Representation learning

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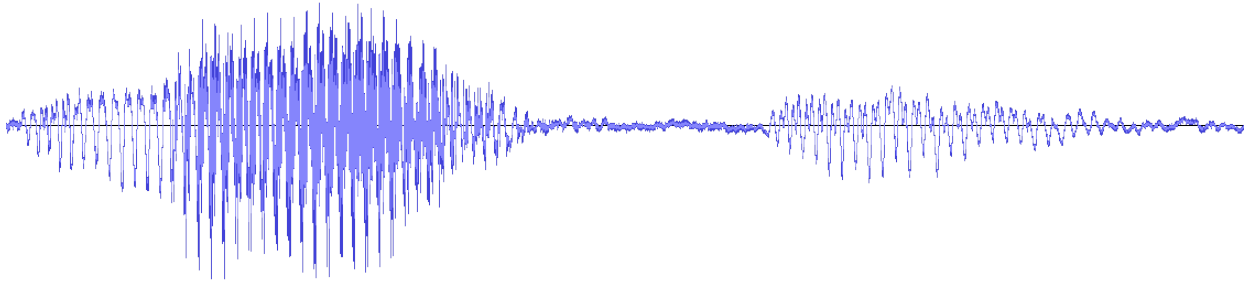
Representation learning

| Raw input | → | Better representation | → | Learning and classification |
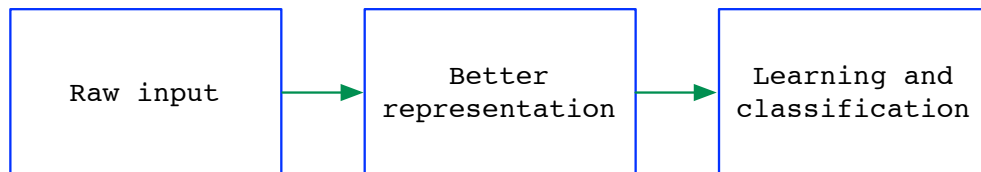
Good representations make learning easier.

- They bring out the true degrees of freedom in the data.
- They capture relevant structure at multiple scales.
- They screen out noisy or irrelevant structure.

Degrees of freedom

Usual representation of speech:

- Take overlapping windows of the speech signal
- Apply many filters within each window
- More filters $\Rightarrow$ higher dimensional

Yet it comes from a physical system with a few degrees of freedom.

Multiscale structure

Commonly-occurring structure at many levels.

Representation learning: goals

Learn underlying degrees of freedom and multiscale structure from the statistics of unlabeled data, e.g.:

- Clustering
- Linear projections
- Embedding and manifold learning
- Metric learning
- Autoencoders

Or learn a representation in tandem with the classifier: deep learning.