

The background features a light gray, swirling pattern on the left side, resembling stylized vines or water. Scattered throughout the background are several small, light gray butterfly silhouettes. The overall aesthetic is clean and elegant.

# Exploration of Granting Memorization to Networks

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# Motivation

- Mainstream artificial neural networks have to use all of the data available to yield the best accuracy.
- What if the data increases continuously?
- If we can design a network structure which has the ability of memorizing former data, the accuracy of networks will improve ceaselessly.

# Former Work

- *Max-out Networks:*
  - Ian J. Goodfellow and David Warde-Farley
- **Contribution:**
  - Proposed a max-out network structure.

# Former Work

- *Compete to Compute:*
  - Rupesh Kumar Srivastava and Jonathan Masci
  - NIPS 2013
- Contribution:
  - Proposed a network structure which is similar to max-out network/channel-out network.
  - Claimed that this network has an implicit long term memory.

# My First Idea

- Create a network which can increase its scale automatically.
- During the fine-tuning procedure, if the accuracy experiences a decline, compared with the former state of the network, generate a new branch to memorize the newly learned information.
- A branch can be defined as a small scale network which will be added to the existing network after fine-tuning.

# My Second Idea

- Change the conventional idea about classification using artificial neural networks.
- Regard data as the most valuable information in a network, rather than the weights of a network./Data oriented.
- Refine data using different techniques, especially neural networks.

# My Second Idea

- Separate the original data set into two parts, A and B.
- Combine A with the outputs of a network tuned by B to get refined data set C. Dimensionality reduction strategies, such as PCA, LDA may be used to accomplish this goal.
- Suppose that refined data C somehow combines the information of A and B. We can simply use C to tune a network which may be comparable to a network tuned by  $A+B$ .



# My Third Idea

- According to research in the area of brain science, there are two types of cells in our brain. Other than nerve cells which we interpreted as an artificial neural network in our field, there are cells which can control the growth rate of the nerve cells.
- Perhaps a nether network which records the former state/learning information of the upper network will be beneficial to grant the network the ability of memorization.

# Difficulties

- Almost no relevant work has been done by others. Thus hard to find papers and useful materials.
- The first idea seems to have little feasibility. An ever-increasing network may be a disaster if not been well controlled.
- The third idea faces a lack of proper property to serve as variables for the nether network.

# Future Work

- Gather information in the field of brain science, although many papers have already been read and biologists seem to have little knowledge about the mechanism of memorization either.
- Implement the network structure of my second idea and test the refining capacity of PCA and LDA.

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**Thank you**