

## Challenges

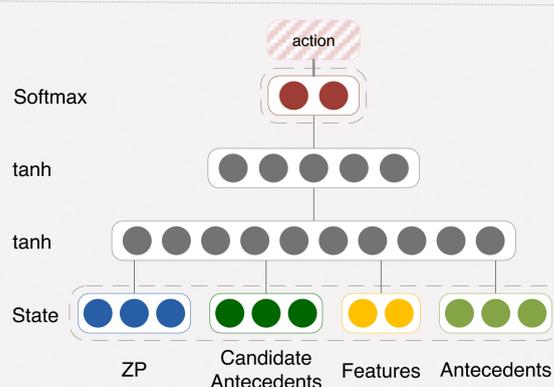
- Traditional models are short-sighted
  - local decisions
- Overlooking coreference impacts on future decisions.

## Solutions

- Model the long-term influence of the single coreference decision in a sequential manner.
- Encoding antecedent information
- Link the zero pronoun to its potential antecedents incrementally

- Deep Reinforcement Learning
  - Policy Gradient

- State
  - Zero pronoun
  - Candidate
  - Antecedent information
- Action
  - coreference
  - non-coreference
- Reward
  - F-score of the sequence



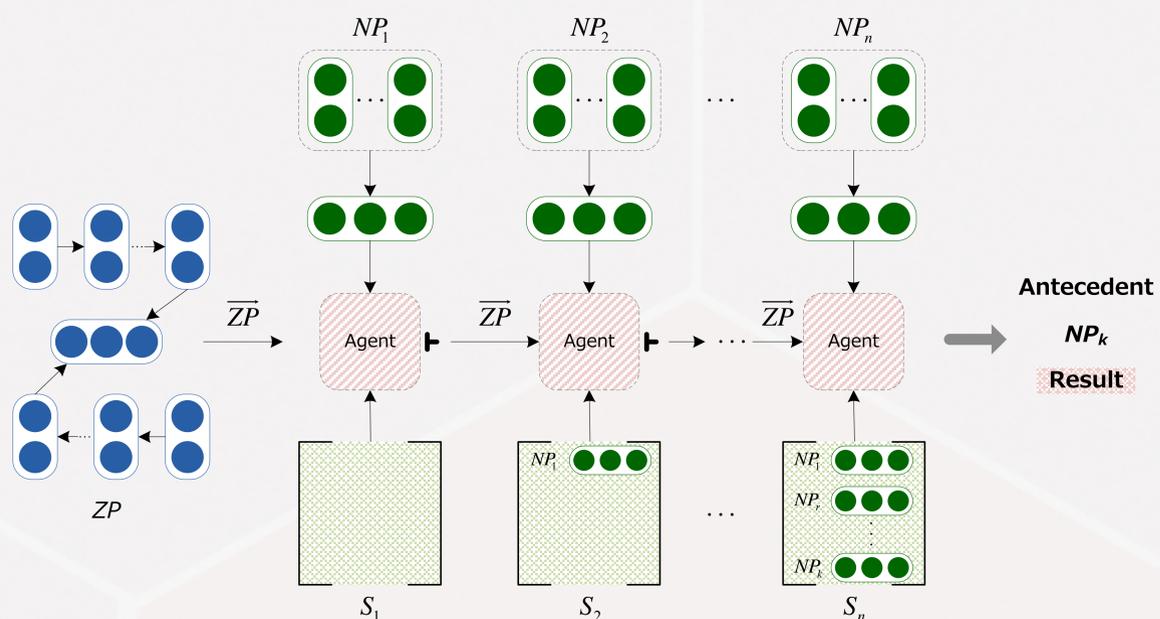
- Agent
  - Input – state vector
  - Output – action

$$J(\theta) = \mathbb{E}_{\mathbf{a}_{1:T} \sim p(\mathbf{a} | \mathbf{z}_p, \mathbf{np}, \theta)} R(\mathbf{a}_{1:T})$$

## Zero Pronoun (ZP) Resolution



## Reinforcement Learning for ZP Resolution



## Experimental Data

- OntoNotes Release 5.0 from CoNLL-2012
  - From six sources: Broadcast News (BN), Newswires (NW), Broadcast Conversations (BC), Telephone Conversations (TC), Web Blogs (WB), Magazines (MZ)
  - Gold AZP & Gold Parse

## Performance on Test Data

	NW	MZ	WB	BN	BC	TC	Overall
Zhao and Ng (2007)	40.5	28.4	40.1	43.1	44.7	42.8	41.5
Chen and Ng (2015)	46.4	39.0	51.8	53.8	49.4	52.7	50.2
Chen and Ng (2016)	48.8	41.5	56.3	55.4	50.8	53.1	52.2
Yin et al. (2017b)	50.0	45.0	55.9	53.3	55.3	54.4	53.6
Yin et al. (2017a)	48.8	46.3	59.8	<b>58.4</b>	53.2	54.8	54.9
<b>Our model</b>	<b>63.1</b>	<b>50.2</b>	<b>63.1</b>	56.7	<b>57.5</b>	<b>54.0</b>	<b>57.2</b>