

Semantics

Assignment Project Exam Help

<https://powcoder.com>

Add WeChat powcoder
Lizhen Qu



Australian Government



State Government
Victoria



NSW
GOVERNMENT
Trade & Investment



Queensland
Government



Australian
National
University



DEAKIN
UNIVERSITY
Griffith
UNIVERSITY



LA TROBE
UNIVERSITY



MACQUARIE
UNIVERSITY



MONASH
University



QUT



RMIT
UNIVERSITY



SWINBURNE
UNIVERSITY



THE UNIVERSITY
OF ADELAIDE
AUSTRALIA



THE UNIVERSITY
OF MELBOURNE



THE UNIVERSITY
OF NEWCASTLE
AUSTRALIA



THE UNIVERSITY
OF
CANBERRA



UNIVERSITY OF
TECHNOLOGY
SYDNEY



UNIVERSITY OF
WESTERN
SYDNEY

Overview of the NLP Lectures

- Introduction to natural language processing (NLP).
- Regular expressions, sentence splitting, tokenization, part-of-speech tagging.
Assignment Project Exam Help
- Language models
<https://powcoder.com>
- Vector semantics.
Add WeChat powcoder
- Parsing.
- Semantics.
 - Lexical semantics.

Semantic Analysis

- Meaning representation: formal structures to represent the meanings of linguistic utterances.
- Semantic analysis: the process of constructing and assigning meaning representations to linguistic inputs.

I have a car.

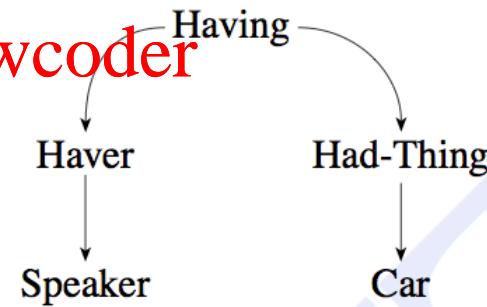
semantic
analysis

Assignment Project Exam Help

<https://powcoder.com>

$\exists x, y \text{Having}(x) \wedge \text{Haver}(\text{Speaker}, x) \wedge \text{HadThing}(y, x) \wedge \text{Car}(y)$

Add WeChat powcoder



Car
↑ POSS-BY
Speaker

Having
Haver: Speaker
HadThing: Car

Lexical Semantics

- Lexical semantics: linguistic study of word meaning.
- Key questions:
 - What is the meaning of words?
 - Most words have more than one sense.
 - How are the meanings of different words related?
 - Specific relations between senses.
 - *Vehicle* is more general than *car*.
 - Semantic fields.
 - *travel* is related to *flight*.

Terminology

- **Wordforms**: any form of a word.
 - good, better, best, decide, decided.
- **Lexeme**: an abstract representation of a word and corresponds to a set of all its forms.
 - RUN = {run, runs, ran and running}.
- **Lemma**: a particular grammatical form that is used to represent a lexeme. This is often the base form.
 - book, car, fly
- **Word sense**: a discrete representation of one aspect of the meaning of a word.

Assignment Project Exam Help

<https://powcoder.com>

Add WeChat powcoder

Lemmatization

- Map a wordform to a lemma.
 - Countries -> country
 - Europe -> Europe

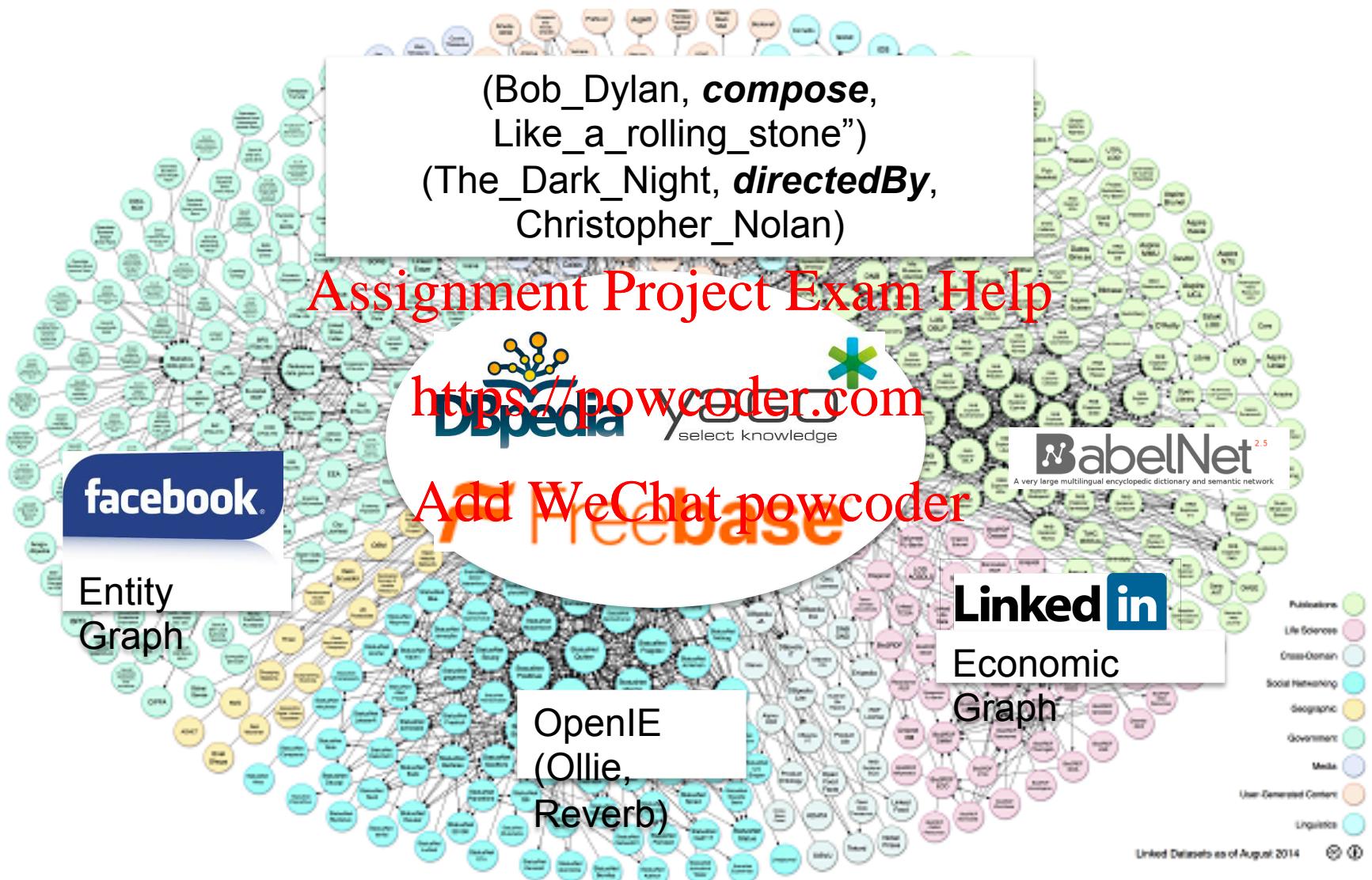
Assignment Project Exam Help

- Tools:
 - <https://powcoder.com>
 - <http://nlp.stanford.edu/software/corenlp.shtml>
Add WeChat powcoder
 - <http://textanalysisonline.com/nltk-wordnet-lemmatizer>

WordNet

- Very large lexical database of English.
 - 117k nouns, 115k verbs, 21k adjectives, and 4k adverbs.
- **Synset**: the set of near-synonyms for a sense.
 - 82k noun synsets, 13k verb synsets, 18k adj. synsets, 3k adv. synsets.
 - Avg. # synsets: noun 1.24, verb 2.17, adj. 1.4, adv. 1.25
- Website : <http://wordnet.princeton.edu/>
- WordNet in other languages: German, Italian ...

Knowledge Bases (Open Linked Data)



Overview of the NLP Lectures

- Introduction to natural language processing (NLP).
- Regular expressions, sentence splitting, tokenization, part-of-speech tagging.
Assignment Project Exam Help
- Language models
<https://powcoder.com>
- Vector semantics
Add WeChat powcoder
- Parsing.
- Semantics.
 - Lexical semantics.
 - Compositional semantics.

Compositional Semantics

- Principle of compositionality.

The meaning of a complex expression is determined by its structure and the meanings of its constituents.

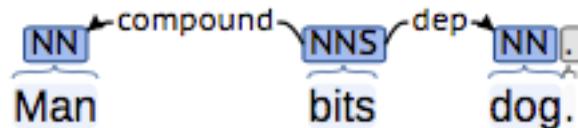
Assignment Project Exam Help

- Examples:

<https://powcoder.com>



OR



Challenges for NNs

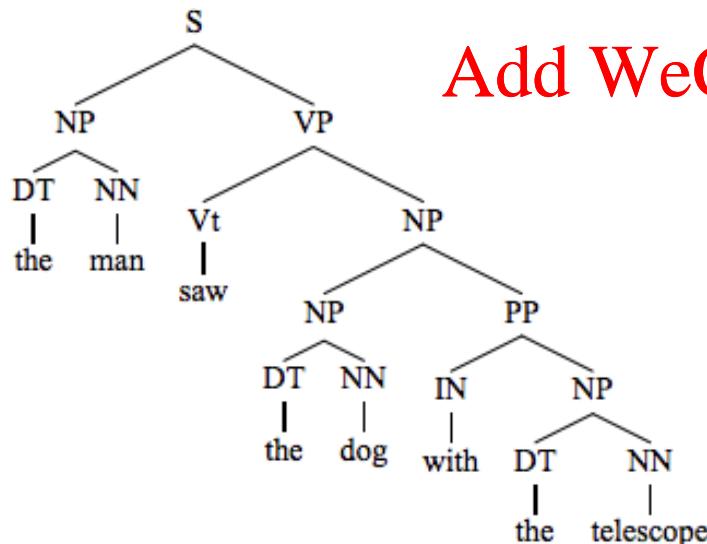
- Variable lengths of sentences.

Dog bites man.

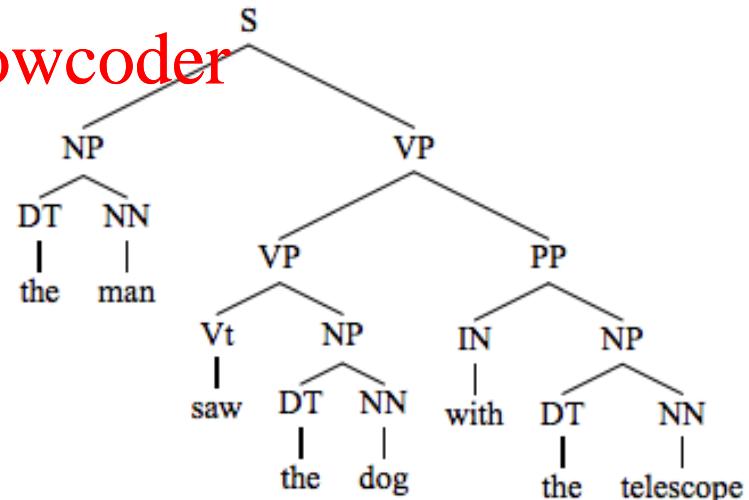
The man saw the dog with the telescope.

Assignment Project Exam Help

- Variable syntactic structures.
<https://powcoder.com>

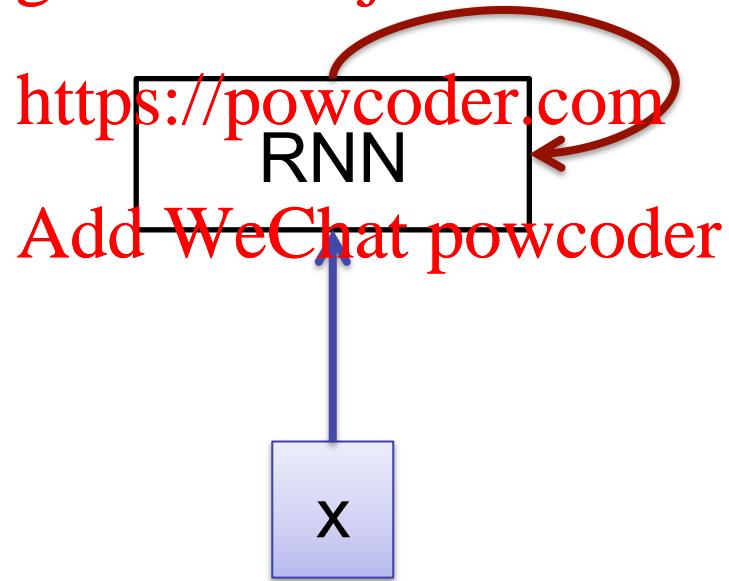


Add WeChat powcoder

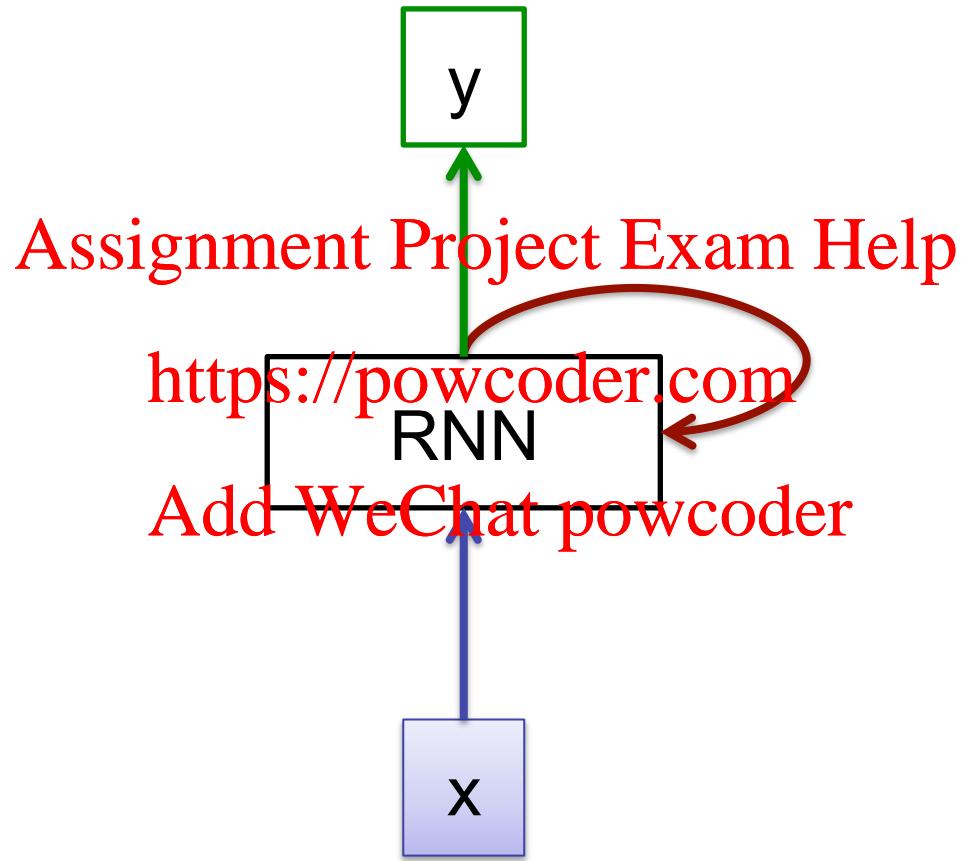


Recurrent Neural Networks

Assignment Project Exam Help



Recurrent Neural Networks



Recurrent Neural Networks

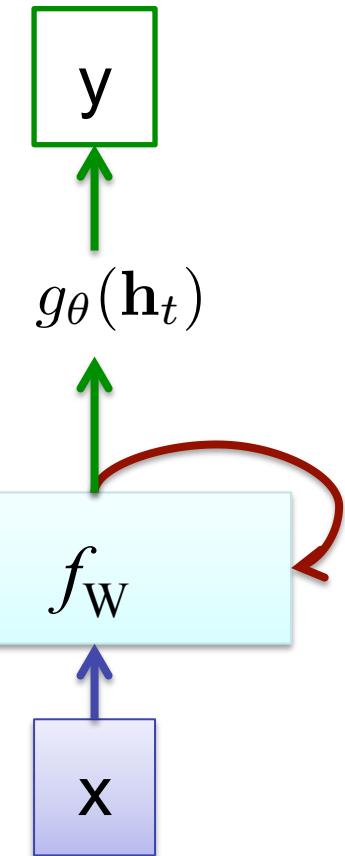
$$\mathbf{h}_t = f_{\mathbf{W}}(\mathbf{h}_{t-1}, \mathbf{x}_t)$$

new state Assignment Project Exam Help

<https://powcoder.com>

$$\mathbf{y}_t = g_{\theta}(\mathbf{h}_t)$$

label at time t



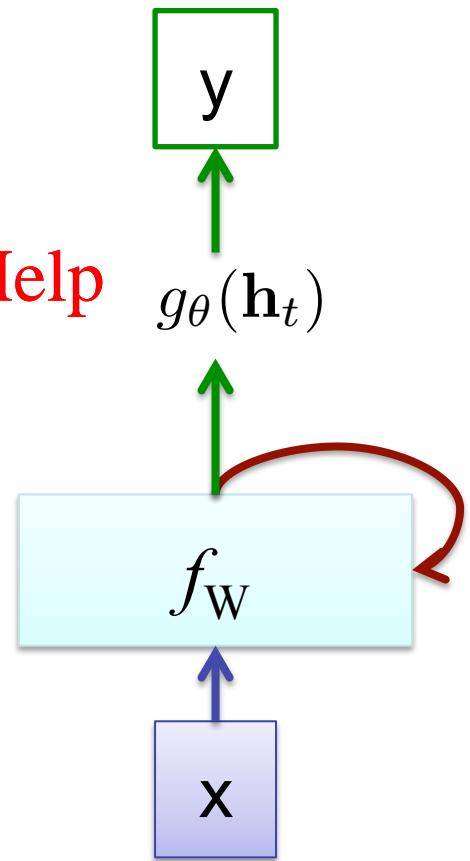
Vallina RNN for Word Prediction

$$\mathbf{h}_t = \tanh(\mathbf{W}_h \mathbf{h}_{t-1} + \mathbf{W}_x \mathbf{x}_t)$$

Assignment Project Exam Help

<https://powcoder.com>

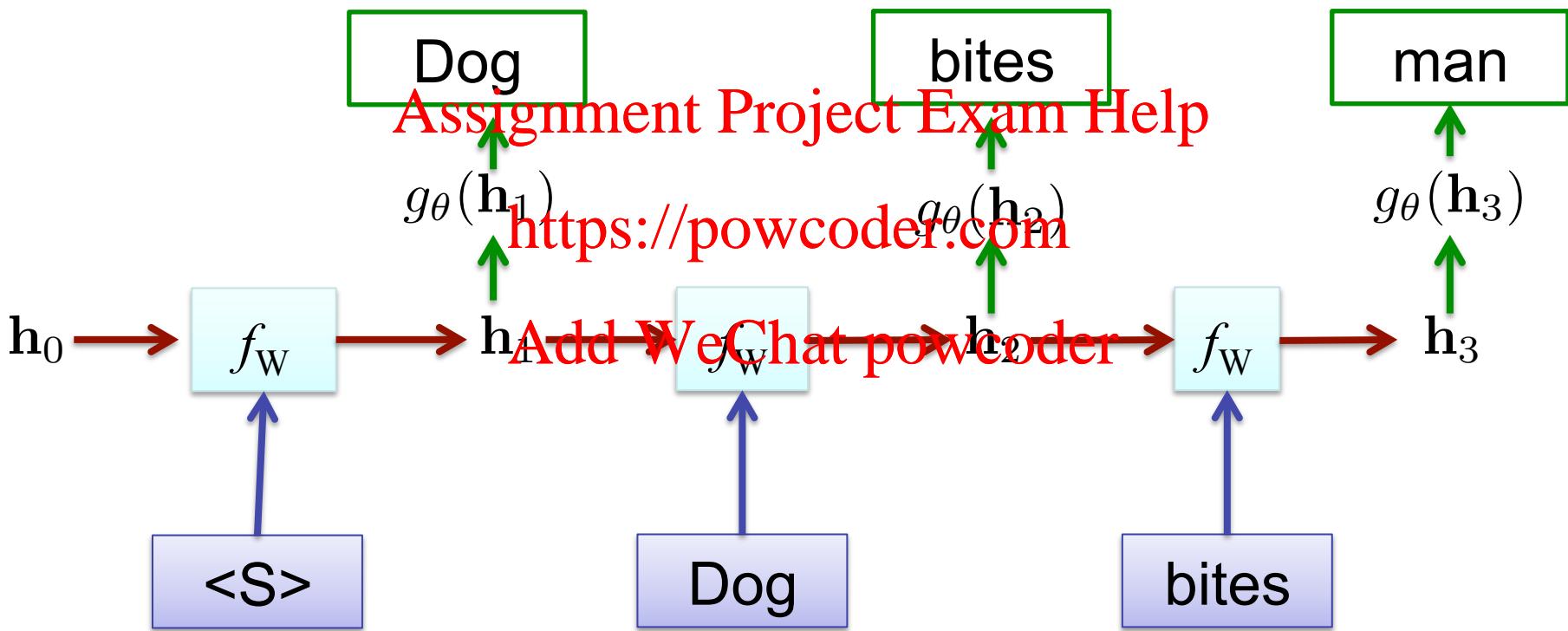
$$p(Y = y' | \mathbf{x}_{<t}) = \frac{\exp(\mathbf{w}_{y'}^T \mathbf{h}_t)}{\sum_{v \in \mathcal{V}} \exp_v(\mathbf{w}_v^T \mathbf{h}_t)}$$



Vallina RNN for Word Prediction

$$\mathbf{h}_t = \tanh(\mathbf{W}_h \mathbf{h}_{t-1} + \mathbf{W}_x \mathbf{x}_t)$$

$$p(Y = y' | \mathbf{x}_{<t}) = \frac{\exp(\mathbf{w}_{y'}^T \mathbf{h}_t)}{\sum_{v \in \mathcal{V}} \exp_v(\mathbf{w}_v^T \mathbf{h}_t)}$$



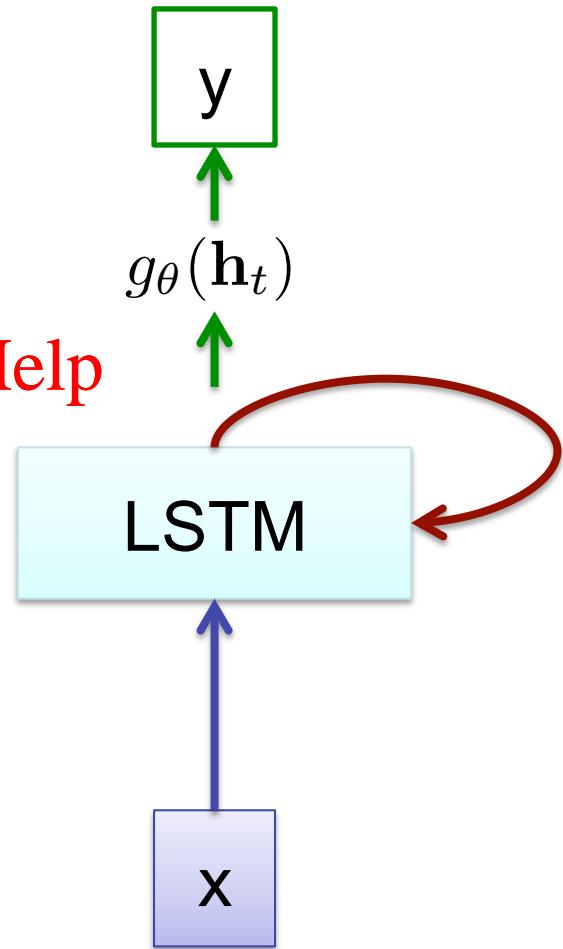
Long Short Term Memory and GRU [1,2,5]

$$\mathbf{h}_t = \text{LSTM}(\mathbf{h}_{t-1}, \mathbf{x}_t)$$

Assignment Project Exam Help

$$p(Y = y' | \mathbf{x}_{<t}) = \frac{\exp(\mathbf{w}_{y'}^T \mathbf{h}_t)}{\sum_{v \in \mathcal{V}} \exp_v(\mathbf{w}_v^T \mathbf{h}_t)}$$

<https://powcoder.com>
Add WeChat powcoder



Recursive Neural Networks [3,4]

$$\mathbf{h}_p = f_{\mathbf{W}}(\mathbf{x}_{lc}, \mathbf{x}_{rc})$$

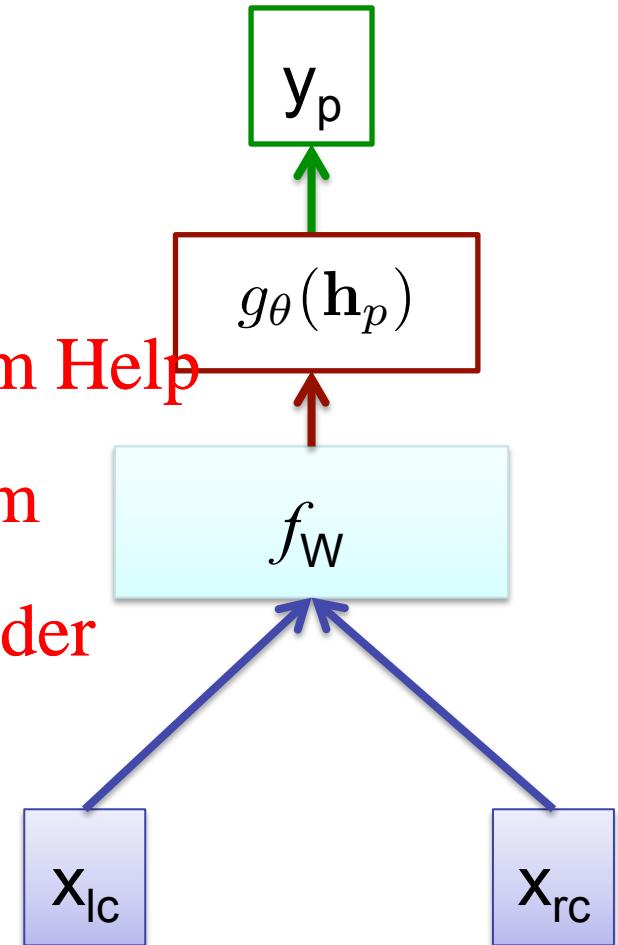
parent

Assignment Project Exam Help

<https://powcoder.com>

$$\mathbf{y}_p = g_{\theta}(\mathbf{h}_p)$$

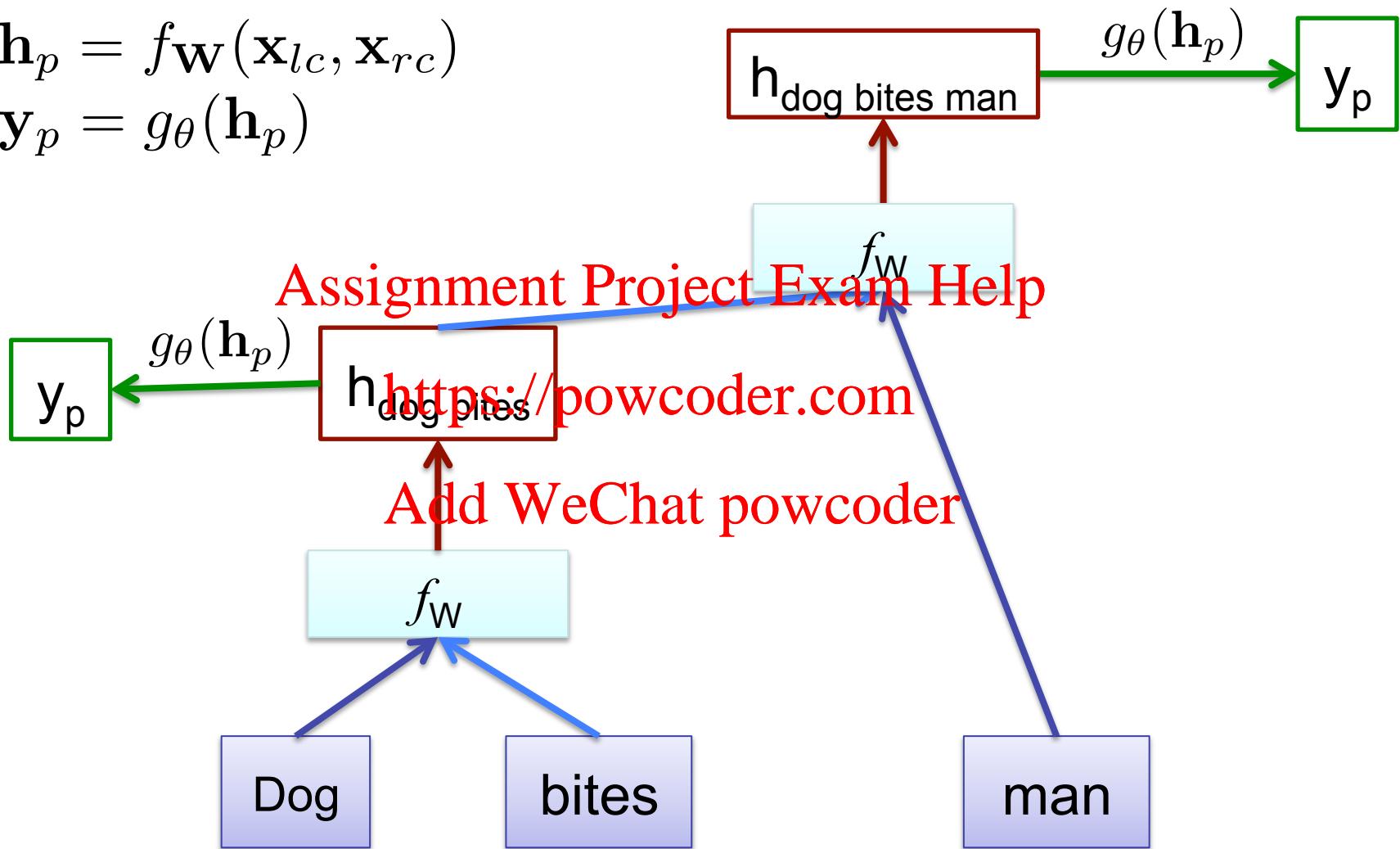
label of parent node



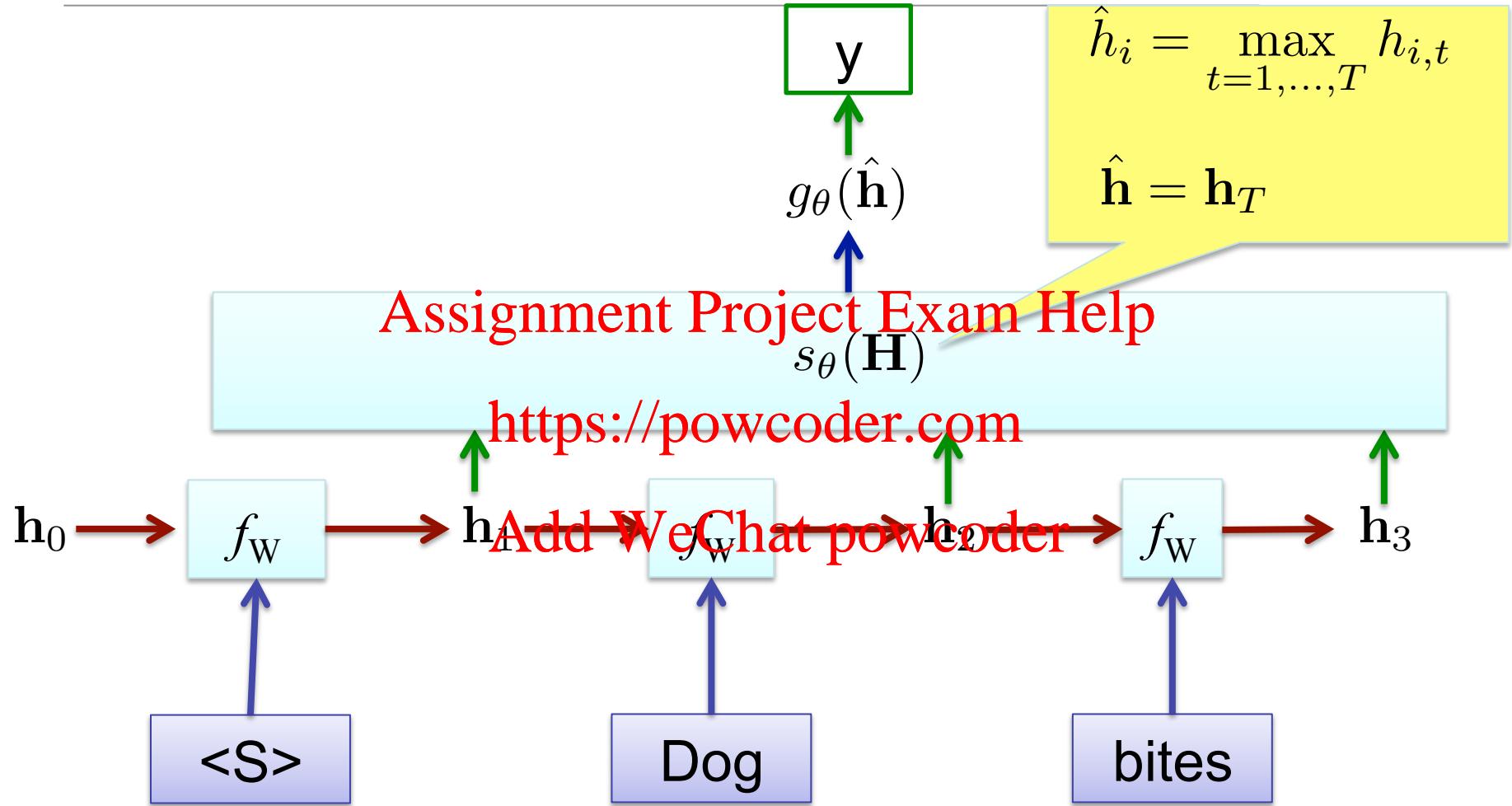
Recursive Neural Networks [3,4]

$$\mathbf{h}_p = f_{\mathbf{W}}(\mathbf{x}_{lc}, \mathbf{x}_{rc})$$

$$\mathbf{y}_p = g_{\theta}(\mathbf{h}_p)$$



Sequence Classification



REFERENCES

- [1] Sepp Hochreiter and Juergen Schmidhuber. Long short-term memory. In Neural computation, 1997.
- [2] <https://www.tensorflow.org/tutorials/recurrent> .
- [3] Kai Sheng Tai, Richard Socher, and Christopher D. Manning. Improved Semantic Representations from Tree-Structured Long Short-Term Memory Networks. In ACL, 2015.
- [4] Irsoy, Ozan and Claire Cardie. Deep recursive neural networks for compositionality in language. In NIPS, 2014.
- [5] Chung, Junyoung, Caglar Gulcehre, KyungHyun Cho, and Yoshua Bengio. "Empirical evaluation of gated recurrent neural networks on sequence modeling." In NIPS Deep Learning and Representation Learning Workshop, 2014.
- [6] <https://github.com/aymericdamien/TensorFlow-Examples>.
- [7] <http://web.stanford.edu/class/cs20si/syllabus.html>.

Learning Resources

- NLP conferences.
 - ACL, EMNLP, COLING, NAACL, EACL ...
- NLP online courses.
 - [Assignment Project Exam Help](http://web.stanford.edu/class/cs224n/)
 - [https://powcoder.com](http://www.cs.columbia.edu/~d4705)
- ML online courses.
 - [Add WeChat powcoder](https://www.coursera.org/course/ml)
 - [https://www.youtube.com/watch?v=SGZ6BttHMPw&list=PL6Xpj9I5qXYEcOhn7TqghAJ6NAPrNmUBH](https://www.cs.ox.ac.uk/people/nando.defreitas/machinelearning/)