Deep Learning Representation using Autoencoder for 3D Shape Retrieval

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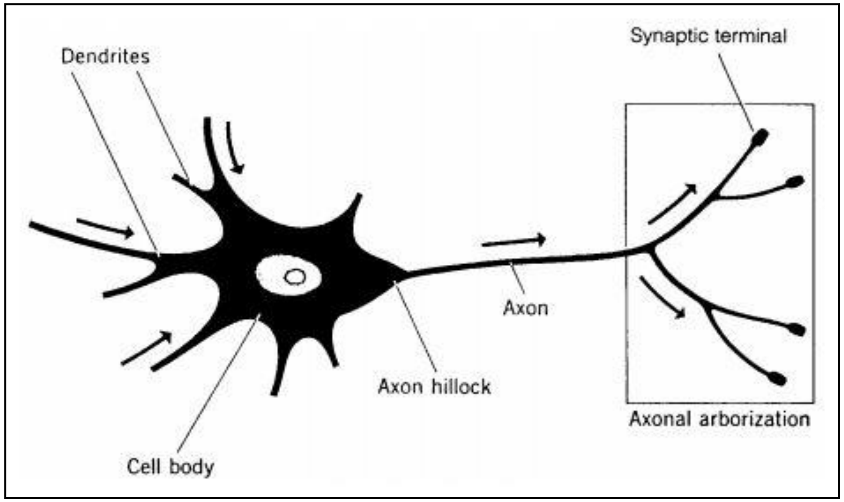
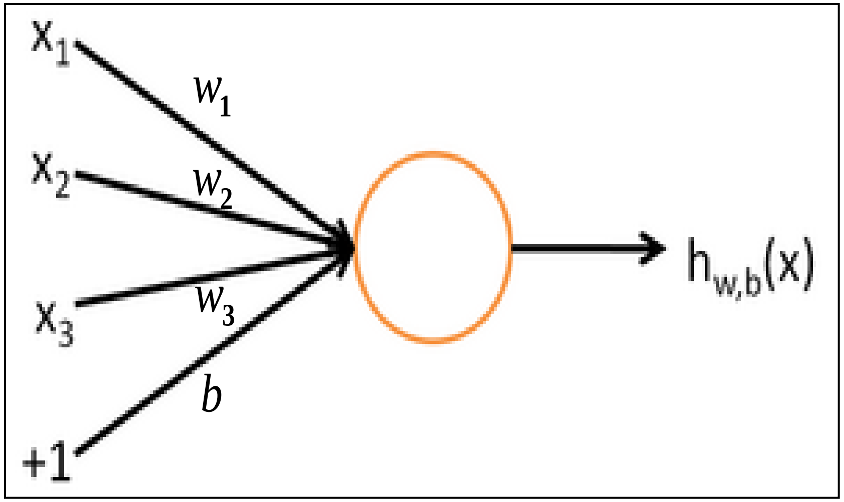
Outline

- What is deep learning?
- What is 3D shape retrieval?
- How I tackle this problem by deep learning.

Deep learning

- Neural network





Deep learning

- Neural network
- Large range of applications
  - Voice recognition
  - Image search
  - Adam

Deep learning

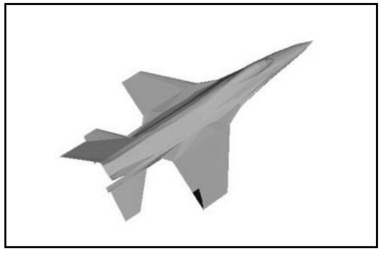
- Neural network
- Large range of applications
- Methematical Models
  - Autoencoder
  - Convolutional Neural Networks(CNN)
  - Restricted Boltzmann Machine(RBM)
  - Deep Belief Networks

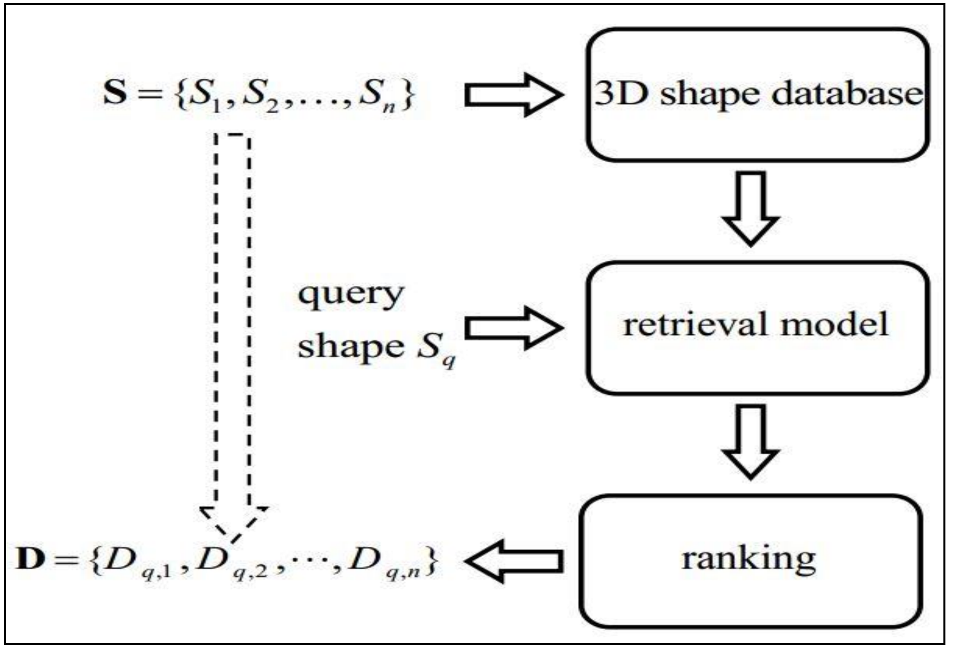
3D Shape Retrieval

- Retrieval

3D Shape Retrieval

- Retrieval
- 3D shape retrieval



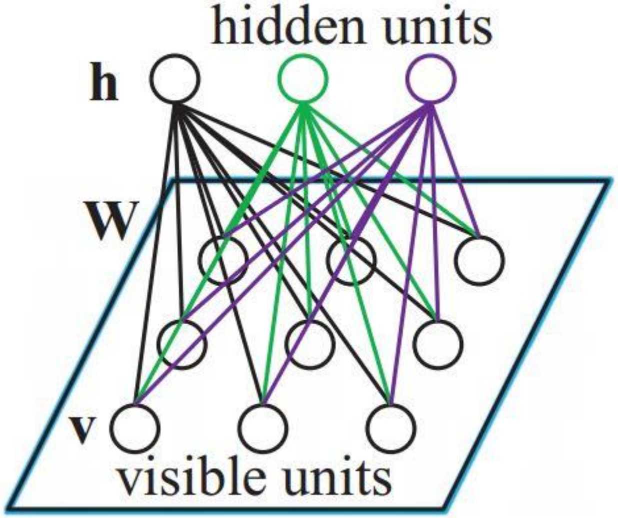


RBM

$$E(\boldsymbol{v}, \boldsymbol{h}) = -\sum_{i \in visible} a_i v_i - \sum_{j \in hidden} b_j h_j - \sum_{i,j} w_{ij} v_i h_j$$

$$p(\boldsymbol{v}, \boldsymbol{h}) = \frac{1}{Z} e^{-E(\boldsymbol{v}, \boldsymbol{h})} \qquad Z = \sum_{\boldsymbol{v}, \boldsymbol{h}} e^{-E(\boldsymbol{v}, \boldsymbol{h})}$$

$$\frac{\partial \log p(\boldsymbol{v})}{\partial w_{ij}} = \langle v_i h_j \rangle_{data} - \langle v_i h_j \rangle_{model}$$

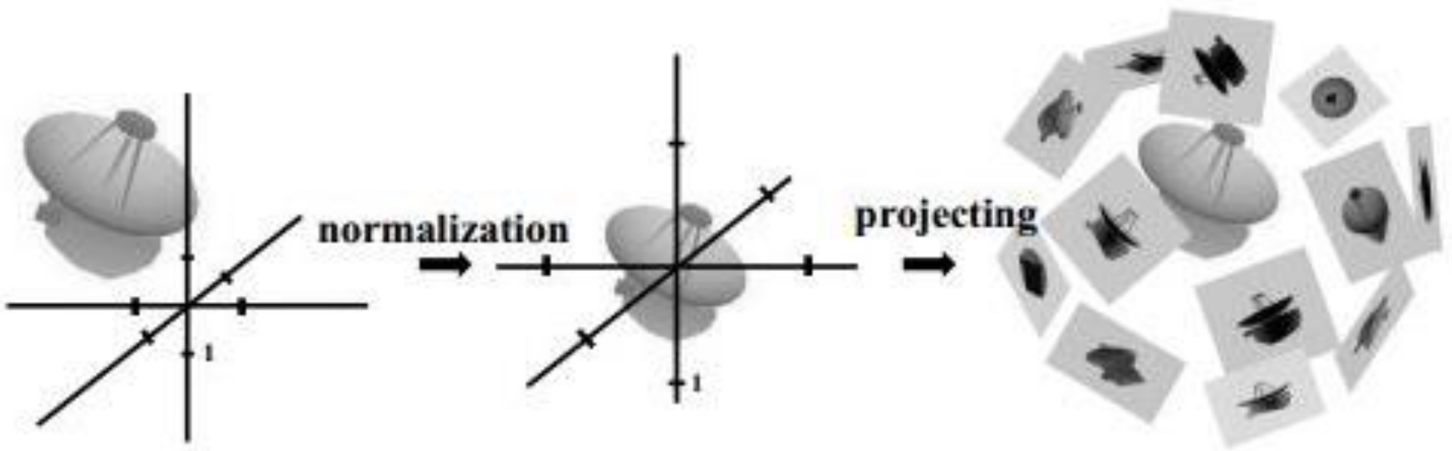


Experiments

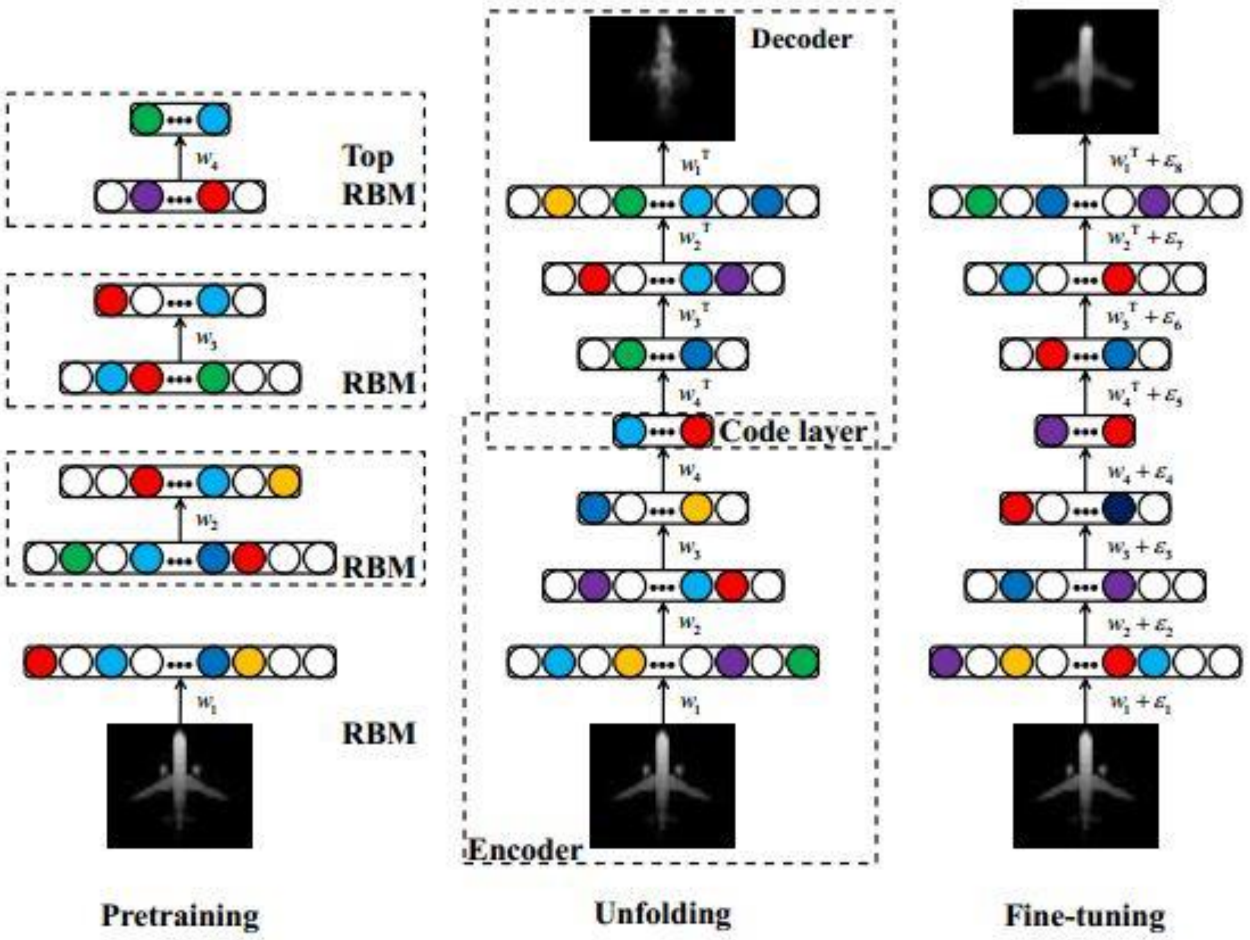
- Project the 3D shape.
- Pretrain a stacked RBMs.
- Construct an autoencoder.
- Fine-tune the structure.
- Define the distance.

Experiments

- Project each model to different viewpoints.



Experiments



Results

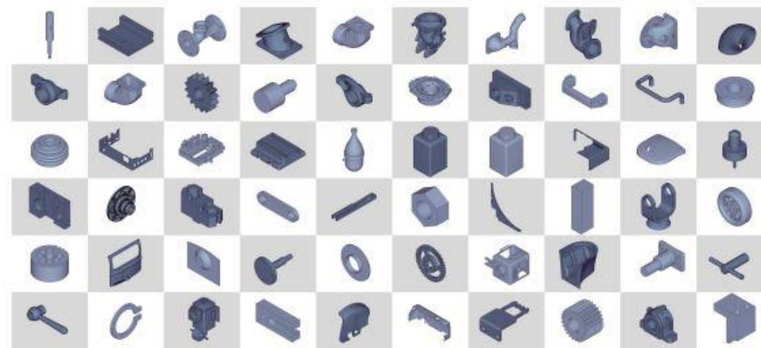


TABLE I. STATISTIC ... PRINCE ... OBAL DESCRIPTORS ON ... HMARK

Algorithm	...	ST(%)
Autoencoder	9	**63.1**
GSMD [16]	5	60.5
DESIRE [13]	7	55.0
LFD [6]	4	53.9

TABLE III. STATISTIC EVALUATION ON PRINCETON SHAPE BENCHMARK

Algorithm	NN(%)	FT(%)	ST(%)
Autoencoder+BoF-SIFT	**77.5**	**52.4**	**65.4**
Autoencoder	72.4	43.3	54.6
BoF-SIFT [10]	71.4	45.1	57.6
CM-BoF+GSMD [7]	75.4	50.9	64.0
PANORAMA [15]	75.3	47.9	60.3
CM-BoF [7]	73.1	47.0	59.8

Thank you!