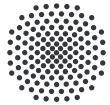

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Germany

Multimodal Feature Fusion via Graph Neural Networks for Visual Dialog

Topic Introduction

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April 27, 2022

Perceptual User Interfaces Group, University of Stuttgart

www.perceptualui.org

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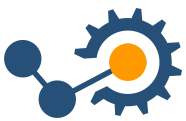
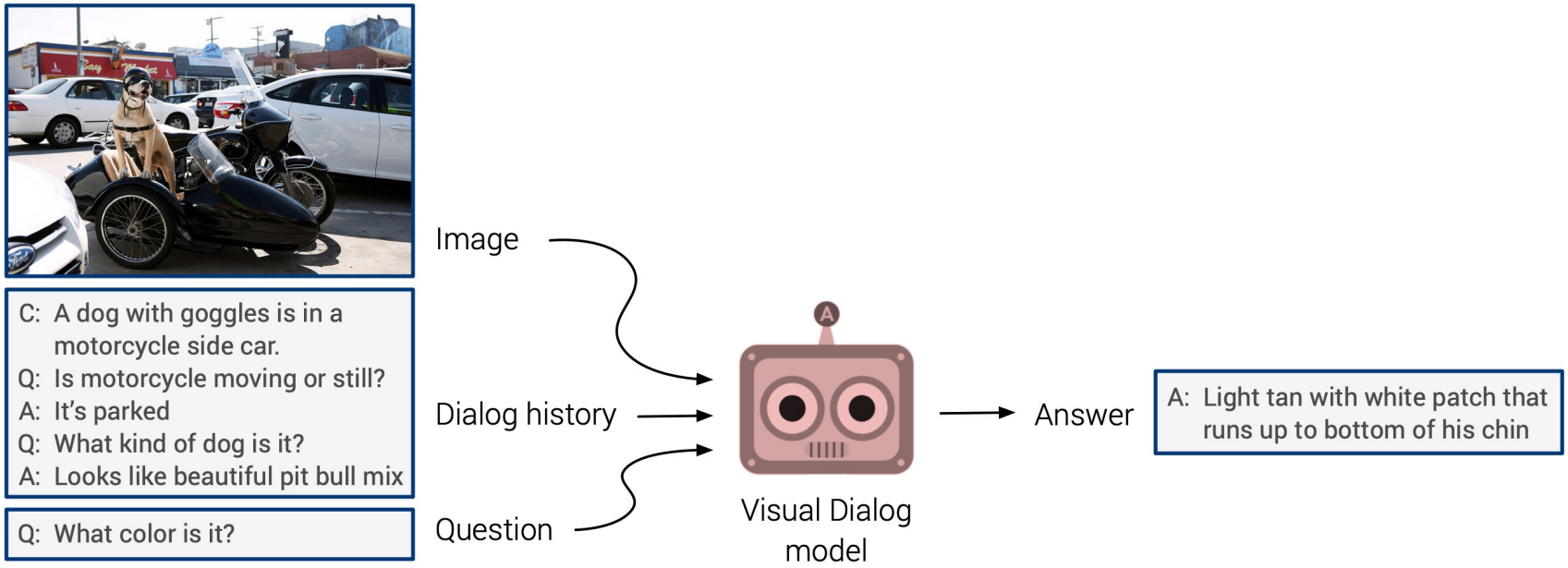


Visual Dialog

Task Introduction

What is Visual Dialog?



Source: Visual Dialog Task Description [Das et al., 2016]

Given an image, a dialog history, and a question, an AI agent has to ground the question in the image and infer from context history to answer questions accurately.

Visual Dialog

Neural Architecture Choices

Why Graph Neural Networks over Deep Neural Networks?

- Deep Neural Networks are good for Euclidean Data (data with an underlying grid-like structure) [Bronstein et al., 2016]
- Complex data having no fixed node ordering or reference point makes it difficult for Deep Learning
- Geometric Deep Learning (Like Graphs) redefine isolated data-points as networks and relations between entities
- The edges and the topology portray the relation between these entities

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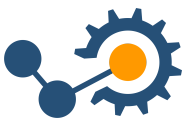
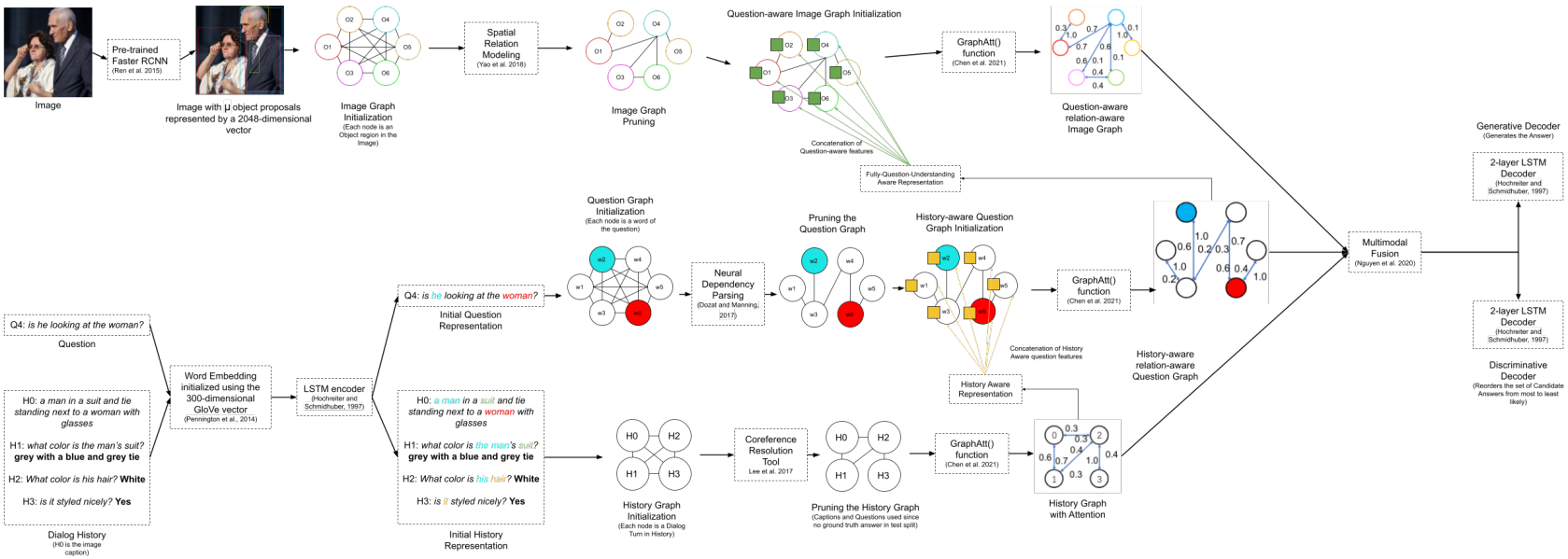


Implementations

GoG: Relation-aware Graph-over-Graph Network [Chen et al., 2021]

Architecture Overview

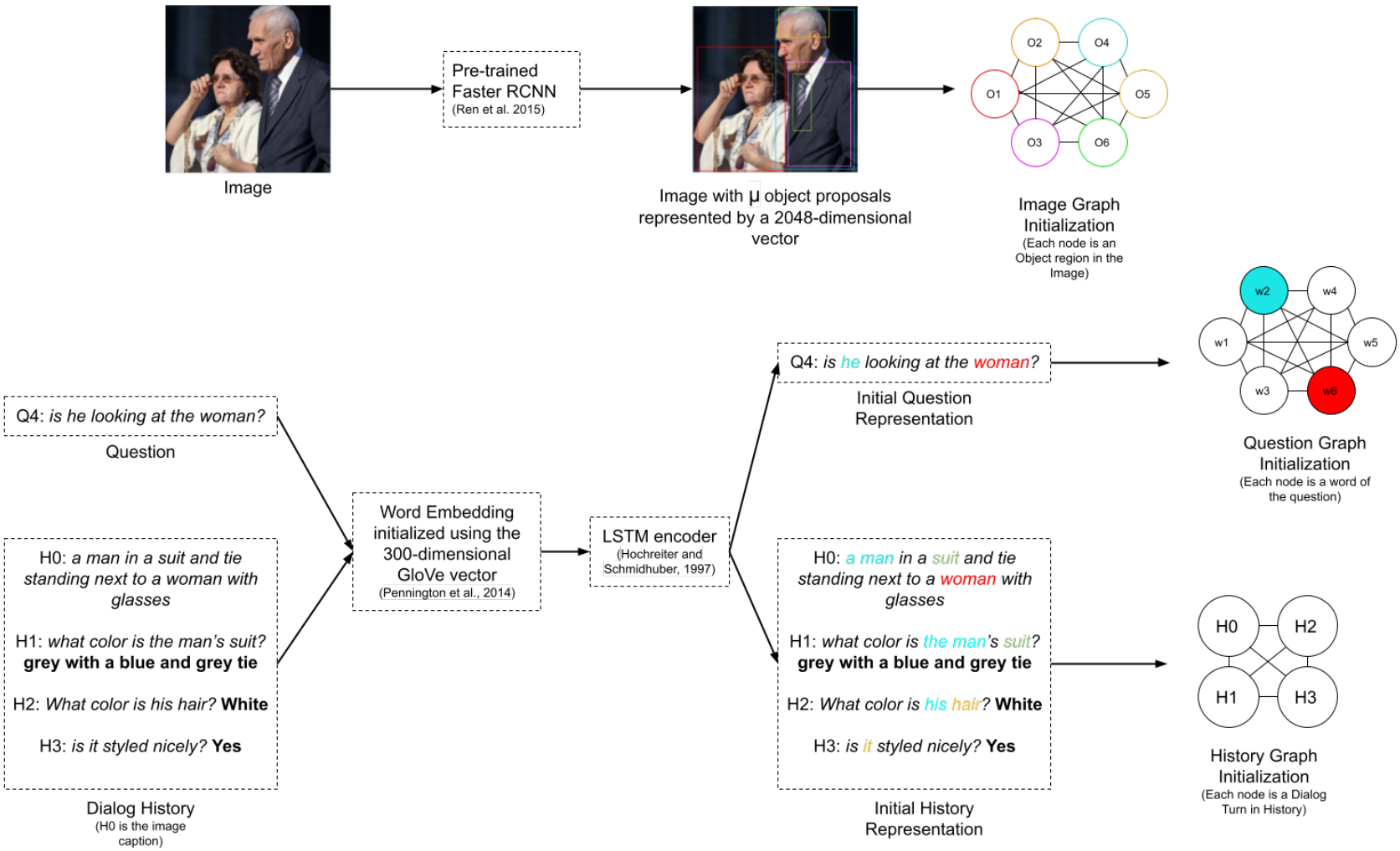


Source: Complete Architecture Overview of [Chen et al., 2021]

1

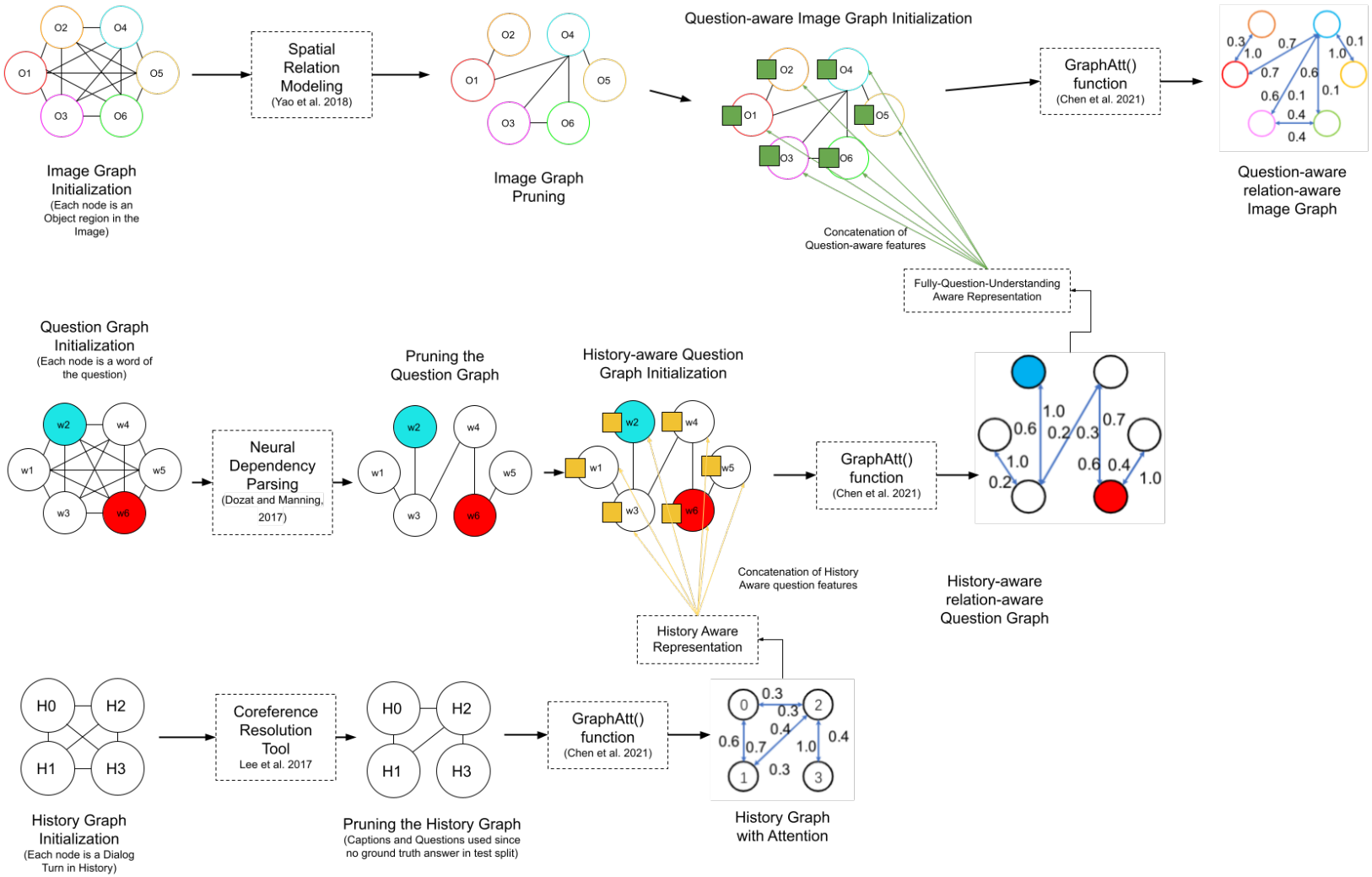
[1] Architecture includes previous methodologies by [Ren et al., 2015], [Yao et al., 2018], [Pennington et al., 2014], [Hochreiter and Schmidhuber, 1997], [Dozat and Manning, 2016], [Lee et al., 2017], [Nguyen et al., 2019]

Feature Representation



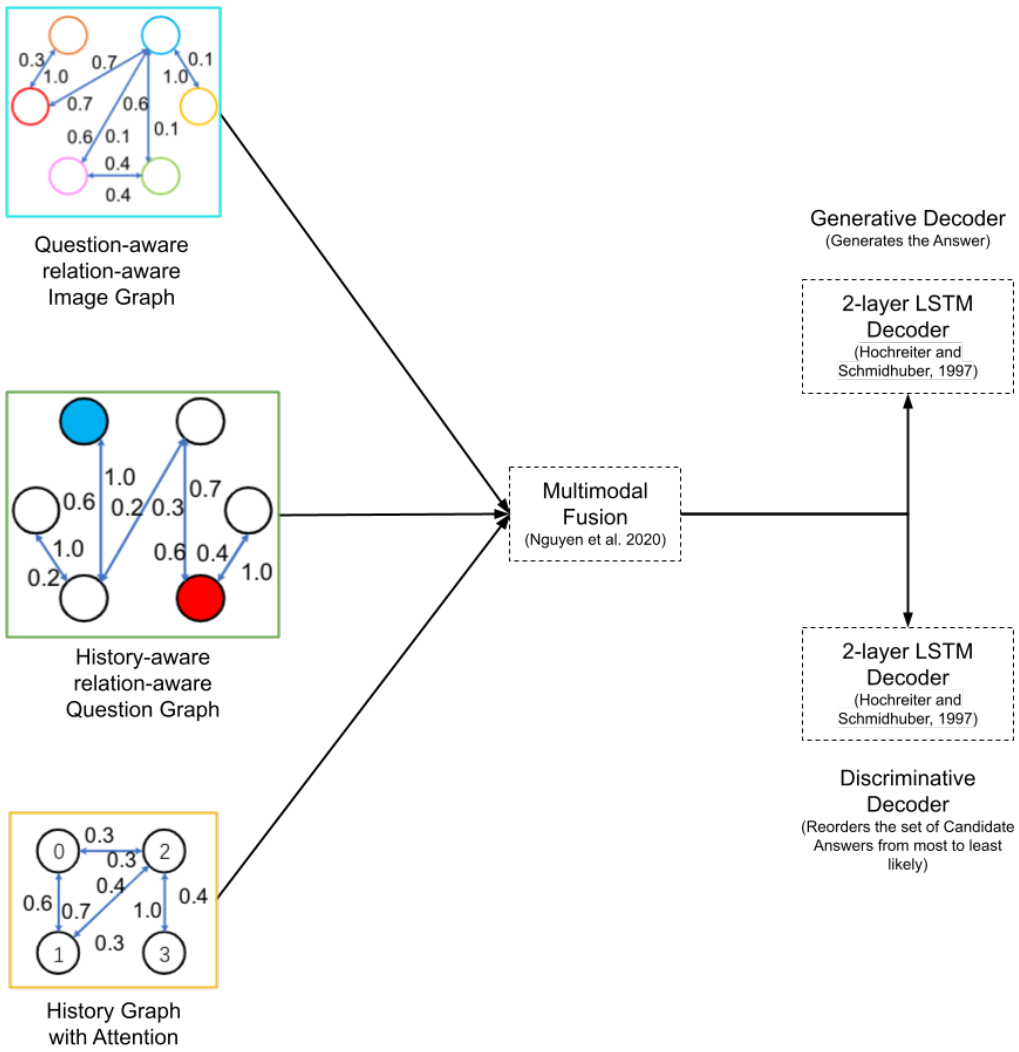
Source: Feature Representation of [Chen et al., 2021]

Pruning, Attention, and Adaptive Relation-awareness



Source: Graph Pruning and Graph Attention Scoring of [Chen et al., 2021]

Evaluation

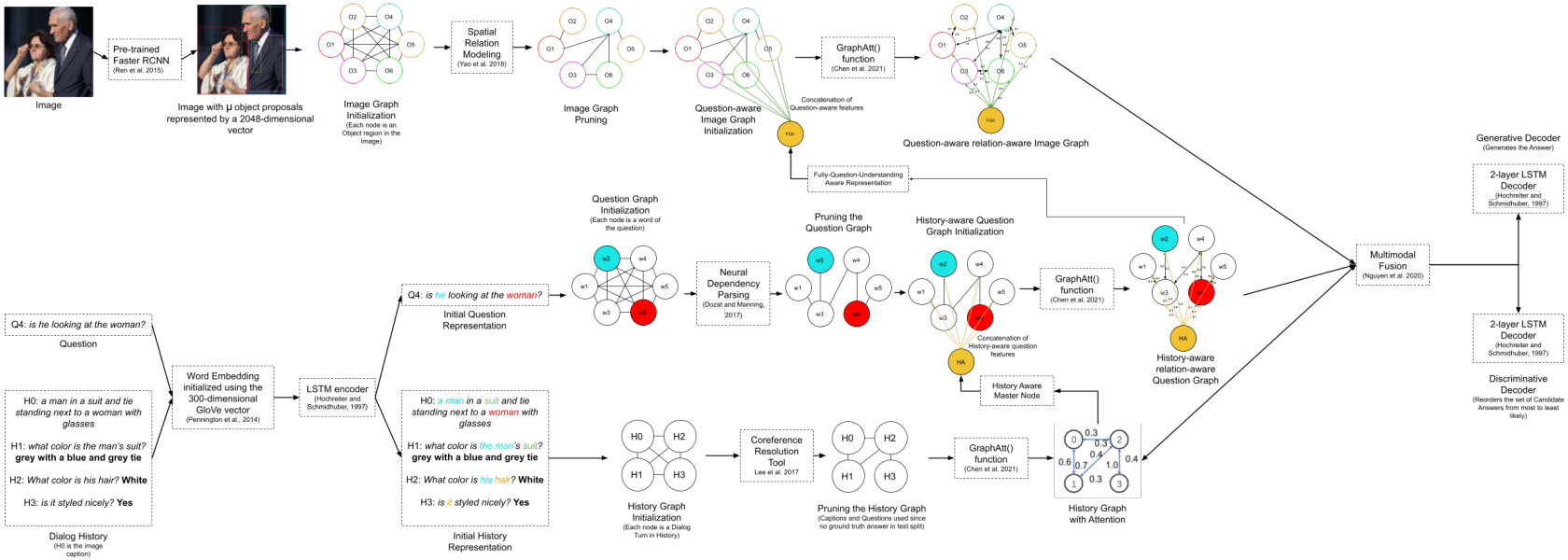


Source: Evaluation of [Chen et al., 2021]

Implementations

Multi-modal Feature Fusion Model (Main)

Architecture Overview

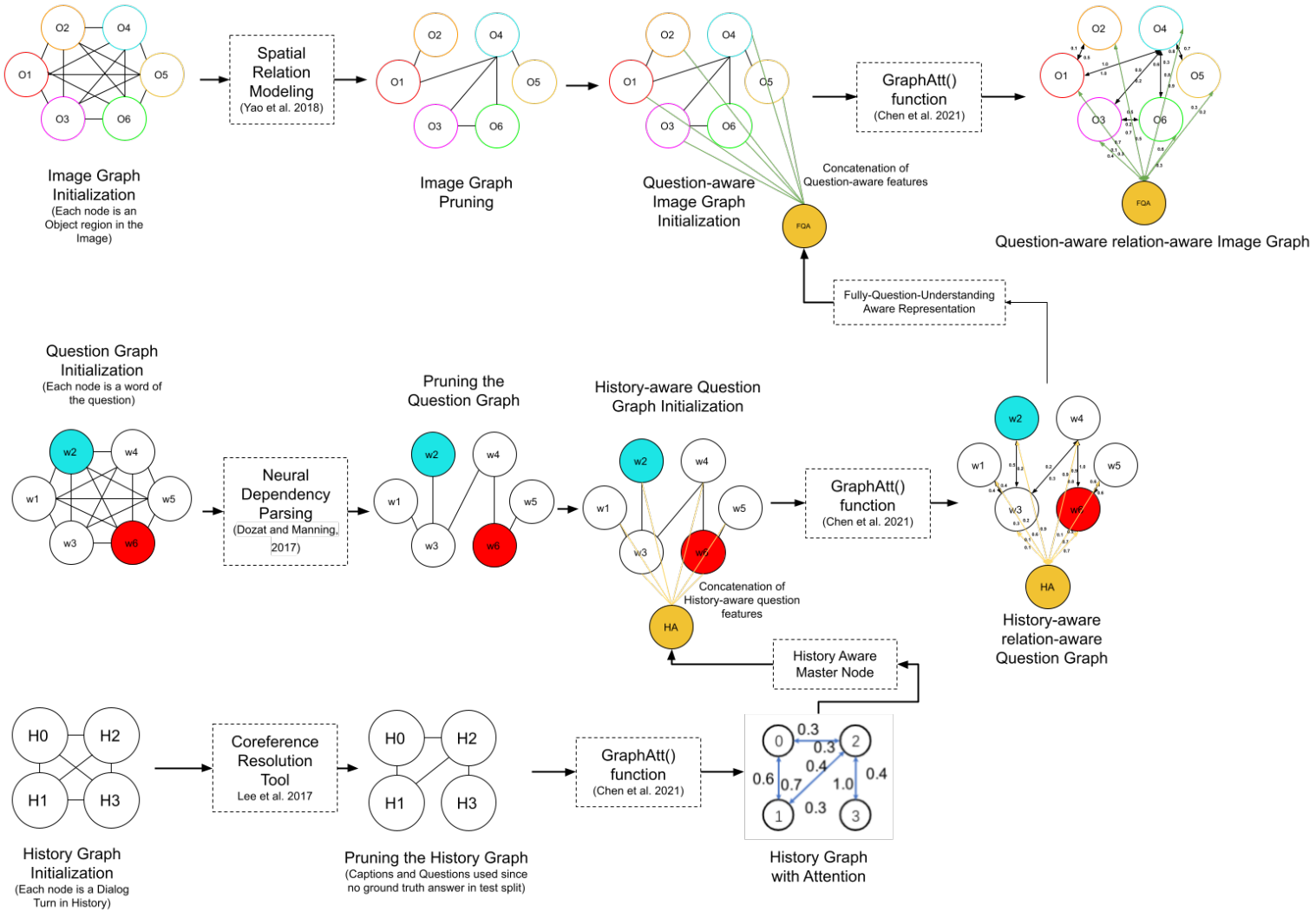


Source: Complete Architecture Overview of the Main novel Implementation

2

[2]Architecture includes previous methodologies by [Ren et al., 2015], [Yao et al., 2018], [Pennington et al., 2014], [Hochreiter and Schmidhuber, 1997], [Dozat and Manning, 2016], [Lee et al., 2017], [Nguyen et al., 2019]

Relation-awareness using Master Node

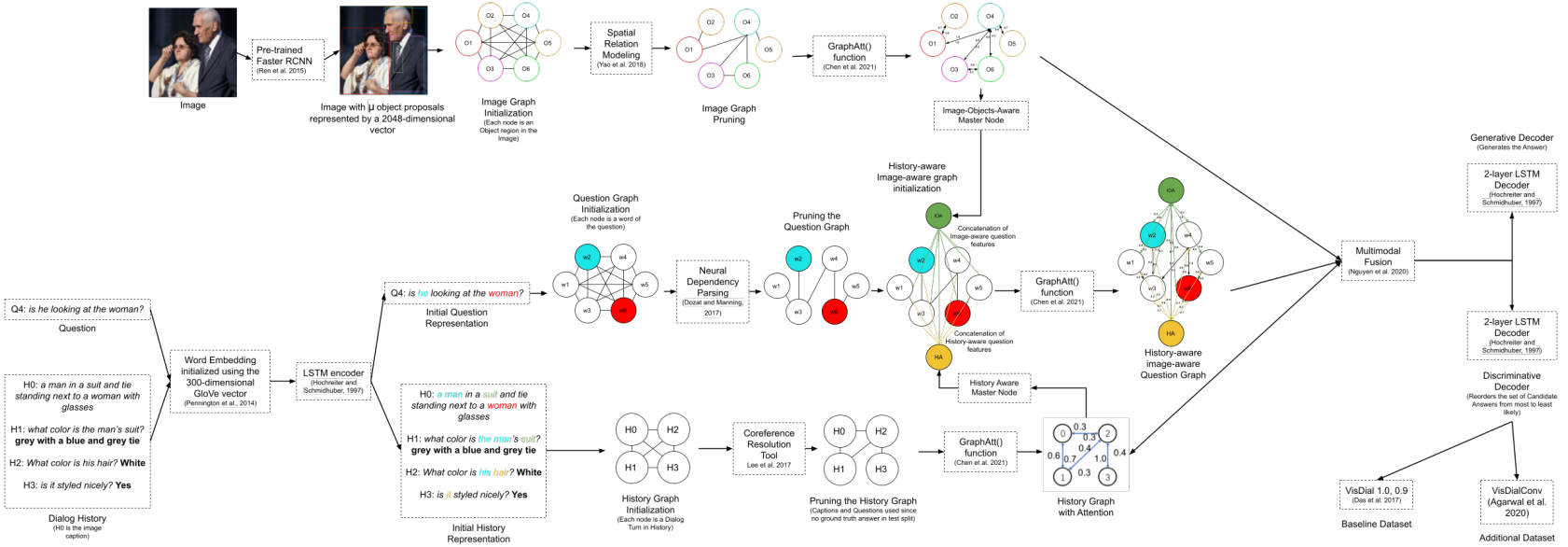


Source: Implementation strategy of the Main novel Implementation

Implementations

Multi-modal Feature Fusion Model (Optional)

Architecture Overview

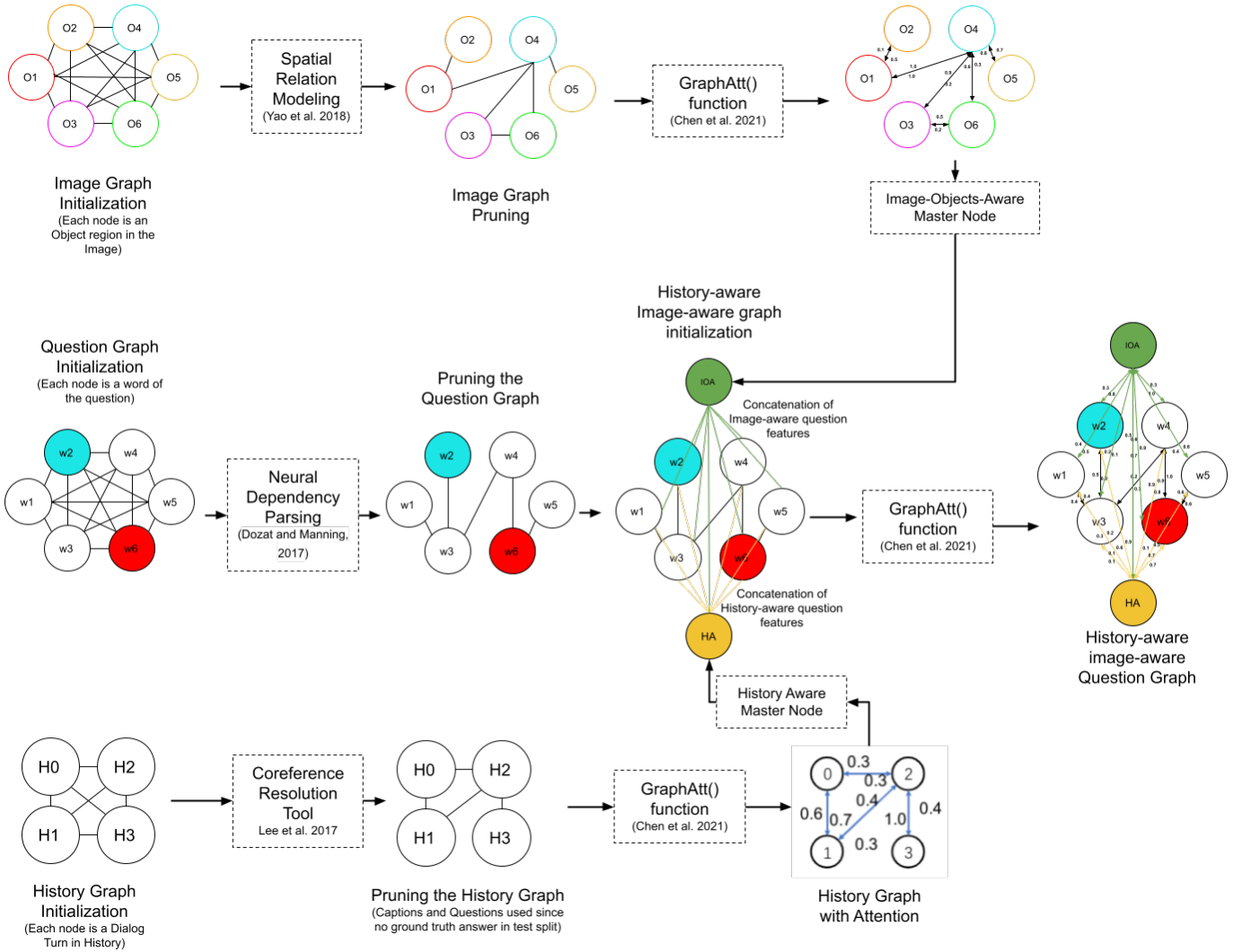


Source: Complete Architecture Overview of the Optional novel Implementation

3

[3] Architecture includes previous methodologies by [Ren et al., 2015], [Yao et al., 2018], [Pennington et al., 2014], [Hochreiter and Schmidhuber, 1997], [Dozat and Manning, 2016], [Lee et al., 2017], [Nguyen et al., 2019]

History-aware Image-aware Question-Graph

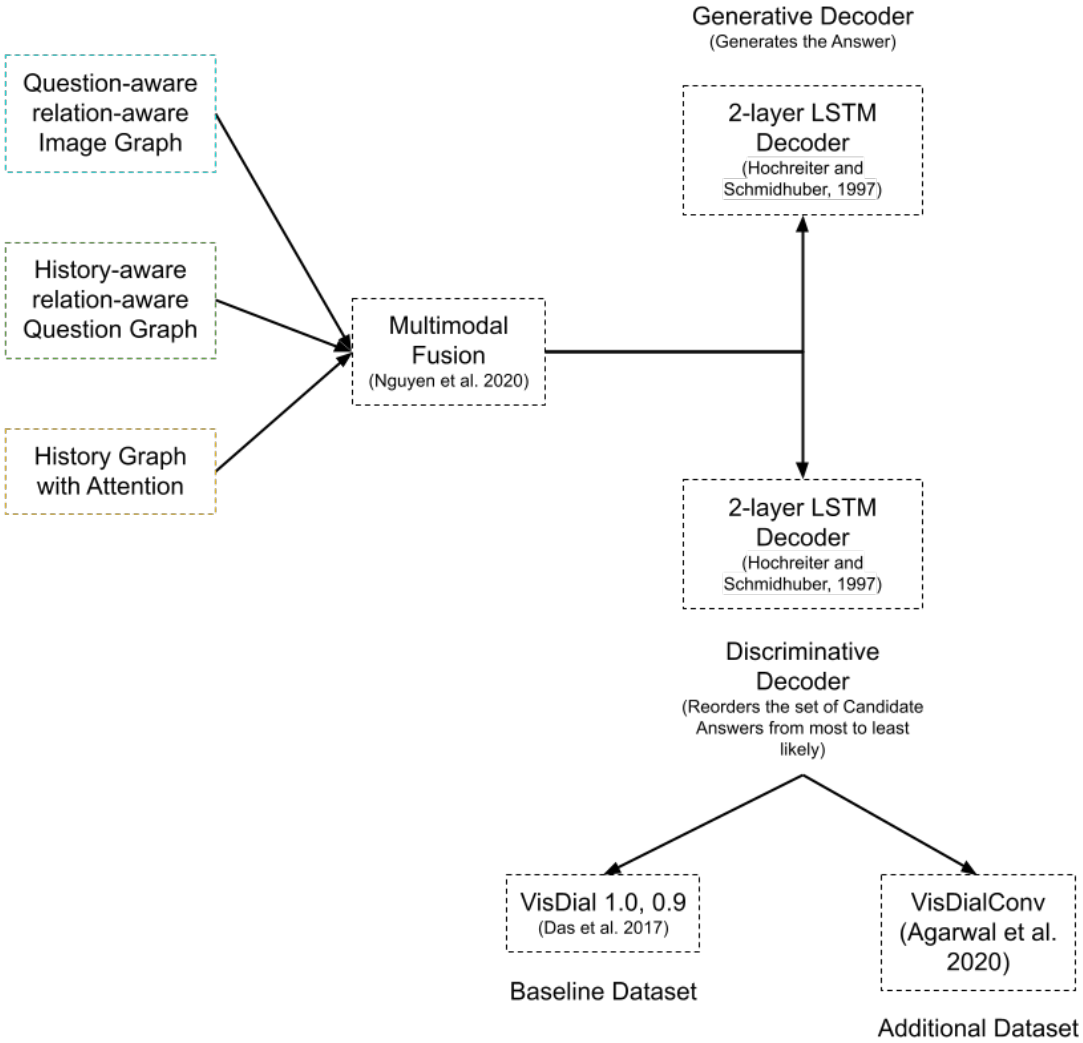


Source: Implementation strategy of the Optional novel Implementation

Implementations

Optional Evaluation Methods

Other Optional Evaluation Methods



Source: Optional Evaluation Implementation with data from [Agarwal et al., 2020]

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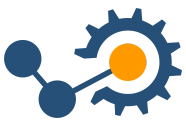
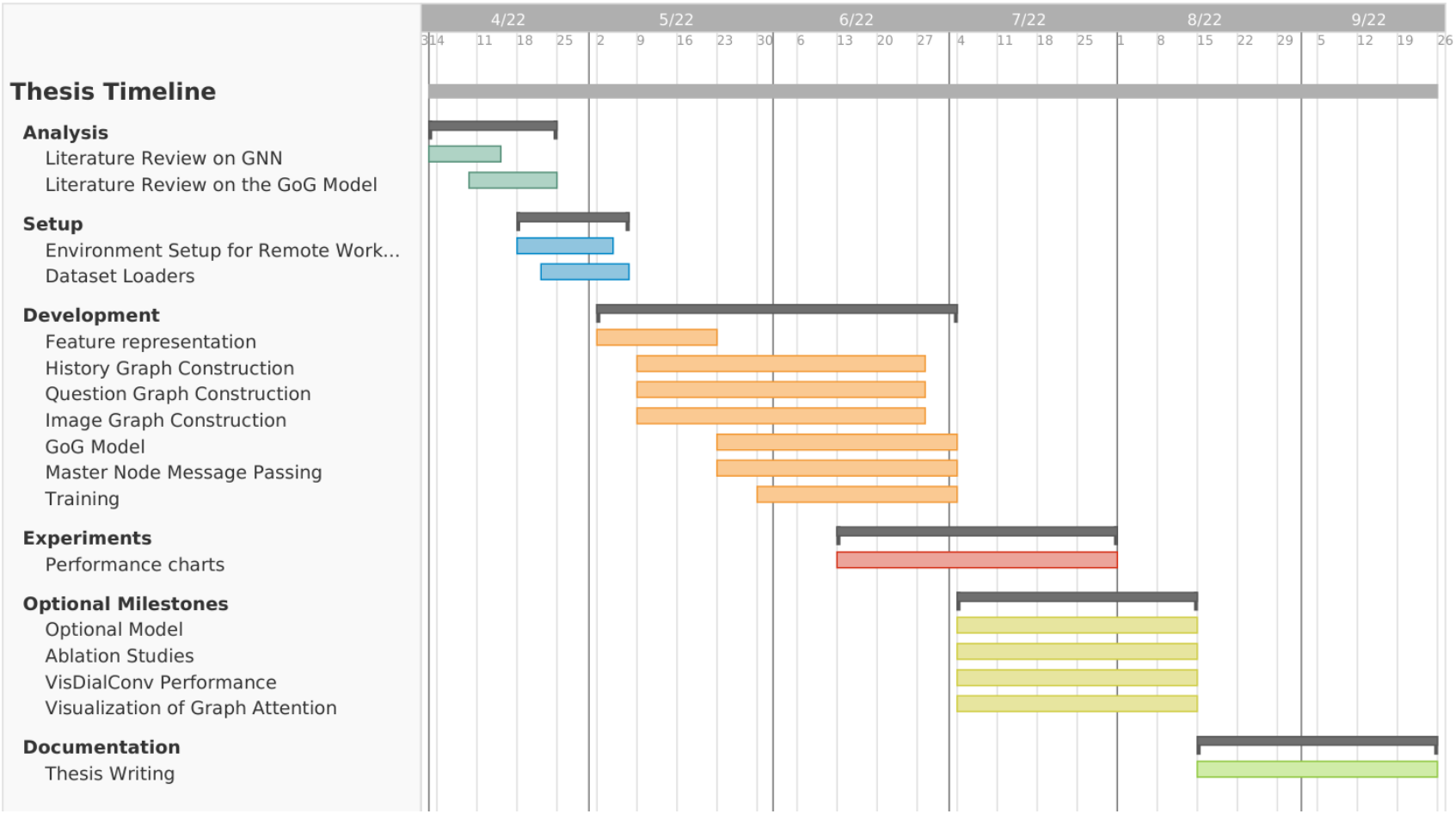


Timeline Overview



Source: Timeline overview

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