# An Anti-fraud System for Car Insurance Claim Based on Visual Evidence

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# Research motivation: Reporting a duplicate claim

- Automatic scene understanding using machine learning algorithms has been widely applied to different industries to reduce the cost of manual labor.
- Car insurance companies now have launched express vehicle insurance claim and settlement by allowing customers uploading pictures taken by mobile devices.
- However, due to the increasing amount of claims every day, system or people are likely to be fooled by repeated claims for identical case leading to big lost to insurance companies

# Research Methodology

## Dataset

- Contributed to the first car damage dataset which contains samples collected from both internet(1790 images) and local public parking lot(92 images).

- These images are manually annotated with bounding boxes tightly bounds the damage regions.

Figure 1: Annotated car dent image

Source credit: google

- Mobile device was used to capture the images in the dataset.
- The whole dataset is used for two purposes:
  - one for damage detection training and evaluation
  - Another for studying the whole system which contains both damage localization and fraud claim detection.

# The anti-fraud system for car insurance claim

- The anti-fraud or fraud detection system is coupled with the claim history database.
- Each user has their own record in the database after they have a claim for the first time.

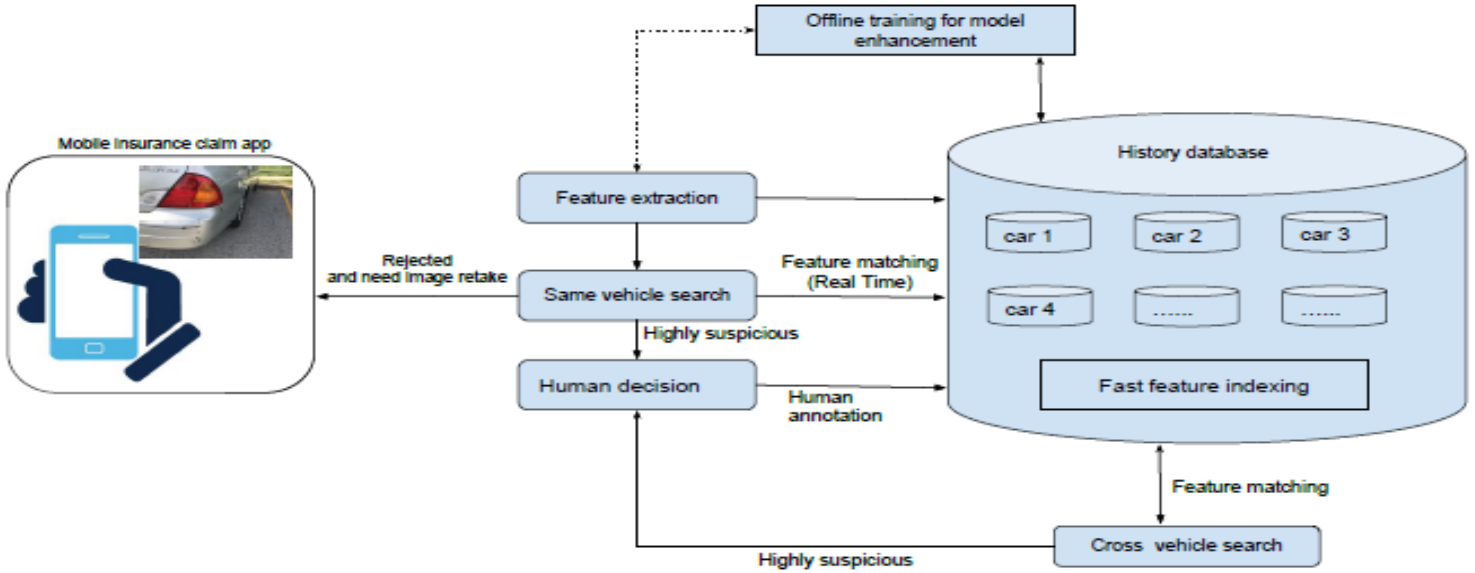


Figure 2: Anti-fraud system overview

## Damage Detection

- The first step to obtaining a robust feature descriptor for fraud detection is the damage detection.
- Three types of damages are mainly consider: scratch, dent, and crack.
- YOLO Detector is used for damage detection.

## Damage Re-Identification/Feature extraction

- Robust features need to be extracted to overcome lighting conditions and different angle of views.
- Both global and local features are being used to determine whether a claim has ever appeared in the history database.
- To extract local features, the pre-trained VGG16 object recognition model is used.
- Using the extracted features a 1 to N match between the probe images and the images in the post-claim history database is conducted .

# Results


Figure 3: Detection examples on data collected online

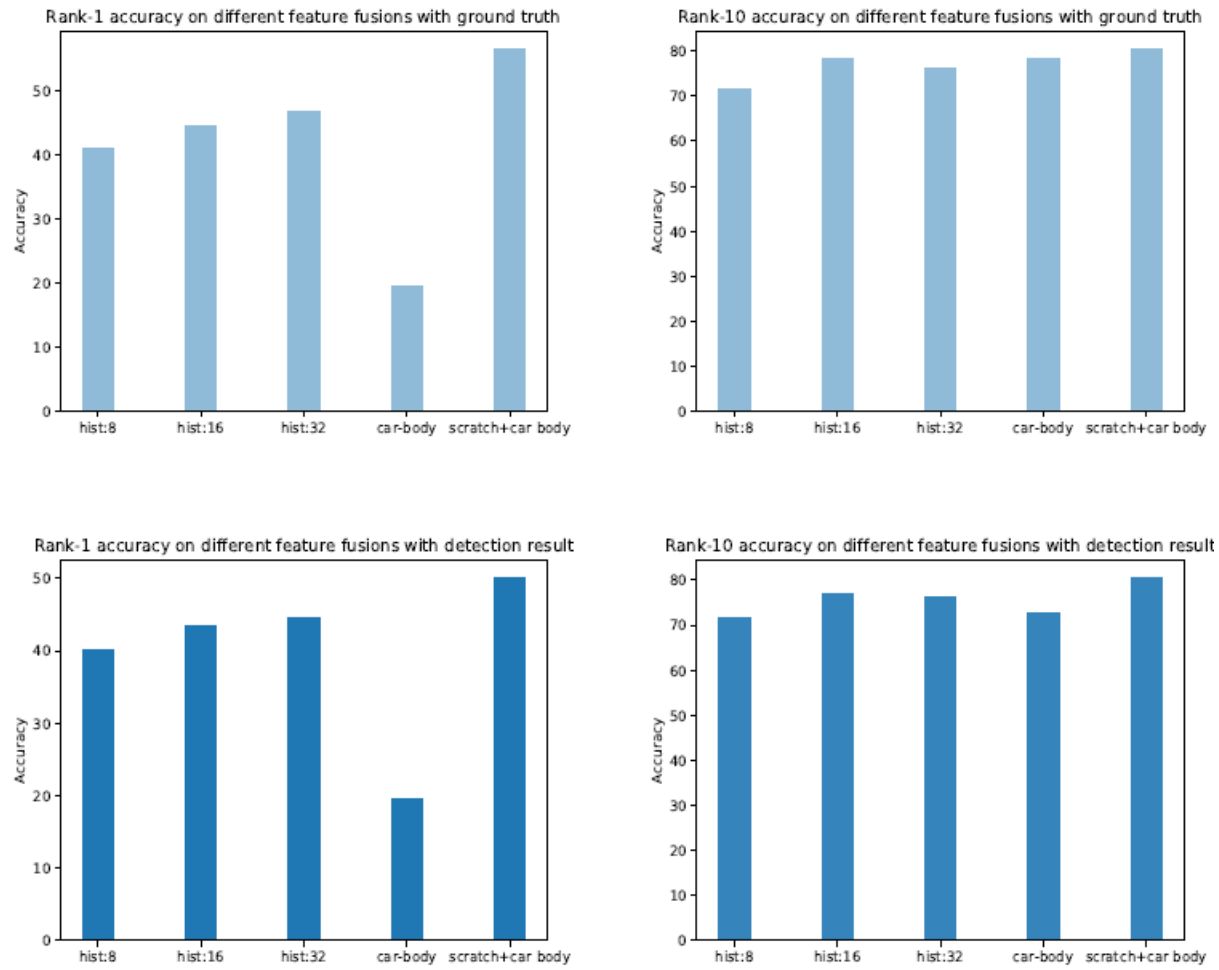


Figure 4: Fraud detection result at rank-1 rate and rank-10 rate with ground truth and detection result with different feature fusions

| | YOLO_original | YOLO_vgg_16 | YOLO_with_LRN | YOLO_with_LRN+dropout | YOLO_tiny |
|---|---|---|---|---|---|
| precision | 12.66 | 11.1 | 14.62 | 14.27 | 9.41 |
| recall | 85.6 | 82.01 | 89.72 | 78.66 | 72.49 |
| precision | 25.58 | 32.75 | 37.96 | 47.04 | 17.48 |
| recall | 76.61 | 57.58 | 81.75 | 63.54 | 66.84 |
| precision | 40.89 | 49.07 | 38.63 | 86.25 | 26.26 |
| recall | 66.32 | 27.25 | 72.49 | 17.74 | 60.15 |

Table 1: Precision Recall @thresholds

# Conclusion

- A useful data set of car damage which is the first data set for car damage detection and matching is introduced.

- A practical system pipeline to detect the fraud claim before issuing the settlement in order to reduce loss for the insurance companies is proposed.

# References

[1] https://towardsdatascience.com/yolo-you-only-look-once-real-time-object-detection-explained-492dc9230006

[2] https://www.quora.com/What-are-local-and-global-features-in-image-processing


Thank
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