Applying UNet for the traffic map prediction across different time and space :

Traffic4cast challenge 2021

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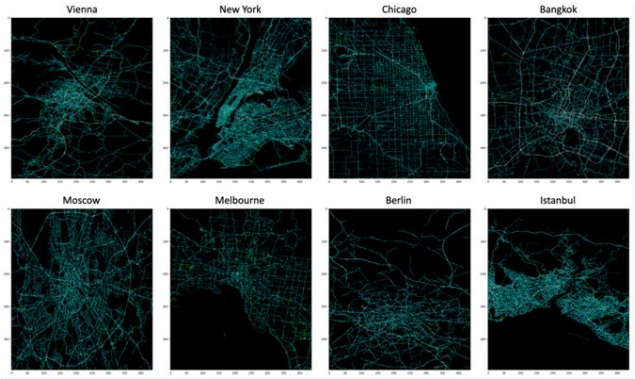
Traffic map



Dynamic data
12, 495, 436, 8 => 495, 436, 96

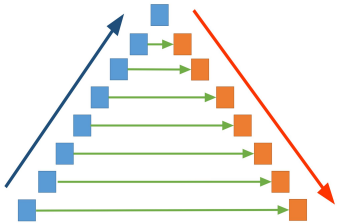
+

Static data
495, 436, 9

High resolution Static data (not used)
4950, 4360

=

Input
495, 436, 105



Output
495, 436, 48 => 6, 495, 436, 8

Overall methodology

Model: UNet

Loss function: Mean squared error

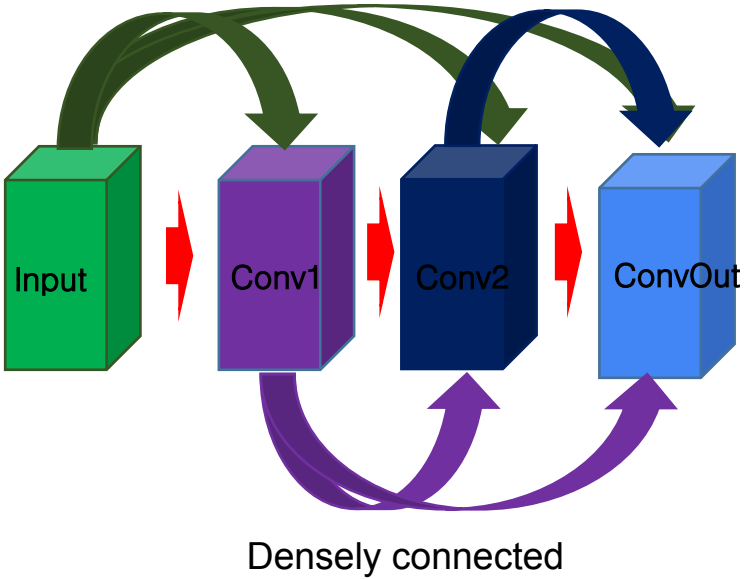
Trained with Adam optimizer, learning rate 3e-4

Model structure variants

- A, B, C, D

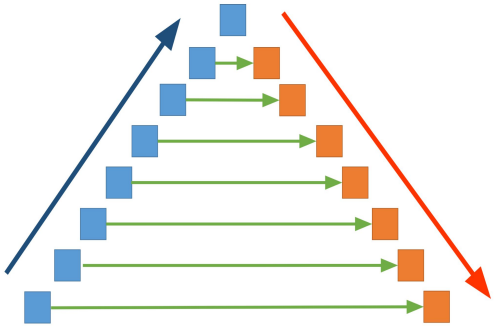
Model_A

DownBlock



Densely connected

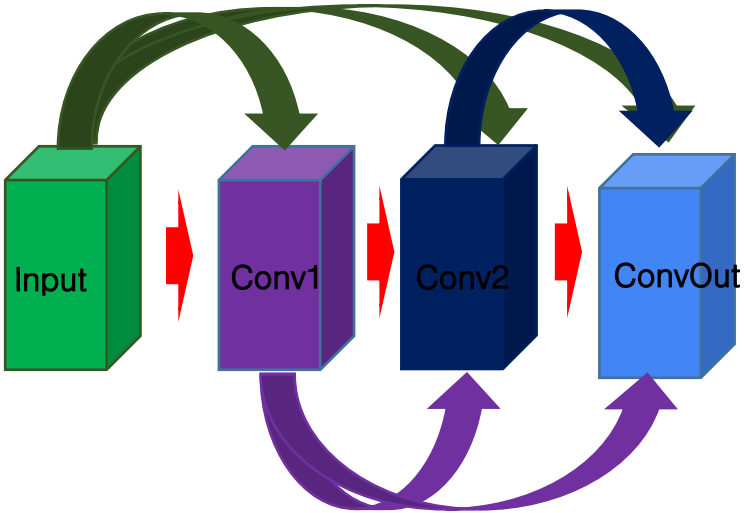
UNet



DownSampling by AvgPool(kernel_size:2)

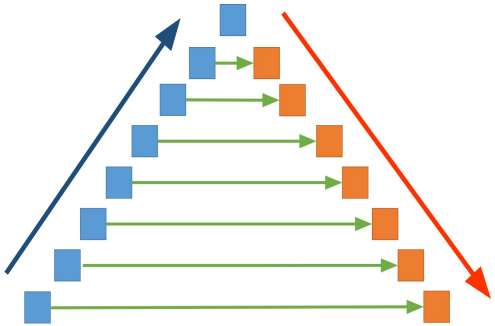
Model_B

DownBlock



Densely connected

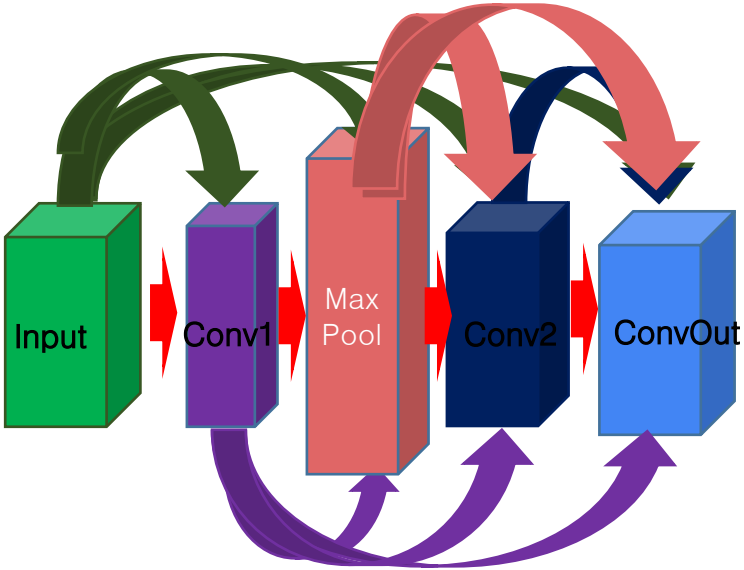
UNet



DownSampling by Linear Interpolation
(Scale factor 0.7)

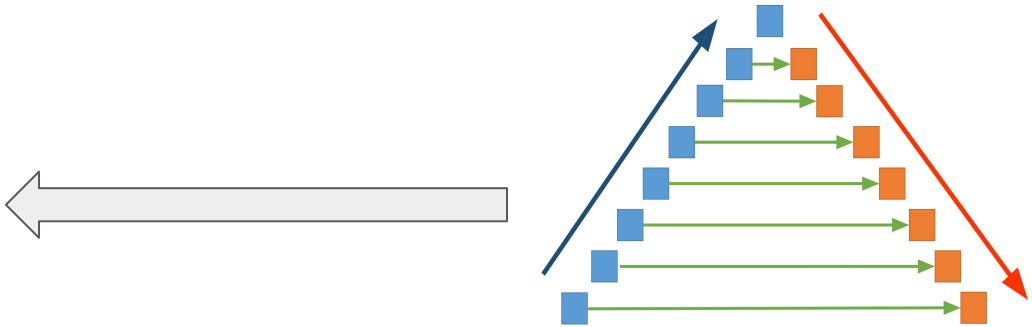
Model_C

DownBlock



Densely connected

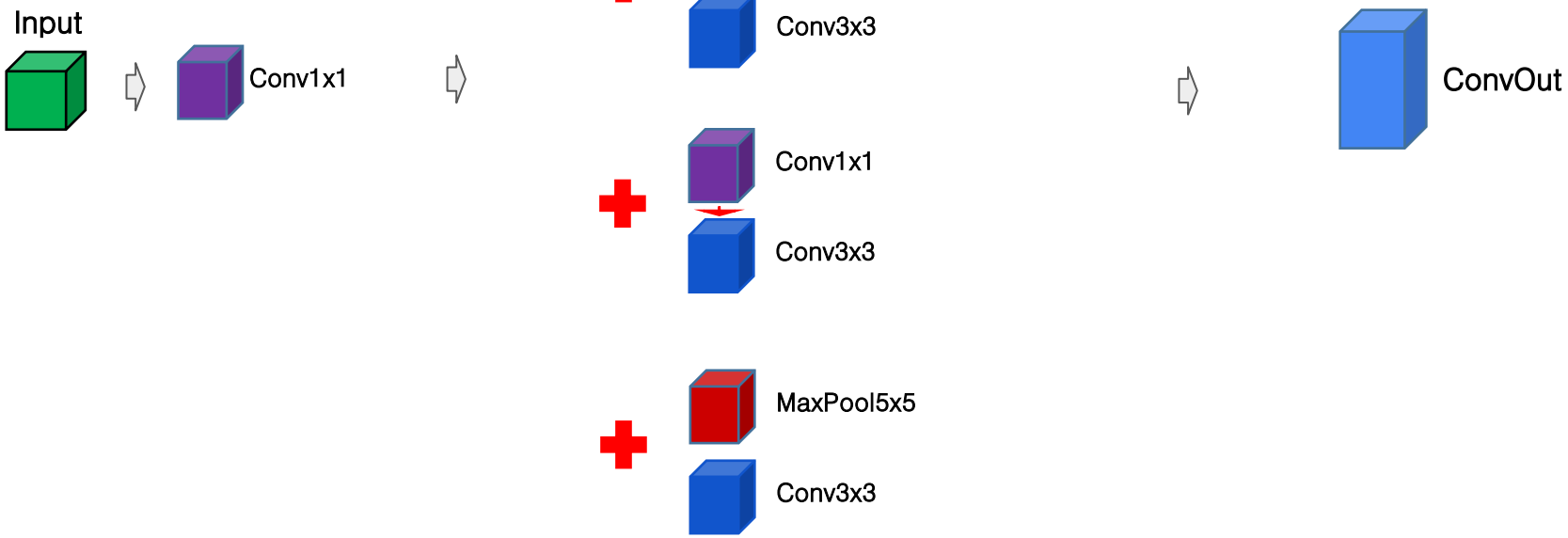
UNet



DownSampling by AvgPool(kernel_size:2)

Model_D

DownBlock



Core task (temporal domain shift) Berlin, Chicago, Istanbul, Melbourne

	Description	**MSE**
t1m1	Model_B used. Model is trained on only the target city train set (e.g., the model for Berlin is trained on a train set from Berlin only).	49.11
t1m2	Same as t1m1	49.16
t1m3	Model_C used Model is firstly trained in an arbitrary other city (Moscow), then later trained on a target train set.	49.33
t1m4	Model_A used Model is trained on train set having all eight cities combined	48.96
t1m5	Same as t1m4	48.98
t1m6	Model_B used. Model is trained on train set having all eight cities combined	49.36
t1m7	Model_D used Model is trained on train set having all eight cities combined	49.33
	Combined by averaging	**48.49**

Extended task (spatio-temporal domain shift) New york, Vienna

	Description	MSE
t2m1	Model_A used Model is trained on train set having all eight cities combined	60.19
t2m2	Model_A used Model is trained on train set having all eight cities combined Train data is augmented with horizontal/vertical image flipping	59.94
t2m3	Model_C used Model is trained on train set having all eight cities combined	60.21
t2m4	Model_C used Model is trained on train set having all eight cities combined Different loss weight is applied per city while training	59.92
	Combined by averaging	**59.55**

t2m4
Loss weight per city
Antwerp: 0.612
Barcelona:1.000
Bangkok: 0.707
Berlin:0.311
Chicago:0.707
Istanbul:0.280
Melbourne:0.866
Moscow:0.252

Thank you