

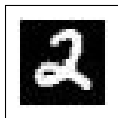
## Module 8.5 : Dataset augmentation

## Different forms of regularization

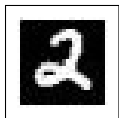
- $l_2$  regularization
- Dataset augmentation
- Parameter Sharing and tying
- Adding Noise to the inputs
- Adding Noise to the outputs
- Early stopping
- Ensemble methods
- Dropout

## Different forms of regularization

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label = 2



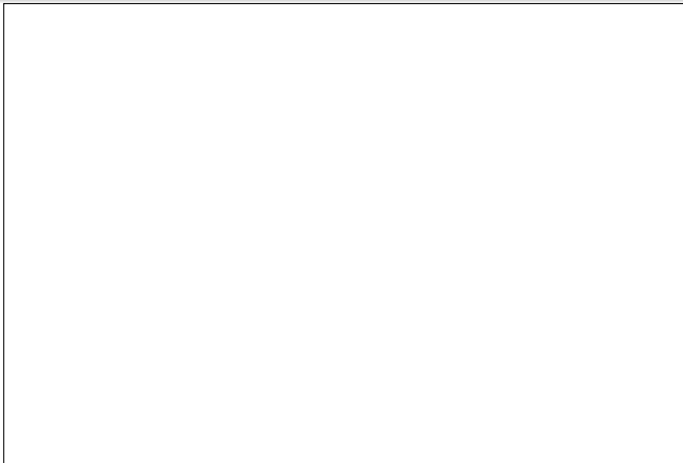
label = 2

[given training data]



label = 2

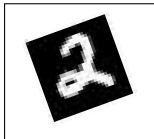
[given training data]





label = 2

[given training data]

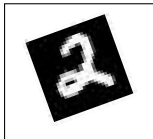


rotated by  $20^\circ$



label = 2

[given training data]

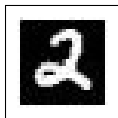


rotated by  $20^\circ$



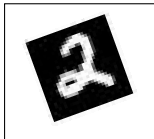
rotated by  $65^\circ$





label = 2

[given training data]



rotated by  $20^\circ$



rotated by  $65^\circ$



shifted vertically



label = 2

[given training data]



rotated by  $20^\circ$



rotated by  $65^\circ$



shifted vertically



shifted horizontally



label = 2

[given training data]



rotated by  $20^\circ$



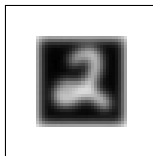
rotated by  $65^\circ$



shifted vertically



shifted horizontally



blurred



label = 2

[given training data]



rotated by  $20^\circ$



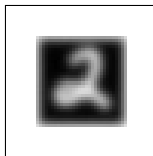
rotated by  $65^\circ$



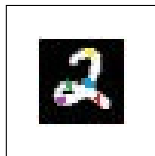
shifted vertically



shifted horizontally



blurred



changed some pixels



label = 2

[given training data]



rotated by  $20^\circ$



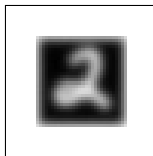
rotated by  $65^\circ$



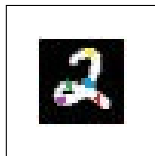
shifted vertically



shifted horizontally



blurred



changed some pixels

label = 2



label = 2

[given training data]



rotated by  $20^\circ$



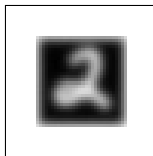
rotated by  $65^\circ$



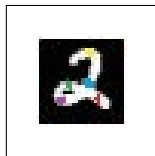
shifted vertically



shifted horizontally



blurred



changed some pixels

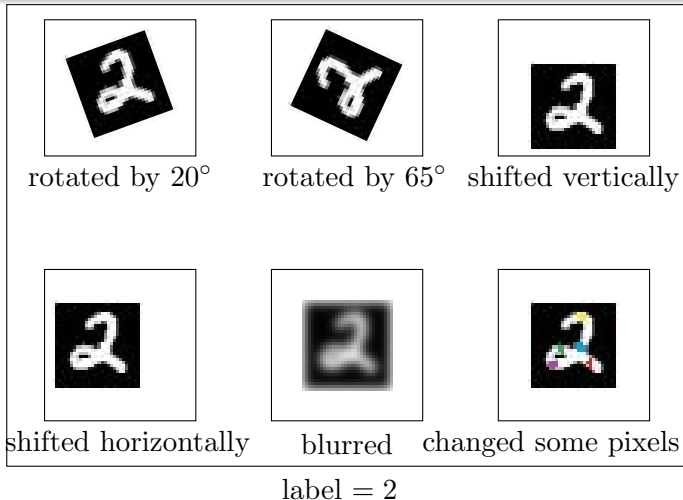
label = 2

[augmented data = created using some knowledge of the task]



label = 2

[given training data]  
We exploit the fact that certain transformations to the image do not change the label of the image.



[augmented data = created using some knowledge of the task]

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- For some tasks it may not be clear how to generate such data