

Concept Correlation and Its Effects on Concept-Based Models

Appendix

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1. Additional information about the datasets

1.1. 3D shapes

The 3D shapes datasets depict objects of 6 different shapes: cube, sphere, cylinder, cone, torus, and icosphere. These shapes are defined as concepts and 2 - 4 shapes appear in one image. Other parameters for generating images are varied randomly. These include size (small, large), material (rubber, metal), and color (gray, red, blue, green, brown, purple, cyan, yellow) of the 3D object. Example images are shown in Figure 1.

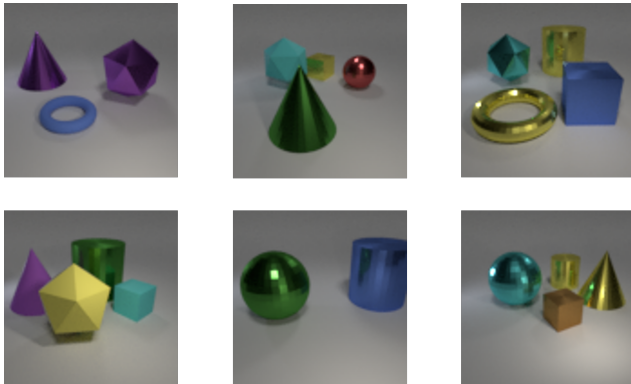


Figure 1. Example images of the 3D shapes dataset

1.2. GTSRB

For our experiments, the GTSRB dataset has been annotated by us with 43 class-based concepts. These concepts include:

- main color (white, red, blue, yellow)
- border color (white, red)
- shape (round, triangular, square, octagonal)
- number (0...3, 5...8)

- symbol (car, truck, stop, animal, ice, children, pedestrian, construction site, attention, traffic lights, bicycle, narrow point, uneven, diagonal stripes, right of way, horizontal bar, curve left/right, double curve, arrow right/left/straight, arrow bottom right/left, arrow roundabout)

All images of a class have the same concept annotations.

Figure 2 shows the correlation coefficients between these concepts.

1.3. CUB

Figure 3 shows the correlation coefficients between all of the 112 bird attributes. We see patterns of high correlations between concepts describing attributes of parts close to each other (e.g. upper parts & wing, crown & forehead).

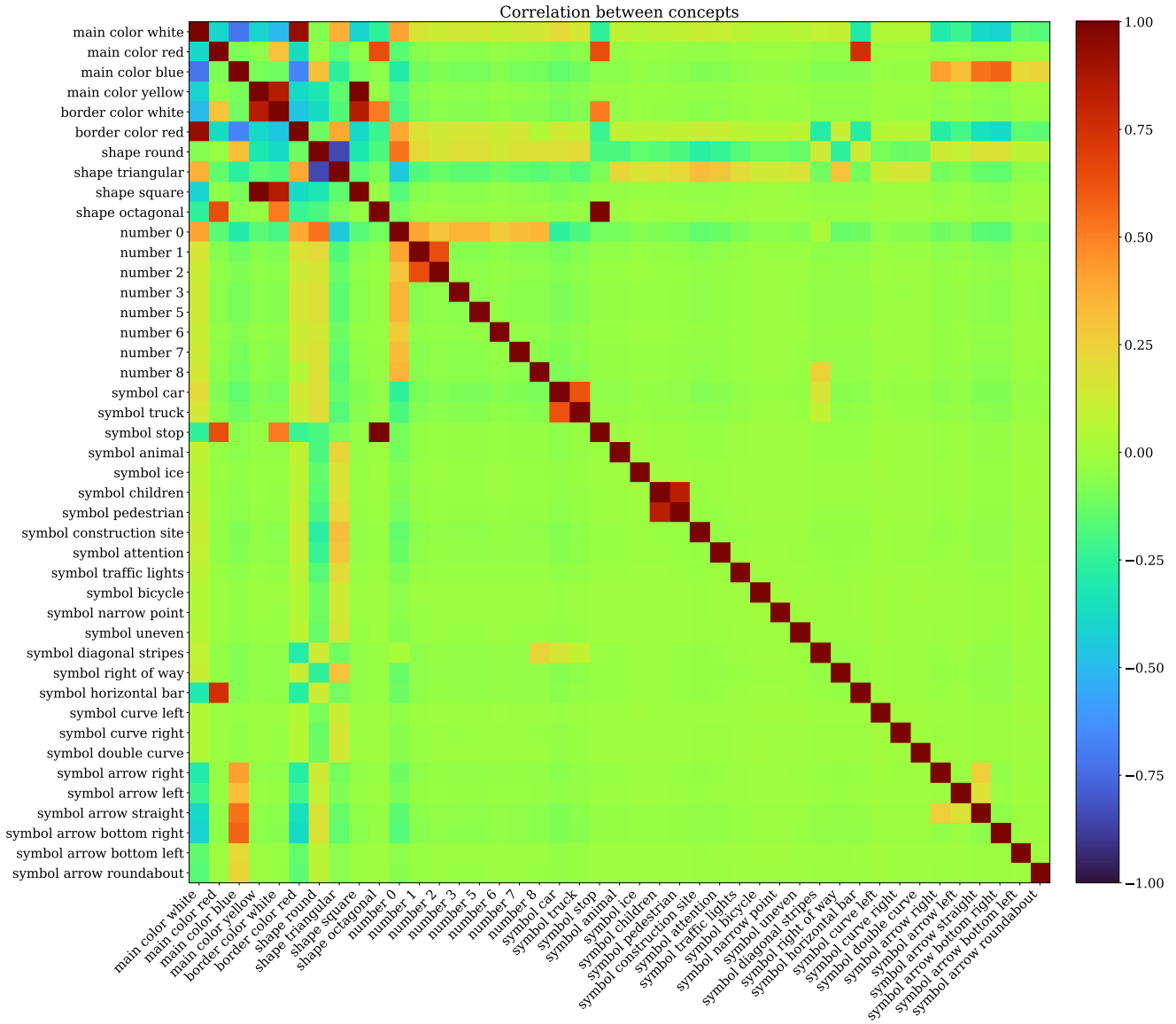


Figure 2. Overview of correlation coefficients between all concepts of the GTSRB dataset.

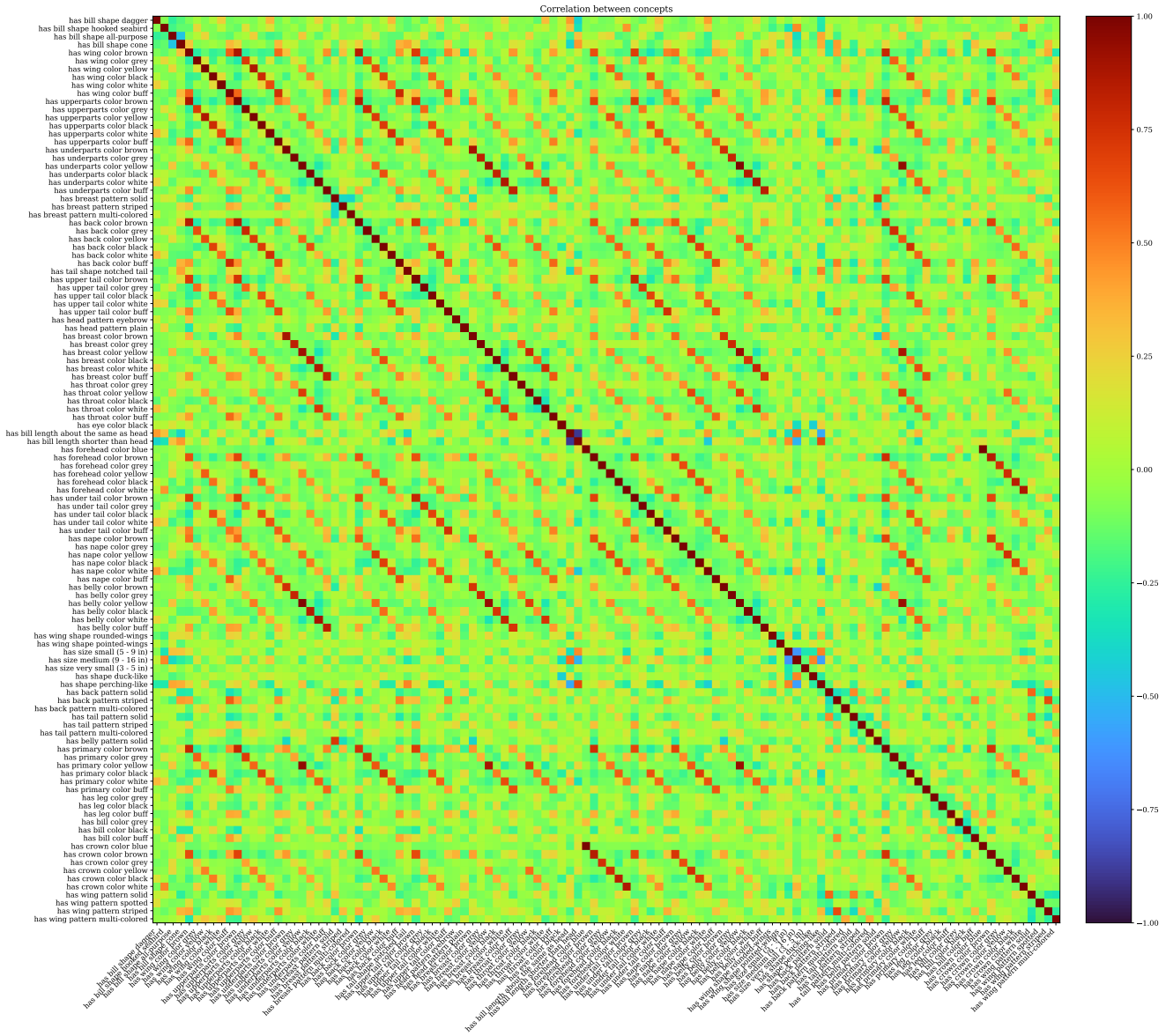


Figure 3. Overview of correlation coefficients between all concepts of the CUB dataset.