

LIME Analysis (Task-3)

1. Objective

The goal is to use **LIME (Local Interpretable Model-agnostic Explanations)** to identify image regions that most influence ResNet50 predictions on 10 ImageNet samples, and to compare these with Grad-CAM results.

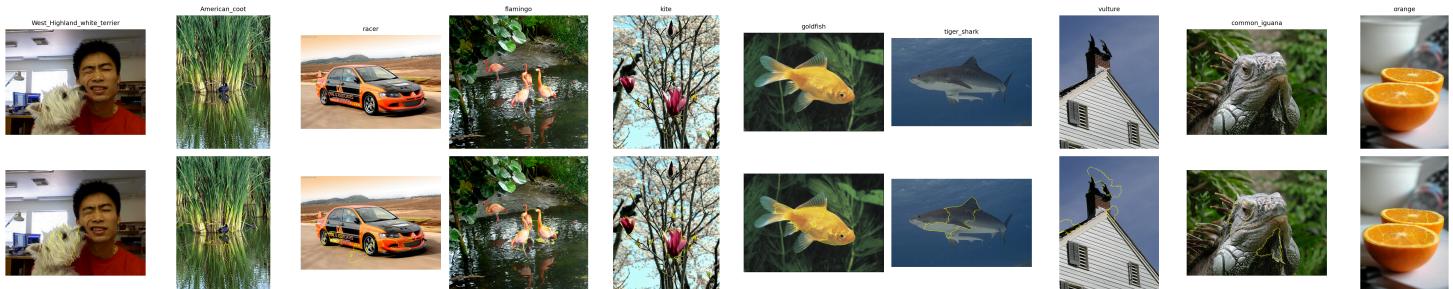
2. Setup

- **Model:** ResNet50 (ImageNet, `ResNet50_Weights.IMAGENET1K_V2`)
- **Images:** West_Highland_white_terrier, American_coot, racer, flamingo, kite, goldfish, tiger_shark, vulture, common_iguana, orange.
- **LIME Parameters:**

```
top_labels = 5
hide_color = 0
num_samples = 1000
```

- **Visualization:** Top-1 class, highlighting 5 most relevant superpixels via `mark_boundaries`.

3. Results



Key Observations

- **Focused Object Parts:**
 - *goldfish*: body and fins are precisely highlighted.
 - *orange*: fruit pulp areas dominate the explanation.
 - *tiger_shark*: head and dorsal fin highlighted as key features.
- **Background Separation:**

LIME segments objects clearly from complex backgrounds, e.g., *kite* and *American_coot*.
- **Comparison to Grad-CAM:**
 - LIME provides sharper object boundaries, while Grad-CAM heatmaps are broader and centered.
 - Agreement is higher on simple objects (*goldfish*, *orange*) and lower on complex or cluttered scenes.

4. Conclusion

LIME effectively captures critical visual cues for model predictions, complementing Grad-CAM with more localized and interpretable object-focused regions. The results suggest LIME excels in scenarios requiring fine-grained spatial explanations.