



deeplearning.ai

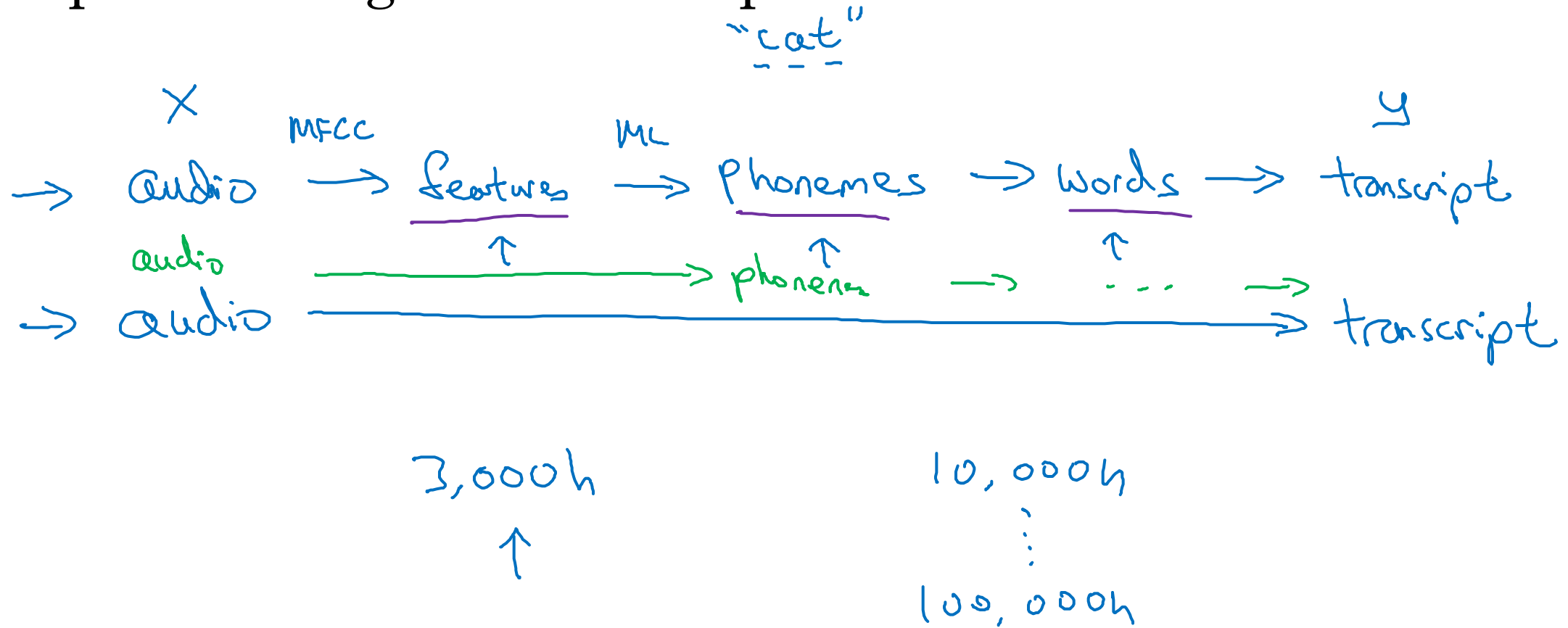
# End-to-end deep learning

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## What is end-to-end deep learning

# What is end-to-end learning?

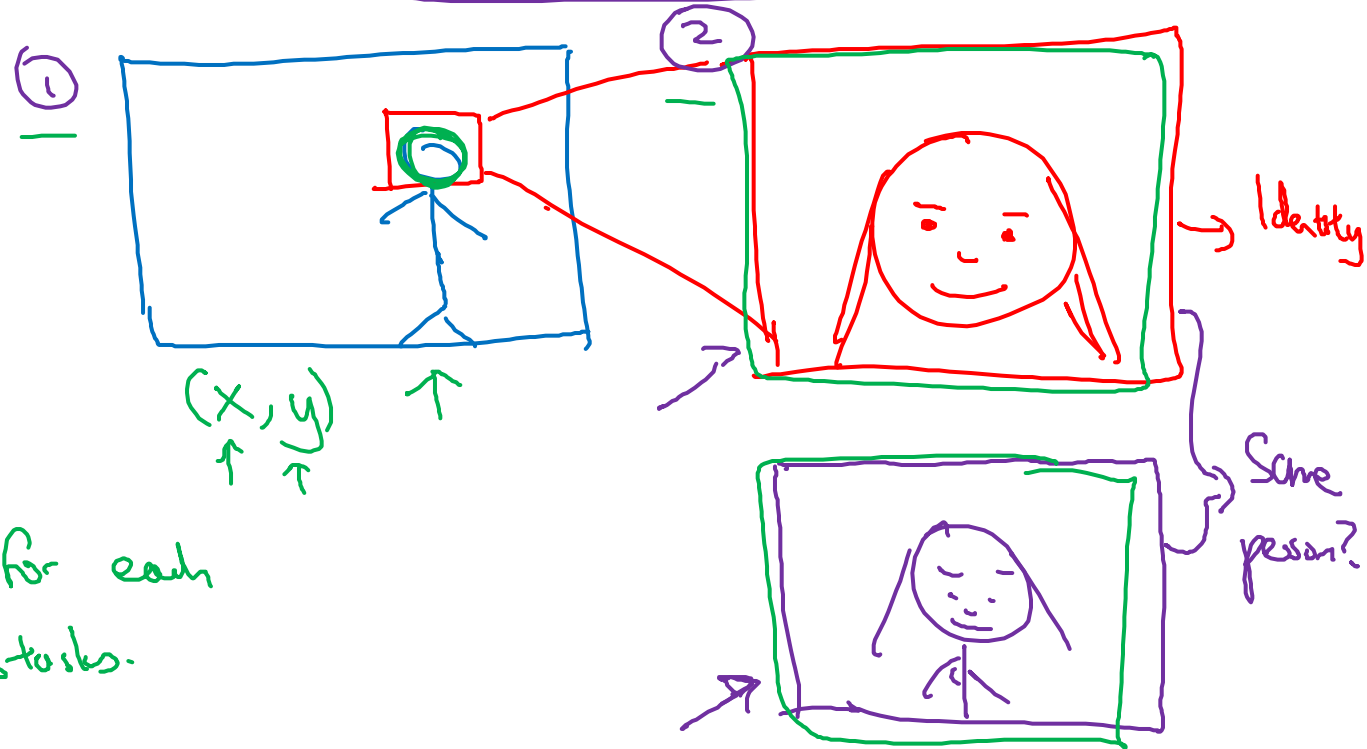
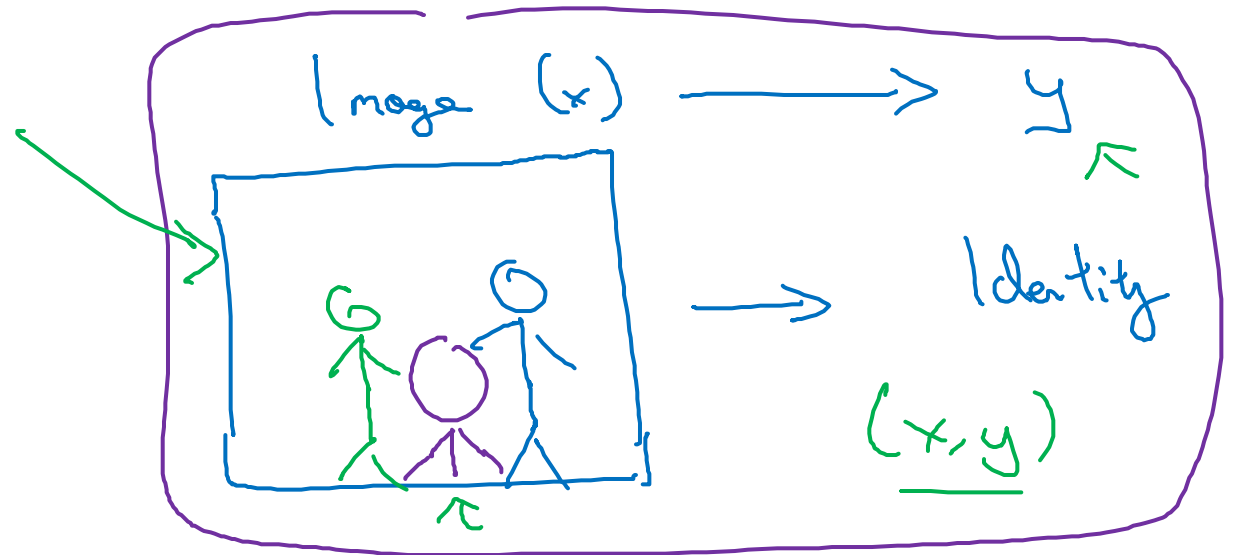
## Speech recognition example



# Face recognition



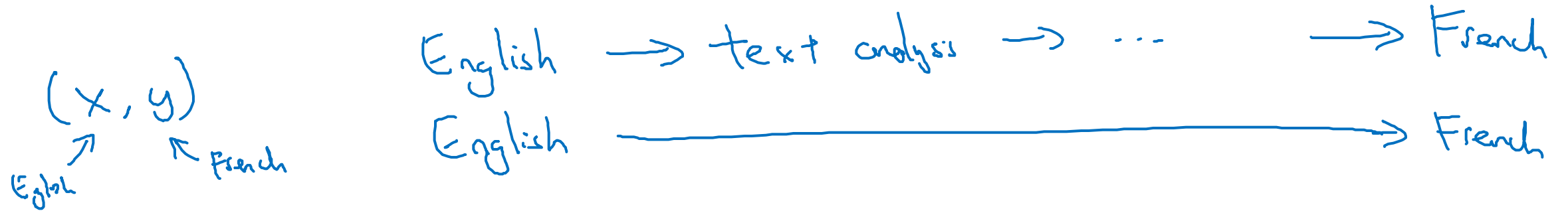
[Image courtesy of Baidu]



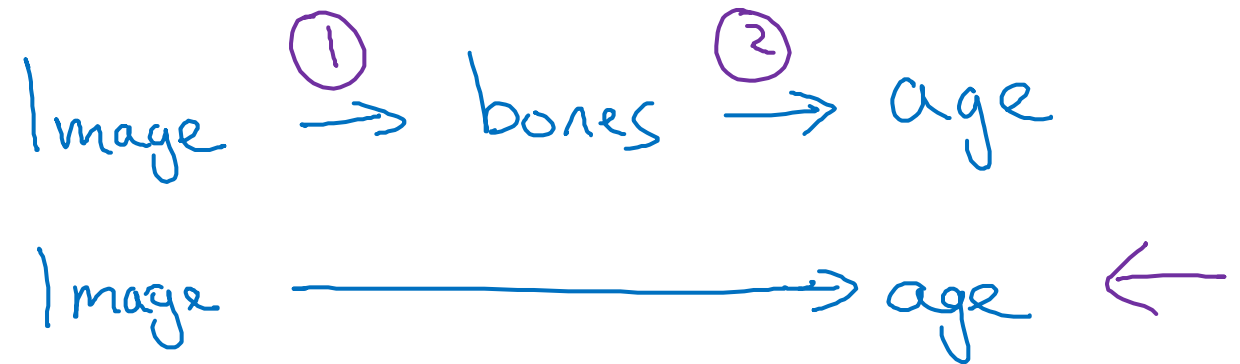
Have data for each  
of 2 sub-tasks.

# More examples

## Machine translation



## Estimating child's age:





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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

$x \rightarrow y$

→ "phonemes"  
c a t

## Cons:

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

$x - - - - - \rightarrow y$

input  
end  
↓  
 $x \rightarrow y$   
output  
end  
↓

(x, y)

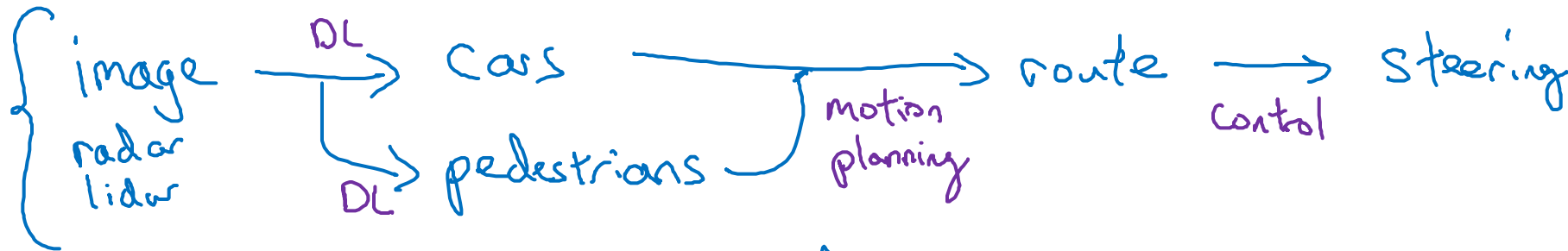
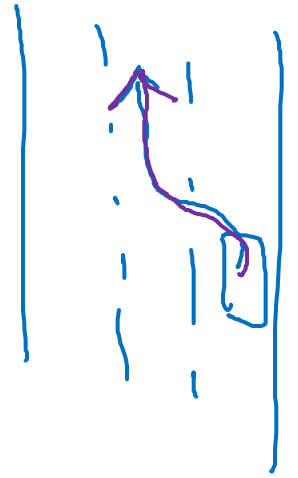
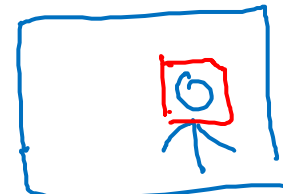
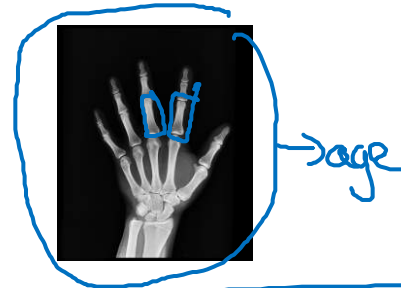
Data.  
- - - -

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