使用 爬山演算法自動建構神經網路架構

A Github Paper

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September 25, 2021

Abstract

A method based on Hill Climbing Algorithm is use to build Neural Network model automatically. In our experiment, several simple robust model was construct to recognize handwritten digit on MNIST test base.

***K*eywords** Neural Network · Deep Learning · MNIST

1 簡介

近幾年深度學習技術讓人工智慧領域有了很大的進展，也吸引到了學術界與產業界共同投入研究。然而，目前幾乎都還是使用人腦建立模型，而非由程式自動架構出模型。我們認為程式自動建構有很多優點，因次使用手寫數字的 MNIST 資料庫進行了一系列的小型實驗，實驗顯示透過爬山演算法逐步演化建構的模型，並不亞於人腦所建立的模型。而且這樣的算法，在未來還有很多改進空間，有可能建構出人腦所難以建構的神經網路模型。

2 背景

『爬山演算法』是一種相當簡單的區域性搜尋演算法，由於其過程相當類似人類爬山時不斷向上爬的動作，因此稱為爬山演算法。爬山演算法可說是一種啟發式方法，其搜尋策略乃是不斷尋找周邊更好的解答，然後向更好的解答前進。換句話說，就是反覆的搜尋鄰居，一旦發現更好的鄰近點，就向該點前進，直到無法再改進為止。

3 方法

簡易的『爬山演算法』如下圖所示 1 所示。

```
Algorithm Hill-Climbing(pi)
 p = pi // 設定粒子 p 為起始粒子 pi
 while not isEnd()
 pn = p.neighbor(step) //選擇粒子 p 的鄰居 pn
 if pn.fitness()>=p.fitness() //如果更好，就接受
 p = pn;
End Algorithm
```

*Use footnote for providing further information about author (webpage, alternative address)—*not* for acknowledging funding agencies.

3.1 高度函數如何設計

Measure Measure Measure Measure Measure Measure Measure Measure Measure Measure Measure Measure Measure Measure

$$\xi_{ij}(t) = P(x_t = i, x_{t+1} = j|y, v, w; \theta) = \frac{\alpha_i(t) a_{ij}^{w_t} \beta_j(t+1) b_j^{v_{t+1}}(y_{t+1})}{\sum_{i=1}^{N} \sum_{j=1}^{N} \alpha_i(t) a_{ij}^{w_t} \beta_j(t+1) b_j^{v_{t+1}}(y_{t+1})} \tag{1}$$

3.1.1 如何選取好的鄰居？

任何的參數變動，都可以創造出新的鄰居模型，因此、鄰居的選擇性是無限多的，我們面臨的問題是，該如何從無限多的鄰居當中，選擇一個有可能更好的適當鄰居呢？

在此、我們用了一些啟發式法則如下

1. 加一個新層
2. 將一層換成另一層
3. 調整某層的參數

Paragraph Paragraph Paragraph Paragraph Paragraph Paragraph Paragraph Paragraph Paragraph Paragraph Paragraph Paragraph Paragraph Paragraph Paragraph

4 Experiments

Experiments Experiments Experiments Experiments Experiments Experiments Experiments Experiments Experiments Experiments Experiments Experiments Experiments

[1, 2] and see [3].

The documentation for `natbib` may be found at

`http://mirrors.ctan.org/macros/latex/contrib/natbib/natnotes.pdf`

Of note is the command `\citet`, which produces citations appropriate for use in inline text. For example,

```
\citet{hasselmo} investigated\dots
```

produces

> Hasselmo, et al. (1995) investigated…

`https://www.ctan.org/pkg/booktabs`

4.1 Figures

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[2] Sample of the first footnote.

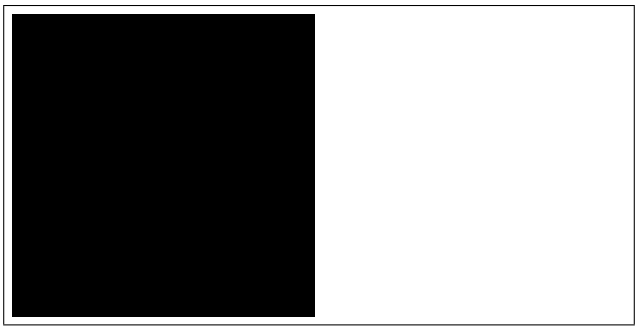

Figure 1: Sample figure caption.

Table 1: Sample table title

Part		
Name	Description	Size (μm)
Dendrite	Input terminal	$\sim$100
Axon	Output terminal	$\sim$10
Soma	Cell body	up to 10^6

4.2 Tables

Etiam euismod. Fusce facilisis lacinia dui. Suspendisse potenti. In mi erat, cursus id, nonummy sed, ullamcorper eget, sapien. Praesent pretium, magna in eleifend egestas, pede pede pretium lorem, quis consectetuer tortor sapien facilisis magna. Mauris quis magna varius nulla scelerisque imperdiet. Aliquam non quam. Aliquam porttitor quam a lacus. Praesent vel arcu ut tortor cursus volutpat. In vitae pede quis diam bibendum placerat. Fusce elementum convallis neque. Sed dolor orci, scelerisque ac, dapibus nec, ultricies ut, mi. Duis nec dui quis leo sagittis commodo. See awesome Table 1.

4.3 Lists

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- consectetur adipiscing elit.
- Aliquam dignissim blandit est, in dictum tortor gravida eget. In ac rutrum magna.

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