Image Matching For Branding Phishing Kit Images

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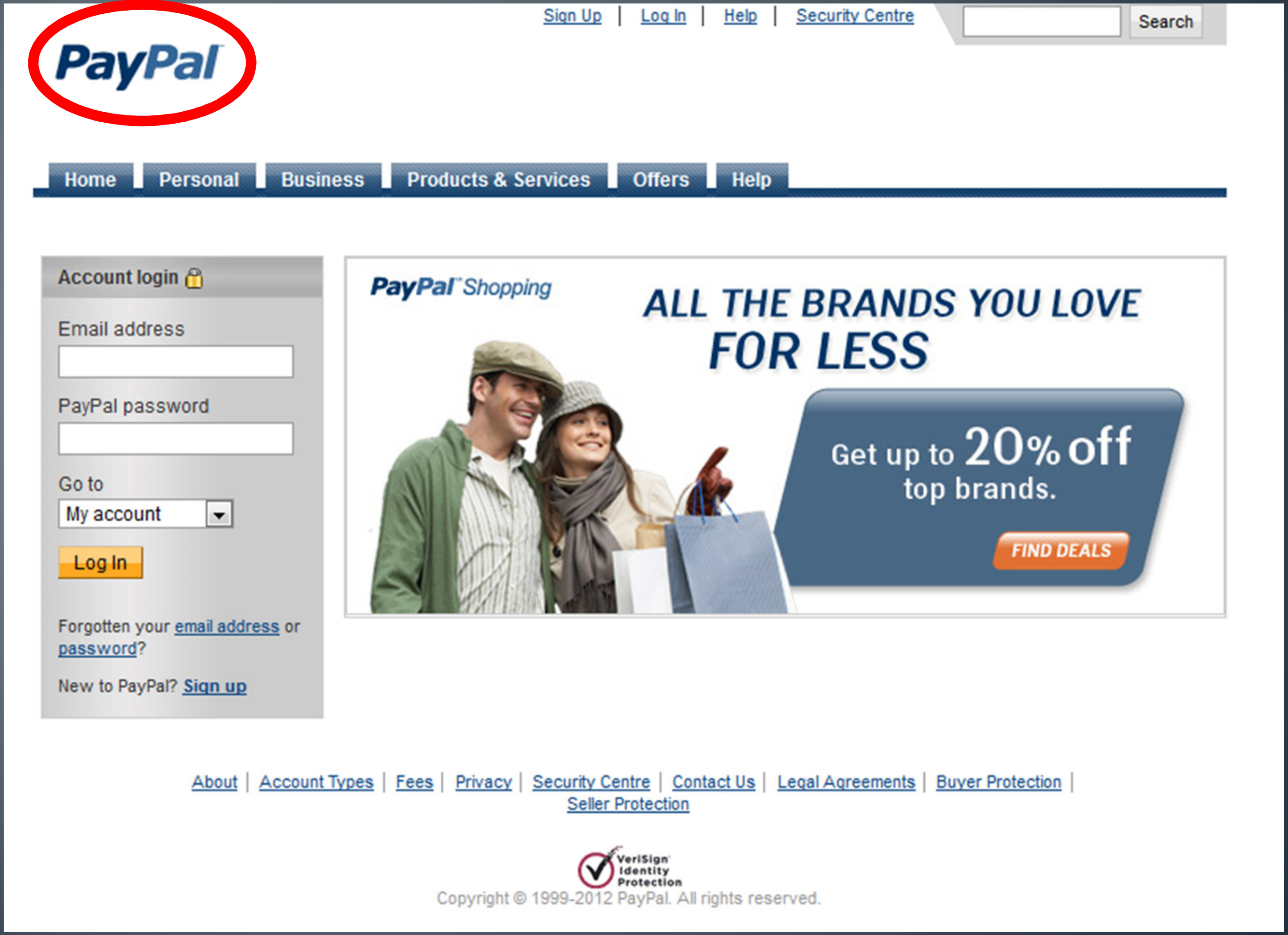
Phish, Phish Kits, and Drop Mails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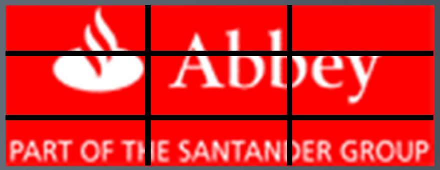
Color Histogram

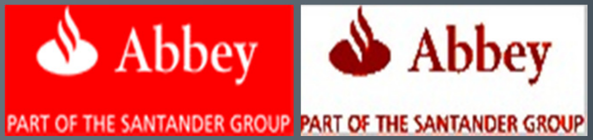
- Standard image analysis technique
- Represents the color distribution in an image.
- Algorithm:
  - Extract two most significant bits of the 8 bit representation from each R, G, and B channel.
  - Forms 64 bins for each image
  - Bin percentage is percentage of the image with a particular color code.
  - Calculate histogram dissimilarity using histogram intersection

Algorithms Evaluated

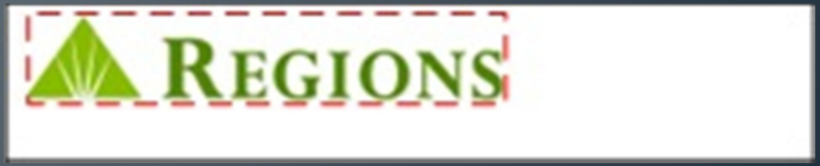
- GCH: Global Color Histogram
- LCH: Local Color Histogram



- LCH+: Local Color Histogram with dimensional constraint and background removal



- LCH++: Dimensional constraint, minimum bounding box (MBB), and background removal



Data Set

- Data source, UAB Kit Data Mine
- Collection of 56,926 kits
- 10,130 unique images with 215 brand images and 9,915 general images
- Manually viewed images to determine ground truth
- 42 different brands covered
- Training Set: 109 training brand images
- Testing Set: 106 testing brand images and 9,915 general images.

Image Matching

- Determined optimal minimum distance threshold
- 106 brand and 9,915 general images used for testing
- Found most similar training image for each testing image
- Calculated true positive (TP), true negative (TN), false positive (FP), false negative (FN) for the four algorithms

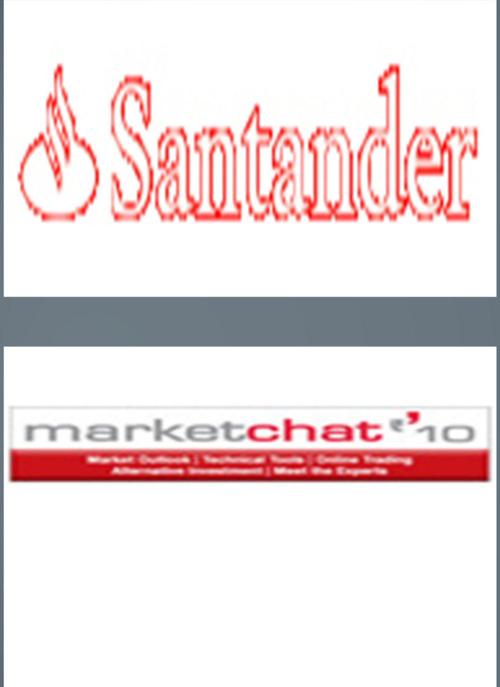
Results

Algorithm	GCH	LCH	LCH+	LCH++
TP	67	62	71	65
TN	8,945	9,046	9,822	9,864
FP	971	870	94	52
FN	38	43	34	40
Accuracy (%)	89.93	90.88	98.72	99.08

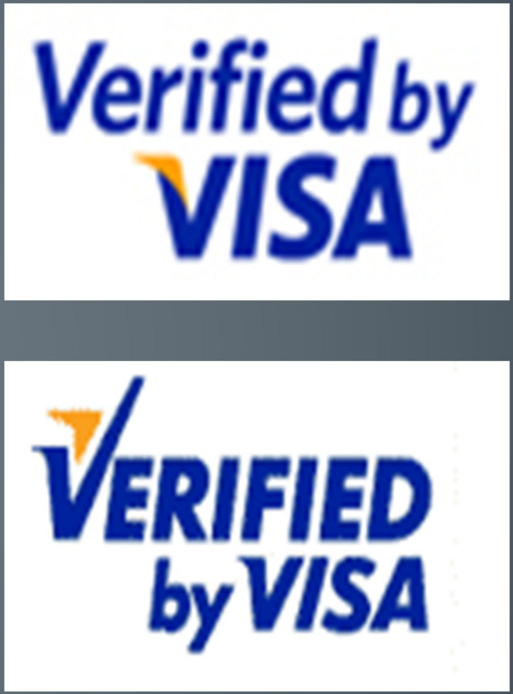
Evaluation of result(Total # of test images: 10,021)

Accuracy = (TP+TN)/(Total # of testing images)

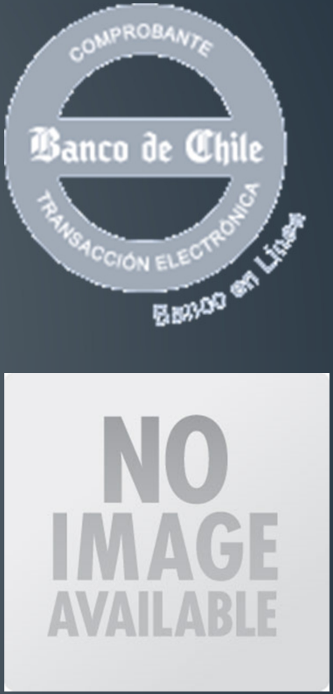
Discussion



GCH False Positive



LCH False Negative



GCH, LCH, LCH+, and LCH++ False Positive

Conclusion

- LCH is generally better than GCH.
- Dimensional constraints, background removal, and minimum bounding box (foreground extraction) improve accuracy.
- Sufficiently accurate for kit retrieval

Future Work

- Explore other visual features
- Use multi-dimensional index to decrease run time
- Develop phish kit branding strategies using image brands
- Brand phish using screen shots
- Spam campaign identification using images

Questions