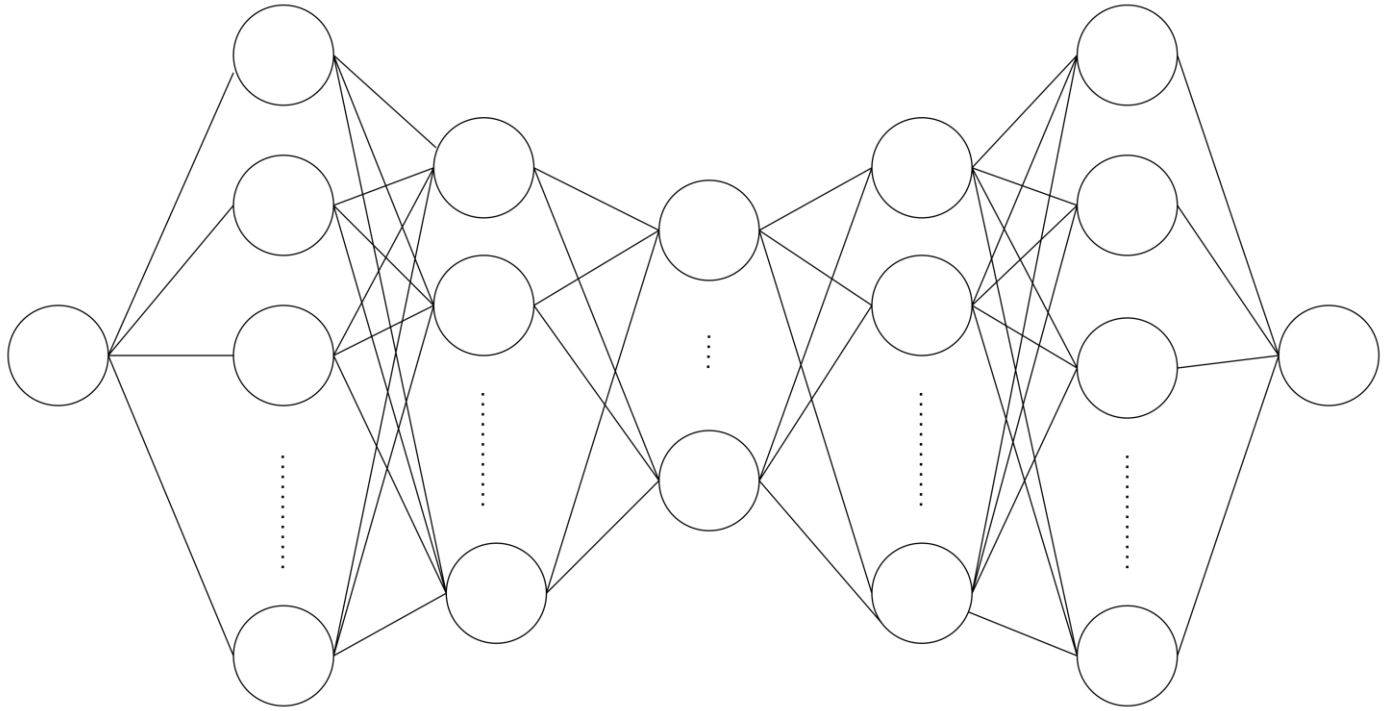

Generator
Generated Itinerary
Actual Path Dataset
-1 1 -1
-1 1
-1 -1
Discrimiantor
Original Loss Function
1 -1
-1 0.25
-1 0.5 -1
Condition Path Dataset
MAE
Loss is predicted by the discriminator



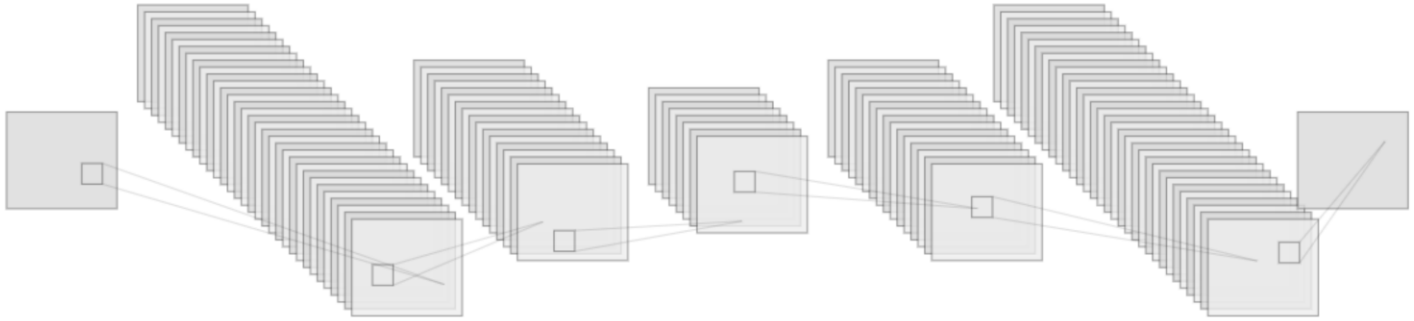
Removal of Discriminator will do

Model

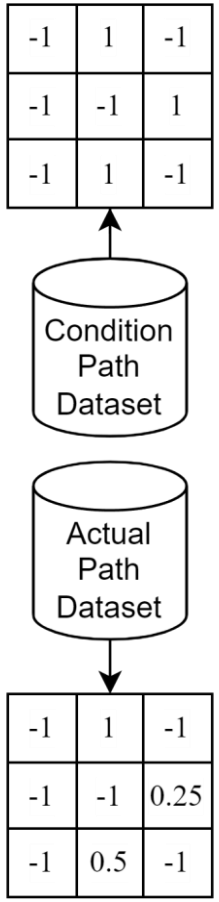
Fully Connected Neural Networks



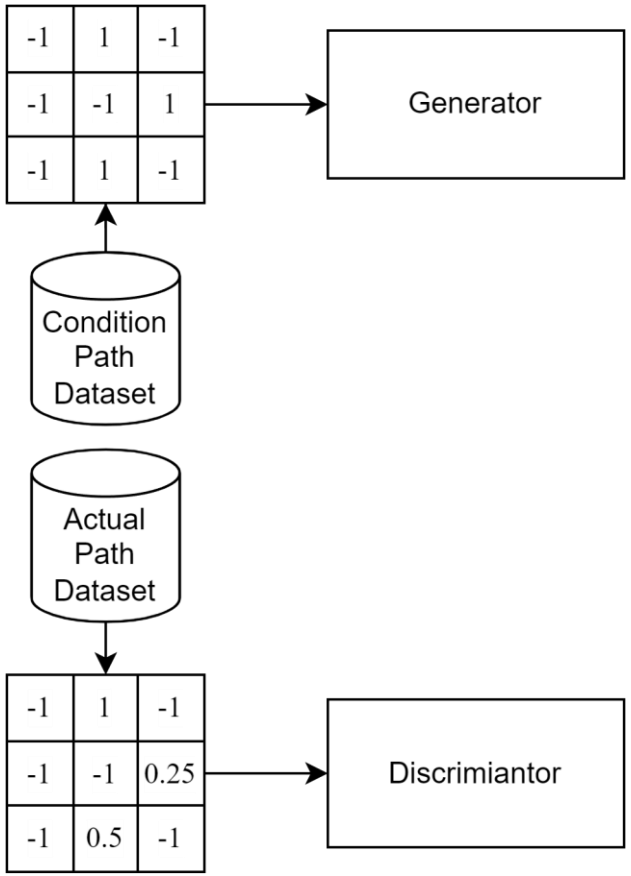
Convolutional Neural Networks



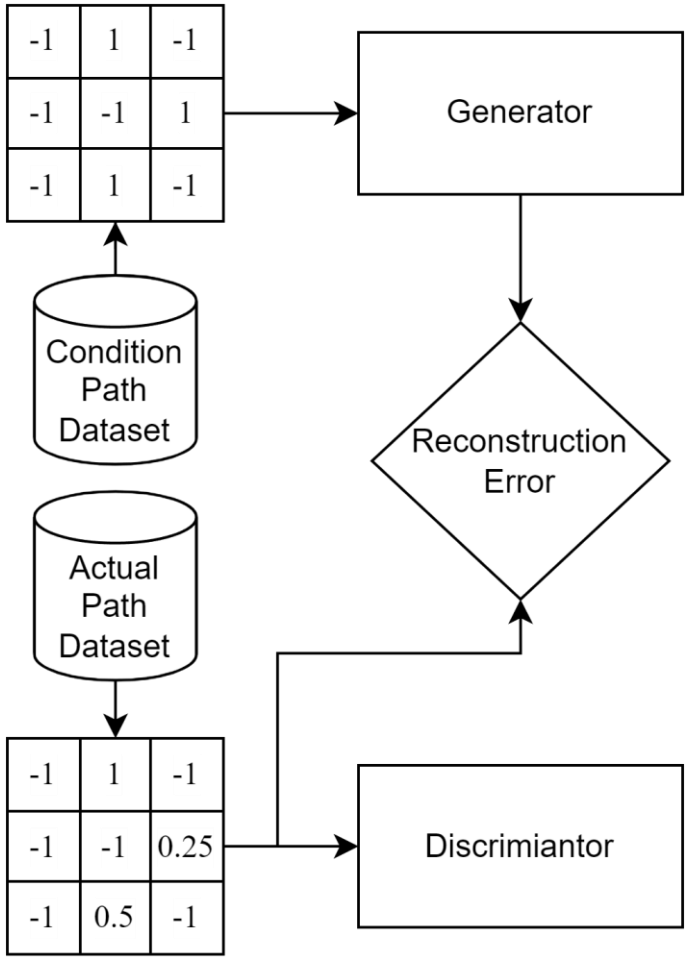
Generative Adversarial Networks



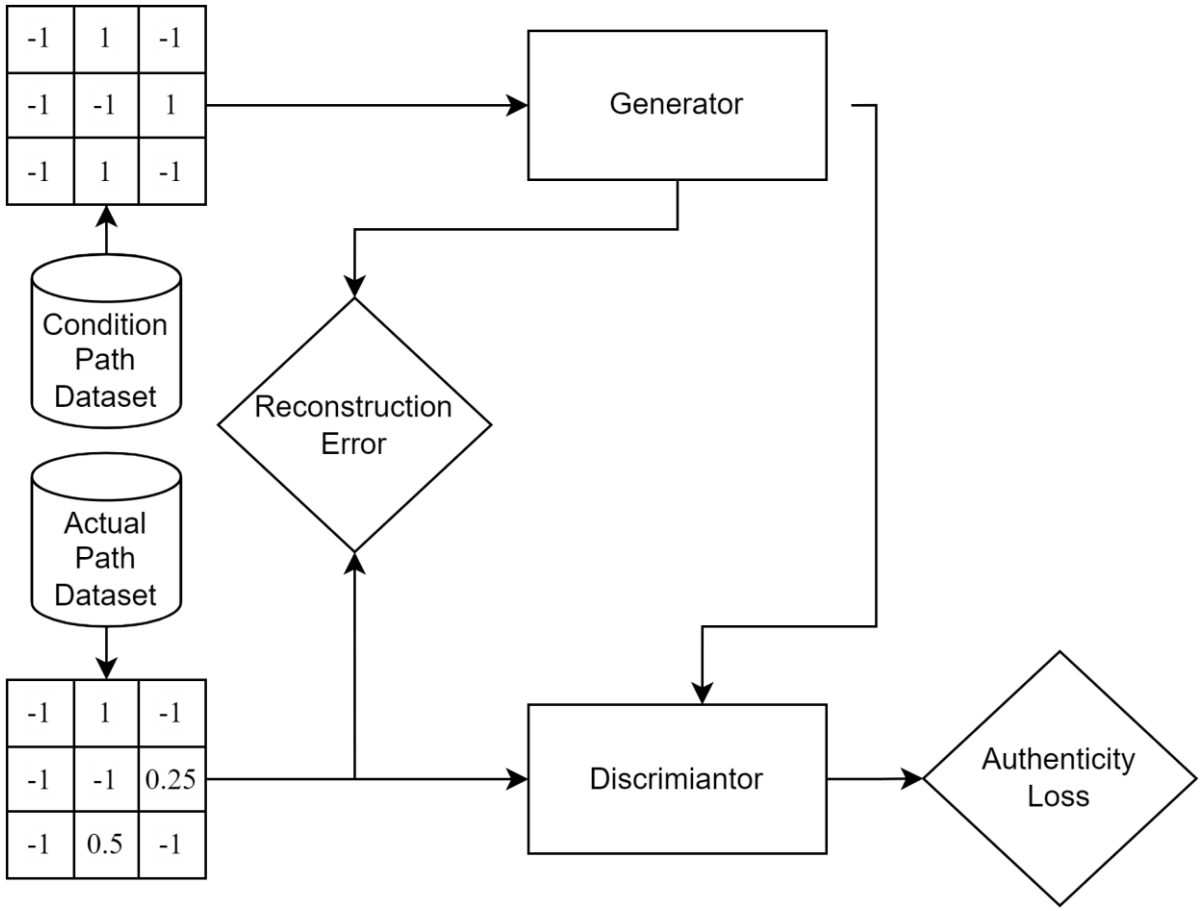
Generative Adversarial Networks



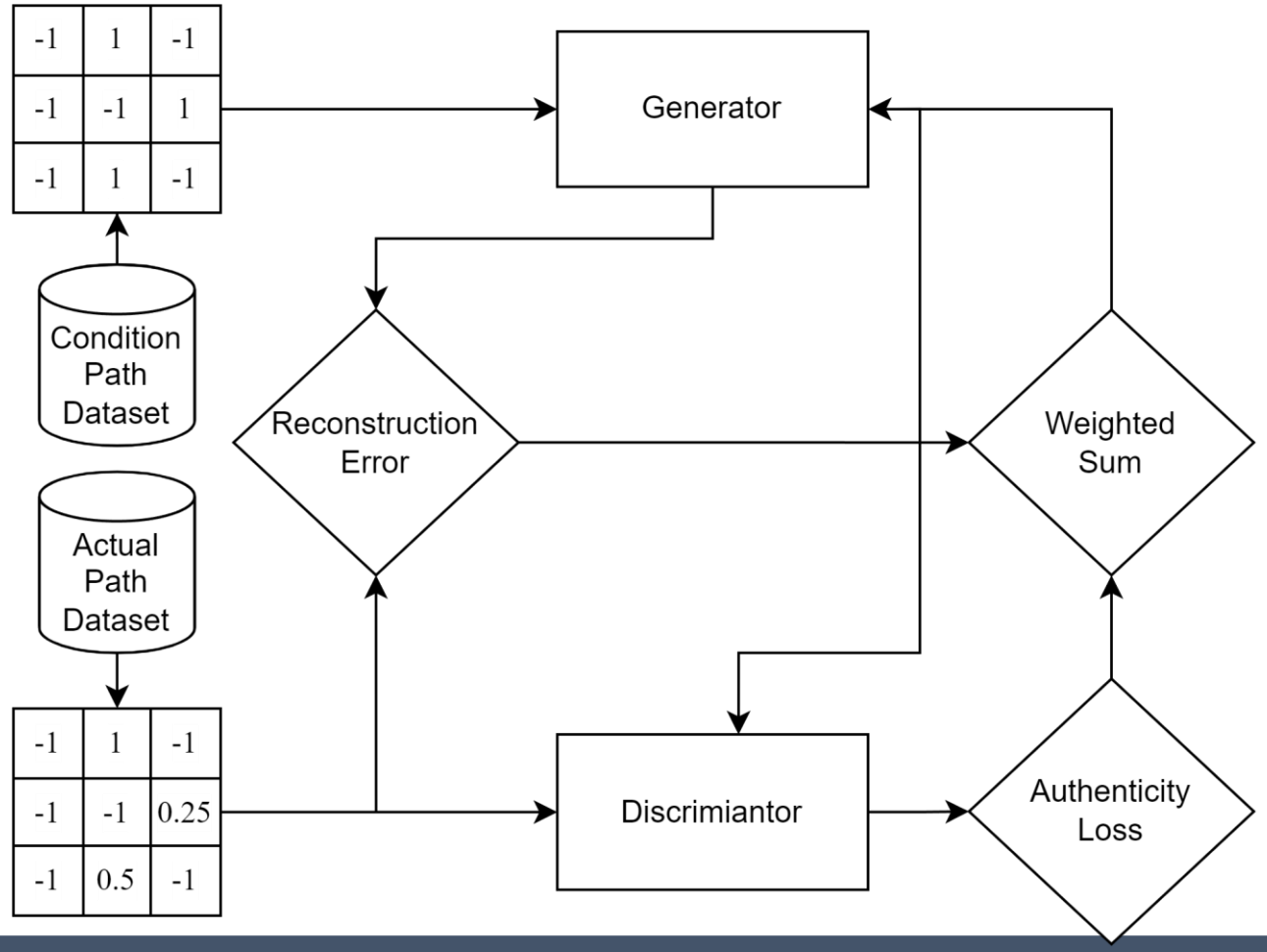
Generative Adversarial Networks



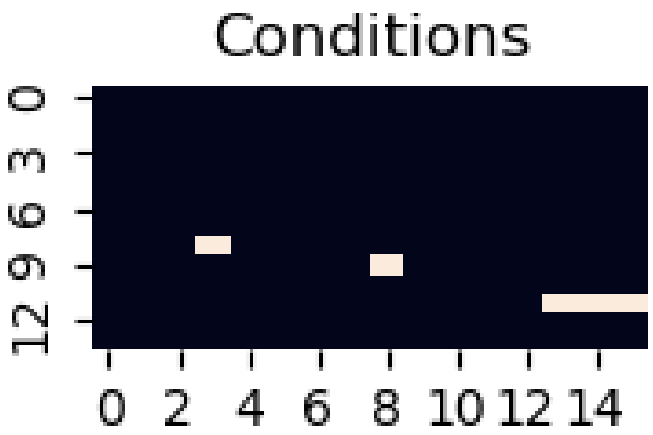
Generative Adversarial Networks

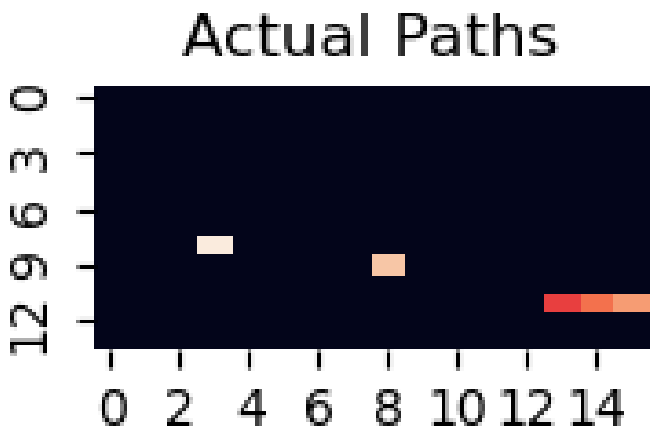


Generative Adversarial Networks

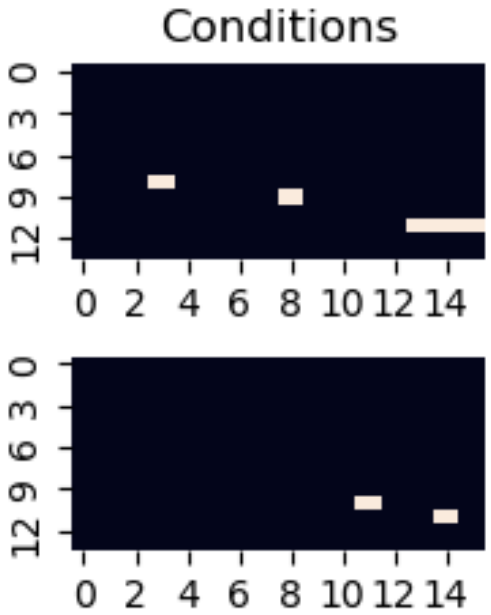


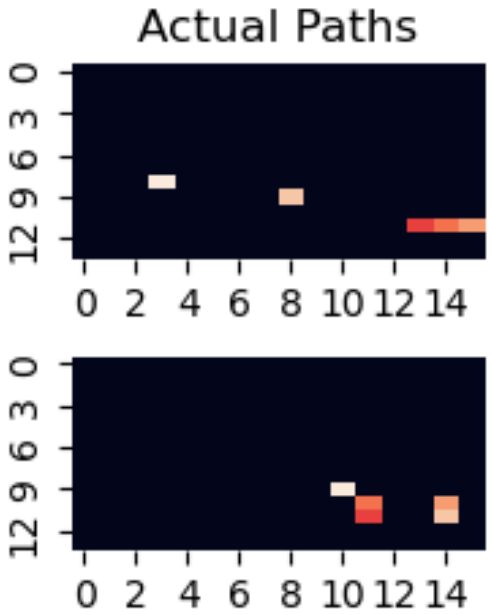
Experiment

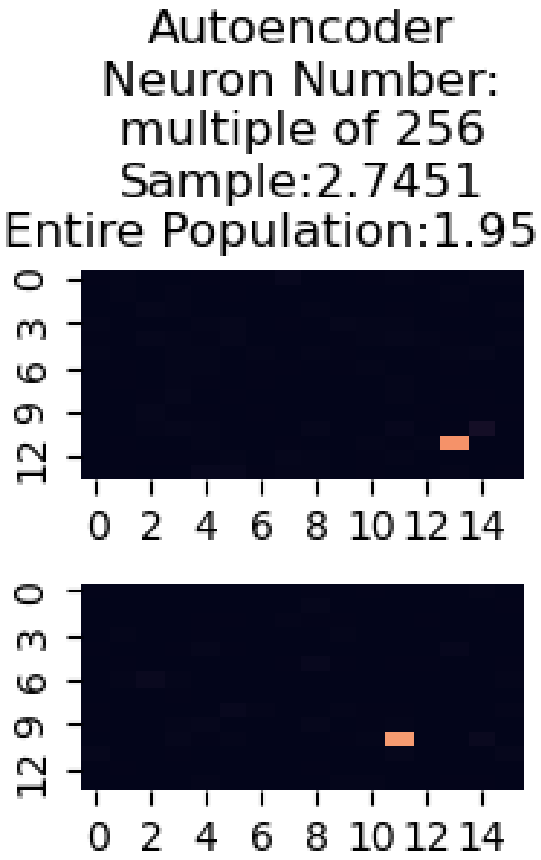

Conditions
0
3
6
9
12
0 2 4 6 8 10 12 14
0
3
6
9
12
0 2 4 6 8 10 12 14


Actual Paths
0
3
6
9
12
0 2 4 6 8 10 12 14
0
3
6
9
12
0 2 4 6 8 10 12 14

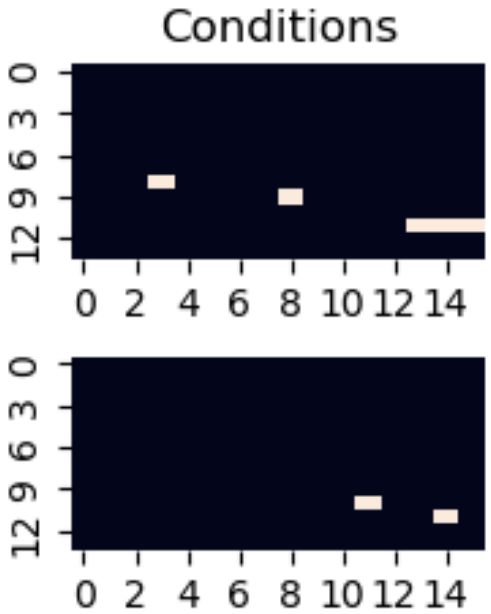
Fully Connected Neural Networks

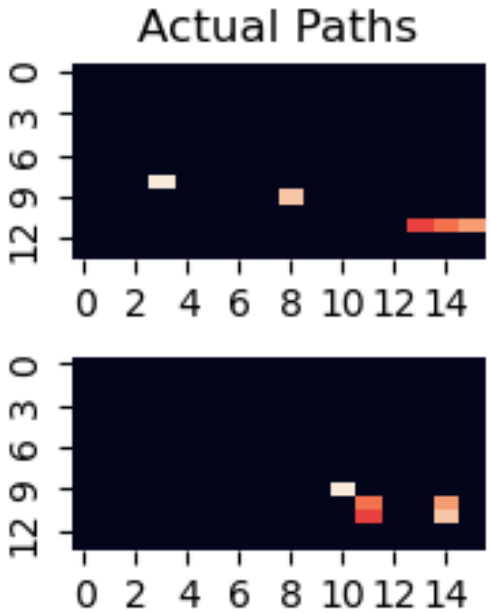


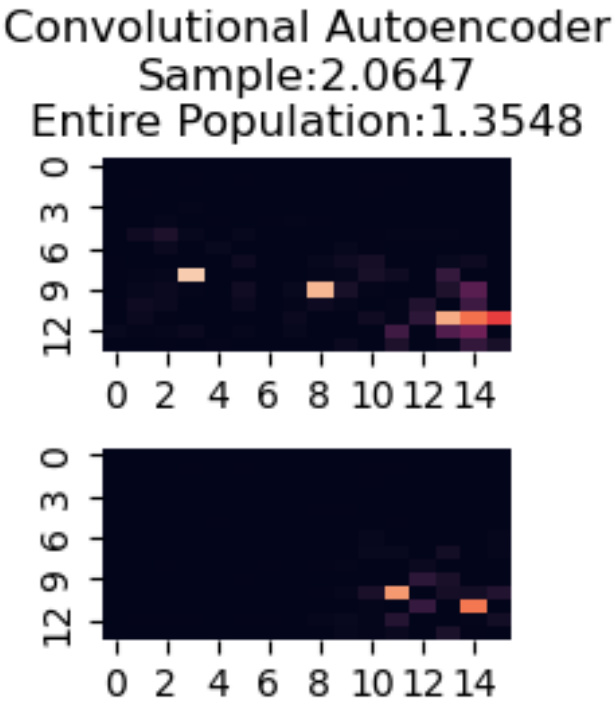




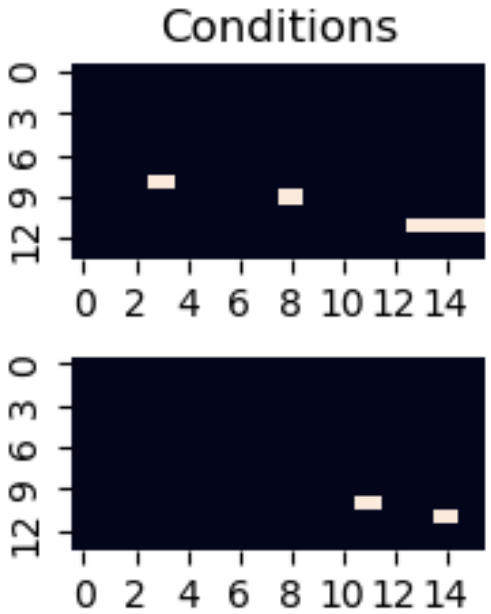
Convolutional Neural Networks

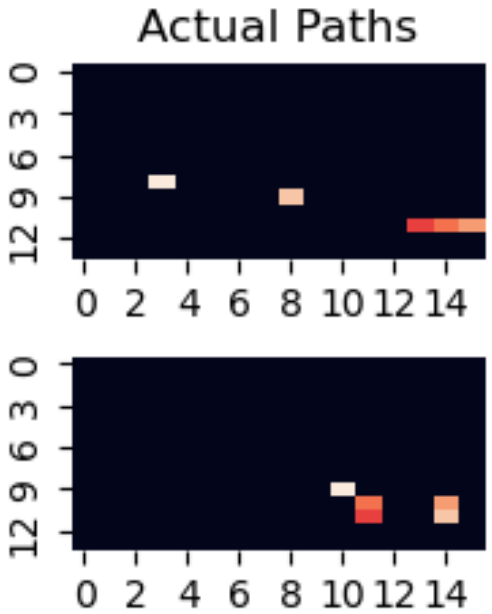


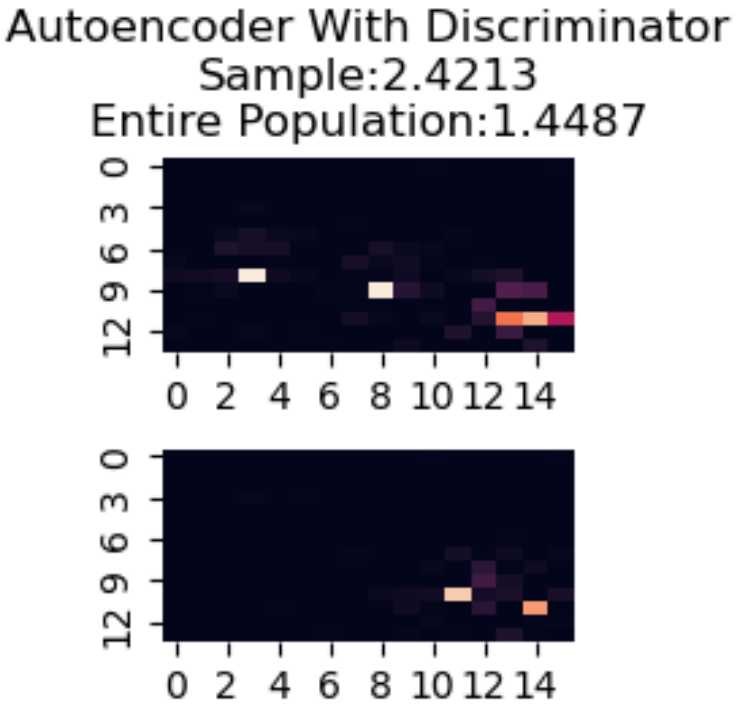




Generative Adversarial Networks







Conclusion

Problems

1. Inconsistent result
2. Noisy output

Problems

1. Inconsistent result
2. Noisy output

Solutions

1. Gaussian Noise removal
2. Change of the training procedure

	Fully Connected Neural Network	Convolutional Neural Networks	Generative Adversarial Networks
Loss	1.9564	1.3548	1.4487

Q & A sessions