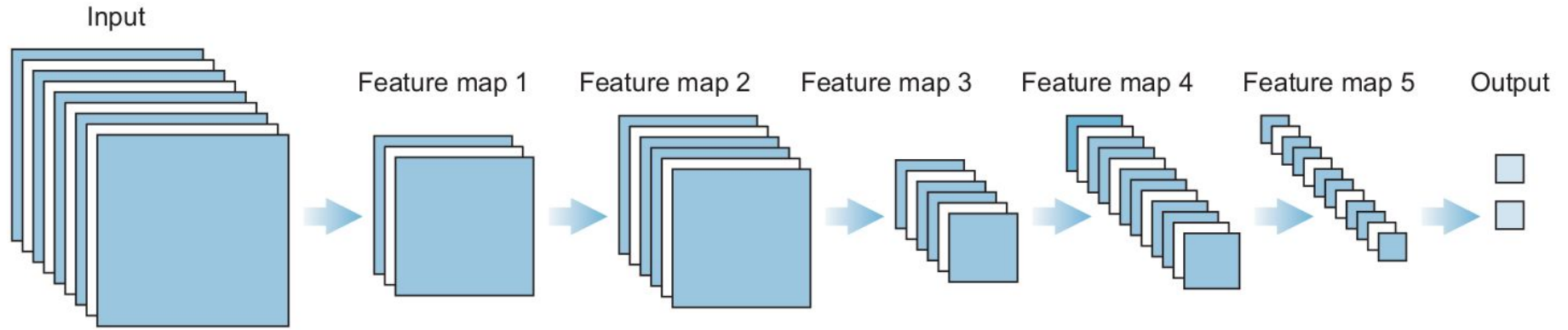


# Transfer Learning

# Deep Learning Architectures



# Learned Features

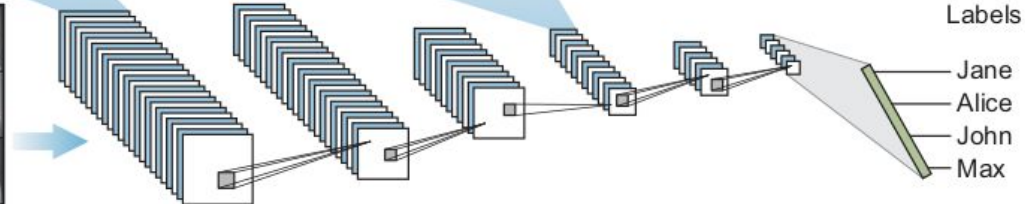
Low-level generic features  
(edges, blobs, etc.)



Mid-level features:  
combinations of edges and other  
features that are more specific to  
the training dataset



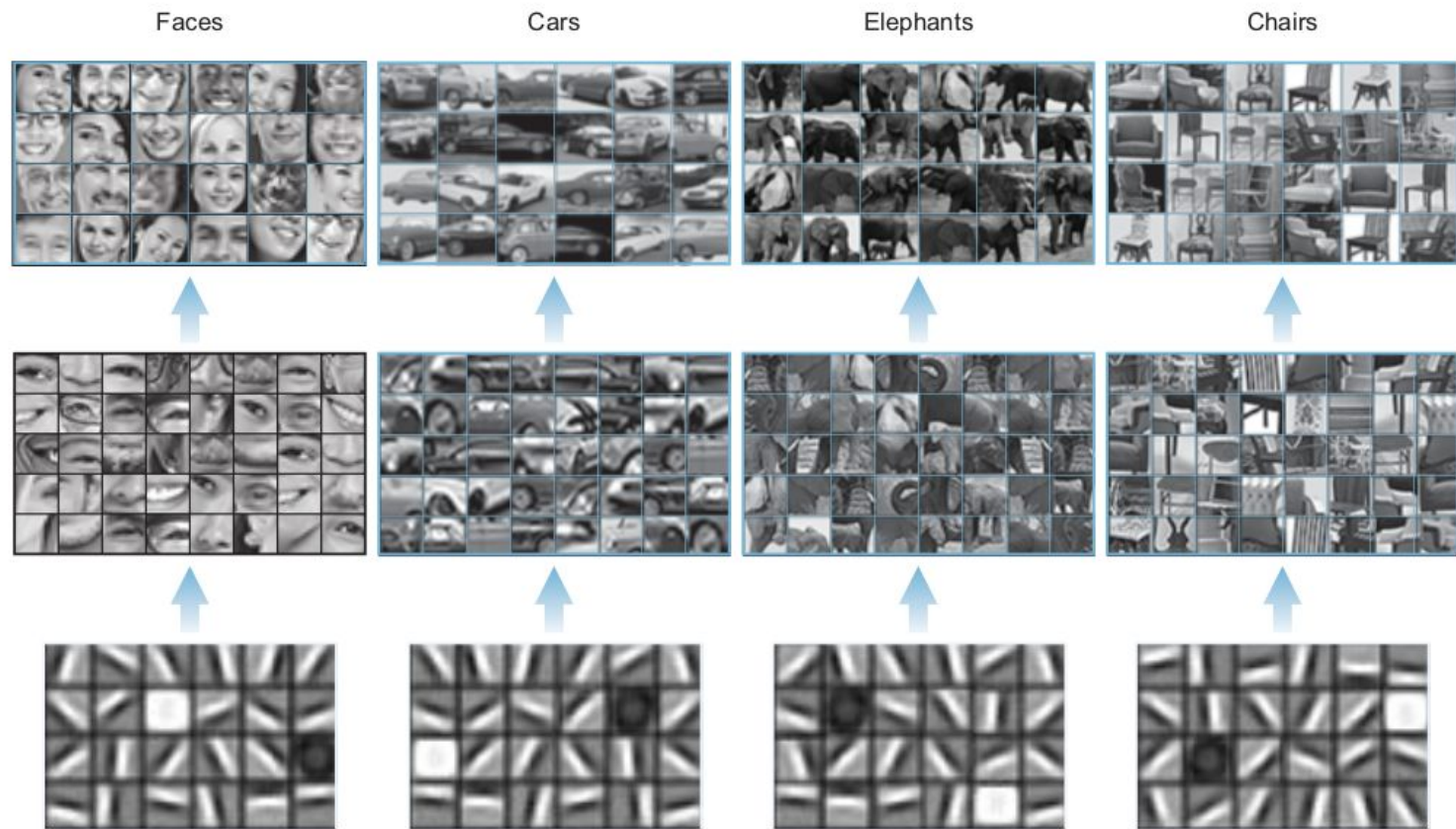
High-level features that are very  
specific to the training dataset



Labels

Jane  
Alice  
John  
Max

# Utility of Learned Features for other Applications



**How about the Transferability of Features  
Extracted at Later Layers?**

# How to Reuse Features Learned for new Applications

- Use a trained network without any changes (limited to the same or very similar domains)
- Using a pretrained network as a feature extractor and train the classifier
- Fine-tune the feature extractor and the learn the classifier

## Which one Should be used?

- The target dataset is small and similar to the source dataset.
- The target dataset is large and similar to the source dataset.
- The target dataset is small and very different from the source dataset.
- The target dataset is large and very different from the source dataset.

Size of the target data	Similarity of the original and new datasets	Approach
Small	Similar	Pretrained network as a feature extractor
Large	Similar	Fine-tune through the full network
Small	Very different	Fine-tune from activations earlier in the network
Large	Very different	Fine-tune through the entire network