CLASSIFYING BUILDINGS POST HURRICANE

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MAIN TARGET

After a hurricane, damage assessment is vital to the relief helpers and first responders so that resources and help can be planned and allocated appropriately. in this project, we want to classify buildings between damaged and not damaged buildings using the satellite imagery data whichis provided by Deep Learning.

METHODOLOGY: DATA

◎Data Sources: Imagery data from satellites, namely “Geo-satellite sensor” and “Geo Bigdata” ◎Raw Datasets (4 Sets of labelled data): ○Train dataset - 5000 images with damage; 1000 images with no damages ○Validation dataset - 1000 images of each class. ○Test dataset 1 - unbalanced data: 8000 of “damaged”, 1000 of “undamaged” ○Test dataset 2 - balanced data: 1000 of “damaged”, 1000 of “undamaged” ◎Data Augmentation: ○Random Rotation, Flip, Zoom, Shear, Shift… ○Solving the issue of data inadequate ○Only implemented in the training set

ALGORITHMS INTRODUCTION

Step 1 : Data Processing

Import and Input Datasets
Data Augmentation

Step 2: Modelling with 7 CNN Models

•Building CNN: Setting Parameters of each layers
•Visualizing each filters: Comparing filters of different models
•Visualizing feature maps and saliency maps: Observing how NN extracts features layer by layer
•Training model
•Visualizing feature maps and saliency maps again: Observing how our NN changes after the modification of the parameters

Remarks: the procedure above is almost the same for each of our NN models, but there might be slight difference or small adjustments in some of them.

Step 3: Results Comparison

•Summarizing the accuracy for each model
•Further drawing ROC curves and AUC areas
•Interpreting the results
•Further improvement
…

METHODOLOGY: VARIOUS MODELS

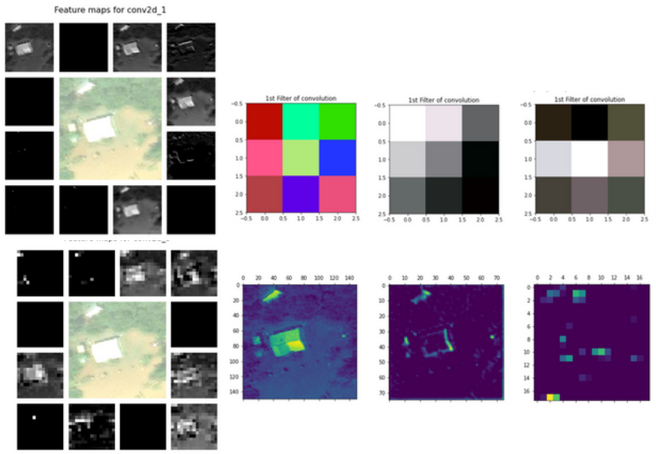
◎Traditional NN:
○Vanilla model
○Vanilla with Dropout
○No prior knowledge on the model structures
○Time-consuming
◎ Transfer Learning:
○VGG 16
○VGG 19
○MobileNetV2+Adam/ RMSprop

METHODOLOGY: TOOLS AND DETAILED ALGORITHM

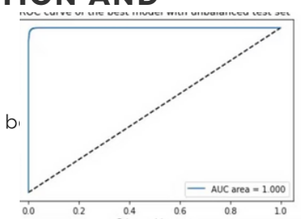
◎Used Core Libraries in Python
○Pandas, Numpy: Fundamental data manipulations
○Matplotlib: Data and results visualization Keras, Tensorflow, sklearns: Neural Network training and implementations

◎Detailed Algorithm (For instance, Vanilla with Dropout)

METHODOLOGY: MAP VISUALIZATIONS



RESULTS INTERPRETATION AND CONCLUSIONS



Conclusions Model MobileNet v2 has b
performance among the SOTAs
Compared to transfer learning,
the traditional NN shows …… ……
Further Improvements and thoughts How to assess the severity level of the buildings (e.g., on the scale of 0 to 10) Combining the locations (Coordinates) of the building, how to inference the formation of the hurricane and the future movements of the floods Models: “Bayesian Cuts models” : weights on the sources of the pictures