Regression Unets, RGB Video Processing, Mobile Applications Project Report

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Tasks and Goals

Part 1: Segment image, train, test and find error and accuracy using U-NET with keras on seismic images dataset from Kaggle.

Part 2: Develop video processing overlay android app using Python. Insert a dot in the center on playing video and place the dot based on mobile movement using GPS or gyroscope, Sensor.

Data Used and Pre-Processing

Part 1: I used seismic image data [1] from Kaggle. The images are 101x101 pixels and each pixel is classified as either salt or sediment [1].

All images were resized by same height and width value of 128 and divided by 255 (see imagePro.py line 145, 148 and 154)

Part 2: I used a sample mp4 video [2] for processing (see sample2.mp4).

Models and Methods

Part 1: I used U-net model [3] and modified parameters value (imagePro.py line 166) and used a callback function (imagePro.py line 168) to save the best model between multiple epsoch. Loaded the best model using model-tgs-salt.h5 and evaluated the score of loss and accuracy.

Part 2: I used Java to develop android app (client) and Python flask to develop REST API (server). I used android Sensor Manager [4] to detect android phone movement (see MainActivity.java line 100) and GPS tracking [5] for testing (see GPSTracker.java). I used Opencv-Python to processes video on API side (see videoapi.py). I also used Python Kivy to develop another same mobile app but failed to make fully functional on android device (see main.py in overlay).

Training

Part 1: I used pre implemented model and modified and changed few parameters to get the train and test result accuracy and I got improved accuracy to 0.925% (see accuracy.png).

Part 2: I developed test mobile app using Python Kivy and did some build test on mobile device. Later I migrated it to native android mobile app and test on android device (see results.mp4). Everything works fine as expected.

Results

Part 1: I found accuracy rate of 0.925% and error rate 0.162% (see accuracy.png). A plot called plot.png file is added from the sample output data.

Part 2: A sample output video file is added for video processing result (see results.mp4). I found that after clicking Insert overlay button a yellow dot is added inside the video. If we move the

mobile, then dot also move. I handled every exceptions properly in code and showed appropriate error or success messages to user for every actions they make using android Toast in code.

Discussion

Firstly, I tried to develop mobile app using Python Kivy because it can run in all devices like desktop, android, iPhone. When I built .apk for android on Linux and run it on android but failed to work properly for few packages compatible issue. But later I migrated it to native Java android and succeed. I found limitation on Android media player for Python and OpenCV Python package. But I learned many things like how to develop mobile app using Python. How to create package from Linux and face challenges to build and resolve them.

References

[1] https://www.kaggle.com/c/tgs-salt-identification-challenge/data

[2] https://www.learningcontainer.com/mp4-sample-video-files-download/

[3] https://www.depends-on-the-definition.com/unet-keras-segmenting-images/

[4] https://stuff.mit.edu/afs/sipb/project/android/docs/guide/topics/sensors/sensors_position.html

[5] https://stackoverflow.com/questions/30771596/gpstracker-class-not-working