Photonics chips for machine learning

This topic mainly covers photonics chips design for complex machine learning. I believe it is very important because chips use photonics have many advantages. Nowadays, people use GPU as the calculate units for machine learning because of its special structures. However, with the development in photonics technology, people are thinking about use photonic to instead electronics in chips. Compared with electronic, photonic can transmit information in relatively high speed, which means there will be a low delay in calculation and save time[1]. Chips using photonic can work in a higher frequency, for example, traditional chips using electronics can only work at a frequency at 2 GHZ, but chips with photonics can work at a frequency of 20 GHZ, so that photonic enable chips calculate 10 times more than previous one in 1 second. What’s more, photonic consume less energy than electronics, so that photonics chips can be used in many different severe environments, such as IoT devices used outdoors and spaceflight area. In these environments, power supply can be a huge problem, chips use photonics can use less energy to do more calculation in these cases. So I believe photonics chips will be the next generation chips for machine learning.

In my opinions, photonics chips will be mainly used in environments wilt little power supply and need huge amount of calculation. We can imagine a situation that scientists need devices to monitor the ocean environment. With photonics chips, devices can work long hours, if the device can use solar energy as power supply, devices can work a few years and continuously process data and send them back. I believe photonics chips will bring a lot of benefits in data collecting and save energy, which is environment friendly. What’s more, people can use photonics to build many machine learning models more efficiently, so that there will be more products used machine learning and these products will change our life significantly.

I have search a few open sources, these open sources in github use different computer language to build photonic circuits and stimulate the function of these circuits. Most of them have a MIT licence, which is very convenient for researchers to design their own photonics chips. Fabricating a real chip will cost a lot of money and time, so I believe these open sources are very important.

Reference

[1] Shen, Y., Harris, N., Skirlo, S. *et al.* Deep learning with coherent nanophotonic circuits. *Nature Photon* **11,**441–446 (2017). https://doi.org/10.1038/nphoton.2017.93