Medical Examination Data Prediction Using Recurrent Neural Networks

Han-Gyu Kim[1], *Gil-Jin Jang[2], Ho-Jin Choi[1], Minho Kim[3], Young-Won Kim[3], and Jaehun Choi[3]

[1]School of Computing, Korea Advanced Institute of Science and Technology, 291 Daehak-ro, Yuseong-gu, Daejeon 34141, South Korea

[2]School of Electronics Engineering, Kyungpook National University, 80 Daehakro, Bukgu, Daegu 41566, South Korea

[3]Electronics and Telecommunications Research Institute, Daejeon 34129, South Korea

*E-mail: gjang @knu.ac.kr

In this work, we use two different types of recurrent neural networks (RNNs) to predict medical examination results of a subject given the previous measurements. The first one is a simple recurrent network (SRN) which models temporal trajectories of a data sequence to infer the unknown future observation, and the second one is a long short-term memory (LSTM) that enables modeling the longer trajectories by exploiting forgetting switches. The non-linear, temporal evolution of medical status of a human subjects are approximated by the RNNs, and the prediction of the future measurement becomes more accurate than those of the linear approximation method. The performance evaluation experiments are carried out on the real medical examination data, and the proposed methods show superior performances over the linear regression method. For the subjects who have abnormal behaviors in their medical examination results, the performance improvements are much more significant, so the proposed methods are expected to be used in detecting potential patients to provide earlier diagnosis and proper treatments for their illnesses.

Experimental Results

Table 1. SNR for abnormal persons

Method	Description	Linear regression	Simple Recurrent Network	Long short-term memory
BP_HIGH	highest blood pressure	0.021	0.016	0.017
BP_LWST	lowest blood pressure	0.026	0.023	0.023
BLDS	blood sugar	0.120	0.092	0.091
TOT_CHOLE	total cholesterol	0.037	0.028	0.026
HMG	hemoglobin	0.126	0.123	0.122
OLIG_PROTE_CD	urinary protein	0.399	0.389	0.380
SGOT_AST	serum glutamic oxaloacetic transaminase	0.553	0.529	0.517
SGPT_ALT	serum glutamate-	0.537	0.509	0.508

	pyruvate transaminase			
GAMMA_GTP	gamma-glutamyl transpeptidase	0.393	0.349	0.346

References

S. Hochreiter and J. Schmidhuber, "Long short-term memory," *Neural computation*, 9(8):1735-1780, 1997.

J. Oh and B. Kim, "Prediction model for demands of the health meteorological information using a decision tree method," *Asian Nursing Research*, 4(3):151–162, 2010.

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