

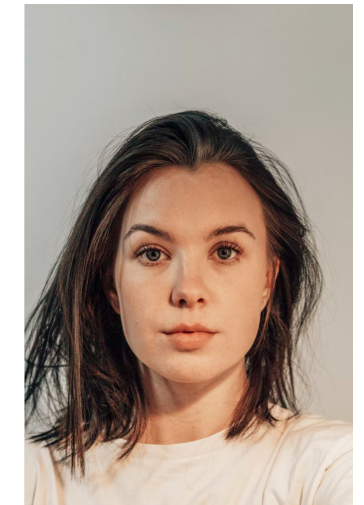


Data Augmentation

UMSL 2022 DL Workshop



- What if you don't have enough data for a particular class?
 - **Ex.** $\frac{1}{2}$ as many NEUTRAL faces as HAPPY or SAD
- What if you want to ensure your network can handle novel input?
 - **Ex.** Person has head tilted up or sideways, or image taken in poor lighting or is over-exposed
- Additional images may not be available
- We can modify our existing training images to create new training images

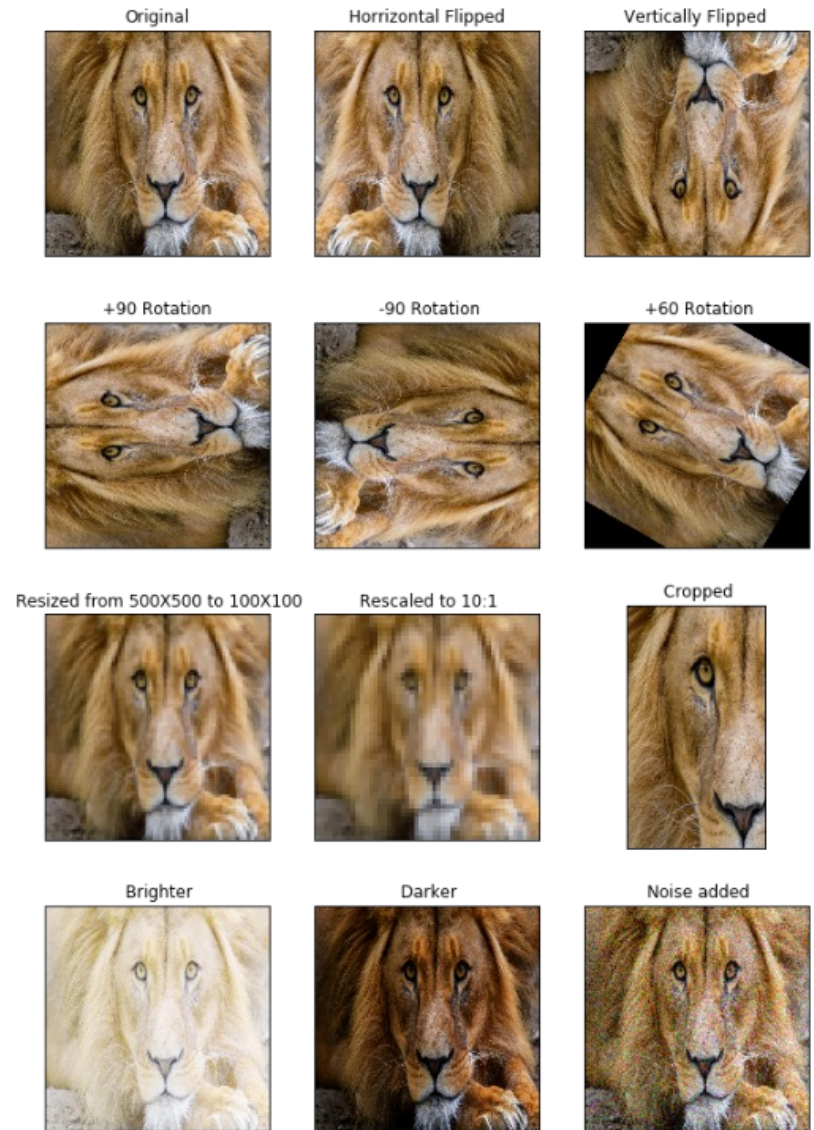


Data Augmentation

- Generate more training data from existing training samples by augmenting them in several random transformations
- The model will never see the exact same image during training
 - Helps expose model to more aspects of data
 - Helps improve generalization
 - Helps prevent model overfitting

- Possible Transformations

- Flipping image across axis
- Rotating image
- Translation
 - Moving image left, right, up, or down
- Resizing image
- Rescaling image
- Cropping
- Brightness/contrast changes
- Grayscale conversion
- Blurring
 - Make image fuzzier



Does augmentation help?

- Multi-class classification on Caltech-101 image data set
- Baseline has no augmentation
- Augmentation significantly improved accuracy

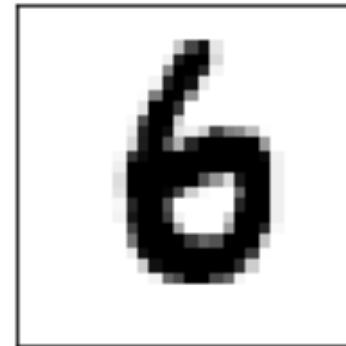


| | Top-1 Accuracy | Top-5 Accuracy |
|------------------|----------------------|----------------------|
| Baseline | 48.13 ± 0.42% | 64.50 ± 0.65% |
| Flipping | 49.73 ± 1.13% | 67.36 ± 1.38% |
| Rotating | 50.80 ± 0.63% | 69.41 ± 0.48% |
| Cropping | 61.95 ± 1.01% | 79.10 ± 0.80% |
| Color Jittering | 49.57 ± 0.53% | 67.18 ± 0.42% |
| Edge Enhancement | 49.29 ± 1.16% | 66.49 ± 0.84% |
| Fancy PCA | 49.41 ± 0.84% | 67.54 ± 1.01% |

Luke T. & Nitschke G. Improving deep learning with generic data augmentation. *IEEE Symposium Series on Computational Intelligence SSCI 2018.*

How much is too much?

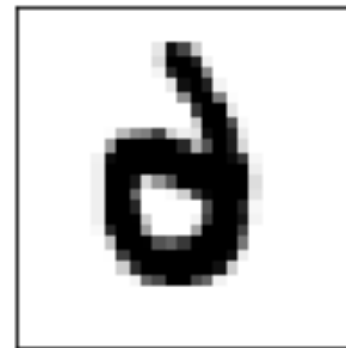
- Cautious about augmenting data
 - **Ex.** Don't want to flip a 6 horizontally or vertically for digit recognition task
- Creates irrelevant data
 - Hurts generalizability and accuracy



True Label:
6



True Label:
6



True Label:
6