

Low Image-Dataset Quality strongly contributes to DCNN Texture-Bias

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The origins of Texture-Bias

Deep Convolutional Neural Networks (DCNNs) trained on ImageNet have been shown to exhibit a texture-bias (*Geirhos et al. 2018*). The origin of this texture-bias has been debated widely (*e.g., Hermann et al. 2020*).

Here, we show that the same models trained on an **ultra-high-resolution dataset** exhibit a **more human-like shape-bias**.

Further, when tested on Cue-Conflict images created from ImageNet, the texture-bias drastically decreases.

Open Amsterdam Data Set (OADS)

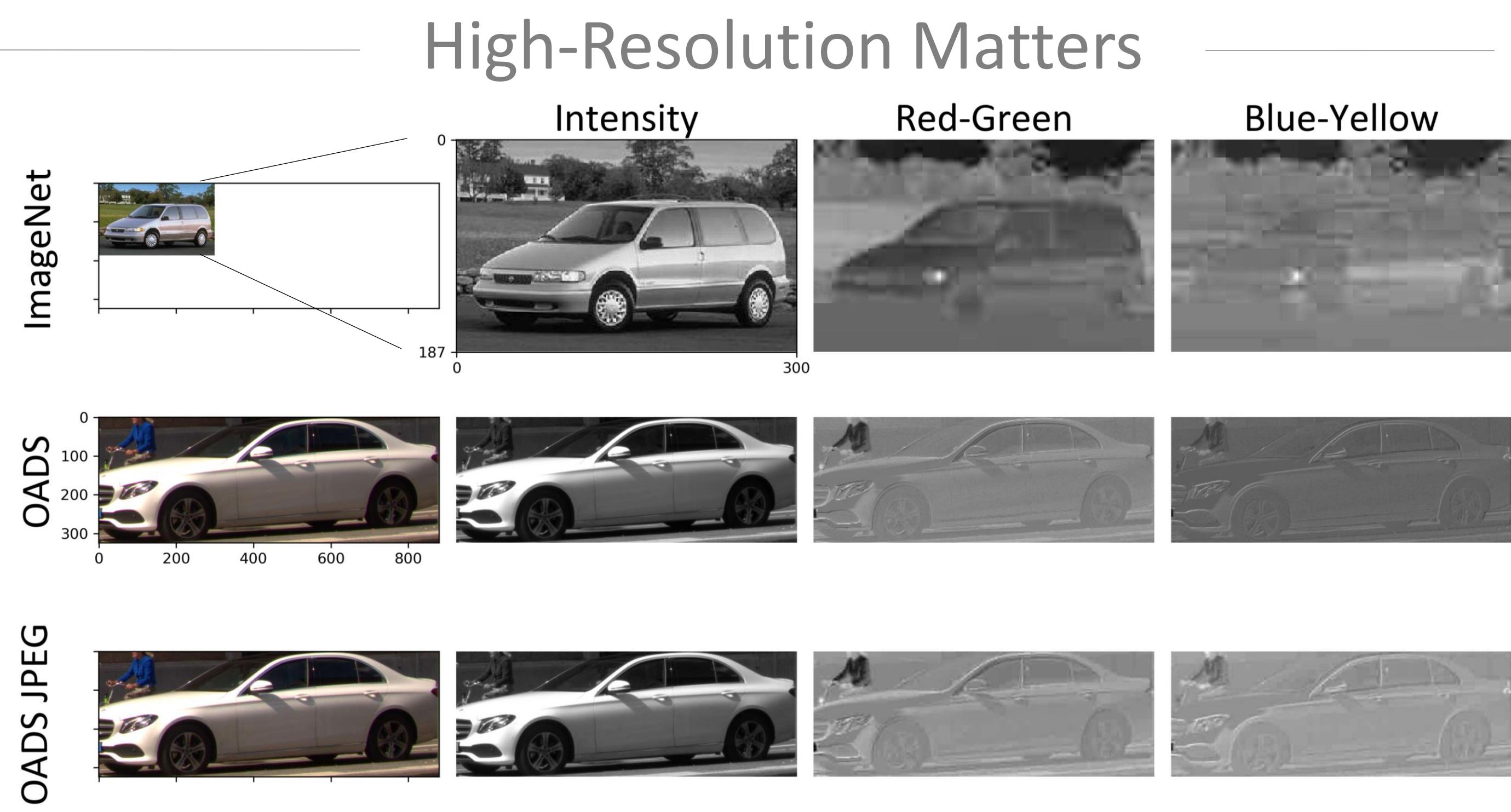
Ultra-high-resolution, labelled image dataset
5691 Images \leftrightarrow 5496x3672 pixels
98534 Object Label annotations

Main Contribution

- Introduction of ultra-high-resolution labelled image dataset **OADS**
- Creation of high-resolution cue-conflict dataset
- **Texture-bias arises as a function of image quality**

DCNN Training & Assessment

We train ResNet50 models with controlled image resolution and quality on a low-quality and a high-quality dataset and assess DCNN texture-bias on a low-quality and a high-quality dataset.



Color-Opponent-Channel (COC) representation allows for a direct inspection of available **shape information**. The top row shows a representative image from ImageNet. The second row shows a representative image crop from the **Open Amsterdam Data Set (OADS)**. The last row shows the JPEG-compressed version of the OADS image crop. Original RGB version (first column), Intensity channel (second column), Red-Green channel (third column), and Blue-Yellow channel (last column) of the COC representation. Images in scale.

ImageNet images are inherently missing shape information

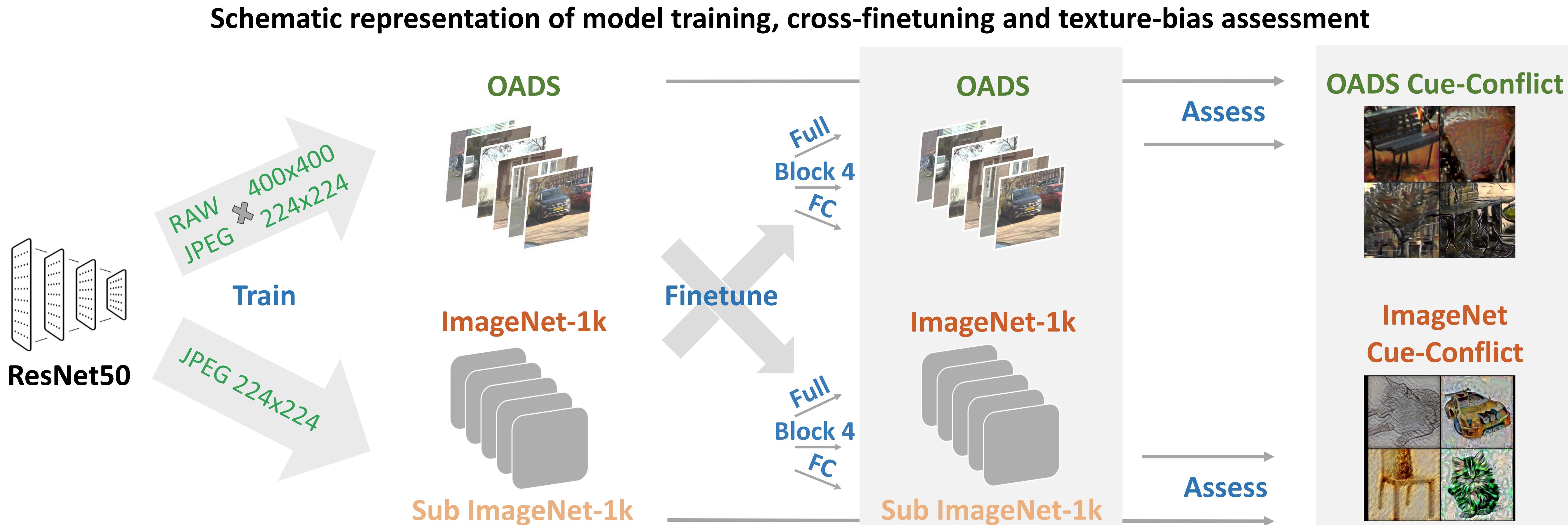
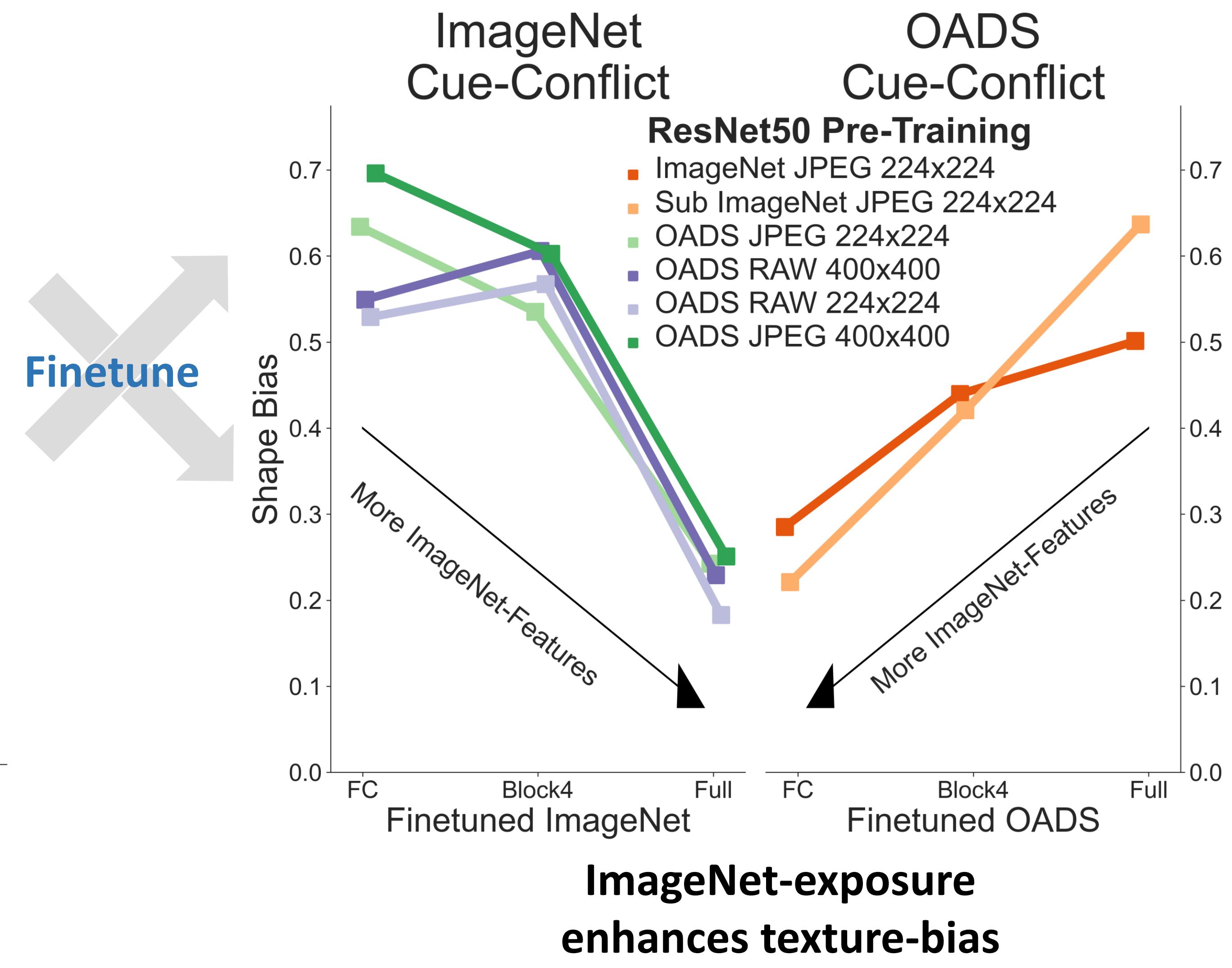
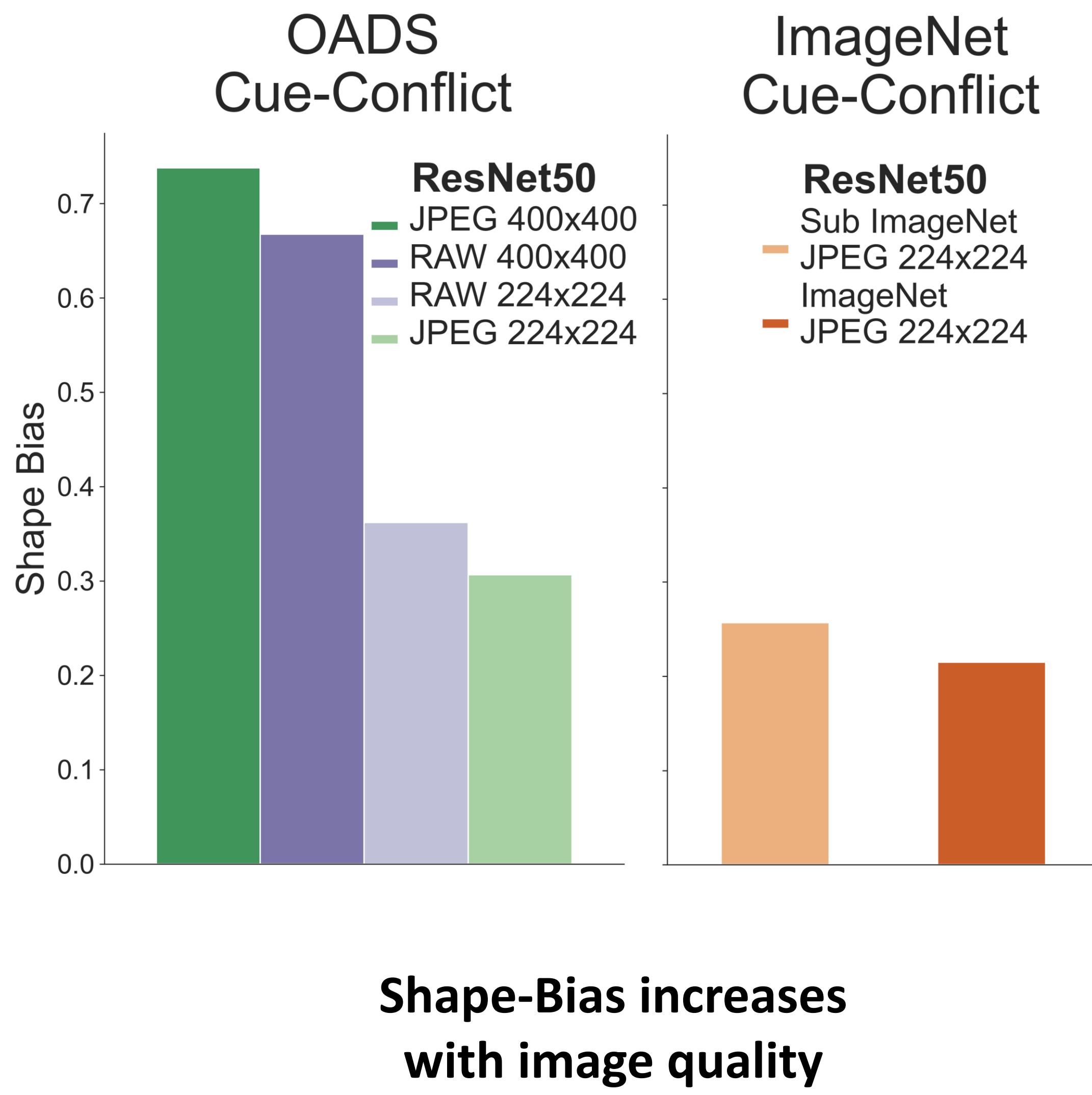


Image Quality vs. Texture-Bias



- Dataset and image quality contribute to DCNN texture-bias
- COC representation yields intuition about texture-bias
- **Low-quality (ImageNet) yields high texture-bias**
- **High-quality (OADS) yields low texture-bias**