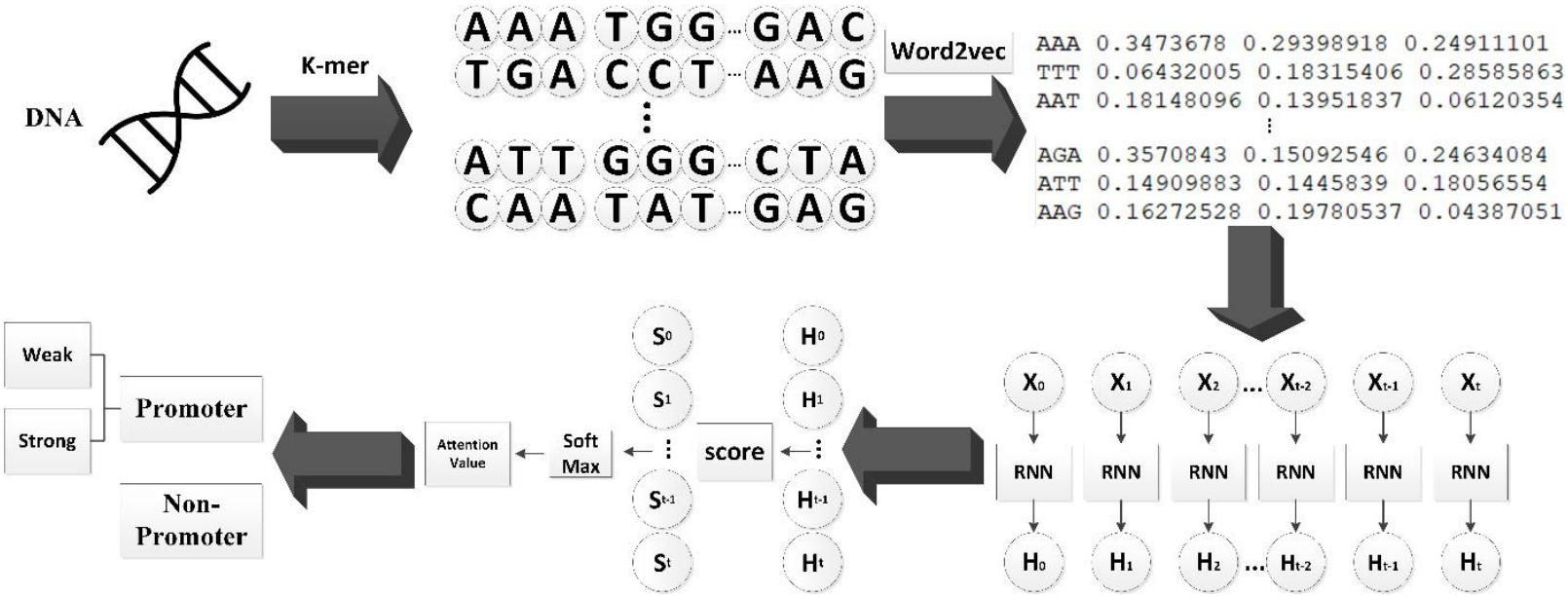
Identification and Classification of Promoters Using The Attention Mechanism Based on Long Short-Term Memory

Qingwen LI, Lichao ZHANG, Lei XU, Quan ZOU, Jin WU, Qingyuan LI

Frontiers of Computer Science, DOI: 10.1007/s11704-021-0548-9

Problems & Ideas

- Problems of previous approaches:
- Predictive performance exist limitations
- Ideas: The attention mechanism algorithm based on LSTM was adopted to improve the prediction performance



Main Contributions

- Contributions:
  - By representing DNA sequences with word embedding, this paper realized accurate identification and classification of promoters by LSTM based attention mechanism.
  - The prediction results of this paper are better than those of previous studies in many indexes.

	Acc	MCC	Sn	Sp
Our method(5-cv)	87.97%	0.7596	87.3%	88.6%
Our method(10-cv)	93.45%	0.8689	93.46%	93.43%
iPSW(2L)-PseKNC	83.13%	0.663	81.37%	84.89%
Nguyen et al.	85.41%	0.709	82.76%	88.05%
iPromoter-2L	81.68%	0.6343	79.20%	84.16%
iPro54	80.45%	0.61	77.76%	83.15%
Stability	78.04%	0.5615	76.61%	79.48%
vw Z-curve	80.28%	0.6098	77.76%	82.80%
PCSF	74.81%	0.498	78.92%	70.70%

	Acc	MCC	Sn	Sp
Our method(5-cv)	78.7%	0.572	75.72%	81.3%
Our method(10-cv)	90.59%	0.8114	90.28%	90.94%
iPSW(2L)-PseKNC	71.20%	0.4213	62.23%	79.17%
Nguyen et al.	73.10%	0.46	69.40%	76.40%