Proposal
Poverty Prediction with satellite imagery

Abstract:
This project aims to analyze an image to determine the camera used to capture the image.

Background:
The most common way to determine the source of a image is metadata. But, unfortunately it is easier to falsify the metadata. Identifying the source of image can help in determining whether the footage involving crime scenes are real. Here, we will limit the scope to fewer camera models and train a model to detect the image source on these models.

Datasets Used:
For this model, we will use the training data from different cameras. The cameras used for this dataset are as follows:

- Sony NEX-7
- Motorola Moto X
- Motorola Nexus 6
- Motorola DROID MAXX
- LG Nexus 5x
- Apple iPhone 6
- Apple iPhone 4s
- HTC One M7
- Samsung Galaxy S4
- Samsung Galaxy Note 3

There might be necessity to download more images for the training and some web scraping might be needed. Part of the test images have been altered - compressed or gamma corrected or resized. These have been labelled as altered as well. Also, the training set data are full images and the test images provided are 512 x 512 pixels of images cropped from the center of the image.

Project Methodology:

To determine the source camera, we will use the features such as noise, optical flaws and any other lower level features we could use. The training data may be altered to reflect the test data by applying a random alteration to it. Care should also be taken to avoid the noises generated by a device shouldnt be used as a feature. The concern will only be on the noises that are generated by the model of the camera.

A combination of CNN models may have to be used to train the data and to extract the features. The final accuracy of the model can be calculated by weighted categorization accuracy of the predictions.

$$\text{weighted\_accuracy}(y, \hat{y}) = \frac{1}{n} \sum_{i=1}^{n} \frac{w_i(y_i = \hat{y}_i)}{\sum w_i}$$

y_hat is the predicted camera label, and w_i is 0.7 for unaltered images, and 0.3 for altered images.

Production:

For this model, the productionized code will be able to predict data from any of the mentioned camera devices. The user will be able to upload the image to a web url which can then produce a result of the camera from which the image was taken.

References:
1. https://www.kaggle.com/c/sp-society-camera-model-identification/overview
2. https://www.youtube.com/watch?v=ETh8bJ_xKGA&feature=youtu.be
3. https://www.kaggle.com/c/sp-society-camera-model-identification/discussion/49299#latest-509739
4. https://www.youtube.com/watch?v=tCG8dTLazF0