



deeplearning.ai

End-to-end deep  
learning

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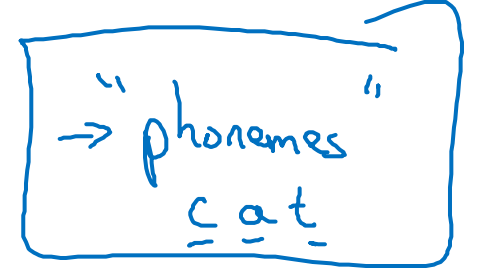
Whether to use  
end-to-end learning

# Pros and cons of end-to-end deep learning

## Pros:

- Let the data speak
- Less hand-designing of components needed

$x \rightarrow y$

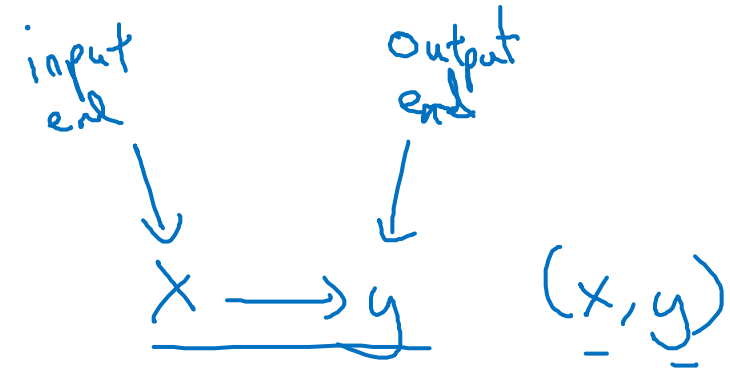


And hand-designed components could be very helpful if well designed. They could also be harmful if it really limits your performance such as if you force an algorithm to think in phonemes when maybe it could have discovered a better representation by itself.

## Cons:

- May need large amount of data
- Excludes potentially useful hand-designed components

$x \text{ --- } y$



So it's kind of double edged sword that could hurt or help more, but hand-designed components tend to help more when you training on a small training set.

And hand designing a component can really be a way for you inject manual knowledge into the algorithm and that's not always a bad thing.

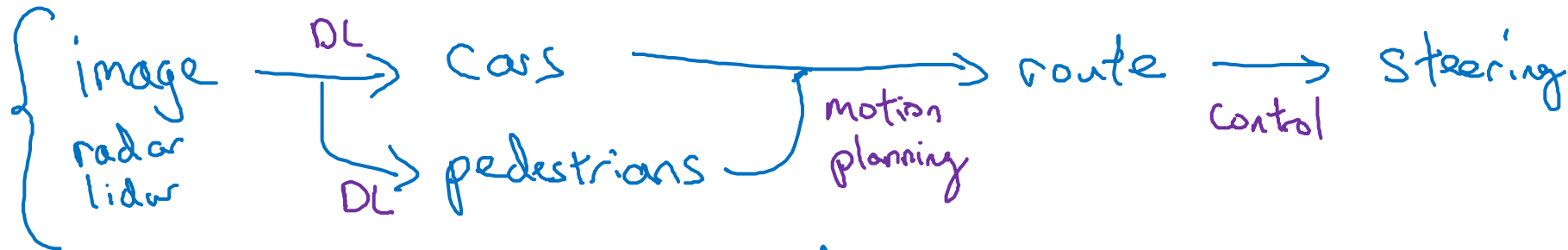
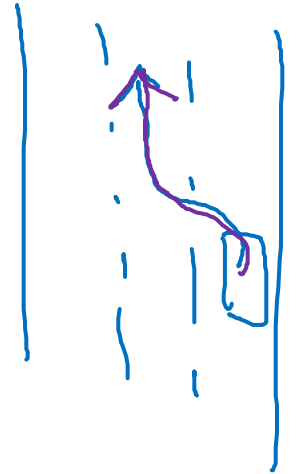
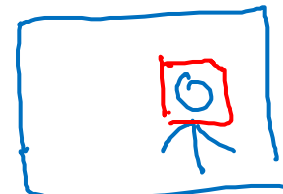
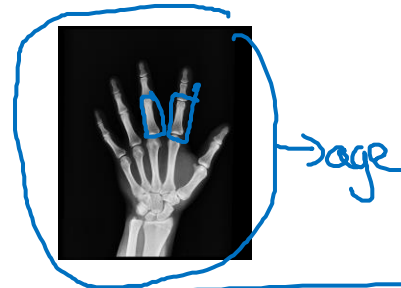
Data.

Hand-design.

# Applying end-to-end deep learning

Key question: Do you have sufficient data to learn a function of the complexity needed to map  $x$  to  $y$ ?

$x \rightarrow y$



- Use DL to learn individual components
- Carefully choose  $x \rightarrow y$  depending what tasks you can get data for.

$\rightarrow$  image  $\rightarrow$  steering

And I think this pure end-to-end deep learning approach is actually less promising than more sophisticated approaches like this, given the availability of data and our ability to train neural networks today.