SEMI-SUPERVISED OUTDOOR IMAGE GENERATION CONDITIONED ON WEATHER SIGNALS

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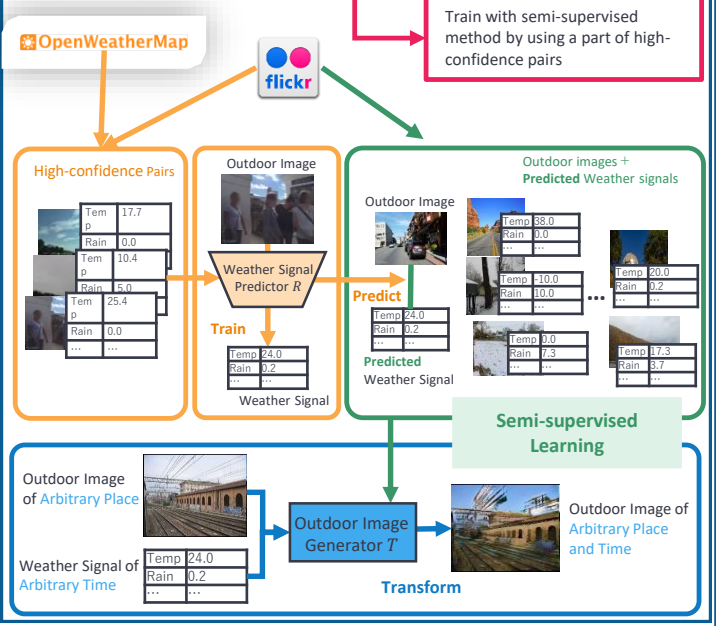
Overview

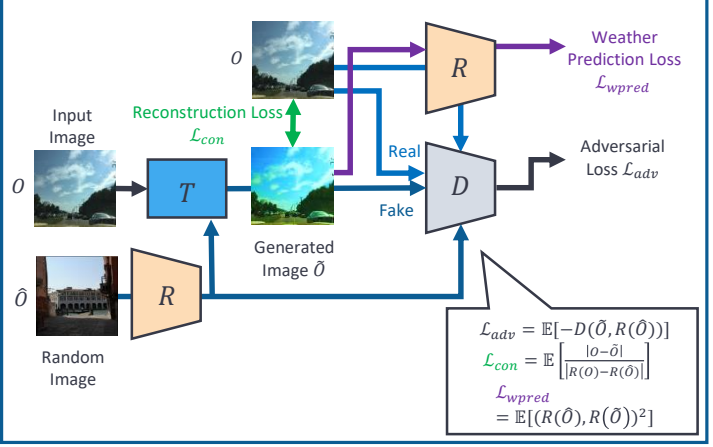
Goal : Outdoor image generation that tells arbitrary place and time situation by image translation conditioned weather signals.

Problem : Training data (a pair of SNS outdoor images and weather signals) created by associating only time and place has a lot of noise.

Train with semi-supervised method by using a part of high-confidence pairs



Network overview



Dataset

Semi-supervised Leaning : Many outdoor Images and few high-confidence pairs

Flickr & OpenWeatherMap

764,566 pairs

Confidence check&
Remove outlier&
Remove duplicate images

- High-confidence pairs (**171,489** pairs)

  Divide to train : val : test = 2 : 2 : 1
- Only outdoor images (**201,059** images)

Supervised Learning: Require high-confidence pairs of image and weather condition → Existing dataset

Image2Wether (i2w): Labeled weather conditions to outdoor images by human

Each weather classes

sunny	70,501
cloudy	45,662
rain	1,252
snow	1,369
foggy	357
other	64,657

Divide to train : val : test = **59319 : 59321 : 500**

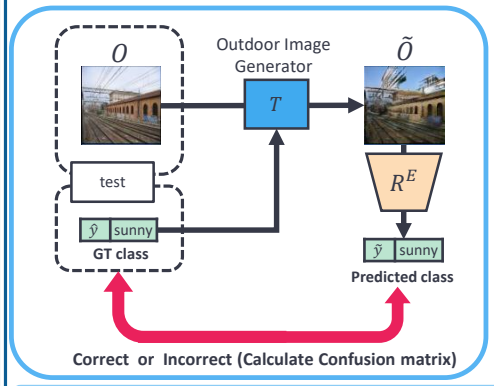
test : 100 images for each class

train, val : Half of remaining for each class

Evaluation of semi-supervised training

Supervised Learning
R: Train set of **i2w**
T : Train set of **i2w**
R^E : Validation set of **i2w**

Semi-supervised Learning
R: Train set of **i2w**
T : **Outdoor images of Flickr**
R^E : Validation set of **i2w**



Clearly improved

Supervised Learning

Ground Truth \ Predicted	sunny	cloudy	rain	snow	foggy
sunny	147	89	106	84	74
cloudy	33	190	137	79	61
rain	72	72	209	87	60
snow	37	40	161	222	40
foggy	3	115	151	68	163

Semi-supervised Leaning

Ground Truth \ Predicted	sunny	cloudy	rain	snow	foggy
sunny	399	29	32	40	0
cloudy	7	277	112	59	45
rain	19	55	320	72	34
snow	16	76	139	217	52
foggy	42	91	108	62	197

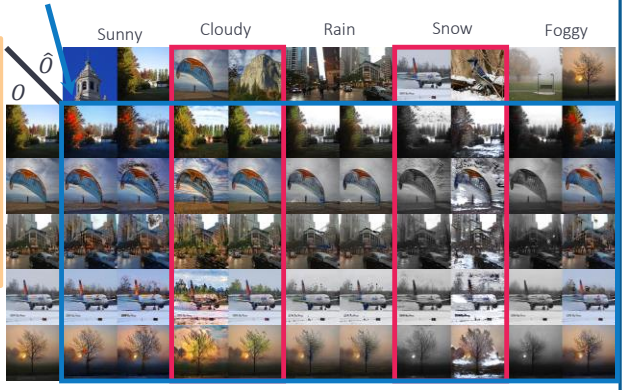
Generator performance improved. This is due to increasing training data more than 3 times by semi-supervised approach

*Accuracy of R : 80%

Evaluation of image-to-image translation on weather signals

Output Images

R: Train set of **Flickr**
T : **Outdoor images of Flickr**
R^E : Validation set of Flickr



Even if the weather class of $\hat{O}$ is same,
it is possible to express differences such as cloudcover.
→ We realize conditional transform on weather signal

Conclusion

- We proposed the conditional semi-supervised outdoor image transformer.
- We confirmed the validity of semi-supervised leaning.
- We realized the diverse image transform by using the weather signal as input condition.