

CS546 Detailed Paper Review: Gatt and Kramer, Survey of the State of the Art in Natural Language Generation: Core tasks, applications and evaluation, JAIR 2018

Introduction and NLG Tasks

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1 Overview

1.1 What is this paper about?

This survey paper[1] introduces the core tasks, applications and evaluation in Natural Language Generation (NLG), defined as the task of generating text or speech from all kinds of data. In this detailed paper review, we will focus on the introduction and various tasks of NLG.

1.2 What are the main contributions of this paper?

Since the survey paper was published in 2017, it covers more traditional methods and architectures. If you want to learn more deep learning methods, you could take a look at this newer survey paper written by Santhanam and Shaikh[2]. Nevertheless, this survey gives you an idea of what tasks we need to solve essentially when working with NLG. These methods are more understandable and you could interpret the results better instead of training end-to-end deep learning models.

2 NLG Tasks

2.1 Type of Tasks

There are mainly two types of generation tasks in NLG. If the input is existing (human-written) text, then it is called text-to-text generation and examples are machine translation, text summarization, simplification of complex texts and grammar and text correction. If the input is non-linguistic data, then it is called data-to-text generation and applications are automated journalism, generation of soccer reports and weather and financial reports. Although we make this distinguishment, the boundaries between different approaches are blurred. Sometimes, we will use text-to-text techniques in data-to-text systems and vice versa. The survey paper focus more on the data-to-text generation tasks.

2.2 Intro to NLG Tasks

Traditionally, we will split NLG up to six sub-problems and each of them will be briefly introduced below.

2.2.1 Content Determination

It is the first step of NLG and you need to determine the communicative goal based on your target readers. Usually, the raw data contains information more than we need and we have to extract the information of interest, which involves choices of which information to keep and which to ignore.

2.2.2 Text Structuring

After we have determined the content, we need to decide the order of presentation and it is called text structuring. Human readers prefer certain ordering which makes sentences more coherent. Also, this step finds the temporal information from data.

2.2.3 Sentence Aggregation

Next, we need to group those sentences and this stage is called sentence aggregation. It will eliminate the redundant information and make the representation more concise.

2.2.4 Lexicalisation

Lexicalisation happens after we have finalized the content of sentences. Usually, there are many ways to express the same event and we need to choose the most appropriate one for the domain of interest.

2.2.5 Referring Expression Generation

It refers to creation of referring expressions that identify specific entities and it received most attention since it can be separated easily.

2.2.6 Linguistic Realisation

Finally, after we have selected words and phrases, we need to combine them to form the sentences and it is called linguistic realisation.

2.2.7 Discussion

The first three are more domain-specific compared with the last three, where their approaches may be shared among various applications. Recently, there is a trend from human-crafted and template-based approaches to data-driven and machine learning methods. Although the latter one can be more efficient and convenient, the output quality could be compromised.

3 Your own thoughts and analysis

3.1 Your critique of the paper

This survey paper introduces traditional ways of solving NLG problems which split them up to six stages. In this way, it is likely for us to better analyse each sub-problem and study the relevant methods. However, we could lose some of the information when we divide the task and it can be time-consuming to study each of them. Also, most of the techniques involve human efforts and are domain-dependent. Compared with recent end-to-end machine learning methods, those traditional ones could be less convenient and efficient.

3.2 What is this paper's impact?

Although the paper surveys mostly traditional methods, it provides a comprehensive introduction to those new to NLG. Template-based approaches give you more control to the outputs and the quality of generation can be guaranteed even if it means more human efforts are required. Reliability and controllability are the most concerned in commercial scenarios. Large part of data-driven methods have not been applied to real-world applications and they still rely on traditional and stable techniques. Also, end-to-end deep learning models serve like black boxes and they are hard to interpret. In order to further improve the generation quality, it is important to understand the most fundamental parts of NLG.

References

- [1] Albert Gatt and Emiel Krahmer. Survey of the state of the art in natural language generation: Core tasks, applications and evaluation, 2017.
- [2] Sashank Santhanam and Samira Shaikh. A survey of natural language generation techniques with a focus on dialogue systems - past, present and future directions, 2019.