**Table 1** Prediction results on validation set, compared with five deep learning .

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Model | SEN(%) | SPE(%) | ACC(%) | MCC(%) | AUROC(%) |
| CNN | 68.78 | 81.00 | 74.89 | 50.15 | 84.57 |
| LSTM | **88.24** | 74.21 | 81.22 | 63.07 | 89.10 |
| LSTM+ATT | 82.81 | 80.54 | 81.67 | 63.36 | 88.57 |
| GRU | 85.07 | 77.83 | 81.45 | 63.06 | 88.63 |
| GRU+ATT | 82.35 | 81.45 | 81.90 | 63.80 | 87.48 |
| SNN-ac4C | 83.26 | **82.35** | **82.81** | **65.61** | **89.11** |

**Table 2** Prediction results on test set, compared with five deep learning . .

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Model | SEN(%) | SPE(%) | ACC(%) | MCC(%) | AUROC(%) |
| CNN | 83.88 | 67.21 | 75.54 | 51.81 | 83.28 |
| LSTM | 80.98 | **83.70** | 82.34 | 64.70 | 90.04 |
| LSTM+ATT | 80.70 | 83.15 | 81.61 | 63.25 | 89.11 |
| GRU | 80.80 | 82.61 | 81.70 | 63.42 | 88.30 |
| GRU+ATT | 81.34 | 81.16 | 81.25 | 62.50 | 86.90 |
| SNN-ac4C | **87.68** | 81.52 | **84.60** | **69.34** | **90.22** |

**Table 3** Prediction results on validation set for the ablation study

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Model | SEN(%) | SPE(%) | ACC(%) | MCC(%) | AUROC(%) |
| No-MHSA | 81.90 | 81.44 | 81.67 | 63.35 | 89.04 |
| No-CNN | **86.43** | 77.83 | 82.13 | 64.49 | 88.84 |
| No-BiLSTM | 73.30 | 85.52 | 79.41 | 59.27 | 86.44 |
| No-CL | 79.19 | **85.97** | 82.57 | 65.31 | 88.54 |
| SNN-ac4C | 83.26 | 82.35 | **82.81** | **65.61** | **89.11** |

**Table 4** Prediction results on test set for the ablation study

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Model | SEN(%) | SPE(%) | ACC(%) | MCC(%) | AUROC(%) |
| No-MHSA | 86.59 | 80.98 | 83.79 | 67.68 | 90.10 |
| No-CNN | 86.41 | 78.62 | 82.52 | 65.23 | 88.85 |
| No-BiLSTM | 77.72 | 78.26 | 77.99 | 55.98 | 83.92 |
| No-CL | 85.69 | 80.62 | 83.15 | 66.39 | 90.08 |
| SNN-ac4C | **87.68** | **81.52** | **84.60** | **69.34** | **90.22** |

**Table 5** Prediction results on different set, compared with current models.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Model | SEN(%) | SPE(%) | ACC(%) | MCC(%) | AUROC(%) |
| DeepAc4C | 82.8 | 75.58 | 79.19 | 58.57 | 86.49 |
| TransC-ac4C | 80.94 | 80.45 | 80.69 | 61.46 | 86.91 |
| EMDL-ac4C | 81.04 | 81.73 | 80.8 | 61.69 | 87.94 |
| SNN-ac4C | 82.85 | 80.02 | 81.43 | 63.01 | 87.84 |

**Table 6** Prediction results on the test set, compared with different methods.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Model | SEN(%) | SPE(%) | ACC(%) | MCC(%) | AUROC(%) |
| Stacking-ac4C | 80.8 | 80.8 | 80.8 | 61.59 | 88.35 |
| LSA-ac4C | 87.13 | 78.26 | 82.7 | 65.66 | 89.53 |
| ac4C-AFL | 84.4 | 80.3 | 82.3 | 64.7 | 89.5 |
| DPNN-ac4C | 81.78 | 84.78 | 82.78 | 65.78 | 91.03 |
| NBCR-ac4C | 84.96 | 82.07 | 83.51 | 67.06 | 89.58 |
| SNN-ac4C | 87.68 | 81.52 | 84.6 | 69.34 | 90.22 |