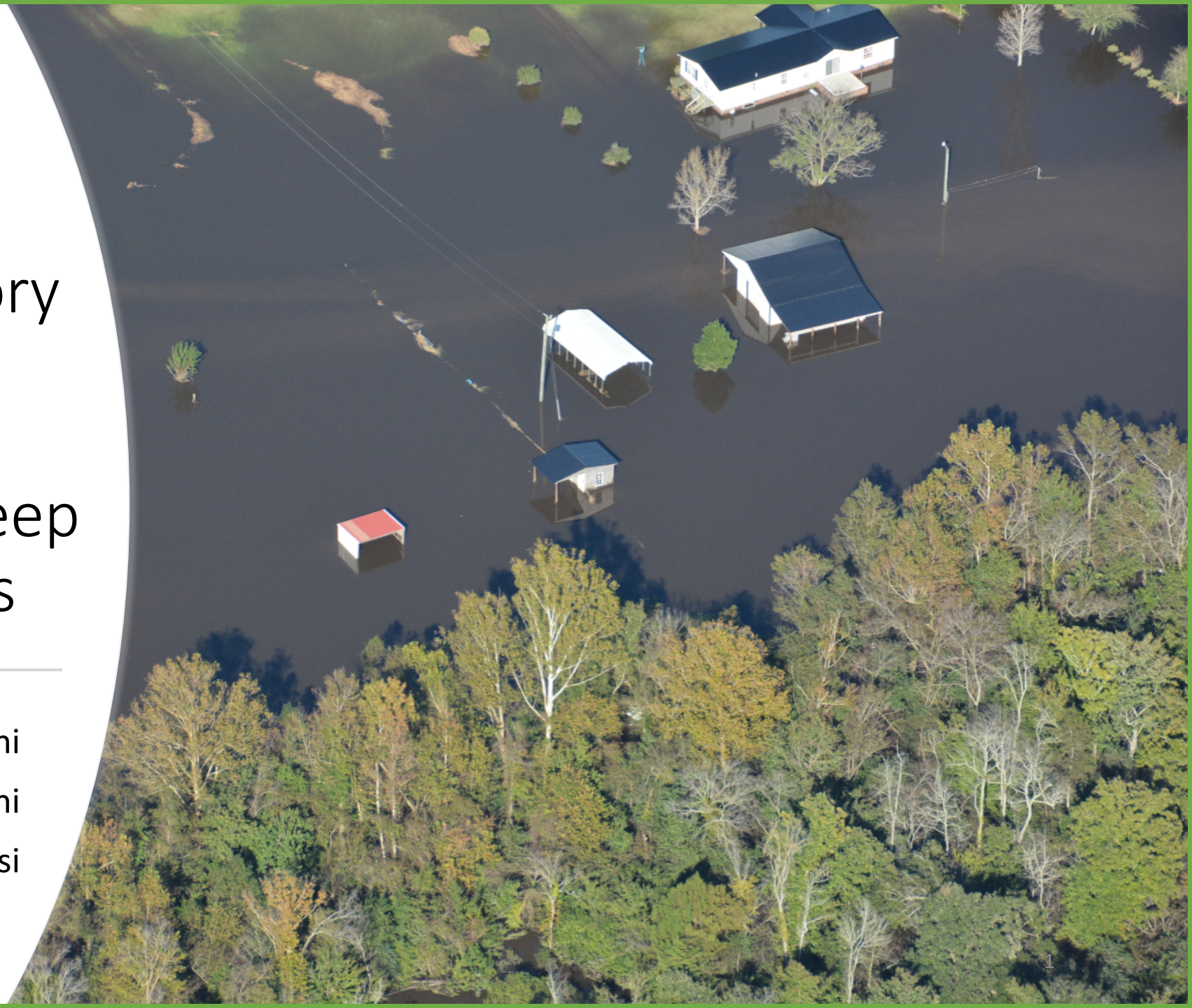
Independent Category Classifiers for Emergency Scene Description using Deep Learning approaches

Mirko Zaffaroni

Federico Oldani

Claudio Rossi



DISASTER SCENE DESCRIPTION AND INDEXING (DSDI)

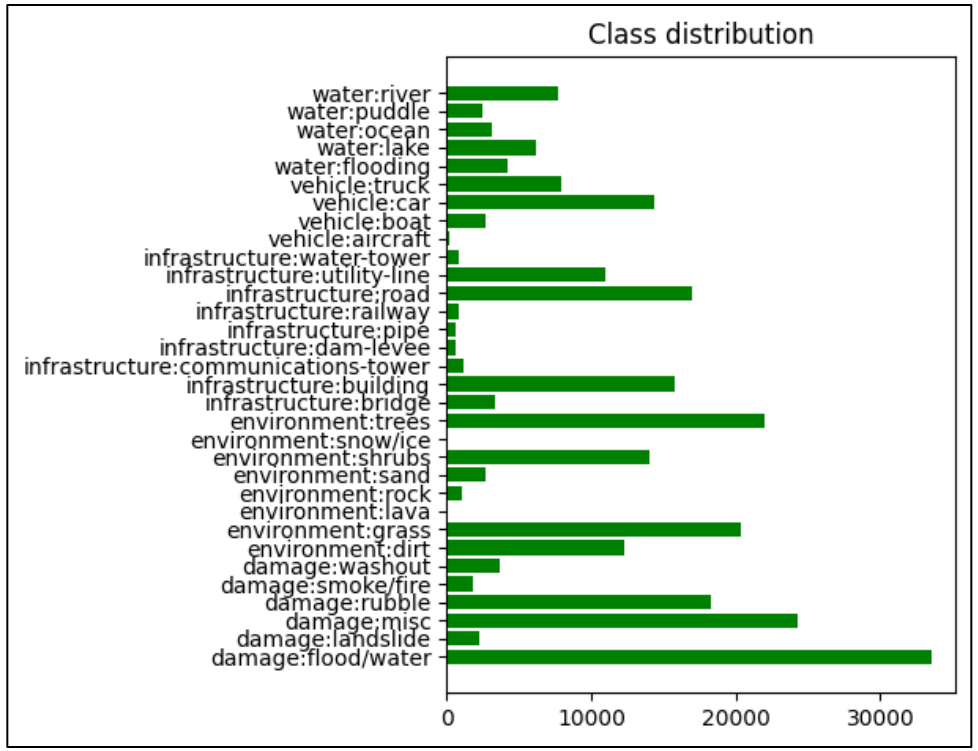
LADI categories:

- Damage
- Water
- Vehicle
- Infrastructure
- Enviroment

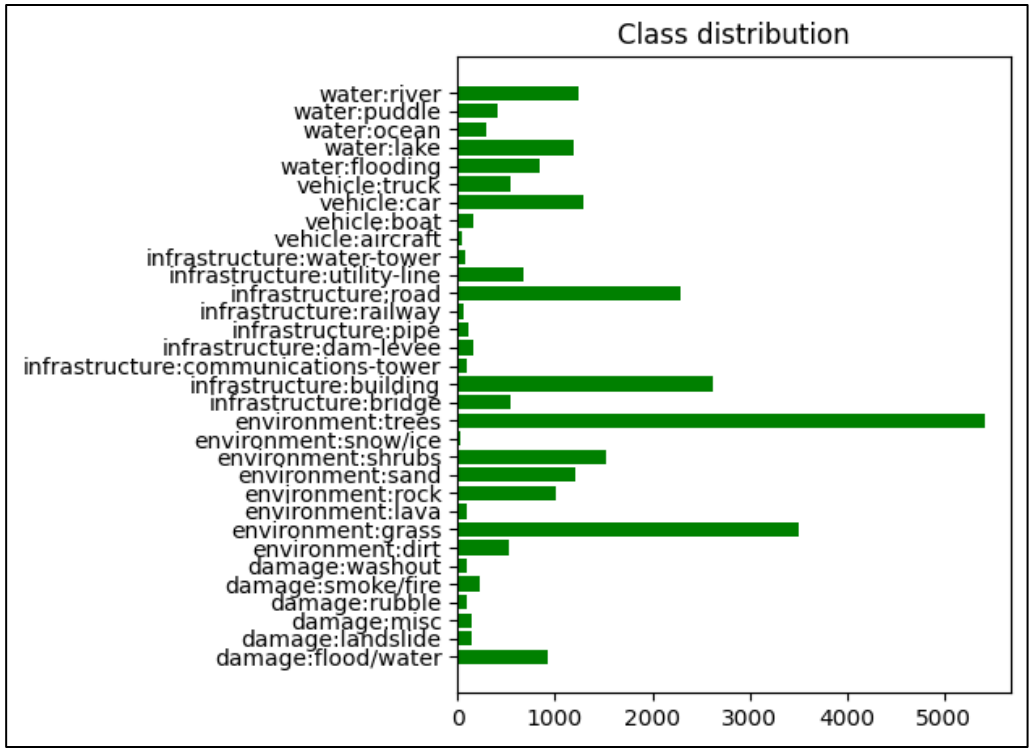
LADI dataset example images

DATASET LABEL DISTRIBUTION

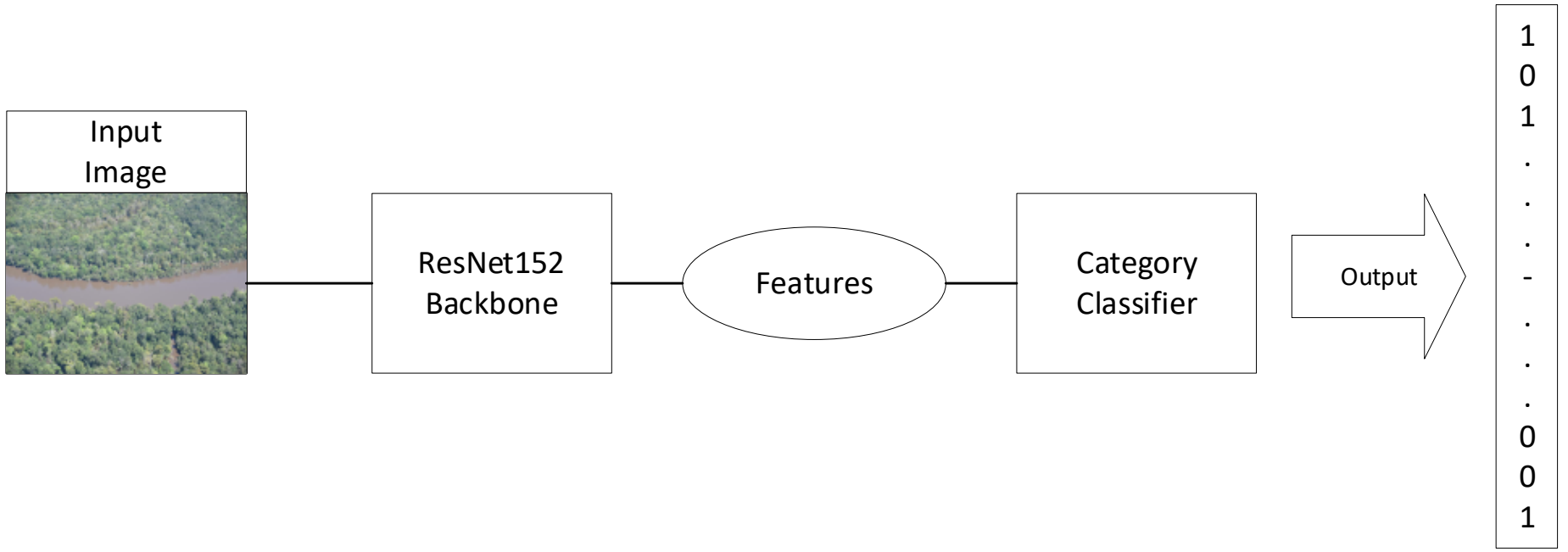
Class distribution of LADI dataset



Class distribution of LADI extension with Amazon Mechanical Turk



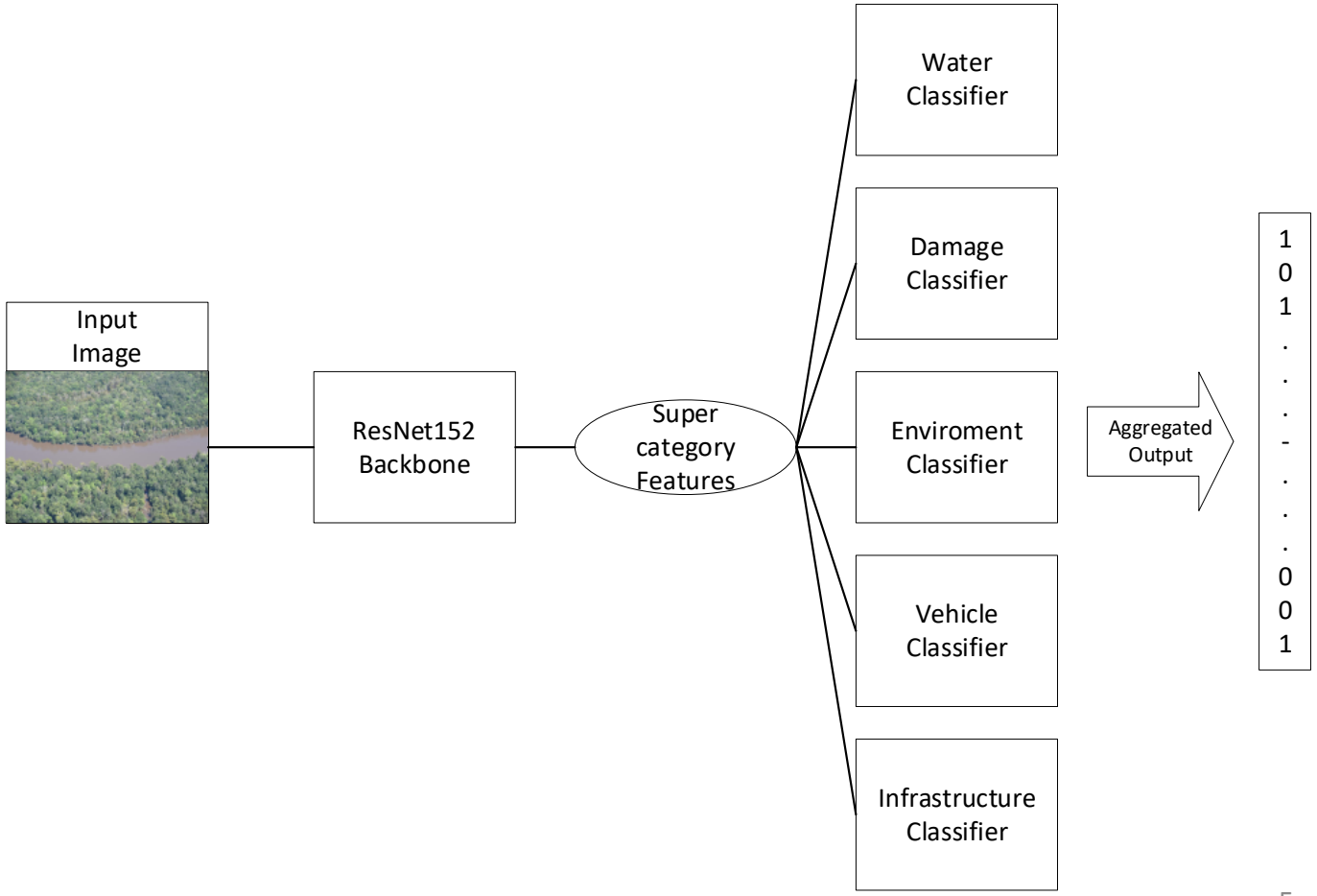
SINGLE CLASSIFIER MODEL



- End-to-end feature extractor based on ResNet152;
- Last layer output costumized for DSDI tasks;
- Output directly provided by the model.

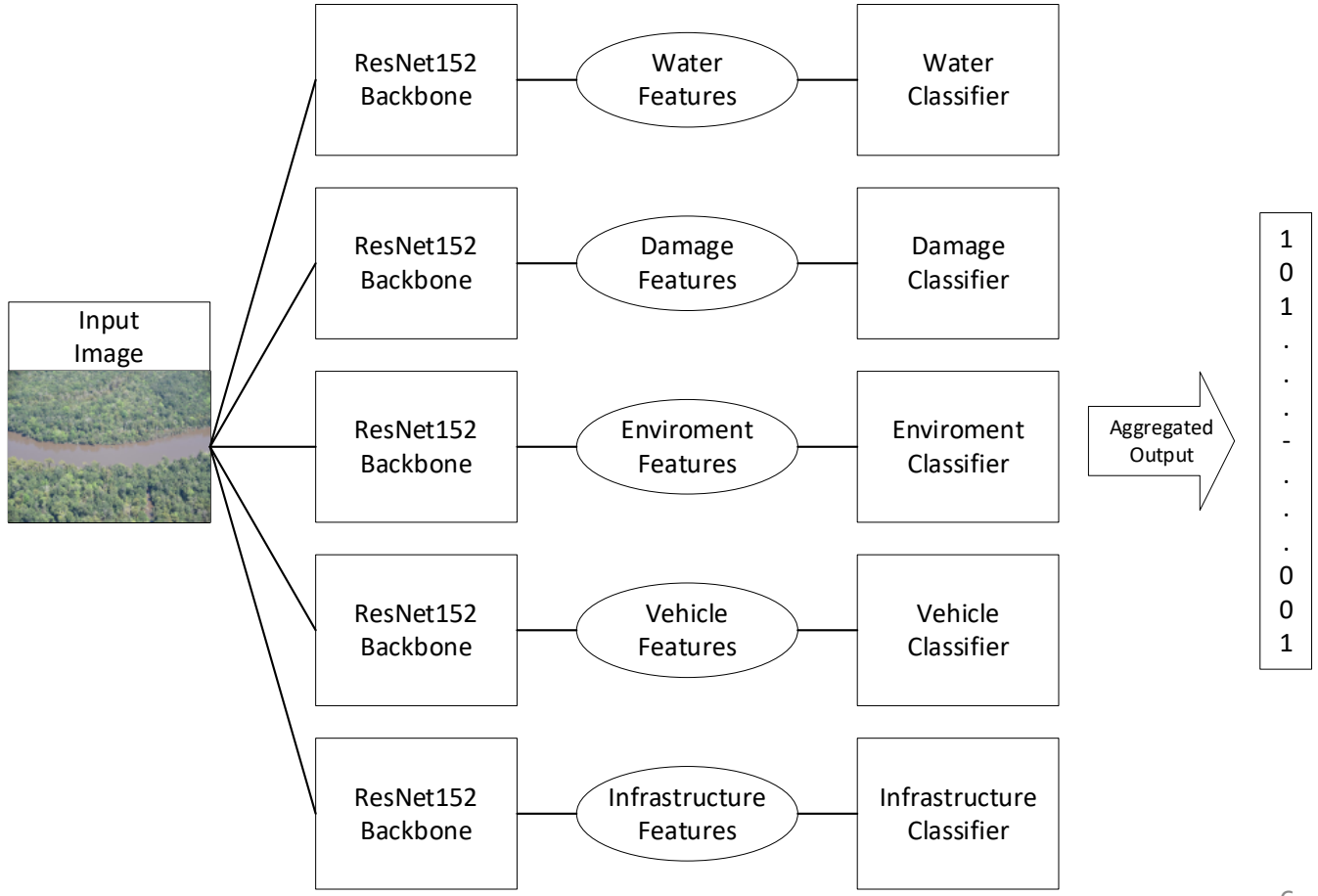
FIVE CLASSIFIERS MODEL

- Single feature extractor based on ResNet152;
- Catergory features learned on a single CNN;
- Five independent classifier to detect the presence of the elements of the category in the image;
- Aggregated single output.



FIVE NETWORKS MODEL

- Five independent feature extractor based on ResNet152;
- Category features learned;
- Five independent classifier to detect the presence of the elements of the category in the image;
- Aggregated single output.

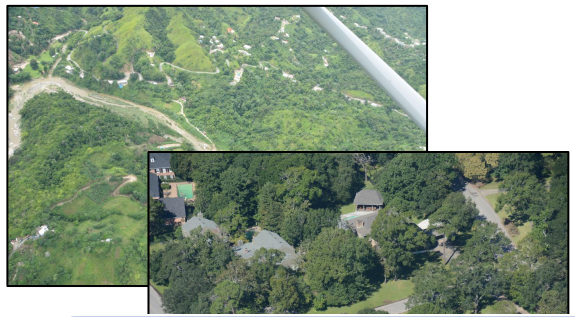


PRELIMINARY RESULTS

MODEL	MAP SCORE
Single Classifier	0.19
Five Classifiers	0.28
Five Independent Networks	0.38

Best scores obtained from validation set

TRAINING EXPERIMENTS



LADI

LADI + MTURK

amazon mechanical turk

Pretraining with Google Images

FINAL RESULTS

TRAINING DATASET	MAP SCORE
LADI + MTurk LADI	0.314
LADI	0.306
LADI + OTHER	0.297

Best scores obtained from the challenge testset

CONCLUSION

- Best solution consisted of a model based on five different classifiers;
- More samples can help in improving performances;
- Need of more refined labels (e.g. segmentation maps, bounding boxes);
- Need of more refined loss functions (DICE loss, Focal loss, etc..) to improve performances thanks to the refined labels.