



The Effect of Partial Semantic Feature Match in Forward Prediction and Backward Retrieval



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Introduction

When processing long distance dependencies, do prediction and retrieval processes lead to different effects of accuracy and interference?

- Retrieval -- interference in long distance retrieval due to the decay of the representations that need to be retrieved [1]
- Prediction -- sharpened expectations facilitate parsing
 - anti-locality effect [2,3]
 - standard N400 effect [4,5]

It is not clear whether prediction simply facilitates parsing of the expected target, or is subject to interference as well (when confronted with overlapping but not fully anticipated semantic features):

- Highly constrained contextual expectation facilitates only the fully expected target, but loosely constrained expectation facilitates both the expected target and semantically related targets [6]
- semantically related targets are facilitated by contextual expectations, regardless of how constrained the expectations are [7]

Chinese Classifier...N Dependency

- Mandarin Chinese classifiers must be used with nouns in the presence of numerals and demonstratives. Different nouns could be paired with different classifiers.

yi ke shu one CL _{tree} tree	yi ge ren one CL _{person} person	yi ju hua one CL _{sentence} sentence
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• The presence of a classifier obligatorily requires a N, but not vice versa
 na ke shu kaihua le
 that CL_{tree} tree bloom perf.
 That tree bloomed.

shu kaihua le
 tree bloom perf.
 The tree bloomed.

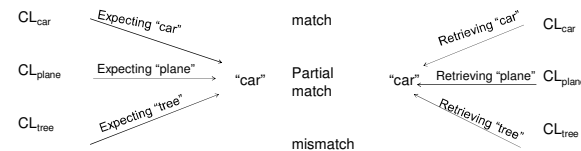
- Processing the canonical CL...N word order involves **forward expectation** originated at the classifier:

Zhangsan ba na-liang-ke henpiaoliangde shu zhongzaile houyuan
 Zhangsan ba that-two-CL_{tree} very beautiful tree planted backyard
 "Zhangsan planted those two trees in the backyard."

- Processing the N...CL word order involves **backward retrieval** originated at the classifier:

Zhangsan zhong de shu li zuipiaoliangde na-liang-ke shi taoshu
 Zhangsan plant LINKER tree most beautiful that-two-CL_{tree} be peach-tree.
 "Among the trees Zhangsan planted, the most beautiful two are peach trees."

- The expectation and retrieval processes share an identical set of features. The current study manipulated the feature match (semantic distance) between the CL and the predicted/retrieved N:



Norming

In a cloze task, native Mandarin speakers (n=25) gave their preferred nouns to a list of 55 commonly used classifiers. 26 highly constrained classifiers were chosen for the current study (21/25 on average for their cloze probability).

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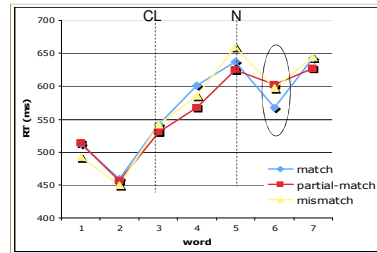
Experiment 1: forward prediction

Material (n=18)

na-san-jia
that-three-CL_{plane}
Fuwong ba na-san-liang ju-da-de sirenfeiji quan dou maixialai le.
Millionaire ba that-three-CL_{car} huge private jet all bought
na-san-li
that-three-CL_{rice}

"The millionaire bought all three huge private jets."

富翁把那三架 / 辆 / 粒巨大的私人飞机全都买下来了。



- At the spill-over region, the N...CL showed interference from partial semantic feature match (close semantic distance); the CL...N order showed no such effect
- However the two expts. did not use the same set of classifiers, and the intervening material between CL and N was different in the two expts.

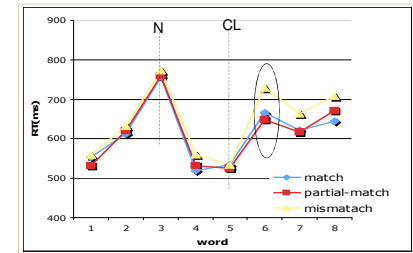
Experiment 2: backward retrieval

Material (n=18)

san-jia
three-CL_{plane}
Jichangshang tingkaode sirenfeiji li you san-sou huangse de feichang yingrenzhumu
airport-ground parked private jet there three-CL_{boat} yellow very draw-attention
san-dong
three-CL_{building}

"Among the private jets parked on the ground, there are three yellow ones that drew lots of attention"

机场上停靠的私人飞机里有三架 / 艘 / 栋黄色的非常引人注目。



Experiment 3: controlling the intervening material

Material (n=19)

na-yi-liang
that-one-CL_{car}
Laozhang ba na-yi-jia hen-kuan-chang-de qiche songgei le LaoWang
Mr.Zhang ba that-one-CL_{plane} very-big car give Mr. Wang
na-yi-suo
that-one-CL_{school}

"Mr.Zhang gave the big car to Mr.Wang."

老张把那一辆 / 架 / 所很宽敞的汽车送给了老王。

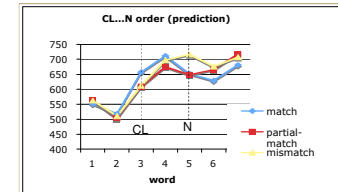
na-yi-liang	5.59	4.8
that-one-CL _{car}		
na-yi-jia	4.69	1.7
that-one-CL _{plane}		
na-yi-suo	4.00	1.4
that-one-CL _{school}		
na-yi-jia	5.59	4.8
that-one-CL _{car}		
na-yi-jia	4.04	1.7
that-one-CL _{plane}		
na-yi-suo	4.02	1.4
that-one-CL _{school}		

"The biggest car Mr.Zhang has driven can seat10 people."

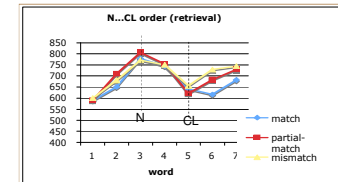
老张开过的汽车里最宽敞的那一辆 / 架 / 所以可以做十个人。

1-7 Rating of the sentences (n=24)	1-5 Rating of the CL...N pair (n=15)
6.43	4.8
4.69	1.7
4.00	1.4
5.59	4.8
4.04	1.7
4.02	1.4

RT(n=51)



Interference at the critical word (N), and a numerical trend (n.s.) at the spill-over showing no interference effect



No effect at the critical word (CL), and interference at the second spill-over

Discussion

- **The effect of close semantic distance:** both prediction and retrieval processes are affected by close semantic distance, even when the set of predictive/retrieval features is highly constrained.
- **Difference between prediction and retrieval processes:** The effects of grammaticality and interference appeared online immediately when there is an expectation at the critical word; when there is only retrieval without prediction, the same effect was delayed. This suggests prediction and retrieval may play different roles in the dynamics of parsing
- Future work will determine whether prediction process can lead to faster recovery from the interference.

References

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