Crack detection on stabilized soil samples

Xiaole Han

Department of Civil & Environmental Engineering
University of Hawaii at Manoa

12/19/2019

1. What is Stabilized Soil ?

Soil stabilization is the process improving the engineering properties of soil and make them suitable for certain infrastructures construction.

❖ **Physical Stabilization**

Traditional Roller Compaction

Geosynthetics Material Enhancement

1. What is Stabilized Soil ?

Soil stabilization is the process improving the engineering properties of soil and make them suitable for certain infrastructures construction.

❖ **Chemical Stabilization**

Traditional Roller Compaction

Cement Stabilized Sand

2. Motivation

Initial State

First Crack Appear

Failure

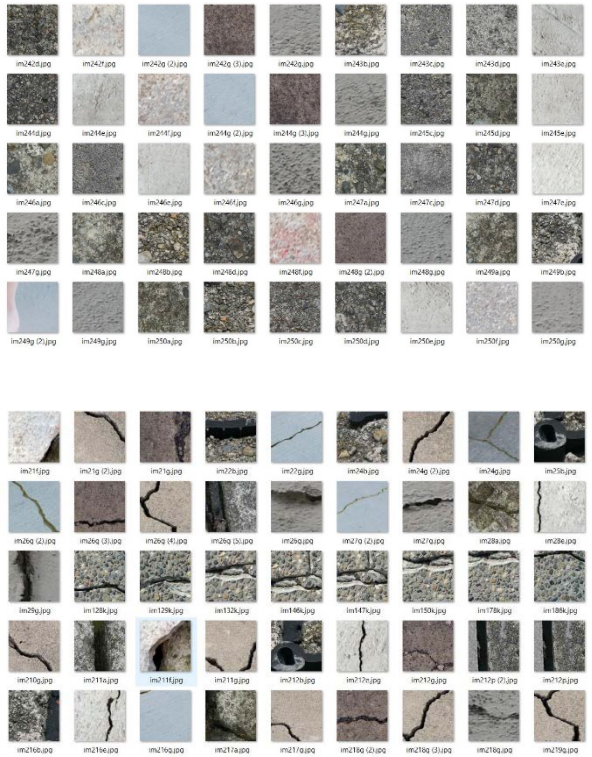
From first crack, how far it is from it finally fails ?

3. Deep Learning

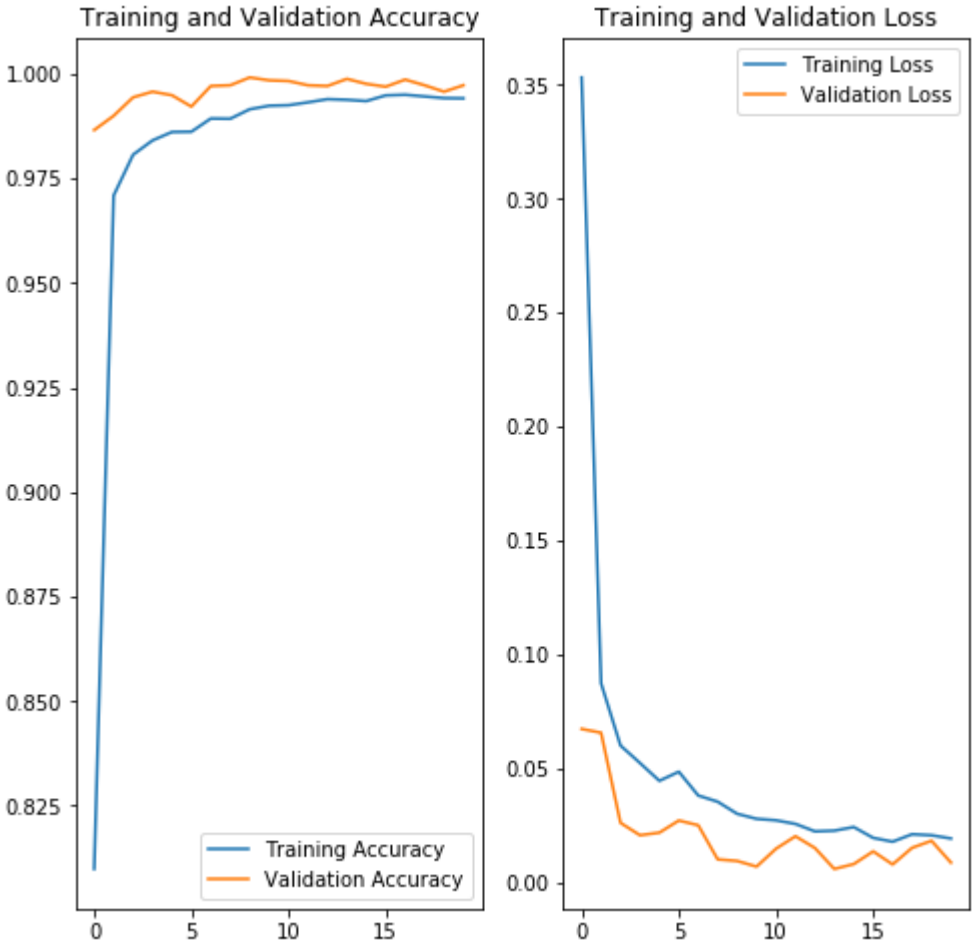
Total training images: 20000
Total validation images: 6000

Layer (type)	Output Shape	Param #
conv2d (Conv2D)	(None, 227, 227, 16)	448
max_pooling2d (MaxPooling2D)	(None, 113, 113, 16)	0
dropout (Dropout)	(None, 113, 113, 16)	0
conv2d_1 (Conv2D)	(None, 113, 113, 32)	4640
max_pooling2d_1 (MaxPooling2	(None, 56, 56, 32)	0
conv2d_2 (Conv2D)	(None, 56, 56, 64)	18496
max_pooling2d_2 (MaxPooling2	(None, 28, 28, 64)	0
conv2d_3 (Conv2D)	(None, 28, 28, 128)	73856
max_pooling2d_3 (MaxPooling2	(None, 14, 14, 128)	0
conv2d_4 (Conv2D)	(None, 14, 14, 64)	73792
max_pooling2d_4 (MaxPooling2	(None, 7, 7, 64)	0
dropout_1 (Dropout)	(None, 7, 7, 64)	0
flatten (Flatten)	(None, 3136)	0
dense (Dense)	(None, 128)	401536
dense_1 (Dense)	(None, 1)	129

Total params: 572,897
Trainable params: 572,897
Non-trainable params: 0



3. Deep Learning



4. Future work

- **Try pretrained model on high resolution image**
- **Characterize crack dimension and shape**
- **Predict crack development**

Appendix

Training Model on Colab

https://colab.research.google.com/drive/1Y3mky7JyVZ7YxXqWUpWGST5TLE128HOt

UNIVERSITY of HAWAI'I®

MĀNOA

Thank you very much for your attention