Conference Poster

A Review of Deep Learning for Automatic Sleep Stage Scoring

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Successful deep learning architectures for sleep scoring share a two-stage design.

This enables the identification of time-invariant and temporal features similar to manual scoring.

A Review of Deep Learning for Automatic Sleep Stage Scoring

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INTRODUCTION
Automated sleep scoring can provide high added value to the sleep study communities:

- Reduce human workload.
- Alleviate inter-rater variability.
- Enable real time scoring.

METHOD
- We reviewed publications on automatic sleep stage scoring using deep learning as well as other machine learning methods.
- We selected three models based on the performance and compared their designs.

PERFORMANCE on MASS Dataset [4]:

<table>
<thead>
<tr>
<th>Model</th>
<th>Acc.</th>
<th>MF1</th>
</tr>
</thead>
<tbody>
<tr>
<td>RNN + RNN [1]</td>
<td>87.1</td>
<td>83.3</td>
</tr>
<tr>
<td>CNN + RNN [2]</td>
<td>86.2</td>
<td>81.7</td>
</tr>
<tr>
<td>DNN + RNN [3]</td>
<td>85.9</td>
<td>80.5</td>
</tr>
<tr>
<td>SVM [3]</td>
<td>79.7</td>
<td>75.0</td>
</tr>
</tbody>
</table>

RESULTS

1) Stages
Network architectures using two stages outperformed ones with only one stage and classical machine learning approaches.

2) Feature Extraction
Two-stage networks use one stage to extract time-invariant features and one to connect these to get a temporal context. This combination of features is also important in the manual scoring.

3) Neural Network (NN)
All of the networks use recurrent neural networks to capture the temporal features.

REFERENCES