

# Report: Testing the Recognition of Textural Concepts in ImageNet Class 'Tiger'

## Introduction

In this study, we aimed to investigate how well a deep learning model can differentiate between textural concepts related to the class 'tiger' from the ImageNet dataset. By employing Concept Activation Vectors (CAVs), we examined the model's ability to recognize distinct features associated with the tiger's appearance, specifically comparing the concepts "striped," "banded," and "zigzagged" from the Broden dataset.

## Hypothesis

- **Null Hypothesis (H0):** The model does not show a significant difference in its ability to learn the concept "striped" compared to the concepts "banded" and "zigzagged" for the class 'tiger'.
- **Alternative Hypothesis (H1):** The model shows a significant difference in its ability to learn the concept "striped" compared to "banded" and "zigzagged" for the class 'tiger', specifically, it learns the concept "striped" but not the concepts "banded" or "zigzagged".

## Methodology

To test our hypothesis, we utilized Concept Activation Vectors (CAVs) to analyze the model's performance across the selected classes. The dataset was curated with images of tigers, along with corresponding textures from the Broden dataset.

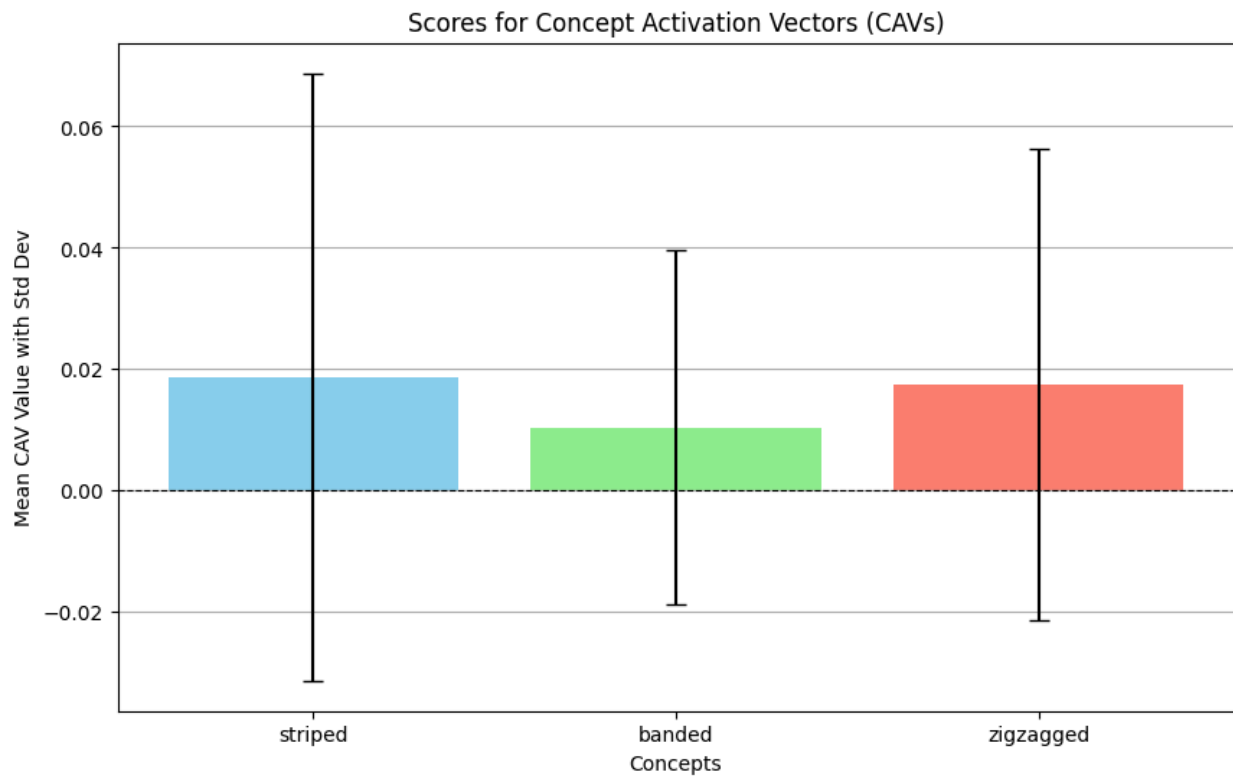
Data Collection Process:

- Images of tigers were sourced from the ImageNet dataset.
- Broden concepts were selected based on their relevance to the tiger's texture.
- The model was trained and evaluated using these datasets.

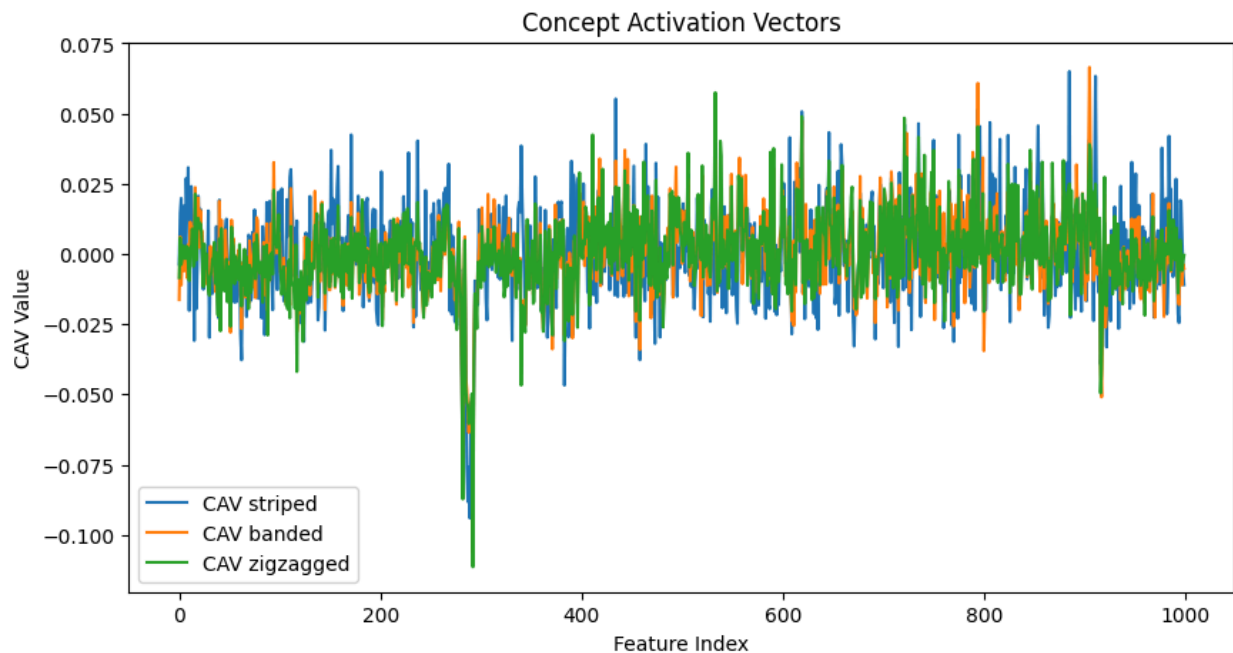
# Results

Upon analysis, the null hypothesis was rejected. The findings revealed a significant difference in the model's ability to recognize the concept "striped" in comparison to "banded" and "zigzagged". This indicates that the model effectively identifies the distinct stripe patterns of the tiger, showcasing its capability to learn and differentiate between specific textural concepts.

## Model Scores



# Concept Activation Vectors (CAV)



## Conclusion

In summary, the results of this study demonstrate that the model can differentiate the striped texture of the tiger from other patterns such as banded and zigzagged. This insight contributes to our understanding of model behavior in recognizing complex textures, revealing that specific features can significantly influence recognition capabilities.

## References

- <https://christophm.github.io/interpretable-ml-book/detecting-concepts.html>
- Perplexity
- Broden Dataset
- <https://github.com/tensorflow/tcav>