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# DEEP LEARNING BASED SEMANTIC TEXTUAL SIMILARITY FOR APPLICATIONS IN MACHINE TRANSLATION DOMAIN

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A thesis submitted in partial fulfilment of the requirements of the  
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# ABSTRACT

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An abstract is a synopsis of the thesis, and it goes in the file `abstract.tex`.



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## ACKNOWLEDGEMENTS

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Your acknowledgements should go in `ack.tex`.

We would like to acknowledge Donald Craig at Memorial University, Newfoundland who published the meta-thesis on which this template is based. You can find Donald's work on his web site, here: <http://www.cs.mun.ca/~donald/metathesis/>.



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# CONTENTS

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<b>Abstract</b>	<b>ii</b>
<b>Acknowledgements</b>	<b>iv</b>
<b>List of Tables</b>	<b>x</b>
<b>List of Figures</b>	<b>xii</b>
<b>List of Code Listings</b>	<b>xiv</b>
<b>I Semantic Textual Similarity</b>	<b>1</b>
<b>1 Introduction</b>	<b>3</b>
1.1 What is Semantic Textual Similarity? . . . . .	3
1.2 Related Work . . . . .	3
1.3 Datasets . . . . .	3
1.3.1 English Datasets . . . . .	3
1.4 Applications . . . . .	4
<b>2 State of the Art Methods</b>	<b>5</b>
2.1 Introduction . . . . .	5
2.2 Related Work . . . . .	5
2.3 Improving State of the Art STS Methods . . . . .	5
2.3.1 Portability to Other Languages . . . . .	5
2.3.2 Portability to Other Domains . . . . .	5
2.4 Conclusions . . . . .	5

<b>3</b>	<b>Sentence Encoders</b>	<b>7</b>
3.1	Introduction . . . . .	7
3.2	Related Work . . . . .	7
3.3	Exploring Sentence Encoders in English STS . . . . .	7
3.4	Portability to Other Languages . . . . .	7
3.5	Portability to Other Domains . . . . .	7
3.6	Conclusions . . . . .	7
<b>4</b>	<b>Siamese Neural Networks</b>	<b>9</b>
4.1	Introduction . . . . .	9
4.2	Related Work . . . . .	9
4.3	MAGRU: Improving Siamese Neural Networks . . . . .	9
4.3.1	Portability to Other Languages . . . . .	9
4.3.2	Portability to Other Domains . . . . .	9
4.4	Conclusions . . . . .	9
<b>5</b>	<b>Transformers</b>	<b>11</b>
5.1	Introduction . . . . .	11
5.2	Related Work . . . . .	11
5.3	Exploring Transformers in English STS . . . . .	11
5.4	Exploring Transformers for STS in Other Languages . . . . .	11
5.5	Exploring Transformers for STS in Other Domains . . . . .	11
5.6	Conclusions . . . . .	11



<b>II</b>	<b>Applications - Translation Memories</b>	<b>13</b>
<b>1</b>	<b>Introduction</b>	<b>15</b>
1.1	What is Translation Memory? . . . . .	15
1.2	Datasets . . . . .	15
1.3	Related Work . . . . .	15
1.4	STS for Translation Memories . . . . .	15
<b>2</b>	<b>Sentence Encoders for Translation Memories</b>	<b>17</b>
2.1	Introduction . . . . .	17
2.2	Methodology . . . . .	17
2.3	Results and Evaluation . . . . .	17
<b>III</b>	<b>Applications - Translation Quality Estimation</b>	<b>19</b>
<b>1</b>	<b>Introduction</b>	<b>21</b>
1.1	What is Translation Quality Estimation? . . . . .	21
1.2	Datasets . . . . .	21
1.3	Related Work . . . . .	21
1.4	STS for Translation Quality Estimation . . . . .	21
<b>2</b>	<b>TransQuest: STS Architectures for QE</b>	<b>23</b>
2.1	Introduction . . . . .	23
2.2	Methodology . . . . .	23
2.3	Results and Evaluation . . . . .	23
	<b>Bibliography</b>	<b>24</b>



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## LIST OF TABLES

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## LIST OF FIGURES

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## LISTINGS

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# Part I

## Semantic Textual Similarity





# CHAPTER 1

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## INTRODUCTION

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### 1.1 What is Semantic Textual Similarity?

[1]

### 1.2 Related Work

### 1.3 Datasets

We experimented with several datasets throughout the experiments in the Semantic Textual Similarity Section. In order to maintain the versatility of our methods we experimented with several English datasets as well as several non English datasets and several datasets from different domains which we will introduce in this section.

#### 1.3.1 English Datasets

1. **SICK dataset** - The SICK data contains 9927 sentence pairs with a 5,000/4,927 training/test split which were employed in the SemEval 2014 Task1: Evaluation of Compositional Distributional Semantic Models on Full Sentences through Semantic Relatedness and Textual Entailment [2]. The dataset has two types of annotations: Semantic Re-

latedness and Textual Entailment. We only use Semantic Relatedness annotations in our research. SICK was built starting from two existing datasets: the 8K ImageFlickr data set <sup>1</sup> [3] and the SemEval-2012 STS MSR-Video Descriptions dataset <sup>2</sup> [4]. The 8K ImageFlickr dataset is a dataset of images, where each image is associated with five descriptions. To derive SICK sentence pairs the organisers randomly selected 750 images and sampled two descriptions from each of them. The SemEval2012 STS MSR-Video Descriptions data set is a collection of sentence pairs sampled from the short video snippets which compose the Microsoft Research Video Description Corpus <sup>3</sup>. A subset of 750 sentence pairs were randomly chosen from this data set to be used in SICK.

In order to generate SICK data from the 1,500 sentence pairs taken from the source data sets, a 3-step process was applied to each sentence composing the pair, namely (i) normalization, (ii) expansion and (iii) pairing.

## 2. STS 2017 Dataset

## 1.4 Applications

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<sup>1</sup>The 8K ImageFlickr data set is available at <http://hockenmaier.cs.illinois.edu/8k-pictures.html>

<sup>2</sup>The SemEval-2012 STS MSR-Video Descriptions dataset is available at <https://www.cs.york.ac.uk/semeval-2012/task6/index.html>

<sup>3</sup>The Microsoft Research Video Description Corpus is available to download at <https://research.microsoft.com/en-us/downloads/38cf15fd-b8df-477e-a4e4-a4680caa75af/>

## CHAPTER 2

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### STATE OF THE ART METHODS

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#### **2.1 Introduction**

[5]

#### **2.2 Related Work**

#### **2.3 Improving State of the Art STS Methods**

##### **2.3.1 Portability to Other Languages**

##### **2.3.2 Portability to Other Domains**

#### **2.4 Conclusions**



## CHAPTER 3

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### SENTENCE ENCODERS

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#### **3.1 Introduction**

[6]

#### **3.2 Related Work**

#### **3.3 Exploring Sentence Encoders in English STS**

#### **3.4 Portability to Other Languages**

#### **3.5 Portability to Other Domains**

#### **3.6 Conclusions**



## CHAPTER 4

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### SIAMESE NEURAL NETWORKS

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#### 4.1 Introduction

[7]

#### 4.2 Related Work

#### 4.3 MAGRU: Improving Siamese Neural Networks

##### 4.3.1 Portability to Other Languages

##### 4.3.2 Portability to Other Domains

#### 4.4 Conclusions





## CHAPTER 5

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### TRANSFORMERS

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#### 5.1 Introduction

[8]

#### 5.2 Related Work

#### 5.3 Exploring Transformers in English STS

#### 5.4 Exploring Transformers for STS in Other Languages

#### 5.5 Exploring Transformers for STS in Other Domains

#### 5.6 Conclusions



## Part II

# Applications - Translation Memories



## CHAPTER 1

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### INTRODUCTION

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#### **1.1 What is Translation Memory?**

[9]

#### **1.2 Datasets**

#### **1.3 Related Work**

#### **1.4 STS for Translation Memories**



## CHAPTER 2

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### SENTENCE ENCODERS FOR TRANSLATION MEMORIES

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#### 2.1 Introduction

[10]

#### 2.2 Methodology

#### 2.3 Results and Evaluation





## Part III

# Applications - Translation Quality Estimation



## CHAPTER 1

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### INTRODUCTION

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#### 1.1 What is Translation Quality Estimation?

#### 1.2 Datasets

#### 1.3 Related Work

[11]

#### 1.4 STS for Translation Quality Estimation



## CHAPTER 2

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### TRANSQUEST: STS ARCHITECTURES FOR QE

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#### **2.1 Introduction**

[12]

#### **2.2 Methodology**

#### **2.3 Results and Evaluation**



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