

# Hands-On with **Deep Learning** for Question Answering

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ESWC 2018, Heraklion

# Outline

The QA system

Environment Set-up

Programming

Questions



**Who is the father of  
Luke Skywalker?**



*What is the best DESSERT  
in the world?*

**Name  
one ex  
president  
of United States?**



**Where is  
ESWC 2018 held?**



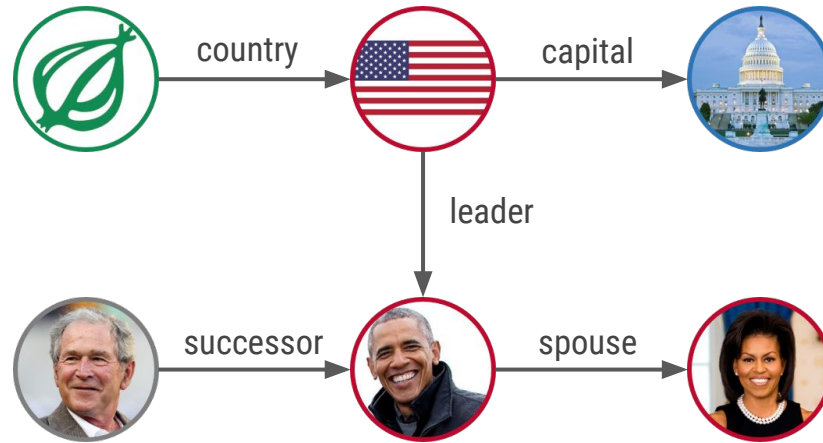
# The System

# Core Chains

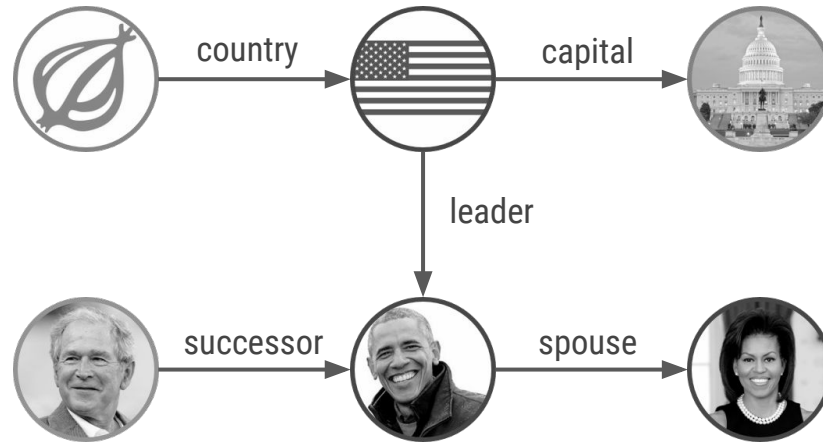
Formal Language, is often used as intermediate language while parsing questions.

Linear chain denoting a path in the Knowledge Graph, leading to the intended answer.

# Core Chains Example



# Core Chains Example



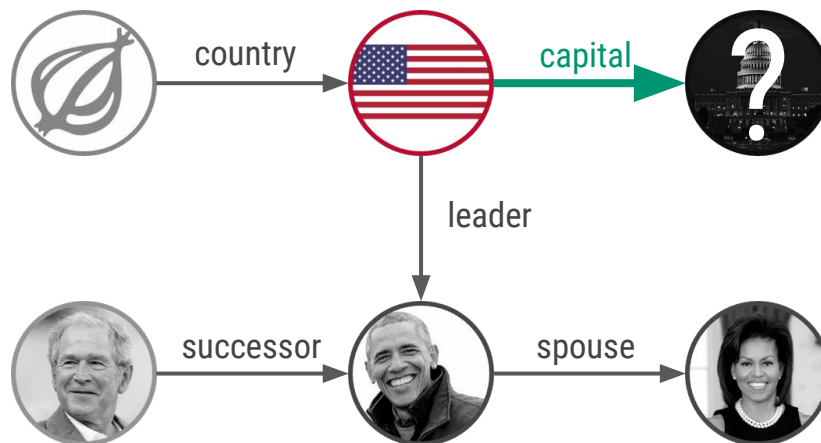
# Core Chains Example

Directions depict

- **incoming**
- **outgoing**

relations in the graph

`dbo:United_States + dbo:capital`



# Core Chains Example

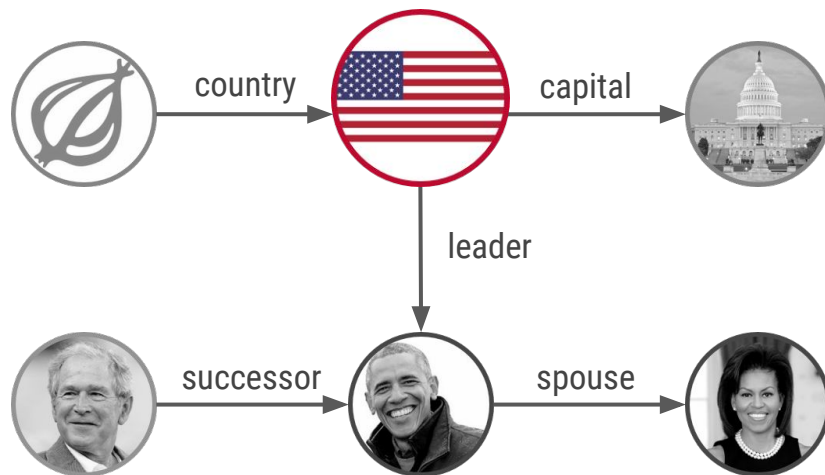
Directions depict

- incoming
- outgoing

relations in the graph

Start from a **topic entity**

`dbo:United_States` – `dbo:country`





# Core Chains Example

Directions depict

- incoming
- outgoing

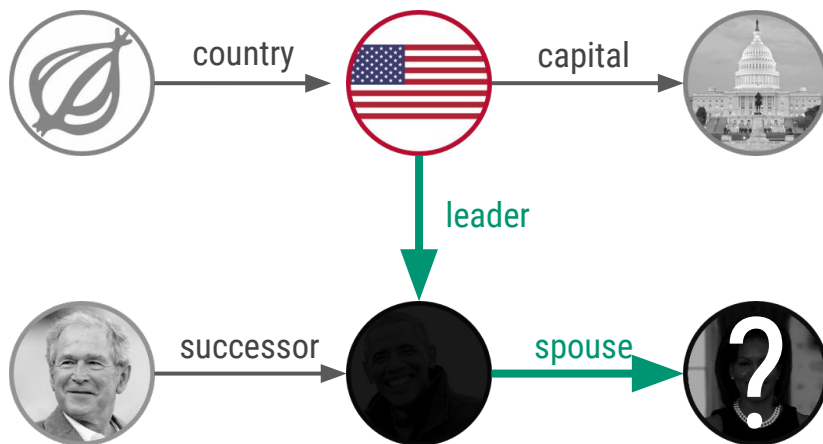
relations in the graph

Start from a topic entity

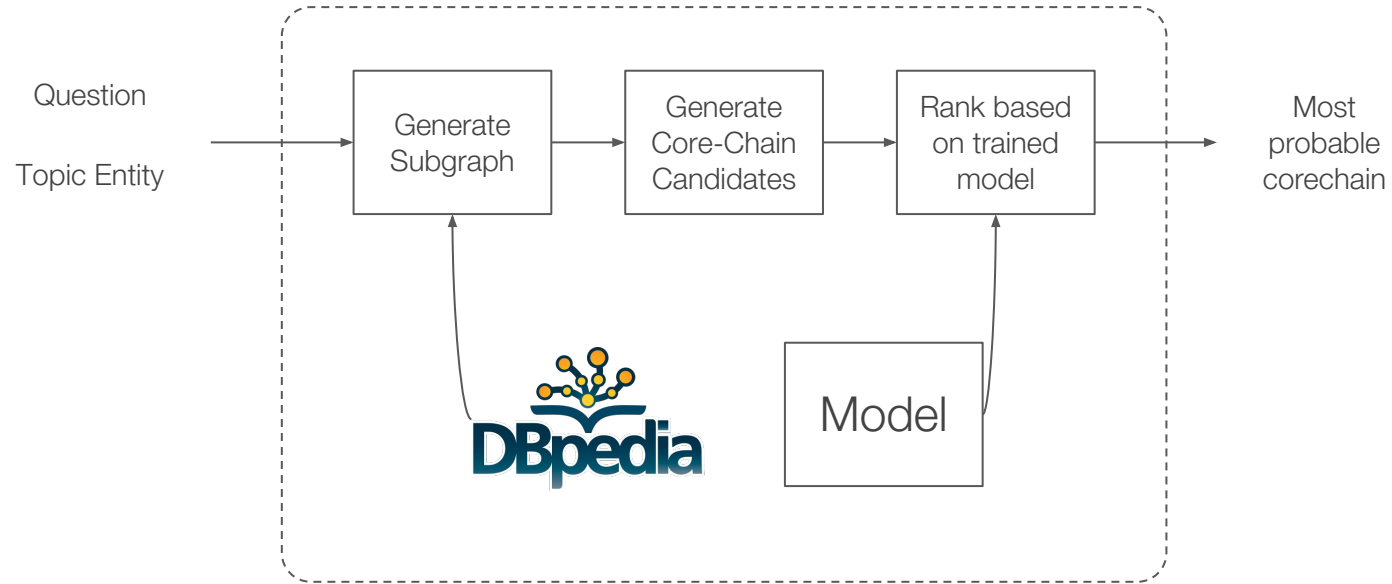
Intermediate entities not mentioned

Have textual resemblance to corresponding question.

`dbo:United_States + dbo:leader + dbo:spouse`



# Architecture



# Architecture

Given: Question, Entity.

Give me a list of everything where Robert Downey Jr Acted?

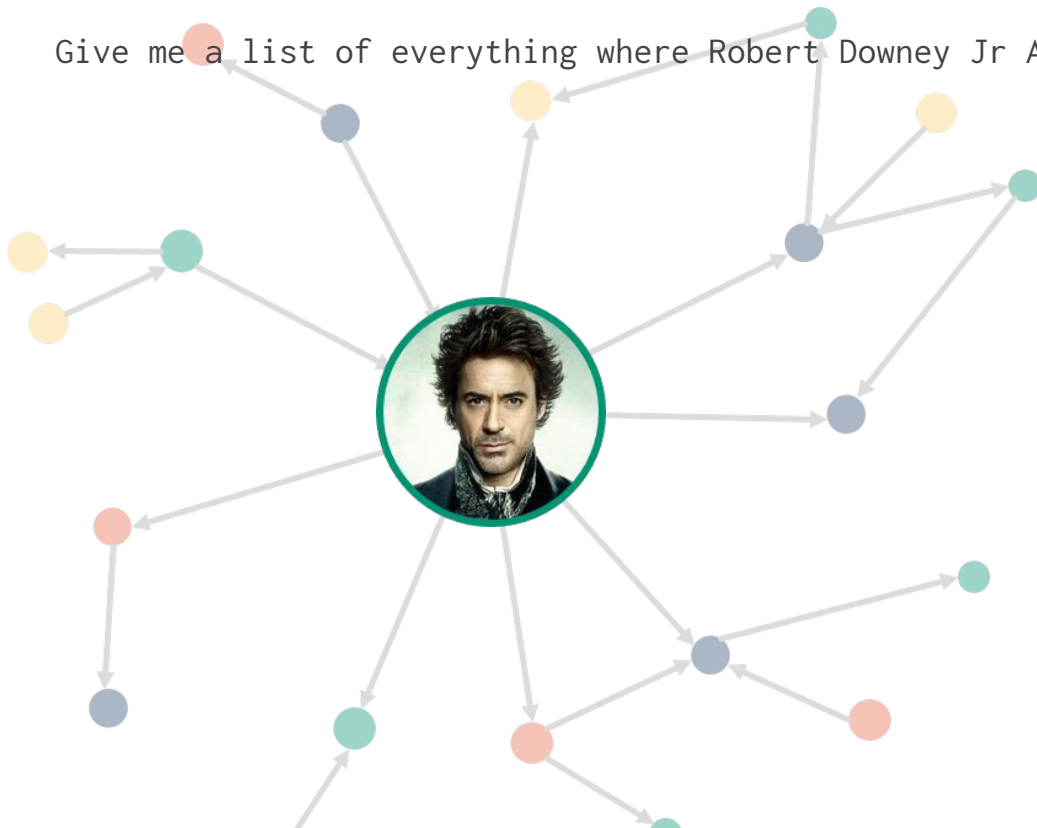


# Architecture

Given: Question, Entity.

Collect 2-hop subgraph around it.

Give me a list of everything where Robert Downey Jr Acted?



# Architecture

Given: Question, Entity.

Collect 2-hop subgraph around it.

Generate core-chain candidates

Give me a list of everything where Robert Downey Jr Acted?

dbo:Robert\_Downey\_Jr + dbo:birthplace

dbo:Robert\_Downey\_Jr + dbo:parent

dbo:Robert\_Downey\_Jr + dbo:spouse - dbo:foundedBy

dbo:Robert\_Downey\_Jr - dbo:starring

dbo:Robert\_Downey\_Jr - dbo:starring + dbo:director

...

# Architecture

Given: Question, Entity.

Give me a list of everything where Robert Downey Jr Acted?

Collect 2-hop subgraph  
around it.

Generate core-chain  
candidates

Rank Candidates

0.10 dbo:Robert\_Downey\_Jr + dbo:birthplace

0.23 dbo:Robert\_Downey\_Jr + dbo:parent

0.04 dbo:Robert\_Downey\_Jr + dbo:spouse - dbo:foundedBy

0.73 dbo:Robert\_Downey\_Jr - dbo:starring

0.41 dbo:Robert\_Downey\_Jr - dbo:starring + dbo:director

...

# Architecture

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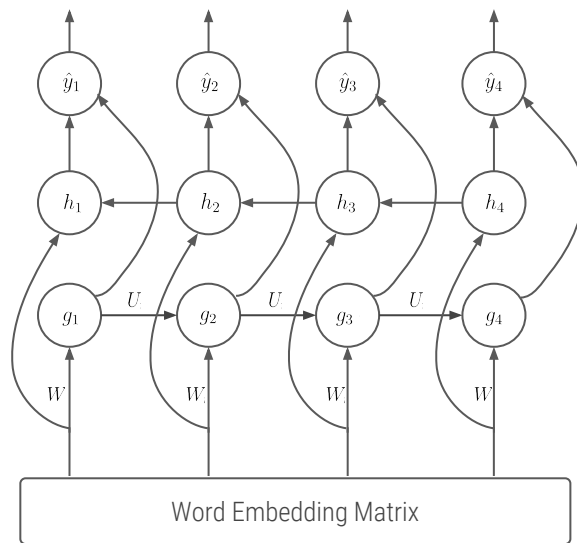
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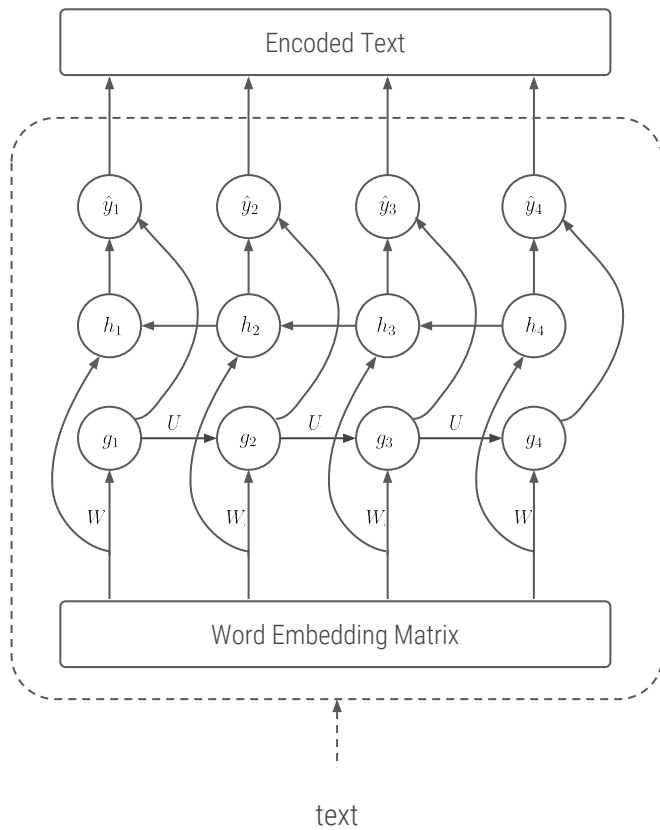
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# Model

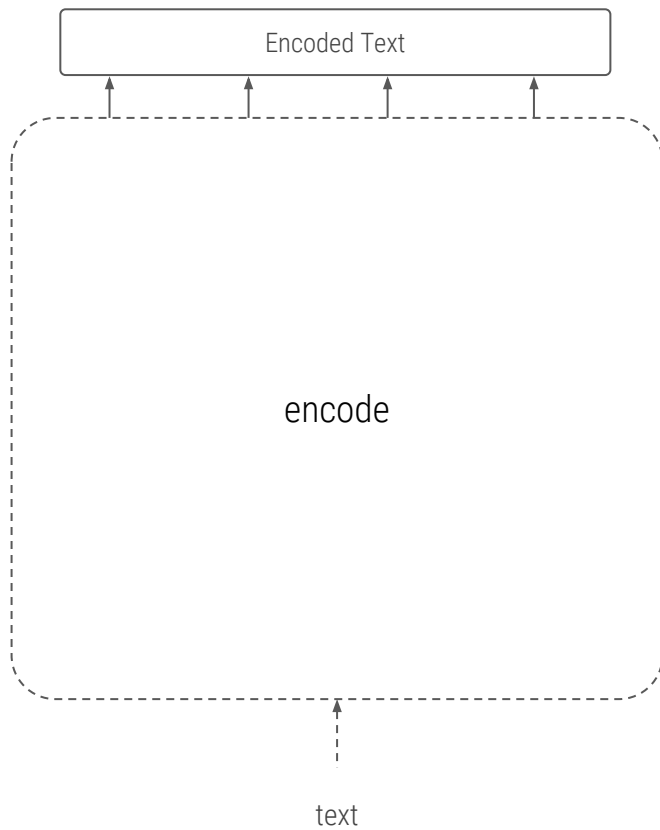




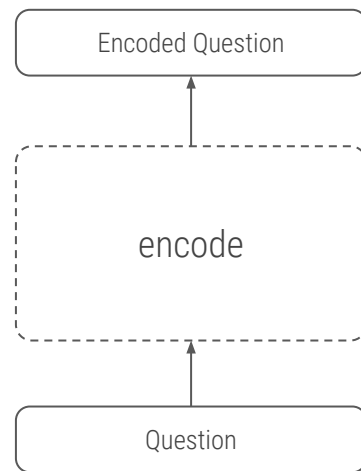
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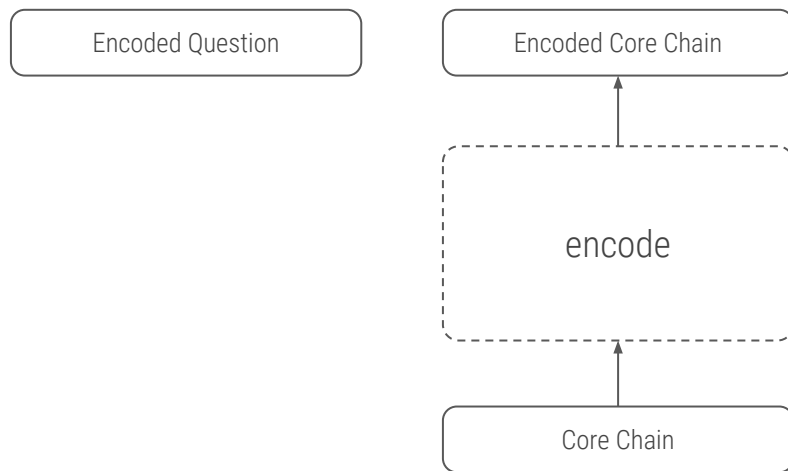
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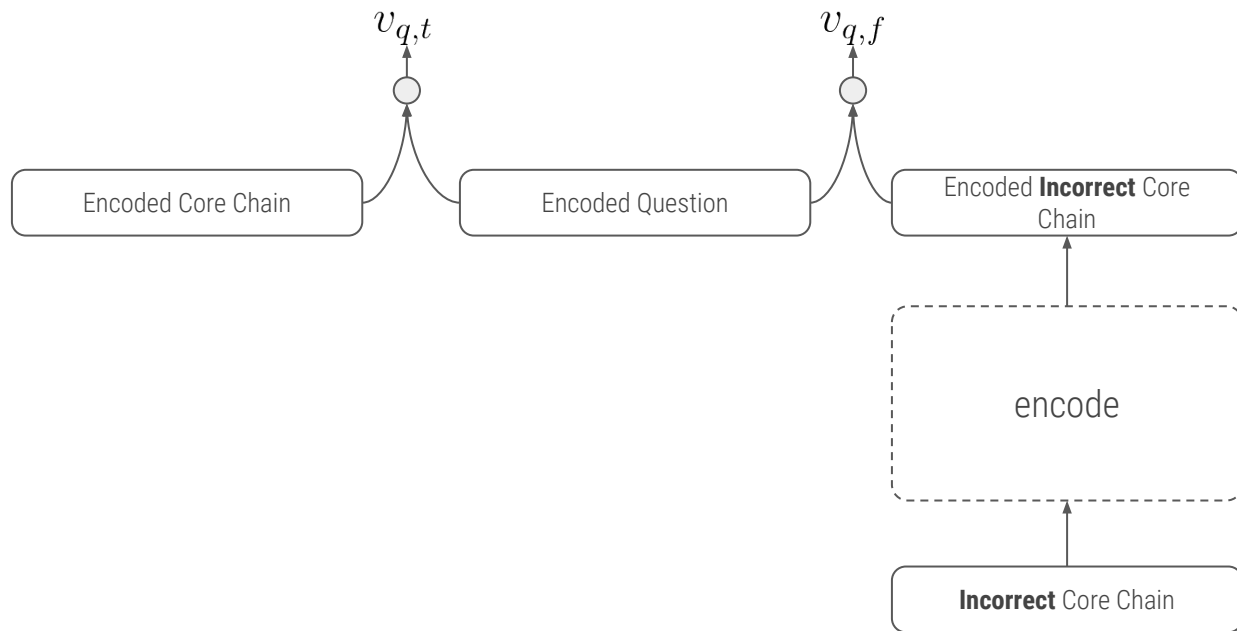
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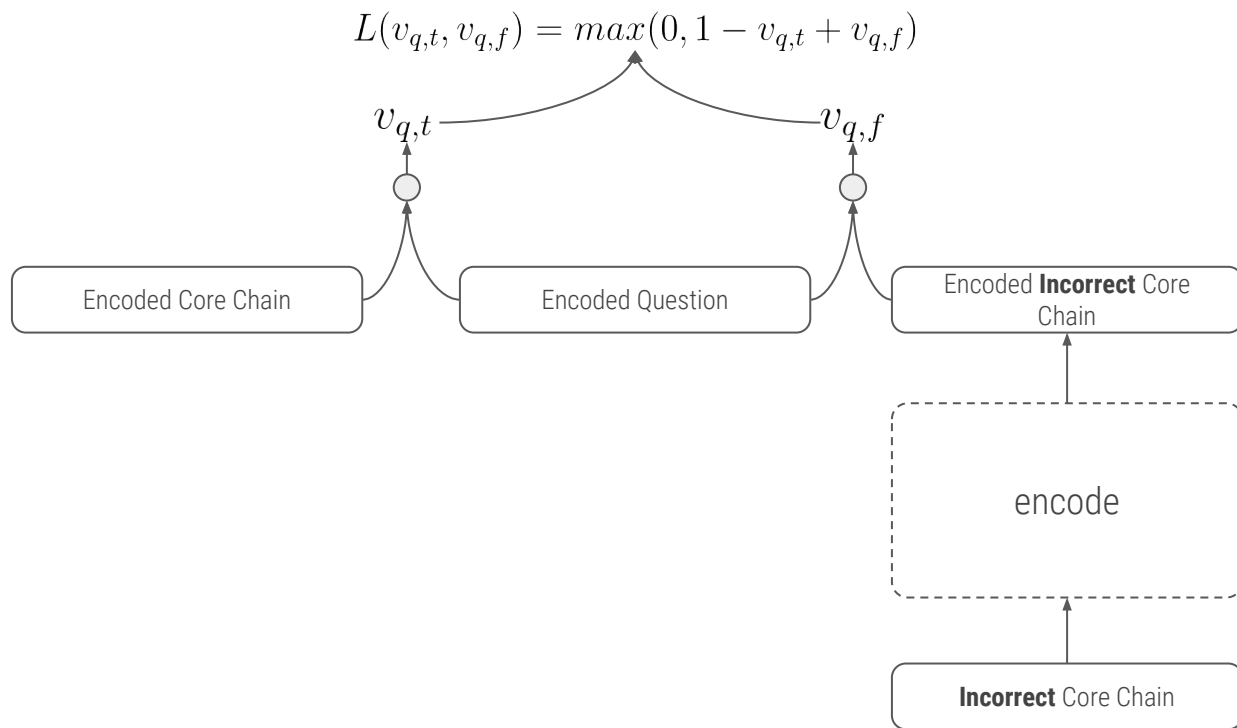
# Model



# Model



# Model



# Experiment

Knowledge Base used: **DBpedia**

Dataset: Subset of LC-QuAD

- Simple Questions only
- 500 Questions

Negative Samples per Question: 100

**BRACE YOURSELF**

**DIMENSION MISMATCH  
ERRORS ARE COMING**

