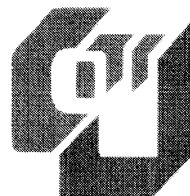


Connectionist Natural Language Processing



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Introduction

Traditional rule-based and probabilistic approaches to Natural Language Processing (NLP) have provided us applications such as translation, summarization, question-answering and information extraction.

Despite the apparent success of those applications, we find such approaches lack scientific inspirations towards the understanding of "cognition". We take Connectionism (also known as: Artificial Neural Network, Parallel Distributed Processing) as an alternative. Recursive Auto-Associative Memory (RAAM) as a kind of recurrent/recursive neural network serves the purpose of forming distributed representation of an input sentence. Our research direction is to push forward Connectionist NLP models by providing improved methodology and/or improved networks.

Connectionism

- Modern foundation:
Parallel Distributed Processing by Rumelhart and McClelland and PDP Research Group
- Research Direction:
As an alternative towards the understanding of *cognition*
- Methodology:
Simulating processes involved in innate cognitive tasks with artificial neural networks modeled from network of biological neurons and associated synaptic connections

Connectionism and NLP

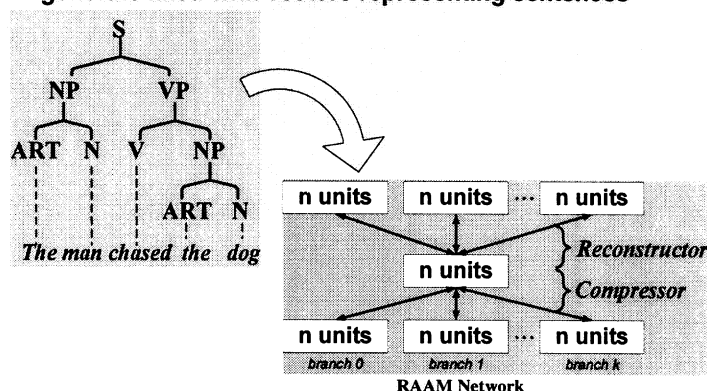
- Linguistics as one of the domain in the interdisciplinary Cognitive Science
- Natural Language Processing as one those "innate tasks"
- Author's personal interest in Connectionism and language

Two Challenges

1. Language is *structured* and with *variable length* whereas neural networks are often static
2. The *compositionality-systematicity* requirement for cognition

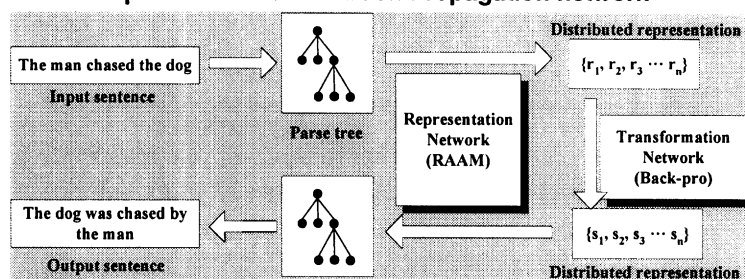
State of the Art

1. *Recursive Auto-Associative Memory (RAAM)* to generate fixed-width vectors representing sentences



2. *Representation-Transformation paradigm*

Transforming the RAAM generated recursive distributed representations with Back-Propagation network



Research Directions

- Possible improvement of simple RAAM
- More in-depth evaluation of the paradigm.
Can more complex sentence structure be represented and processed?
- Genetic Algorithm to improve neural network training
- and more ...

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