CONNECTIONISM:

- **Early neural-network models:**
    - Backpropagation: A method for training a neural network to compute a particular function on the basis of examples
        - EX: Supervised learning

    - **Backpropagation algorithm:**
        - Feed an input through the network to obtain an output.

        - An oracle compares the actual output to the target.

        - Compute the discrepancy (error) between the target output and the actual output.

        - Modify all the weights so as to reduce the error.

- **Principles of Connectionism:**
    - **Biological Plausibility:** Models of the mind should be based on the actual architecture of the brain.

    - **Parallel Computation:** The brain does not have a central processing unit because it has many units working in parallel.

    - **Distributed Knowledge:** Information is not stored in one discrete place, instead it is distributed everywhere in the weights along with the connections.

    - **A single universal model of learning:**
        - All learning follows a common mechanism modification of connection weight based on experience.

        - This applies to perception, action, reasoning, memory, and language.

- **Connectionism vs. Symbol Systems:**
    - **System systems side (rationalist/nativist):**
        - The brain uses rules operating on symbols to understand the world.

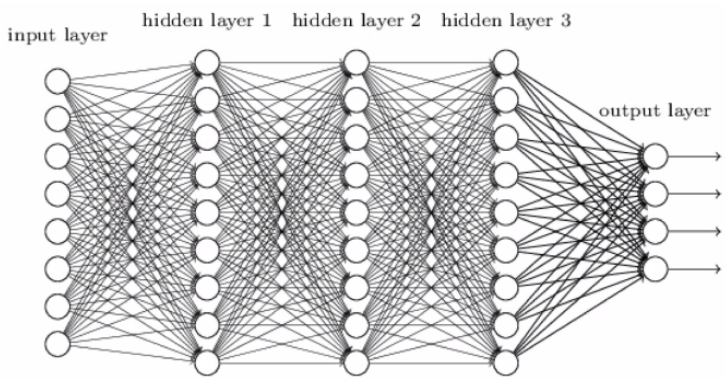
        - Different learning mechanisms in different domains.

        - Some knowledge is innate.

- Connectionist systems can’t represent the full infinite productivity of human thought.

- **Connectionist side (empiricist/associationist):**
  - “Rules” and “symbols” are just epiphenomenal (side-effects).
  - One general mechanism explains learning in all domains.
  - All knowledge is based on experience (training).
  - All knowledge is implicit in the connections between neurons.
  - Argues that only connectionist systems are biologically plausible.
  - Deep learning systems are the modern incarnation of these ideas.

- **Long-term potentiation:**
  - In neuroscience, long-term change in the degree to which a particular synaptic connection conveys excitation or inhibition is called long-term potentiation (LTP).
  - The analog of LTP in an artificial neural network is the weight of the connection between two nodes in the network.
    - Raising an excitatory weight makes it excite more and lowering it makes it excite less.
      - Raising an inhibitory weight makes it inhibit and lowering it makes it inhibit less.
- **Deep Learning:**
  - More layers in a neural network.
  - Much better methods for setting weights.
  - HUGE databases for training.



- **Is deep learning like human learning?:**
    - Deep learning models have been widely successful in AI.

    - **Pros:**
        - Like human learners, they can learn statistical regularities from data.

    - **Cons:**
        - They need millions of examples to do it while humans don't.

        - They generalize very poorly to cases drawn from a different class from the training examples.