

DEEP LEARNING

DL = ANN + Representation Learning

✓ Automatically discover the representations (Abstract) needed for classification

✓ NO explicit feature selection

Mainly inspired by NLP, speech processing & Computer Vision.

Deep: Generally representation learning requires many layers of ANN.

CAP [Credit Assignment Path]: describes potentially causal connections between input & output.

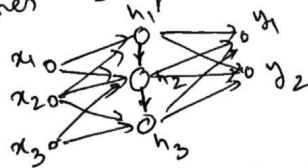
DL usually has high CAP. [no specific threshold]
DL is computationally intensive & became popular largely due to GPUs.

NLP $\left\{ \begin{array}{l} \text{Symbolic [1950s-90s]} \\ \text{Statistical [1990s-]} \\ \text{Neural [2010s-]} \end{array} \right.$

DL Algorithms:

CNN - captures spatial information of images.

RNN - captures sequence information in NLP



vanishing & exploding gradients

LSTM - Additional structure in RNNs to decide which info to keep & which to discard.

Transformers - LSTMs are hard to train since it is sequential & can't be fully parallelised
Uses the "Attention Mechanism" only
Significant improvement in language translation accuracy.

Limitation or Criticism of DL

- Lack of Theory & Explainability
DL is essentially a blackbox
We neither know the function learnt nor the features used for classification or other prediction.
[especially an issue in medical diagnosis]
- Biases in prediction
Algo can learn to classify based on "problematic" features
Bias towards women & ~~other~~ minority groups
(eg. automatic CV suggestions).
for jobs & admissions.
- Cyber Threat
Easy to trick DL based surveillance systems
- Reliance on human microwork
Labelling done by humans
Continued demand for labelled data for calibration & updation of ANN.

Deep Learning is still Weak AI.
Awareness does NOT arise out of ignorance.