

Initial Architecture (Discussion 7 Architecture) - 5/18/2022

Encoder - 3 hidden layers, Decoder - 3 hidden layers, Batch-size - 4, lr - 1e-3

- 10 epochs per city
- 80/20 Training/Validation Split

Training: final loss (palo alto) - 85585.02703631532

Validation: 209867.5162729818

Submission: 5564.16475

Deeper Architecture - 5/18/2022

Encoder - 4 hidden layers, Decoder - 4 hidden layers, Batch-size - 4, lr - 1e-3

- 20 epochs per city
- 80/20 Training/Validation Split
- Added GPU acceleration

Training: final loss (palo alto) - 73952.61728805881

Validation: 122512.03462364046

Submission: 1733.08812

Change Training/Testing Method - 5/18/2022

Encoder - 4 hidden layers, Decoder - 4 hidden layers, Batch-size - 4, lr - 1e-3

- 20 epochs per city
- 100/0 Training/Validation Split
- Testing per city, rather than on the whole dataset

Training: final loss (palo alto) - 287019.6210470934

Validation: N/A

Submission: 1658.79962

Transformer Model - 5/19/2022

Encoder - 4, Decoder - 4, Batch-size - 4, lr - 0.1, dropout - 0.2, d_model = 2, nhead = 2

- 5 epochs per city

- 100/0 Training/Validation Split

Training:

austin

Time elapsed: 7.593198478221893

epoch 0 loss: 196982018.46488315

Time elapsed: 15.17181428273519

epoch 1 loss: 181544203.95763022

Time elapsed: 22.921051637331644

epoch 2 loss: 181507400.42740014

Time elapsed: 30.69908484617869

epoch 3 loss: 181507017.24751797

Time elapsed: 38.16384460528692

epoch 4 loss: 181507003.49082237

miami

Time elapsed: 48.55288451910019

epoch 0 loss: 1026971579.2091588

Time elapsed: 58.03132556676864

epoch 1 loss: 933328099.5034621

Time elapsed: 68.36286822954814

epoch 2 loss: 930720642.8687719

Time elapsed: 78.33688868284226

epoch 3 loss: 930577605.0854676

Time elapsed: 87.99915175040563

epoch 4 loss: 930565862.5793945

pittsburgh

Time elapsed: 95.661305920283

epoch 0 loss: 249492148.59736192

Time elapsed: 103.45517633358638

epoch 1 loss: 225963374.64082474

Time elapsed: 111.3959932923317

epoch 2 loss: 225698929.6957579

Time elapsed: 119.24318982362747

epoch 3 loss: 225696615.12162554

Time elapsed: 126.896784055233

epoch 4 loss: 225696543.21182418

dearborn

Time elapsed: 131.36553070147832

epoch 0 loss: 1923373592.1946504

Time elapsed: 135.68254281282424

epoch 1 loss: 1507630860.7828515

Time elapsed: 139.9931365609169

epoch 2 loss: 1329436127.805364

Time elapsed: 144.43818285067877

epoch 3 loss: 1261203001.5533829

Time elapsed: 148.8357931693395
epoch 4 loss: 1235574052.951275
washington-dc

Time elapsed: 153.5819742043813
epoch 0 loss: 540988582.1681263
Time elapsed: 158.25107935667037
epoch 1 loss: 289921923.79534745
Time elapsed: 162.8028089125951
epoch 2 loss: 221325877.18644178
Time elapsed: 167.35705895026524
epoch 3 loss: 212843184.29295886
Time elapsed: 172.0782636642456
epoch 4 loss: 212438812.45065087
palo-alto

Time elapsed: 174.29300076166788
epoch 0 loss: 1212882064.4125674
Time elapsed: 176.43316045602162
epoch 1 loss: 919497258.9493331
Time elapsed: 178.60580461422603
epoch 2 loss: 697678381.1470947
Time elapsed: 180.73394995133083
epoch 3 loss: 518765077.1416691
Time elapsed: 182.89810092051823
epoch 4 loss: 379540950.0115853

Validation: N/A

Submission: N/A

Linear Model - 5/19/2022

Encoder - 3 hidden layers, Decoder - 3 hidden layers, Dropout - 0.2, Batch-size - 6, lr - 1e-2

- All cities trained per epoch
- 40 epochs
- 100/0 Split

Training:

Time elapsed: 79.33233354091644
epoch 39 loss: 11214078.961732004

Validation: N/A

Submission: 13579726.63092

Thus, dropout is no good for this model.

Linear Model, No Dropout - 5/19/2022

Encoder - 3 hidden layers, Decoder - 3 hidden layers, Batch-size - 4, lr - 1e-3

- All cities trained per epoch
- 40 epochs
- 100/0 Split

Training:

Time elapsed: 105.7999827782313
epoch 39 loss: 5743.232055564923

Validation: N/A

Submission: 1591.04730

SGDRegression - 5/19/2022

Training: 09:21<00:00, 2099.07it/s

Submission: Not working yet

Average Distance - 5/20/2022

Training: No training needed

Submission: 73.87419

Linear Regression, Individual Prediction - 5/21/2022

Training:

Time elapsed: 19.96878539721171
epoch 4 loss: 7834.1724788609135

Submission: 92193.11780

Linear Regression, Group Prediction - 5/21/2022

Training:

Time elapsed: 35.54752346277237

epoch 9 loss: 505409.1528050309

Submission: 9548.50214

Median Velocity, Acceleration - 5/24/2022

Submission: 54.05959

Linear Regression Model Per Output - 5/24/2022

Training:

Time elapsed: 60/60 [04:40<00:00, 7.20s/it]

Submission: 21.58822

Adaboost Regression - 5/25/2022

Training:

60/60 [1:51:29<00:00, 147.26s/it]

Submission: 223841.74938

References:

Discussion 7 - <https://drive.google.com/file/d/1bPcvZyyK0DOYOC6InaIFnSINQgtGEioZ/view>

Original Paper - <https://openreview.net/pdf?id=vKQGe36av4k>

WIMP - <https://github.com/wqi/WIMP>

WIMP Paper - <https://arxiv.org/pdf/2008.10587.pdf>

Kalman Filter -

<https://github.com/wis003/Page-Reading-Project/blob/master/Kalman%20Filter.ipynb>

Transformer -

<https://towardsdatascience.com/a-detailed-guide-to-pytorchs-nn-transformer-module-c80afbc9ffb1>

<https://pytorch.org/docs/stable/generated/torch.nn.Transformer.html#torch.nn.Transformer>

LSTM - <https://towardsdatascience.com/pytorch-lstms-for-time-series-data-cd16190929d7>

<https://cnvrg.io/pytorch-lstm/>