Statistical Machine Translation and Automatic Evaluation

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Presenters:

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Tutorial Programme/Overview

In the age of information society Machine Translation (MT) is gaining importance every day. The use of translation Web services such as *Google*[1], *Bing*[2], *Opentrad*[3] or *Reverso*[4] is now widespread and end-users are already familiar with the advantages and limitations of their usage. At the same time, the research community in language technologies shows a great interest in the topic and the most important conferences in the field are increasing the percentage of articles on MT.

There are several approaches to MT. According to their main architecture we distinguish between rule-based systems and empirical systems. Among these, Statistical Machine Translation (SMT) is a common paradigm for MT within the empirical systems. It offers robustness and flexibility. One of the advantages of SMT is that the systems are in general language independent. There is no need to develop specific tools for every language, and the only essential element is a parallel corpus.

SMT systems are widely used both as an standalone and efficient solution to build a translator and as a base to build a more complex system. Understanding the basics is necessary in both cases and, as it will be commented in the following, it is a good starting point to build tools and systems not necessary related to MT.

Evaluation methods play an important role during the development of a MT system. Since the number of correct translations is not unique, a common MT evaluation setting uses several measures to assess the quality of an automatic translation in comparison to a human translation.

Having the scores given by several measures, MT developers can identify specific weak points of their systems. This is mainly the purpose of the error analysis stage and it becomes a tedious task when a test-set of thousands of sentences and several systems are involved.

Considering this problem and the importance of the error analysis, this tutorial focuses on the fundamentals and engineering of a variety of evaluation measures.

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1   *http://translate.google.es*
2   *http://www.bing.com/translator*
3   *http://www.opentrad.com/*
4   *http://www.reverso.net*

Tutorial Description/Outline/Contents

This tutorial is intended to provide an introduction to Statistical Machine Translation and its evaluation. The statistical paradigm is one of the predominants within machine translation. This is possibly due to the simplicity of building a basic system with free software, the large community behind it and, of course, the good results that it achieves.

The main objective of the first part of the tutorial is to get to know the fundamentals behind the three modules of a statistical system: the language model, the translation model and the decoding or search for the best translation. The presentation, although theoretical, is focused on understanding how standard software such as SRILM and Moses[5] work, what is the logic behind them so that it is easy to understand the extensions and modifications available.

We also devote the second part of the tutorial to see how these systems, and machine translation systems in general, are evaluated automatically. Machine translation evaluation is a delicate topic. Here we will put the evaluation into context, describe in detail the standard metrics and overview other existing possibilities and paradigms such as linguistically motivated measures and confidence estimation.

Along with the theoretical presentation, the standard software will be introduced and a toy SMT system will be built.

OUTLINE

Part I: SMT Background

1. Introduction
2. Basics
3. Components: Language Model, Translation Model and the Decoding
4. The Log-Linear Model
5. Beyond Standard SMT
6. Hands-on Guidelines

Part II: Automatic Evaluation

1. Introduction
2. Evaluation Measures
3. Linguistically Motivated Measures
4. Confidence Estimation
5. Hands-on Guidelines

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5   See *http://slifer.lsi.upc.edu/lrec-mttutorial* for more information about the outline of the tutorial, references and instructions for building an state-of-the-art SMT system.