Automatic Academic Paper Rating Based on Modularized Hierarchical Convolutional Neural Network

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Abstract

●**Task:**

Automatically determine whether to accept an academic paper.

●**Motivation:**

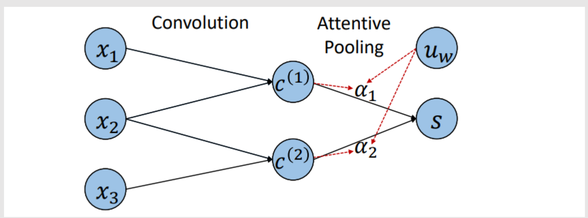
- More and more academic papers are being submitted to conferences and journals.
- Evaluating papers by professionals is time-consuming and can cause inequality due to the personal factors.

●**Proposal:**

- A new dataset for automatic academic paper rating.
- A modularized hierarchical convolutional neural network.

Attention-Based Convolutional Neural Network

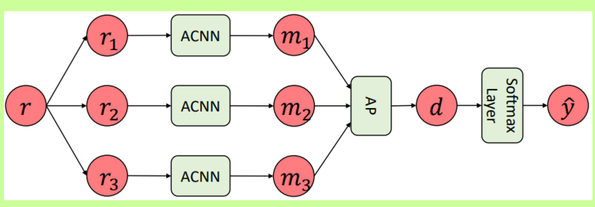
●**Model:**



$(x_1, x_2, \cdots, x_m)$ is the input sequence, u_w is parameter vector, s is the high slevel representation of the whole sequence.

Modularized Hierarchical Convolutional Neural Network

●**Model:**



ACNN denotes attention-based CNN and AP denotes attentive pooling. r_i and m_i represent the token sequence and high ssssslevel representation of the i-th module, respectively. d denotes the final representation of the source paper.

Proposed Model

●**Modularize:**

The source paper r **—>** Several modules $(r_1, r_2, \cdots, r_l)$.

●**Module representation:**

- Input the token sequence r_i.
- **ACNN:** word level —> sentence level —> module level.
- Output the module sslevel representation m_i.

●**Aggregation and classification:**

- Aggregate $(m_1, m_2, \cdots, m_l)$ to d.
- Perform classification based on d.

Experiment

●**Result:**

Models	Accuracy	Models	Accuracy
RP	50.0%	Logistic	60.0%
CART	58.6%	KNN	60.3%
MNB	58.3%	GNB	58.5%
SVM	61.6%	AdaBoost	58.9%
Bagging	59.4%	LSTM	60.5%
CNN	61.3%	C-LSTM	60.8%
MHCNN	**67.7%**		

●**Conclusion:**

- The proposed MHCNN outperforms all baselines.
- The modularized hierarchical structure and attention mechanism are of great help to improve accuracy.

Ablation Study

●**Result:**

Models	Accuracy	Decline
MHCNN	67.7%	−−
w/o Attention	66.8%*	↓0.9%
w/o Module	61.3%*	↓6.4%

●**Conclusion:**

- Either the modularized hierarchical structure or the attention mechanism is of great help to improve accuracy.
- The modularized hierarchical structure of the model is beneficial to obtain better representations by incorporating structure knowledge of the source paper.

Comparison of Various Parts of the Source Paper

●**Result:**

Contexts	Accuracy	Decline
Full data	67.7%	−−
w/o *Title*	66.6%*	↓1.1%
w/o *Abstract*	65.5%*	↓2.2%
w/o *Authors*	64.6%*	↓3.1%
w/o *Introduction*	65.7%*	↓2.0%
w/o *Related work*	66.0%*	↓1.7%
w/o *Methods*	66.2%*	↓1.5%
w/o *Conclusion*	65.0%*	↓2.7%

●**Conclusion:**

- Except for *authors*, the two most significant modules affecting acceptance are *conclusions* and *abstract*.
- The impact of the *title* is the smallest.

Conclusions

●We propose the task of automatically rating academic papers and build a new dataset for this task.

●We propose a modularized hierarchical convolutional neural network model that considers the overall information of the source paper. Experimental results show that the proposed method outperforms the baselines by a large margin.

●we find that the conclusion and abstract parts have the most influence on whether the source paper can be accepted when setting aside the factor of authors.