Surrogate Loss Learning for Dynamic Time Warping(DTW)

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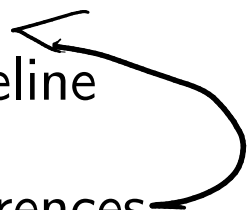
Agenda

1. Motivation
2. Literature Review
3. Research Idea
4. Data Foundation
5. Timeline
6. References



Motivation

- **Dynamic Time Warping(DTW)** is a technique used to quantify the similarity between two varying time sequences.
- DTW and its variants like soft-DTW, Shape and Time Distortion Loss have bounded efficiency and performance.
- This is because of their hyper-parameter dependency and quadratic complexity.
- Surrogate Losses are a superior option.

Motivation

Research has manifested that a neural network can approximate a desired loss.

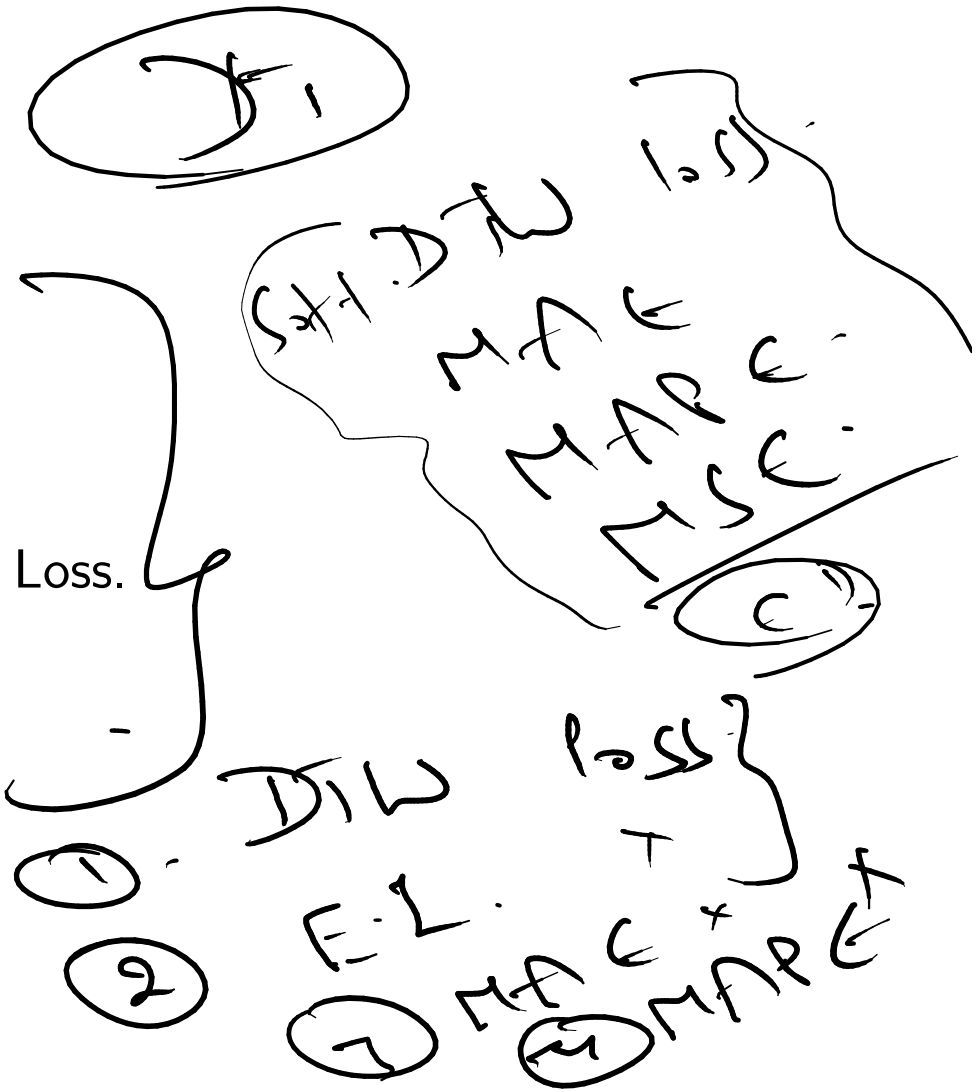
Goal: Develop a surrogate loss function for Shape and Time Distortion Loss(DILATE) as a meta-level neural network.

- Surrogate Loss network will be trained before forecasting model.

Literature Review

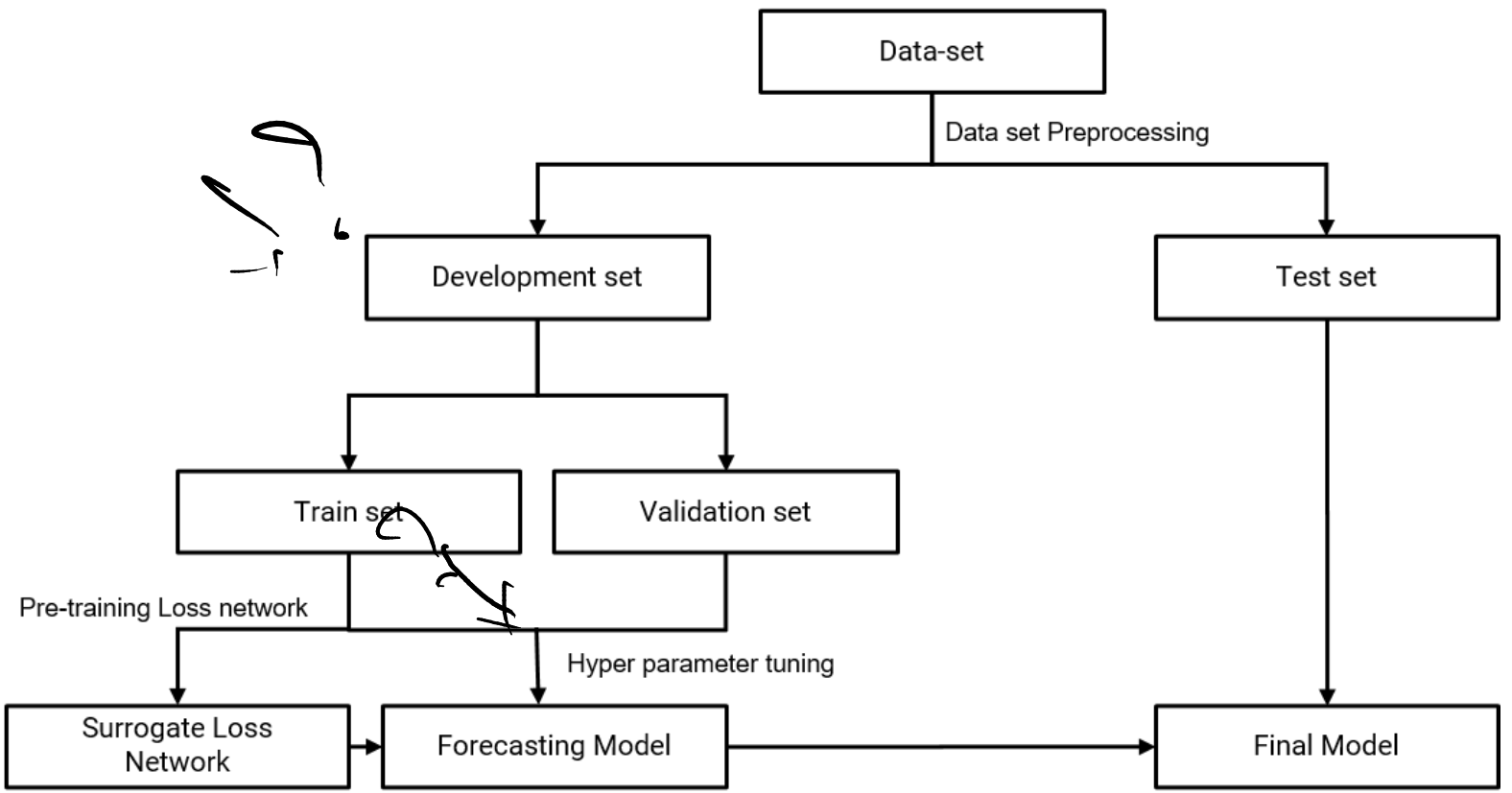
Baselines are bifurcated as:

- DTW based:
  - soft-DTW
  - Shape and Time Distortion Loss.
- Surrogate Loss Learning for:
  - MAE
  - MAPE
  - MSE



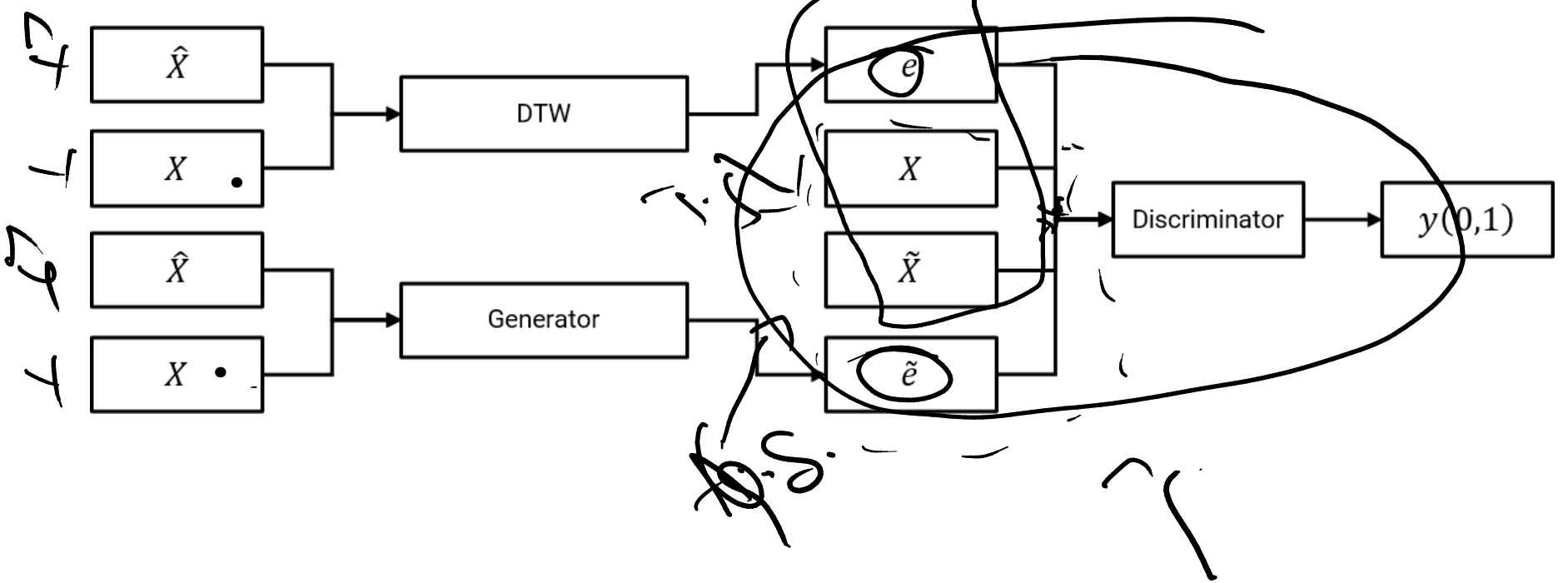
Research Idea

Overall Process:



Research Idea

Surrogate Loss Network- GAN:

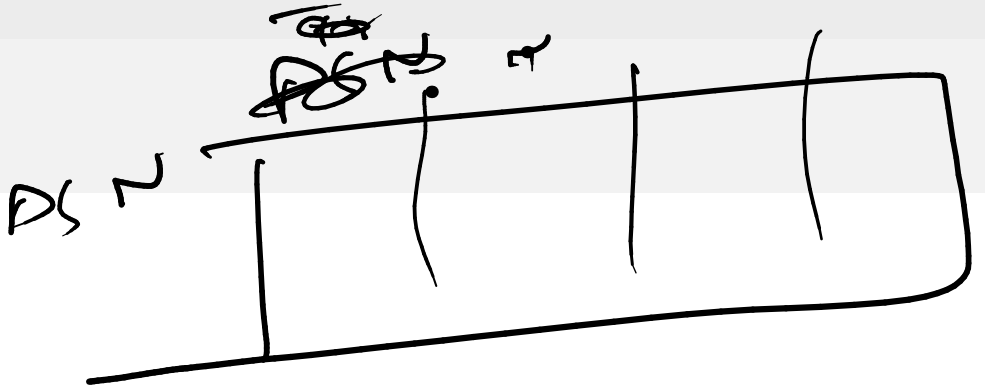


Data Foundation

Public Data-sets:

- Traffic:
  - Hourly Traffic Data from California State Department.
  - Data Tenure of 2015-2016.
  - Size: 17,544
- Electricity:
  - Electricity Load Diagrams Dataset, containing the electricity consumption every 15 minutes.
  - Data Tenure of 2011-2014.
  - Size: 26,304
- Retail:
  - Favorita Dataset is a combination of metadata for different products and the stores, sampled at the daily level.
  - Data Tenure for 2012.

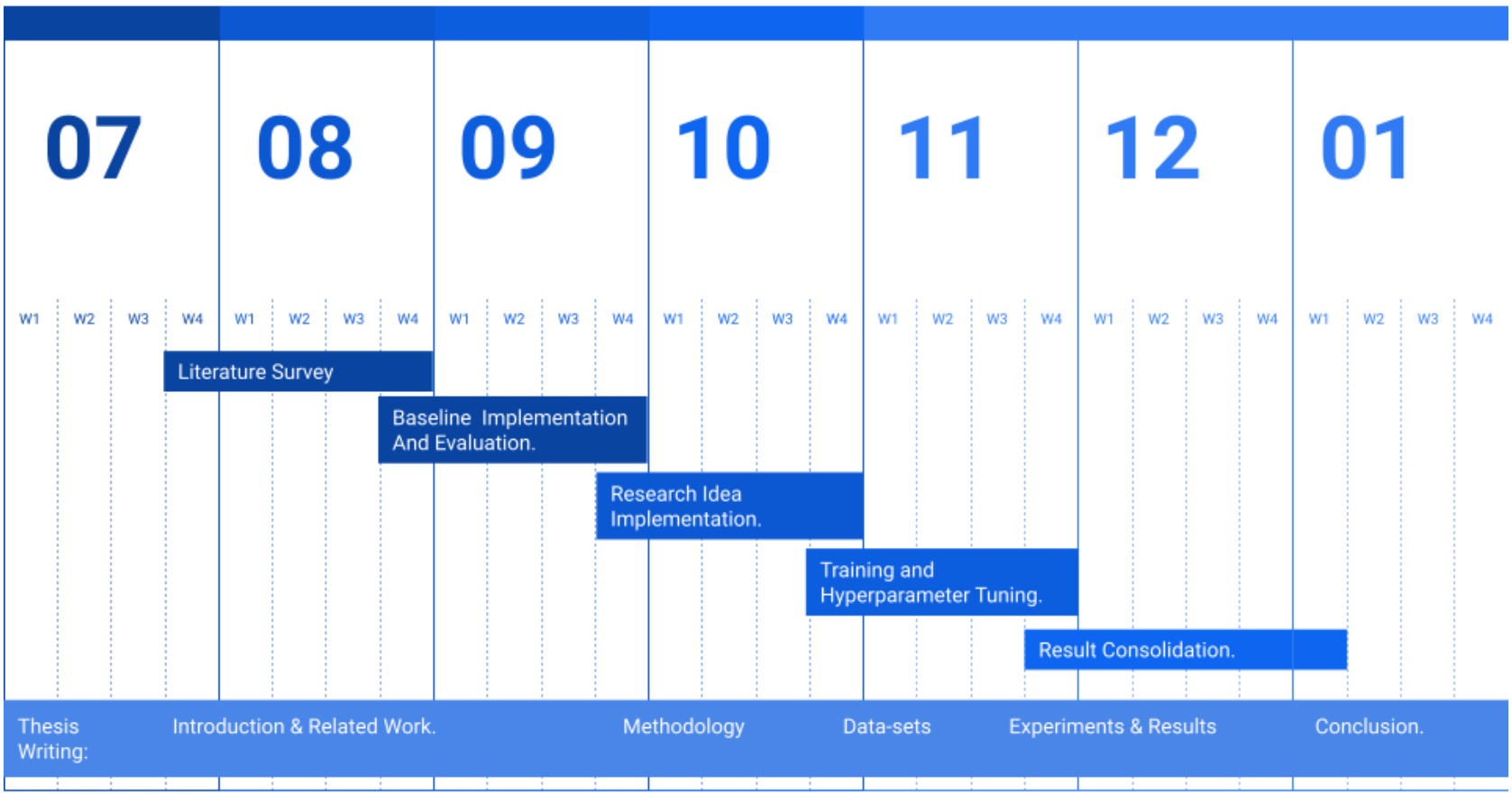
Data Foundation



- Complete Journey:
  - A record set of household transactions of about 2500 households that are frequent shoppers at a retailer.
  - Data Tenure for 2 years.
  - Size: 300 million

Internal Data-set(From MunichRe):
SME sensor data-set
OR
RBB data-set. (Confirming it with the supervisor at the Company.)

Timeline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Literature Survey
Baseline Implementation And Evaluation.
Research Idea Implementation.
Training and Hyperparameter Tuning.
Result Consolidation.
Thesis Writing:
Introduction & Related Work.
Methodology
Data-sets
Experiments & Results
Conclusion.

References

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- Guen, Vincent Le, and Nicolas Thome. Shape and Time distortion loss for training deep time series forecasting models, arXiv:1909.09020(2019).
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- Electricity Data-set: https://archive.ics.uci.edu/ml/datasets/ElectricityLoadDiagrams20112014
- Traffic Data-set: http://pems.dot.ca.gov/

References

- Complete Journey Data-set: https://www.dunnhumby.com/source-files/
- Favorita Data-set: https://www.kaggle.com/c/favorita-grocery-sales-forecasting/data