**RESNET Introduction**

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**Summary:**

RESNET helped addressed the common problems in deep learning 1) low learning efficiency of each layer, and 2) vanishing gradients. It achieved this by using residual learning to learn the difference between the input and desired mapping, and introducing residual blocks to bring the weights directly to the layer.

**High Structure:**

RESNET is a new algorithm of deep learning. Deep learning is a machine learning type that imitates how human brain learns new things. In general, just like human brain uses neurons to process information, deep learning has neural network layers to decode all the messages, and it has gradients, which is passed through different layers to provide feedback (weights) of how to improve the algorithm performance. However, when passing gradients through many layers, gradients tend to be smaller and smaller, affecting the learning efficiency of the whole algorithm, which is called the “vanishing gradients”. RESNET uses residual blocks to bypass layers, if necessary, to address the “vanishing gradients”, which highly increases the learning efficiency.

As was mentioned above, deep learning uses multiple layers to learn the patterns of the data, which means each layer is studying a part of a picture. “Studying” the pattern is a long process that takes a lot of computational space, RESNET innovates that the algorithm finds the difference between the input and the desired mapping. This new way of “studying” is called residual learning, which helps make the whole learning progress more effective.

**Pros:**

* Effective learning:
  + The innovation of residual learning increased the learning efficiency
  + Introducing residual blocks addressed “vanishing gradients”

**Cons:**

* Increased computational complexity:
  + Although “bottleneck” structure is incorporated to the algorithm to reduce the computational complexity, the use of multiple layers and skipping functions still requires significant computational resources
* Overfitting:
  + (It is common for most deep learning algorithms) with small dataset, the depth of the network might lead to overfitting