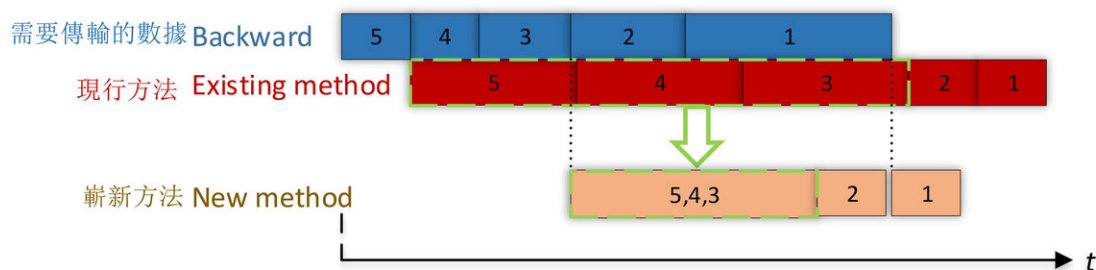


# Team breaks world record for fast, accurate AI training

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**A diagram showing data transmission of a 5-layer model 數據傳輸的示意圖**

(Blue colour) Layers of data blocks (layers 5 to 1) of a neural network (model) that need data exchange. 藍色表示人工智能模型中由 1 至 5 層的数据塊等待傳輸。

(Red colour) Existing method transmits the data blocks layer by layer (from layer 5 to layer 1). 紅色表示現有系統的通訊方式，數據塊從 5 至 1 逐層傳輸。

(Orange colour) New method optimally merges data blocks from several layers into one larger data block (data blocks from layers 5, 4 and 3 are fused into one data block), and then the merged data block is transmitted. 橙色表示新技術將數據塊 5、4、3 集成更較大的組件再傳輸，因此提升整個人工智能訓練的通訊模式。

Diagram showing data transmission of a 5-layer model. Credit: HKBU

Researchers at Hong Kong Baptist University (HKBU) have partnered with a team from Tencent Machine Learning to create a new technique for training artificial intelligence (AI) machines faster than ever before while maintaining accuracy.

During the experiment, the team trained two popular deep neural networks called AlexNet and ResNet-50 in just four minutes and 6.6 minutes respectively. Previously, the fastest [training](#) time was 11 minutes for AlexNet and 15 minutes for ResNet-50.

AlexNet and ResNet-50 are [deep neural networks](#) built on ImageNet, a large-scale dataset for visual recognition. Once trained, the system was able to recognise and label an object in a given photo. The result is significantly faster than previous records and outperforms all other existing systems.

Machine learning is a set of mathematical approaches that enable computers to learn from data without explicitly being programmed by humans. The resulting algorithms can then be applied to a variety of data and [visual recognition](#) tasks used in AI.

The HKBU team comprises Professor Chu Xiaowen and Ph.D. student Shi Shaohuai from the Department of Computer Science. Professor Chu said, "We have proposed a new optimised training method that significantly improves the best output without losing accuracy. In AI training, researchers strive to train their networks faster, but this can lead to a decrease in accuracy. As a result, training machine-learning models at high speed while maintaining accuracy and precision is a vital goal for scientists."

Professor Chu said the time required to train AI [machines](#) is affected by both computing time and communication time. The research team attained breakthroughs in both aspects to create this record-breaking achievement.

This included adopting a simpler computational method known as FP16 to replace the more traditional one, FP32, making computation much faster without losing [accuracy](#). As communication [time](#) is affected by

the size of data blocks, the team came up with a communication technique named "tensor fusion," which combines smaller pieces of data into larger ones, optimising the transmission pattern and thereby improving the efficiency of communication during AI training.

This [new technique](#) can be adopted in large-scale image classification, and it can also be applied to other AI applications, including machine translation; natural language processing (NLP) to enhance interactions between human language and computers; medical imaging analysis; and online multiplayer battle games.

**More information:** Xianyan Jia et al. Highly Scalable Deep Learning Training System with Mixed-Precision: Training ImageNet in Four Minutes. arXiv:1807.11205 [cs.LG]. [arxiv.org/abs/1807.11205](https://arxiv.org/abs/1807.11205)

Provided by Hong Kong Baptist University

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