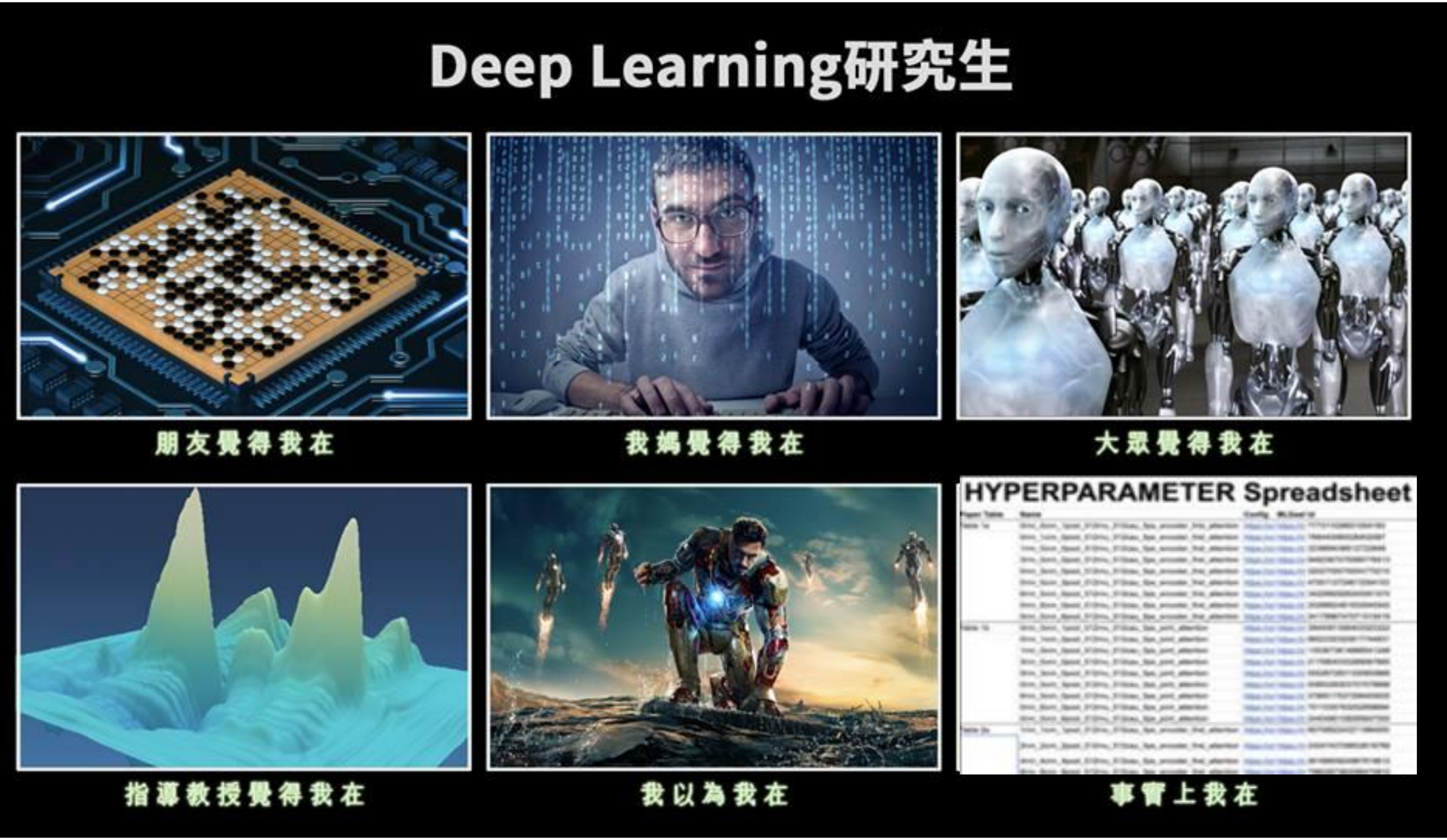
Tuning Hyperparameters

automatically generate hyper parameters

Source of iamge: https://medium.com/intuitionmachine/the-brute-force-method-of-deep-learning-innovation-58b497323ae5 (Denny Britz’s graphic)



感謝 沈昇勳 同學提供圖檔

Grid Search v.s. Random Search

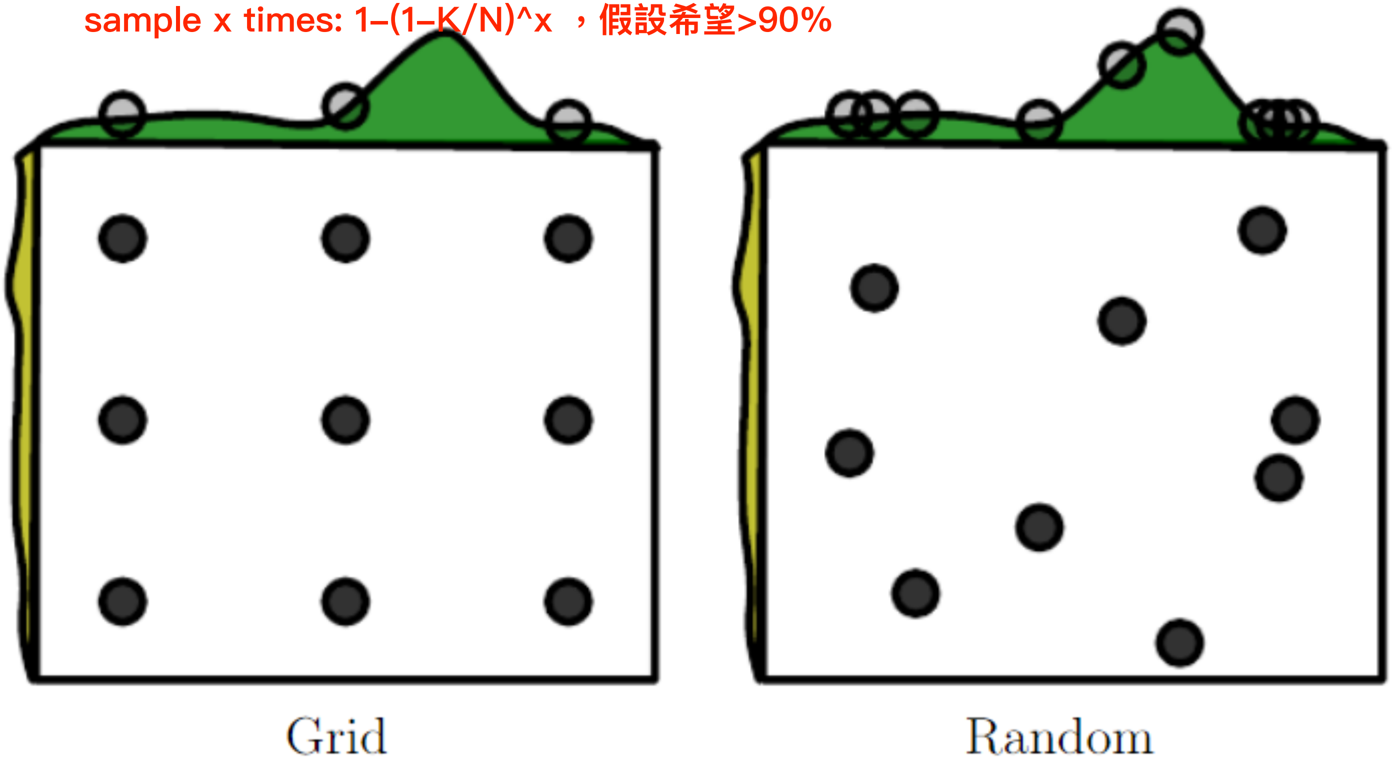
不要去掃過所有參數的組合，而是sample一些參數來做測試

assumption: top K results are good enough

sample到top K 的機率是K/N

sample x times: $1-(1-K/N)^x$ ，假設希望>90%

If N = 1000, k = 10 –> x = 230

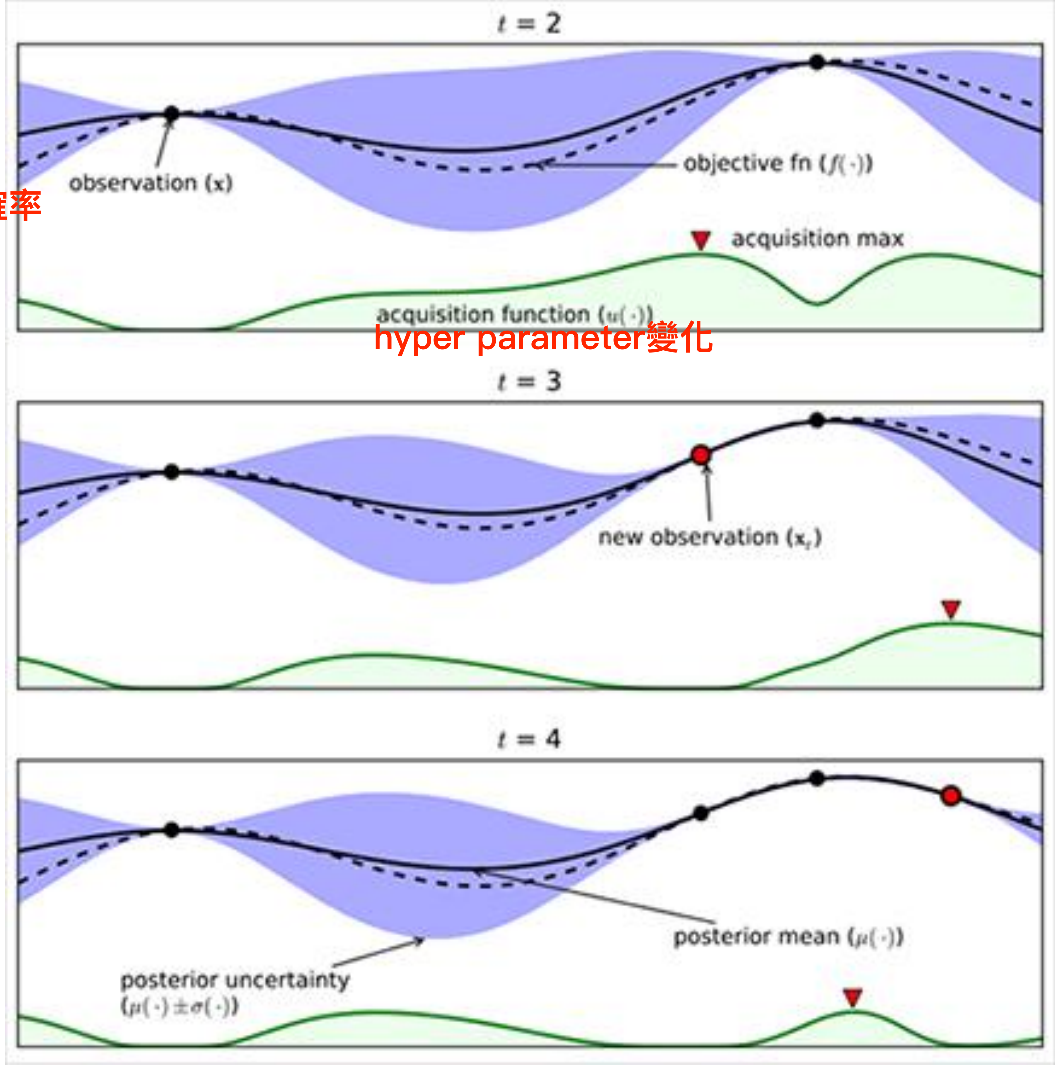


http://www.deeplearningbook.org/contents/guidelines.html

Model-based Hyperparameter Optimization

信心指數，區域越大代表越沒信心

得到的正確率



hyper parameter變化

https://cloud.google.com/blog/big-data/2017/08/hyperparameter-tuning-in-cloud-machine-learning-engine-using-bayesian-optimization

AutoML

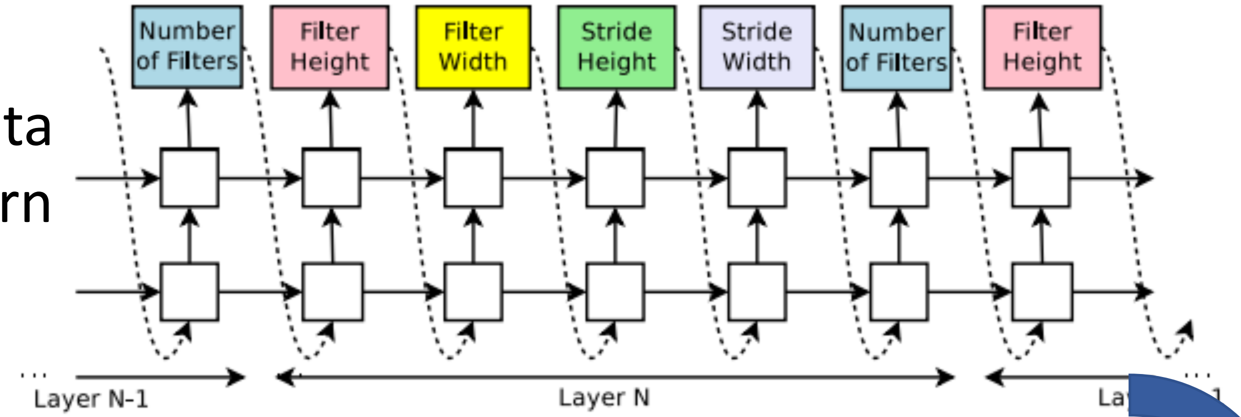
Reinforcement Learning

每次output的數值代表network的架構

It can design LSTM as shown in the previous lecture.

800 GPUs ……

One kind of meta learning (or learn to learn)

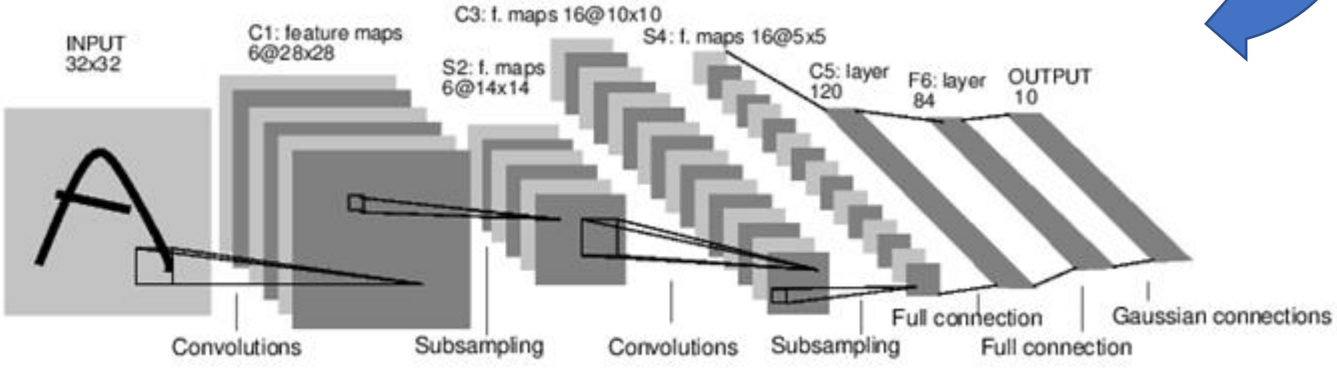


Reinforcement Learning，將train network視為某種actor

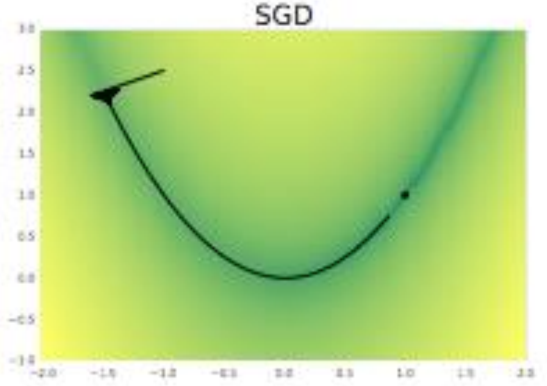
Accuracy as reward

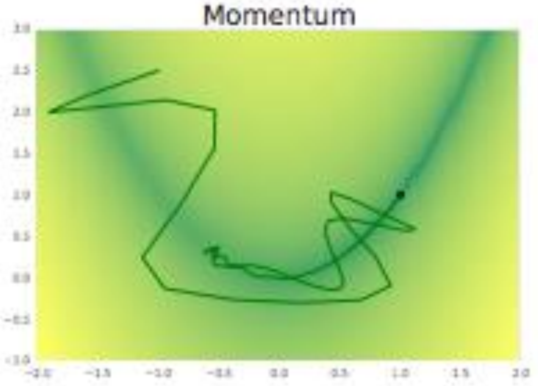
Design a network

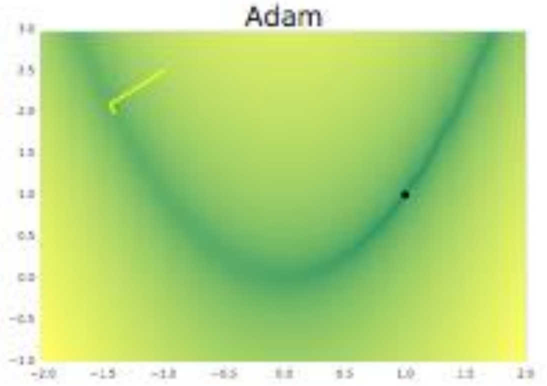
Train the network

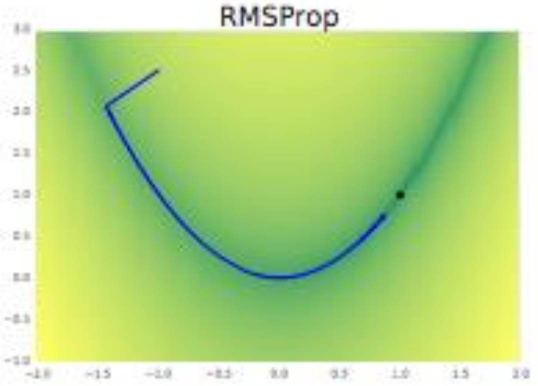


A Full Convolutional Neural Network (LeNet)



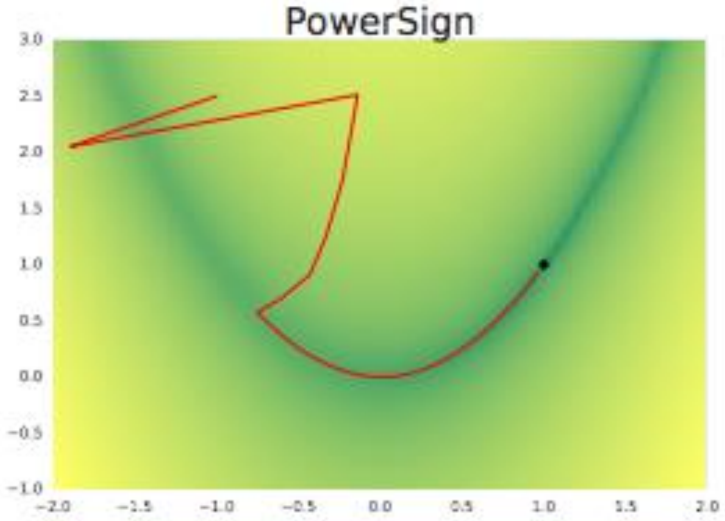






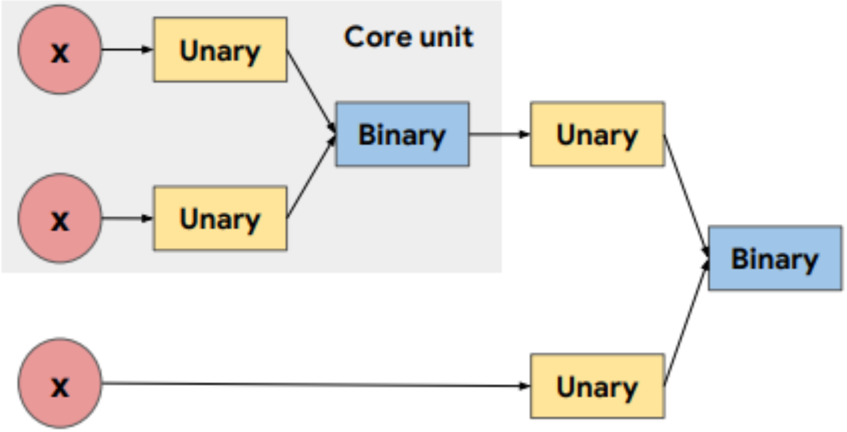
$$e^{\text{sign}(g)*\text{sign}(m)} * g$$

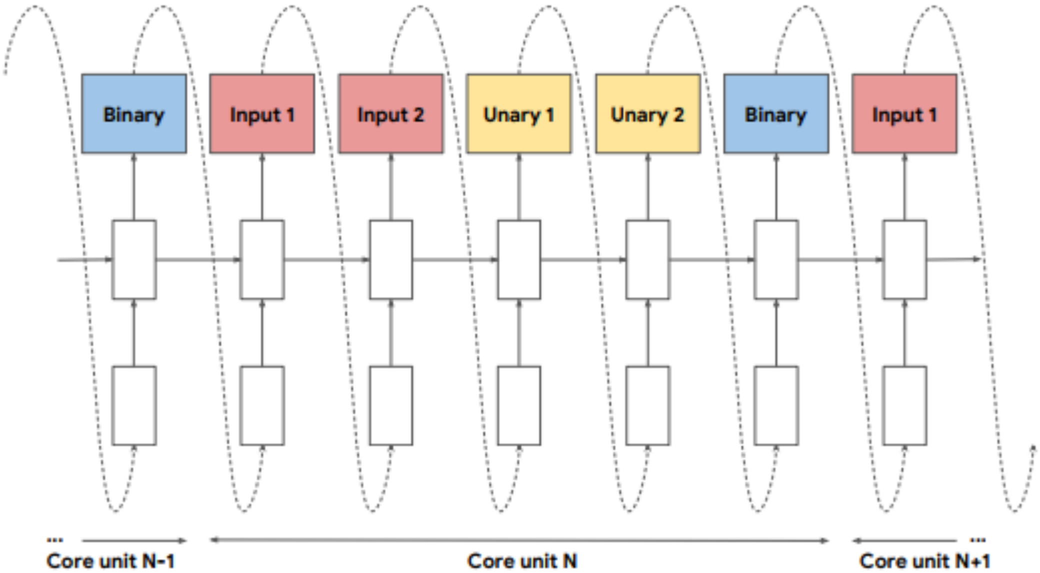
Can transfer to new tasks



SWISH ......

for activation function



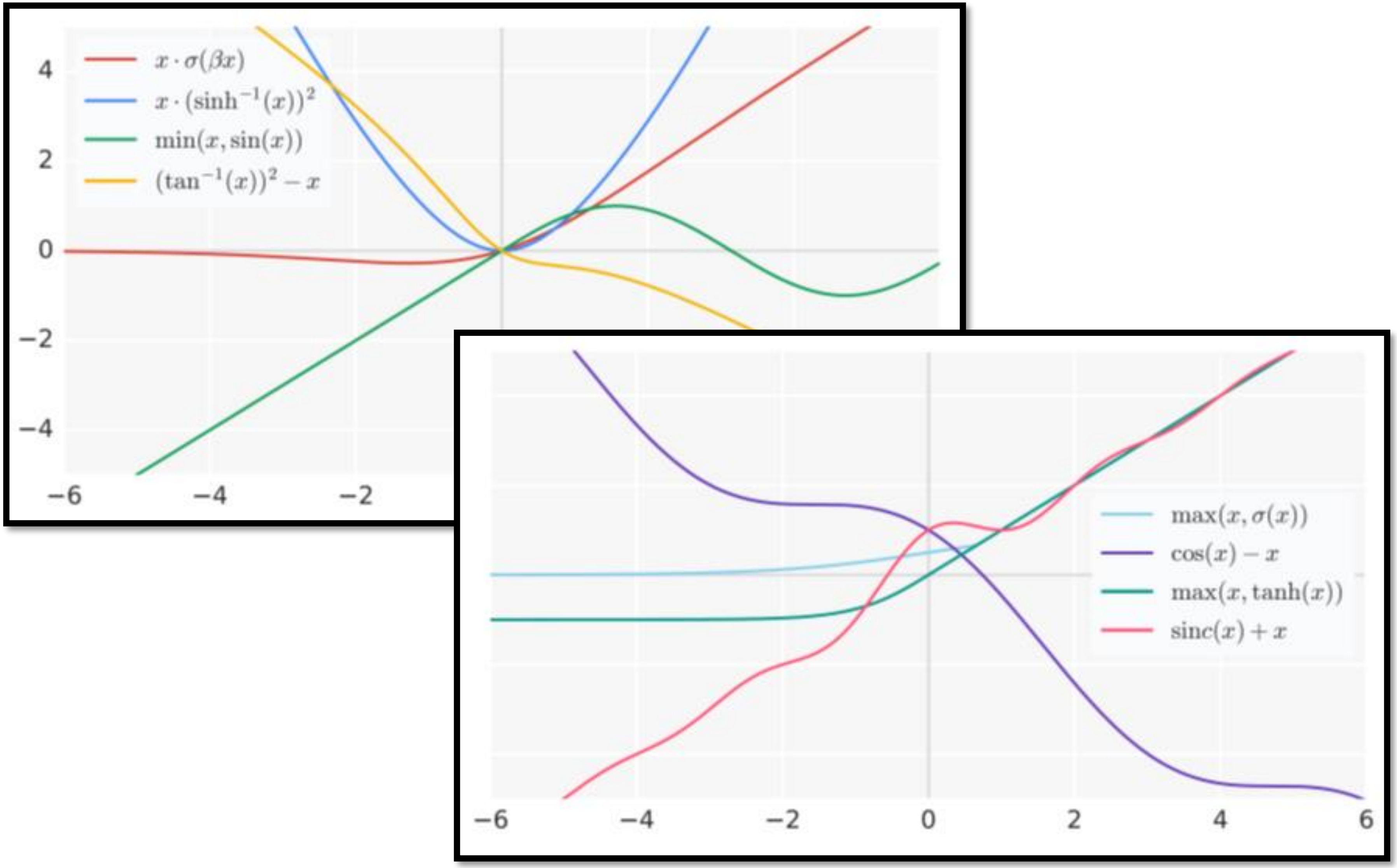


- **Unary functions**: x, $-x$, $|x|$, x^2, x^3, $\sqrt{x}$, βx, $x + \beta$, $\log(|x| + \epsilon)$, $\exp(x)$ $\sin(x)$, $\cos(x)$, $\sinh(x)$, $\cosh(x)$, $\tanh(x)$, $\sinh^{-1}(x)$, $\tan^{-1}(x)$, $\text{sinc}(x)$, $\max(x, 0)$, $\min(x, 0)$, $\sigma(x)$, $\log(1 + \exp(x))$, $\exp(-x^2)$, $\text{erf}(x)$, β

- **Binary functions**: $x_1 + x_2$, $x_1 \cdot x_2$, $x_1 - x_2$, $\frac{x_1}{x_2+\epsilon}$, $\max(x_1, x_2)$, $\min(x_1, x_2)$, $\sigma(x_1) \cdot x_2$, $\exp(-\beta(x_1 - x_2)^2)$, $\exp(-\beta|x_1 - x_2|)$, $\beta x_1 + (1 - \beta)x_2$

swish: a = z* sigmoid(bz)

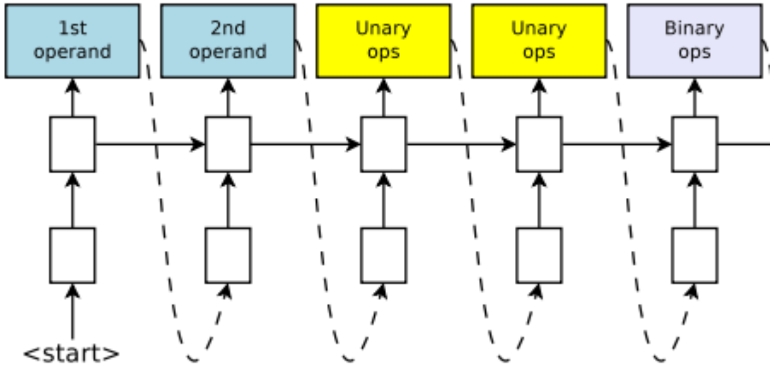
SWISH ......

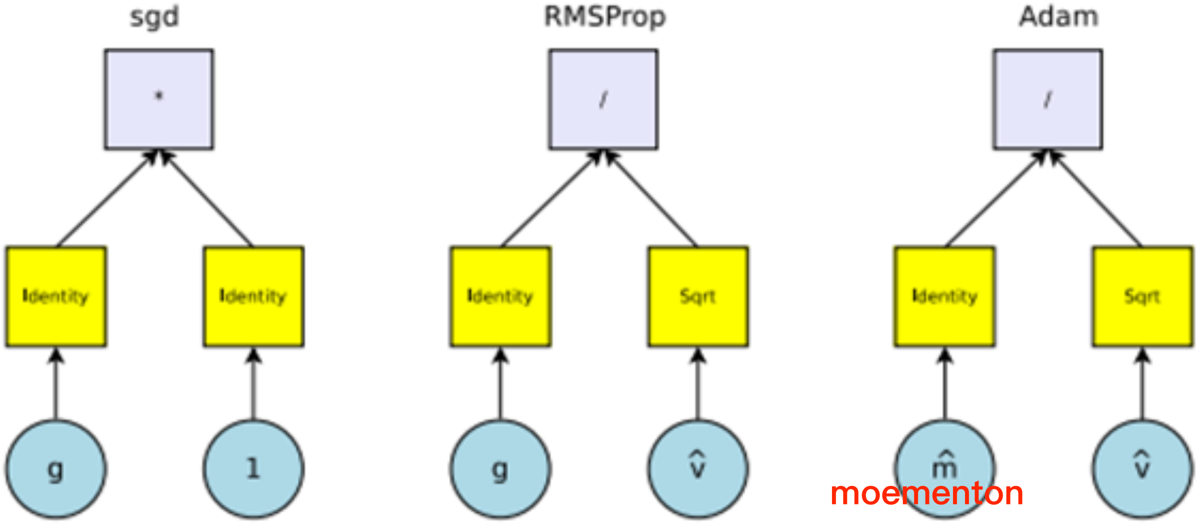


Learning Rate

for optimizer

- **Operands**: g, g^2, g^3, $\hat{m}$, $\hat{v}$, $\hat{\gamma}$, sign(g), sign($\hat{m}$), 1, 2, $\epsilon \sim N(0, 0.01)$, $10^{-4}w$, $10^{-3}w$, $10^{-2}w$, $10^{-1}w$, Adam and RMSProp.
- **Unary functions** which map input x to: x, $-x$, e^x, $\log|x|$, $\sqrt{|x|}$, $clip(x, 10^{-5})$, $clip(x, 10^{-4})$, $clip(x, 10^{-3})$, $drop(x, 0.1)$, $drop(x, 0.3)$, $drop(x, 0.5)$ and sign(x).
- **Binary functions** which map (x, y) to $x + y$ (addition), $x - y$ (subtraction), $x * y$ (multiplication), $\frac{x}{y+\delta}$ (division), x^y (exponentiation) or x (keep left).





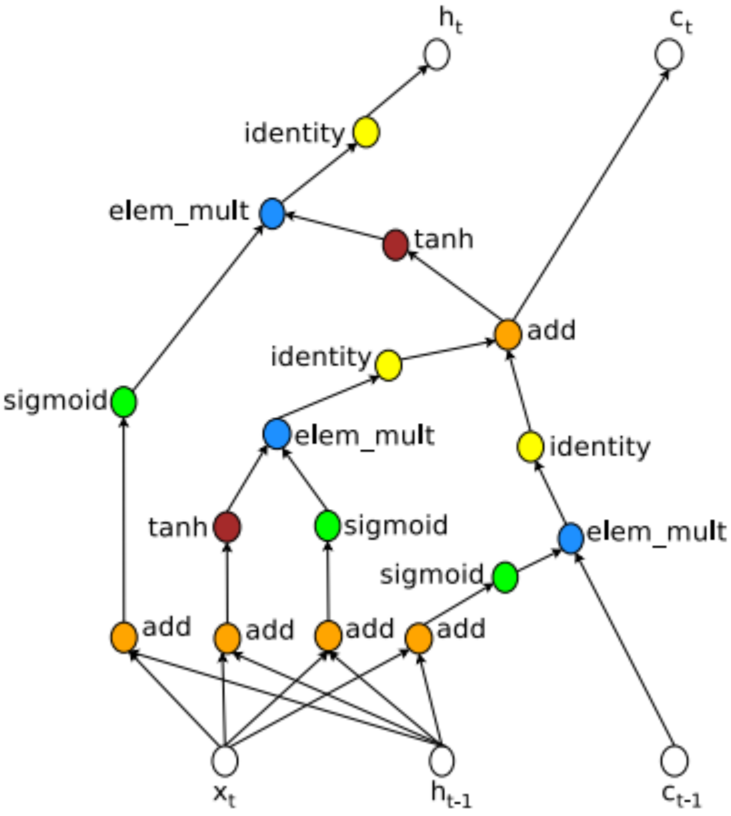
moementon

gradient的平方和

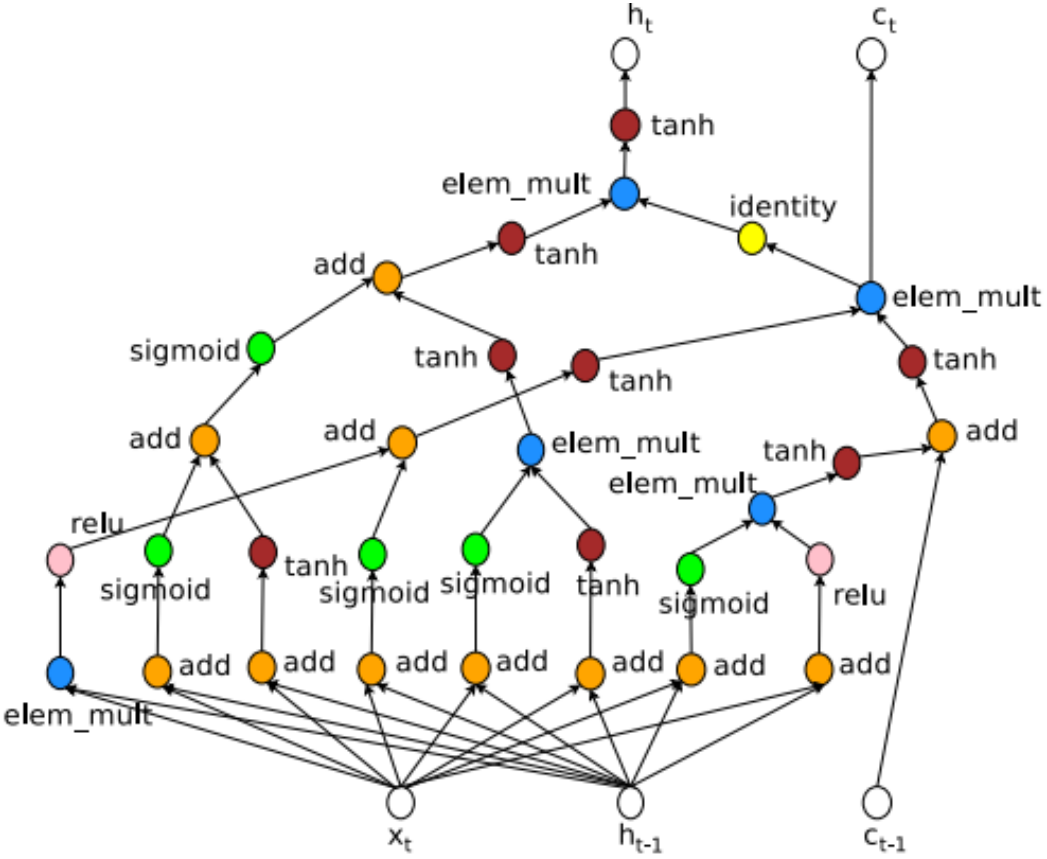
Neural Architecture Search with Reinforcement Learning

for LSTM

LSTM



From Reinforcement Learning



Efficient Neural Architexture Search via Parameter Sharing. arXiv, 2018

概念是train過的block直接將他的參數initial來用