Fast, Scalable Phrase-Based SMT Decoding

Anonymous ACL submission

Abstract

The utilization of statistical machine translation (SMT) has grown enormously over the last decade, many using open-source software developed by the NLP community. As commercial utilization has increased, there has been a pressing need that is optimized for their requirements. Specifically, faster phrase-based decoding, and more efficient utilization of modern multicore servers.

We present in this paper a re-assessment of the major components of phrase-based decoding and decoder implementation with particular emphasis on speed and scalability to multicore machines. The result is a drop-in replacement for the Moses decoder which is up to fifteen times faster and scales almost linearly with the number of cores. Furthermore, the decoder makes less search errors than the current Moses decoder.

1 Introduction

SMT has been one of the outstanding success story from the NLP community in the last decade. It has transition from a mostly research discipline to services such as Google Translate, Microsoft Translator Hub, as well as services and products built around offline products such as the open-source Moses toolkit. The latter has spawned a cottage industry encompassing a range of organizations and services from small language service providers that use SMT to reduce translation cost to large inter-govermental organizations such as the EU and the UN that provides high volume translation.

For high volume users, decoding is a largest and most critical part of the translation process which needs to be fast and efficient. However, it has been noticed that the Moses decoder, amongst others, is unable to efficiently use multiple CPU cores that are now common on modern servers (reviewed paper, github discussion). That is, the time taken to decode a test set does not substantial decrease when more cores are used, in fact, decoding time may increase when more cores are added. The issue will only become more noticeable as the commercial use of SMT grows and the number of cores in servers increases.

There have be speculation on the causes of the inefficiency as well as remedies. This paper is the first we know of that seeks to tackle this problem head on. We present an phrase-based decoder that is not only significantly faster than the Moses baseline for single-threaded operation, but is able to scale run multiple threads on multicore machines with only a slightly loss in linear speed. Model scores and functionality are compatible with Moses to aid comparison and ease of transition for users. All source code will be made available under an open-source license.

1.1 Prior Work

There are a number of open-source SMT projects, most includes a decoder. The most well known is Moses, which supports phrase-based models, hierarchical phrase-based as well as various syntax-based models. Joshua also supports hiearchical and syntax models and has recently supported phrase-based models. Phrasal supports a number of variants of the phrase-based model. CDEC supports hierarchical and syntactic models.

A number of the decoders support multithreading whilst others use alternative methods such as Hadoop or external scripts to parallelize decoding. As we shall see in the Results Section, there are severe limitations to parallelizing using a external scripts to exectute multiple decoding processes.

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The maximum length of a manuscript is eight (8) pages for the main conference, printed single-sided, plus two (2) pages for references (see Section 3 for additional information on the maximum number of pages).

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ACL provides this description in LaTeX2e (`acl2016.tex`) and PDF format (`acl2016.pdf`), along with the LaTeX2e style file used to format it (`acl2016.sty`) and an ACL bibliography style (`acl2016.bst`) and example bibliography (`acl2016.bib`). These files are all available at `acl2016.org/index.php?article_id=9`. We strongly recommend the use of these style files, which have been appropriately tailored for the ACL 2016 proceedings.

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Command	Output
`{\"a}`	ä
`{\^e}`	ê
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Command	Output
`{\c c}`	ç
`{\u g}`	ğ
`{\l}`	ł
`{\~n}`	ñ
`{\H o}`	ő
`{\v r}`	ř
`{\ss}`	ß

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\bibliography{acl2016}
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```

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Acknowledgment sections should go as a last (unnumbered) section immediately before the references.

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[1] `https://en.wikipedia.org/wiki/List_of_computer_science_conference_acronyms`

[2] `http://www.abbreviations.com/jas.php`

[3] This is how a footnote should appear.

[4] Note the line separating the footnotes from the text.

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paper title	15 pt	bold
author names	12 pt	bold
author affiliation	12 pt	
the word "Abstract"	12 pt	bold
section titles	12 pt	bold
document text	11 pt	
abstract text	10 pt	
captions	9 pt	
caption label	9 pt	bold
bibliography	10 pt	
footnotes	9 pt	

Table 2: Font guide.

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Acknowledgments

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