

Deep Writing Network

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General Terms: Machine Learning

Additional Key Words and Phrases: Generative adversarial network, Recursive neural network, Handwriting recognition

1. INTRODUCTION

Every person has an unique handwriting style, and sometime it can expose the person's identity especially with some machine learning exploits. Therefore, in some cases when hand-writing is required, it is helpful to use the model generated hand-writing to hidden one's identity.

Meanwhile, as the accented speech generator could improve the human-computer interaction, a stylish hand-written generator would also become a useful tool to create different kinds of human friendly user experiences.

2. BACKGROUND AND RELATED WORK

Recent studies have used RNN with LSTM to train the model that can generate the Realistic hand-writing sentences [fig.A] ¹, while in many cases, the generated result are not good enough to be indistinguishable with authentic human writing.[fig.A]

The GAN originally proposed by Ian Goodfellow et al.² provides an ingenious design of system with two neural networks competing against each other. Specifially, one generative network is taught to map from a latent space to a particular data distribution of interest, and the other discriminative network is simultaneously taught to discriminate between instances from the true data distribution and synthesized instances produced by the generator.

3. SPECIFICATION

(1) Generative Network (GN):

- (a) Input: temporal model that generates handwritten texts during the training process.
- (b) Output: sample handwritten texts that can be re-used as inputs to the DN.

(2) Discriminative Network (DN):

- (a) Input: handwritten texts from the IAM HandWriting Database ³, and from the GN.
- (b) Output: a confidence score of whether the handwriting is recognizable, such that:
 - i. Data with high confidence scores are fed as new inputs into the GN.
 - ii. Data with low confidence scores are rejected; possibly signals are sent to the GN, indicating the necessity of improvements of the model (e.g. modified learning rates).

4. WORKLOAD DISTRIBUTION

- (1) Jerry Sun: basic learning framework (i.e. GAN implementation, confidence score mechanism, etc.)
- (2) Tong Qiu: data I/O, debugging, results evaluation (e.g. fine-tuning parameters, etc.)
- (3) Jibang Wu: online resources, documentation, code management (Github, Jupyter demo, etc.)

¹ <https://greydanus.github.io/2016/08/21/handwriting/>

² Goodfellow, Ian, et al. "Generative adversarial nets." Advances in neural information processing systems. 2014. APA

³ <http://www.fki.inf.unibe.ch/databases/iam-handwriting-database>

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A. APPENDIX

