A Global Generative Model for Chinese Semantic Role Labeling

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Outline

- Introduction
- Motivation
- Formulation
- Experiment

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Introduction

- SRL is a shallow semantic representation, specifying **WHO** did **WHAT** to **WHOM**, **WHEN**, **WHERE**, **WHY**, **HOW** for a predicate in a sentence.

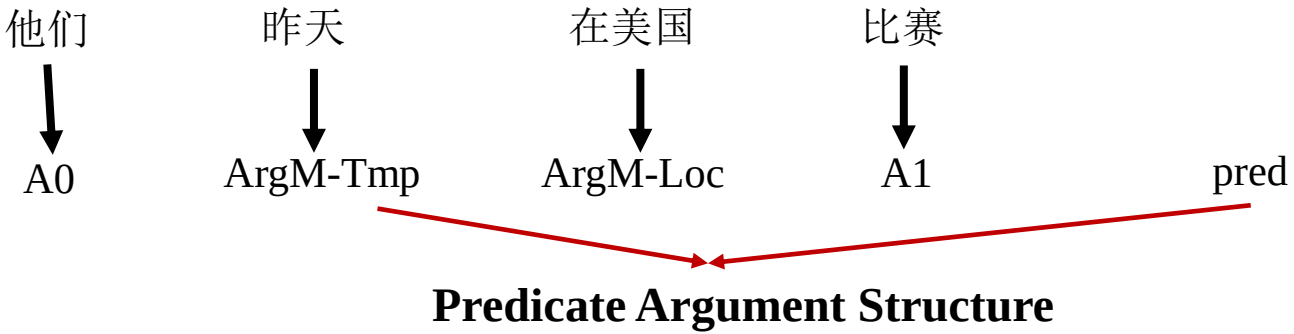
- For example

Introduction

A conventional system for srl

[他们]A0 [昨天]Argm-Tmp [在美国]Argm-Loc [举行]pred 了 [比赛]A1

1. Argument Identification
   [他们]、[昨天]、[在美国]、[比赛]
2. Argument Classification



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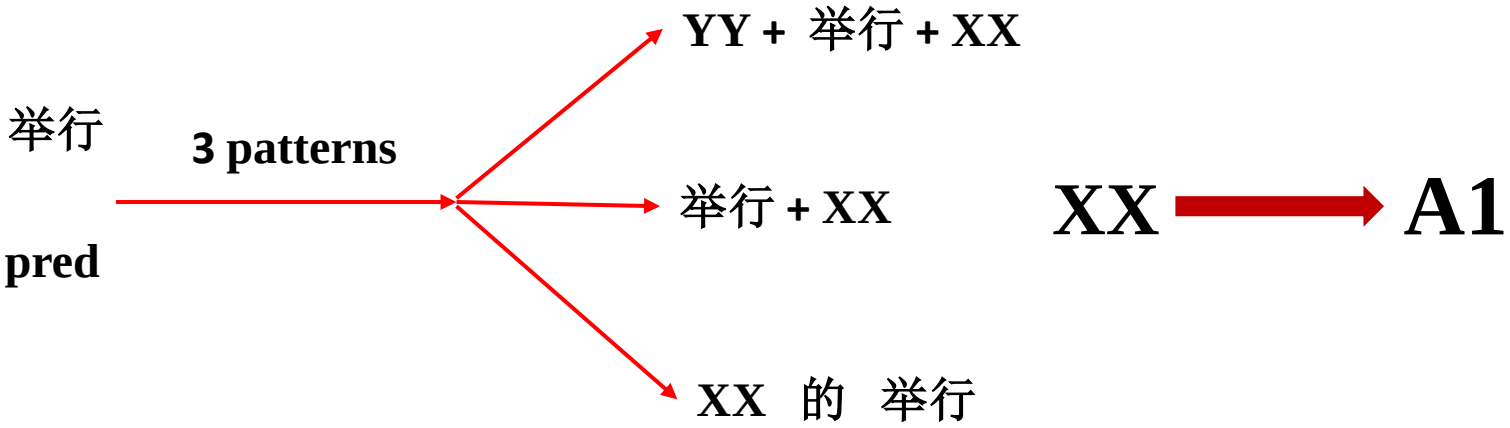
Motivation



A0 + 举行? like 我们 举行 ✖

Motivation

More examples

- 百分之九十五 的产品[A1] **销往** 海外**[A2]**
- 经营成本[A0] **降到** 最低**[A2]**
- 国际油价**[A0]** **暴跌**
- 1994年[ArgM-Tmp] 墨西哥金融危机**[A0]** **爆发**

Motivation

Some thoughts

- Predicates are dominate in predicate-argument-structure.
- A predicate accompanies some specific arguments.
- Predicate-argument-structure is a whole.

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Formulation

- Definition

Predicate-Arguments-Coalition (PAC) is a triple like below,

$$PAC \triangleq \langle Pred, (ArgX : n), (ArgM : n) \rangle$$

[他们]A0 [昨天]Argm-Tmp [在美国]Argm-Loc [举行]pred 了 [比赛]A1

$\langle$ 举行; (A0 : 1, A1: 1); (ArgM−Tmp: 1, ArgM−Loc:1) $\rangle$

Formulation

- Free arguments vs core arguments
  - Free arguments

    thought independent from the predicate

    ArgM-X：ArgM-Tmp ArgM-Loc…
  - Core arguments

    thought strongly dependent on the predicate

    A0-A4

Formulation

- Generative story:

1. Given the predicate, generate a candidate PAC

2. For a candidate PAC, one solution is obtained by assigning every label of the core-multiset and free-multiset of PAC to candidate arguments

3. Repeat (1) and (2), return the optimal solution

$$structure^{*}$$

$$= \arg\max P(structure \mid Cand, pred)$$

$$= \arg\max P(PAC \mid pred) P(structure \mid PAC, Cand)$$

$$= \arg\max P(PAC_{core}, PAC_{free} \mid pred) P(structure \mid PAC_{core}, PAC_{free}, Cand)$$

$$= \arg\max P(PAC_{core} \mid pred) P(Corestruct \mid PAC_{core}, Cand_{core})$$

$$P(Freestruct \mid Cand_{free})$$

$$= \arg\max P(PAC_{core} \mid n, pred) P(Corestruct \mid PAC_{core}, Cand_{core})$$

$$P(Freestruct \mid Cand_{free})$$

$$structure^{*} == \arg\max \lambda * \log P(PAC_{core} \mid n, pred) + \log P(Corestruct \mid PAC_{core}, Cand_{core})$$

$$+ \log P(Freestruct \mid Cand_{free})$$

Formulation

The insights of $P(PAC_{core} \mid n, pred)$ - Global Information

- 百分之九十五 的产品[A1] **销往** 海外[**A2**]

$$P(\mathrm{A}2, \mathrm{A}^* \mid 2, \text{销往}) > P(\mathrm{A}0\,\mathrm{A}1 \mid 2, \text{销往})$$

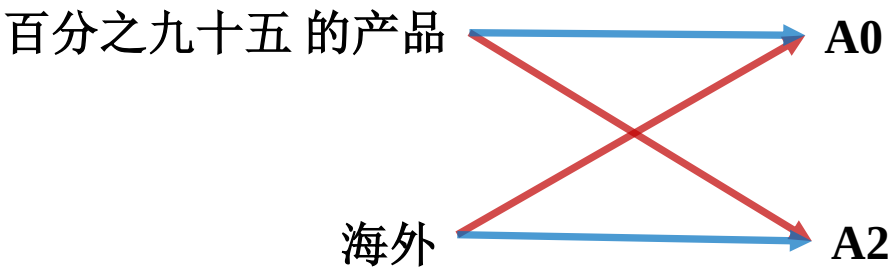
- 经营成本[A0] **降到** 最低[**A2**]

$$P(\mathrm{A}2, \mathrm{A}^* \mid 2, \text{降到}) > P(\mathrm{A}0\,\mathrm{A}1 \mid 2, \text{降到})$$

Formulation

The insights of $P(Corestruct \mid PAC_{core}, Cand_{core})$ - Local Information

- Given a PAC (A0, A2)



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Experiments

- Experiment setup
  - **Data**

    Chinese Propbank 1.0 and the same data division as in Xue (2008)
  - **Parser**

    Berkeley Parser
  - **Features**

    The same features as in Xue (2008)

Experiments

- Main Results

	F1
Baseline	74.04
ours	75.01

	False	Right	Miss	Error
Baseline	1159	5897	2208	377
Ours	1159	5932	2208	322

15%

Thanks!