



Problems in Current Text Simplification Research

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Chris Callison-Burch	UPenn
Courtney Napolis	JHU

What is Text Simplification

What is Text Simplification

INPUT *Applesauce is a puree made of apples.*

What is Text Simplification

INPUT *Applesauce is a puree made of apples.*

OUT-1 *Applesauce is a soft paste.*

What is Text Simplification

INPUT *Applesauce is a puree made of apples.*

OUT-1 *Applesauce is a soft paste.*

OUT-2 *Applesauce is a paste. It is made of apples.*

What is Text Simplification

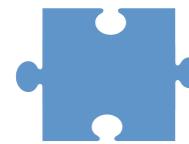
INPUT *Applesauce is a puree made of apples.*

OUT-1 *Applesauce is a soft paste.*

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- for children, disabled, non-native speakers ...
- for other NLP tasks (MT, summarization ...)

What is Text Simplification



paraphrasing

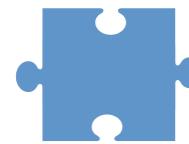
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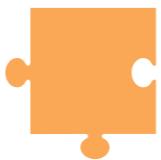
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What is Text Simplification



paraphrasing



deletion

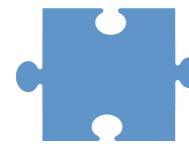
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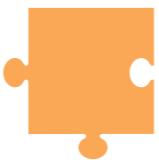
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What is Text Simplification



paraphrasing



deletion



splitting

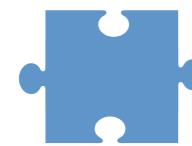
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What is Text Simplification

 **paraphrasing**

 **deletion**

 **splitting**

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Goal of Text Simplification

INPUT *Applesauce is a puree made of apples.*

OUT-1 *Applesauce is a soft paste.*

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Goal of Text Simplification



grammaticality

INPUT *Applesauce is a puree made of apples.*

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Goal of Text Simplification



grammaticality



**meaning
preservation**

INPUT *Applesauce is a puree made of apples.*

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Goal of Text Simplification



grammaticality



meaning
preservation



simplicity

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Goal of Text Simplification



grammaticality



meaning
preservation



simplicity

INPUT

Applesauce is a puree made of apples.

Human Evaluation

OUT-1

Applesauce is a soft paste.

5

4

5

OUT-2

Applesauce is a paste. It is made of apples.

5

5

4

Goal of Text Simplification



grammaticality



meaning
preservation



simplicity

INPUT

Applesauce is a puree made of apples.

Human Evaluation

OUT-1

Applesauce is a soft paste.

5

4

5

OUT-2

Applesauce is a paste. It is made of apples.

5

5

4

(no reliable automatic evaluation yet)

Brief History of Sentence Simplification

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rule-based

- 1997 Chandrasekar & Srinivas
- 1999 Dras (PhD thesis)
- 2000 Carroll, Minnen, Pearce, Canning, Devlin
- 2002 Canning (PhD thesis)
- 2004 Siddharthan (PhD thesis)

Brief History of Sentence Simplification

rule-based

Simple English
WIKIPEDIA



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- 2010 Zhu, Bernhard, Gurevych**

Parallel Wikipedia Corpus

 **WIKIPEDIA**
The Free Encyclopedia

Article Talk Read Edit More Search

Apple sauce

From Wikipedia, the free encyclopedia



Commercially processed apple sauce A chunky German apple sauce

Apple sauce or applesauce is a purée made of apples. It can be made with peeled and/or unpeel

What links here Related changes Upload file Special pages

and allspice). Flavorings or sweeteners such as s or honey are also commonly added. Apple sauce inexpensive and is widely used in the United King North America and some European countries.^[1]

 **Simple English WIKIPEDIA**

Page Talk Read Change More Search

Applesauce

From Wikipedia, the free encyclopedia

Applesauce (or apple sauce) is a sauce that is made from stewed and mashed apples. Peeled or

cinnamon can be used. Sugar or high fructose corn syrup is sometimes added to the applesauce to sweeten it. Applesauce can be fine or coarse textured, and can include large pieces of apple. It is easy to make at home, and it is also sold already made in supermarket or as a snack for children and people who have problems with eating solid food. Parents often feed babies applesauce because teeth are not needed to eat it. It is sometimes used to help fight diarrhoea, since it is high in dietary fibre.

A bowl of applesauce

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Brief History of Sentence Simplification

rule-based

Simple English
WIKIPEDIA

machine
translation



- | | |
|-------------|------------------------------------------|
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| 2011 | Woodsend & Lapata |
| 2011 | Coster & Kauchak |
| 2012 | Wubben, van den Bosch, Krahmer |
| 2014 | Narayan & Gardent |
| 2014 | Siddharthan (Survey) |
| 2014 | Angrosh, Nomoto, Siddharthan |
| 2014 | Narayan (PhD thesis) |

Brief History of Sentence Simplification

rule-based

Simple English
WIKIPEDIA

machine
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| 2014 | Narayan (PhD thesis) |
| Now | Xu, Callison-Burch, Napoles (Opinion) |

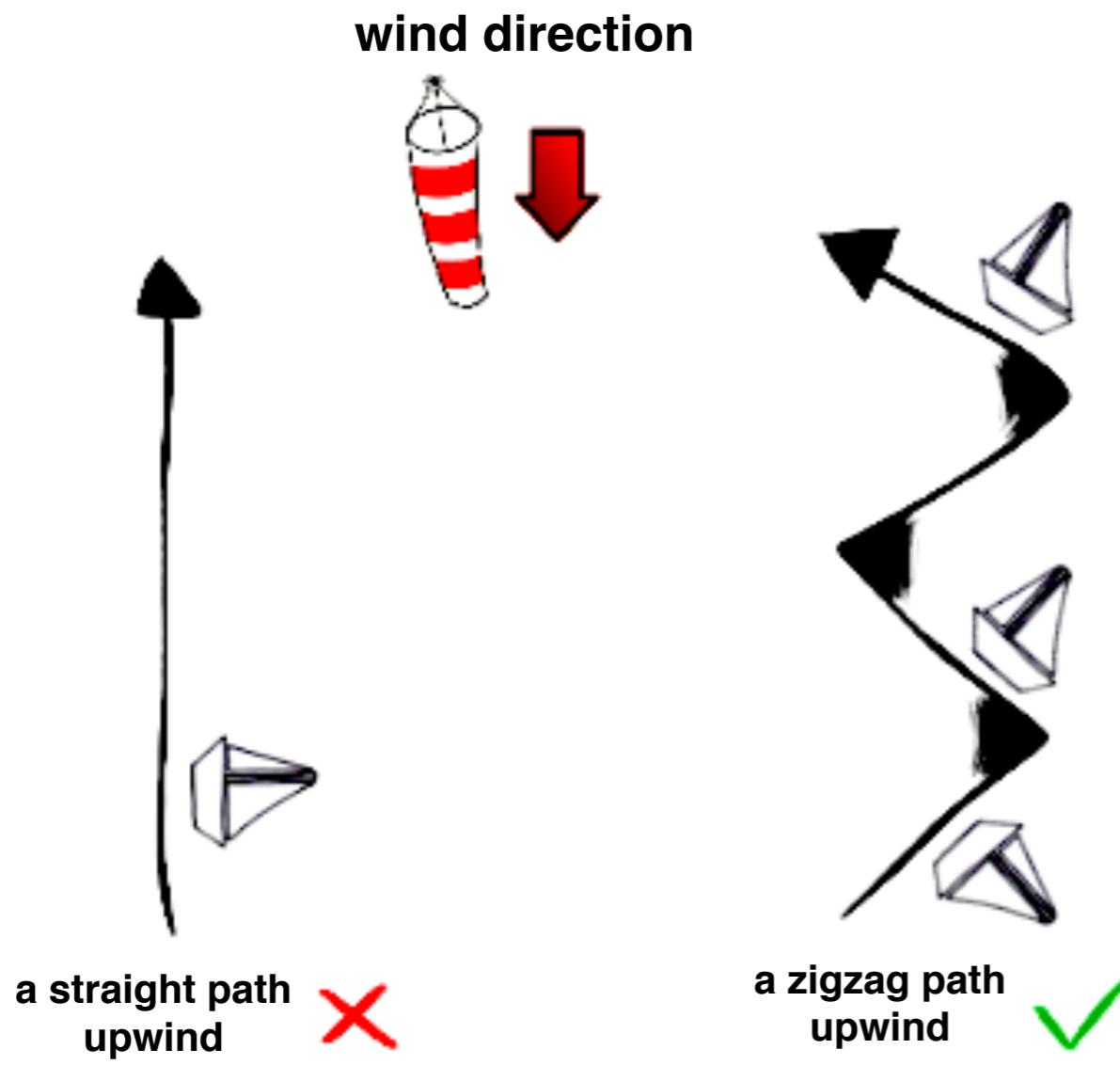
Problems in Simplification Research

- State-of-the-art evaluation is suboptimal. But we have been doing this in the past 5 years*.
- Simple Wikipedia data dominated in the past 5 years. But its quality was taken for granted. It limits the scope of research.

* (Angrosh et al. 2014) tried comprehension quiz

Why this is important?

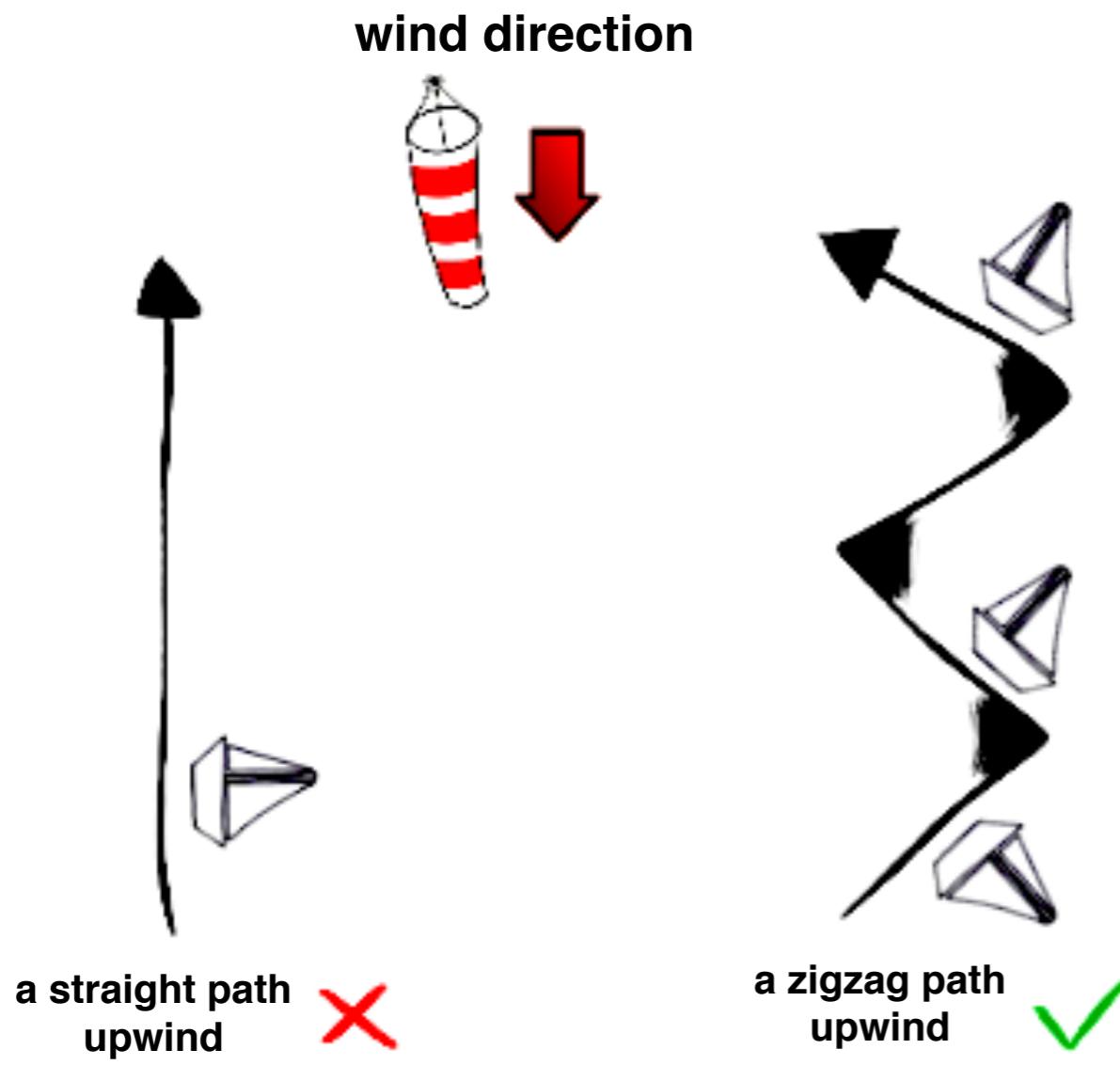
Breakthrough on Sea



- better understanding
- better **review**
- more diverse research
- better data and evaluation
- better model

Why this is important?

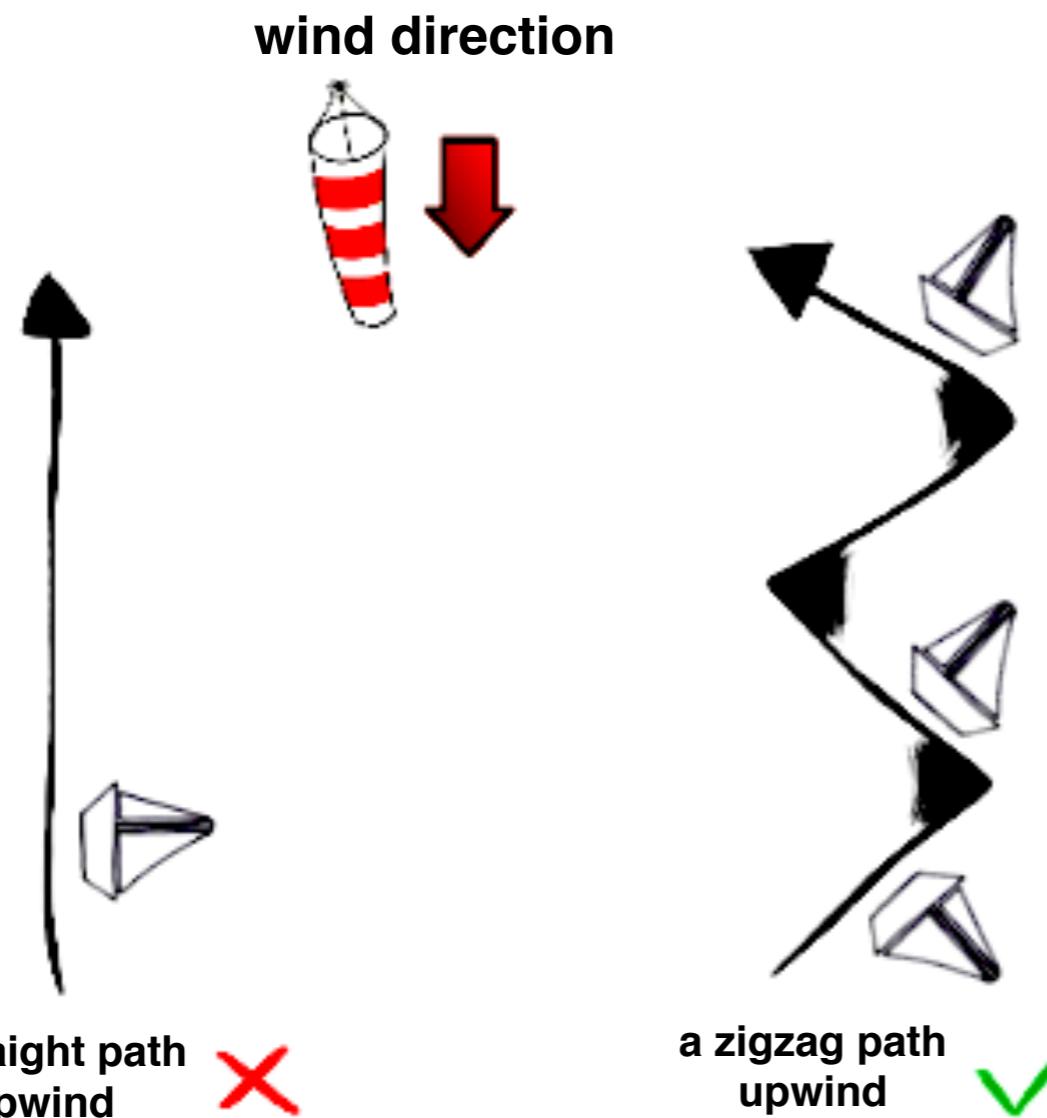
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Why this is important?

Simplification Breakthrough on Sea



- better understanding
- better **review**
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“Recently, there have been several attempts at addressing the text simplification task as a monolingual translation problem ... However, they did not try to seek reasons for the success or the failure of their systems.”

—— Štajner, Béchara, Saggion (2015)

“Recently, there have been several attempts at addressing the text simplification task as a monolingual translation problem ... However, they did not try to seek reasons for the success or the failure of their systems.”

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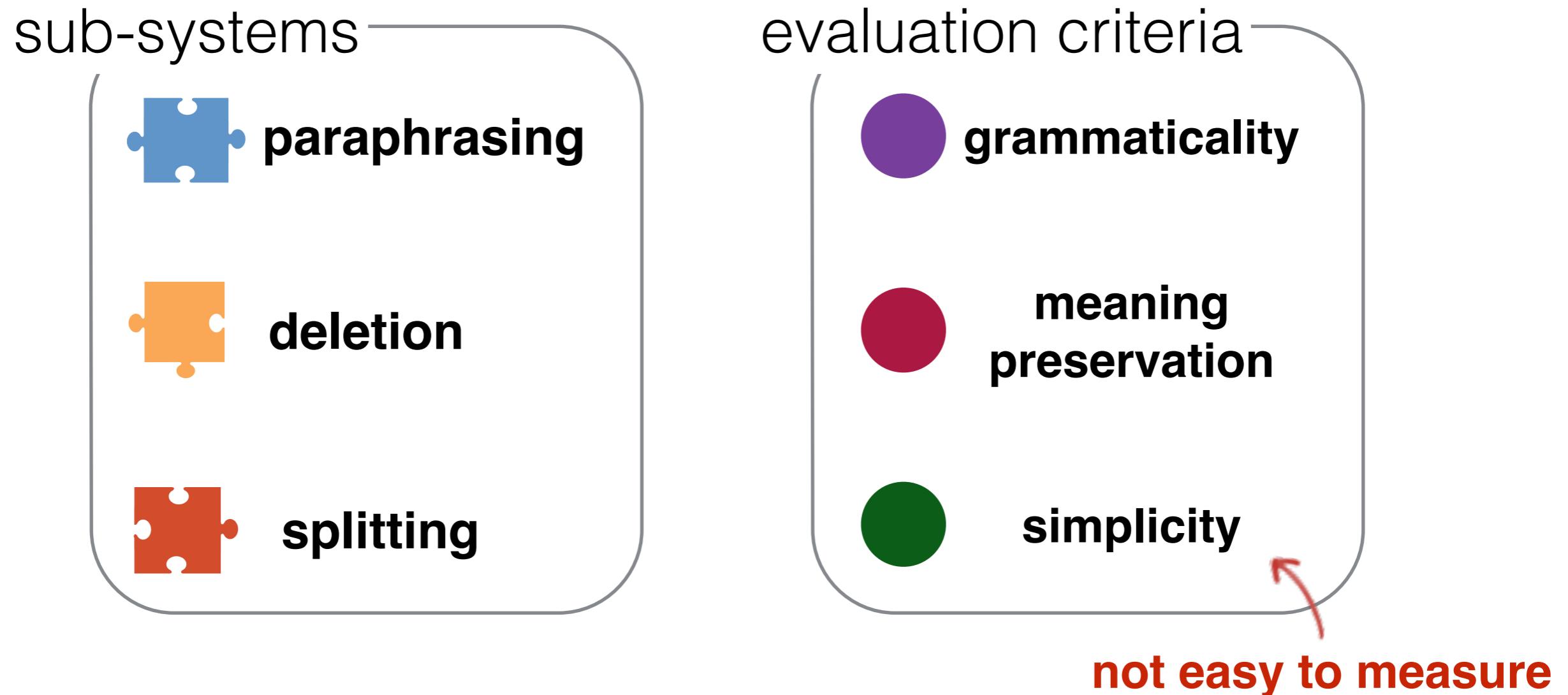
WHY DID THIS HAPPEN?

- 1 “state-of-the-art” competition
- 2 not easy to do

Opinion #1

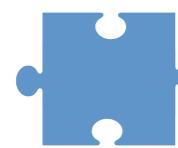
Current evaluation **doesn't**
tell us what's going on.

System Comparability



System Comparability

sub-systems



paraphrasing



deletion



splitting

evaluation criteria



grammaticality



**meaning
preservation**



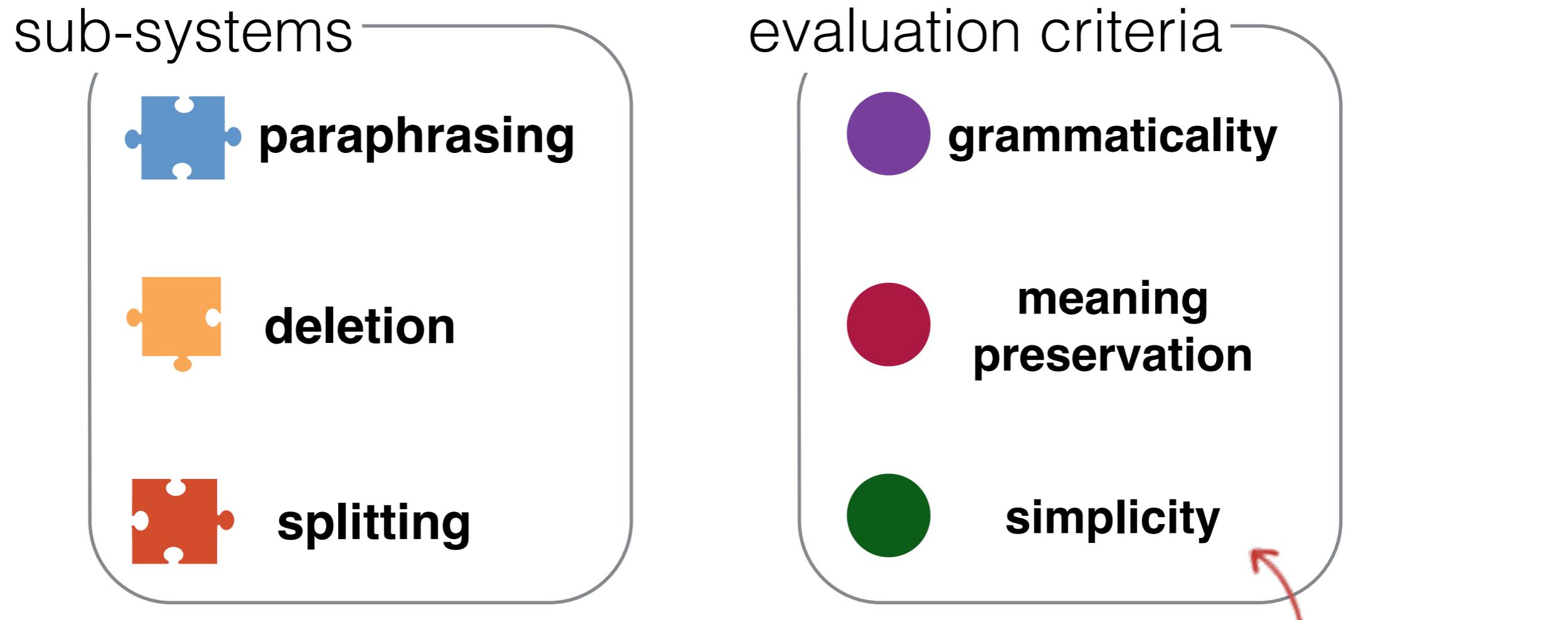
simplicity



not easy to measure

We need more controlled evaluation:

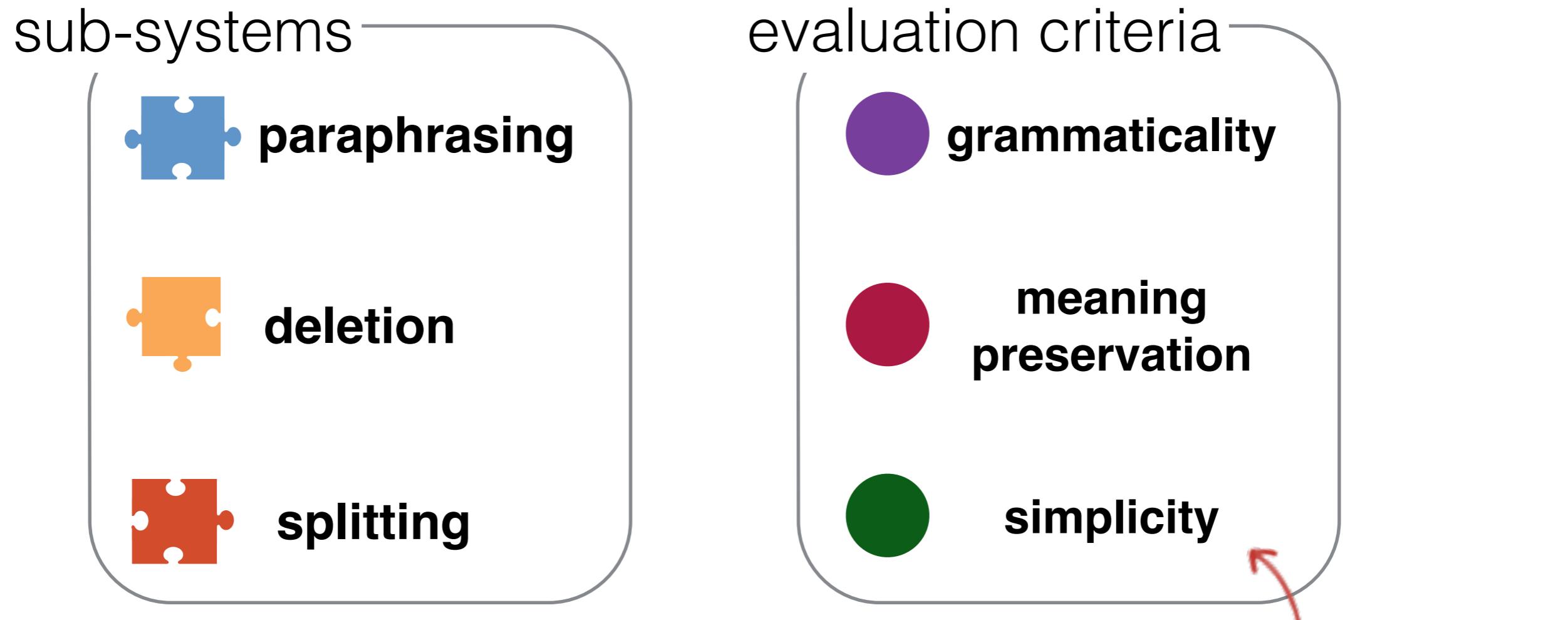
System Comparability



We need more controlled evaluation:
- evaluate sub-tasks separately

not easy to measure

System Comparability



We need more controlled evaluation:

- evaluate sub-tasks separately
- target specific audience (e.g. 10-12 year old)

not easy to measure

Opinion #2

Simple Wikipedia is
not that simple



Simple English
WIKIPEDIA

Page

Talk

Read

Change

More ▾

Search

Photolithography

From Wikipedia, the free encyclopedia

Main page

Photolithography is the combination of photography and lithography.

Microphotolithography is the use of photolithography to transfer geometric shapes on a **photomask** to the surface of a **semiconductor wafer** for making **integrated circuits**.

“Specific questions that need addressing are :

... we need to better understand the quality of Simple English Wikipedia, a resource that has been used to train many SMT based simplification systems...”

—— Advaith Siddharthan (2014 Survey)

“Specific questions that need addressing are :

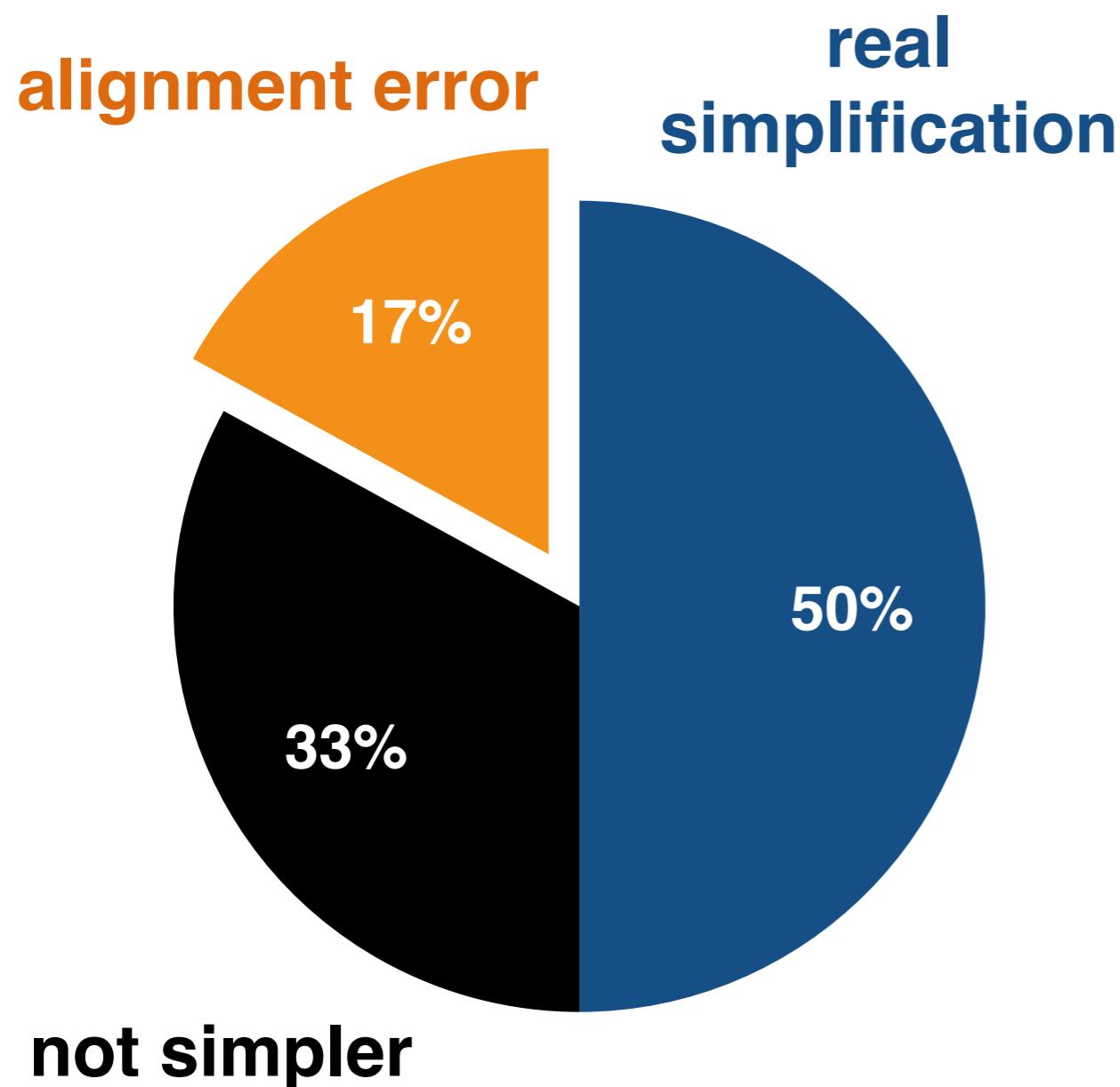
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WHAT'S NEW?

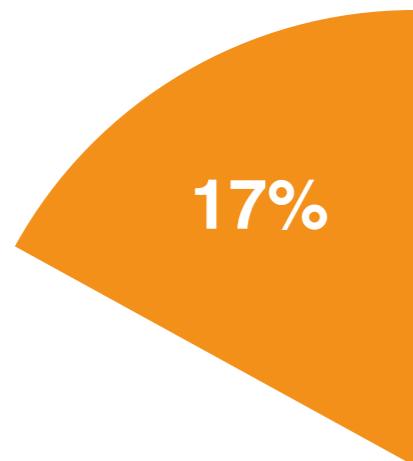
We quantitatively and systematically answer this quest.

Quality of Parallel Wikipedia Corpus*



Inaccuracy in Parallel Wikipedia Corpus*

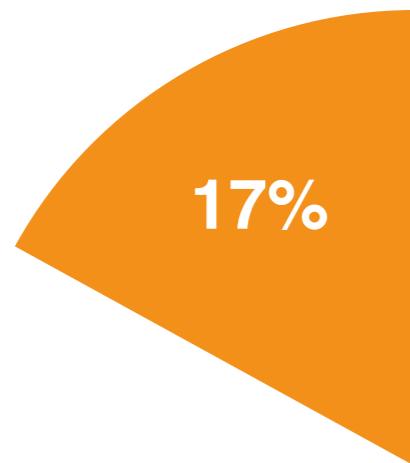
alignment error



(two sentences have different meaning)

Inaccuracy in Parallel Wikipedia Corpus*

alignment error

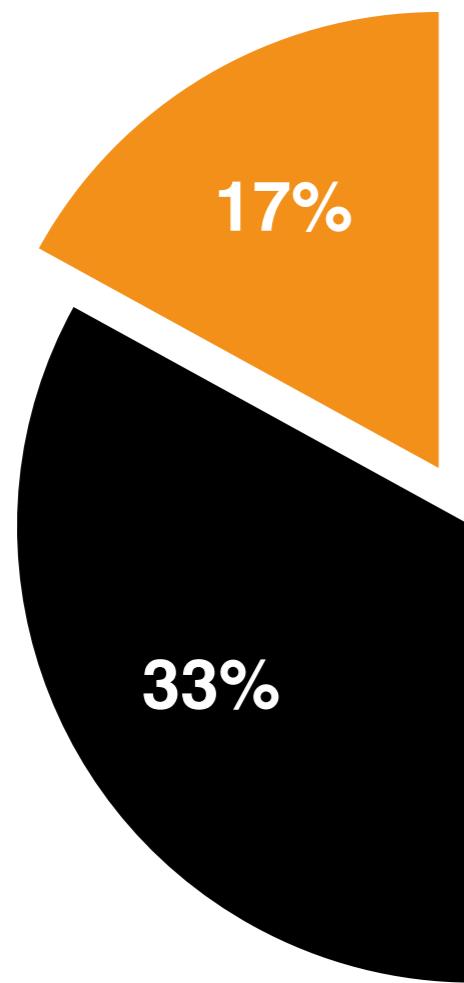


(two sentences have different meaning)

Best automatic sentence alignment gets about **0.7 F1** score (Hwang et al. 2015)

Inadequacy in Parallel Wikipedia Corpus*

alignment error

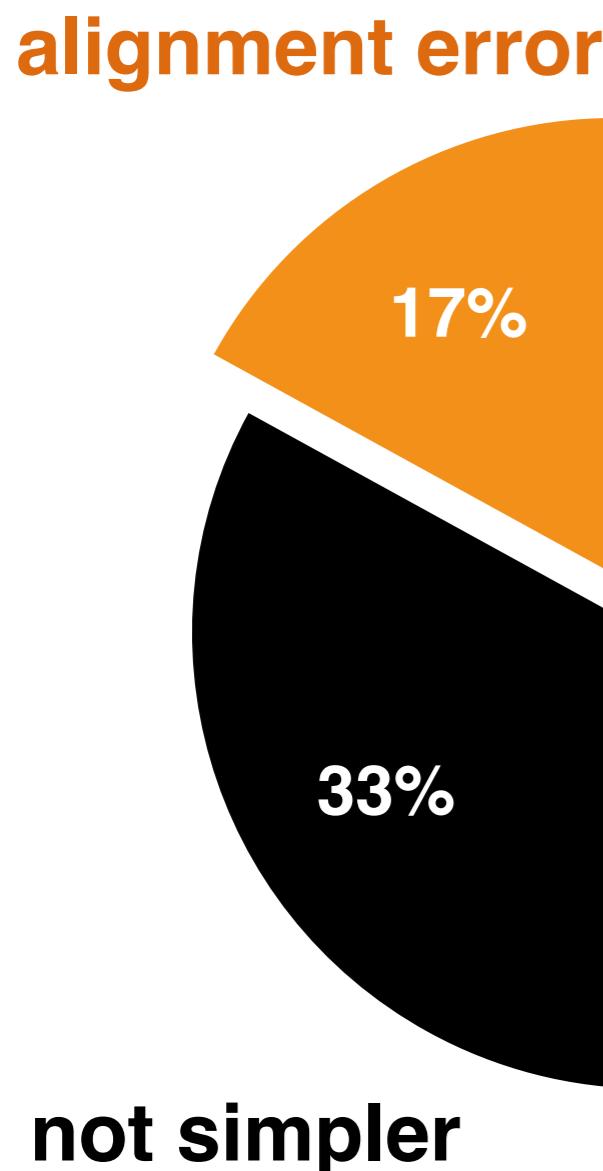


(two sentences have different meaning)

Best automatic sentence alignment gets about **0.7 F1** score (Hwang et al. 2015)

not simpler

Inadequacy in Parallel Wikipedia Corpus*

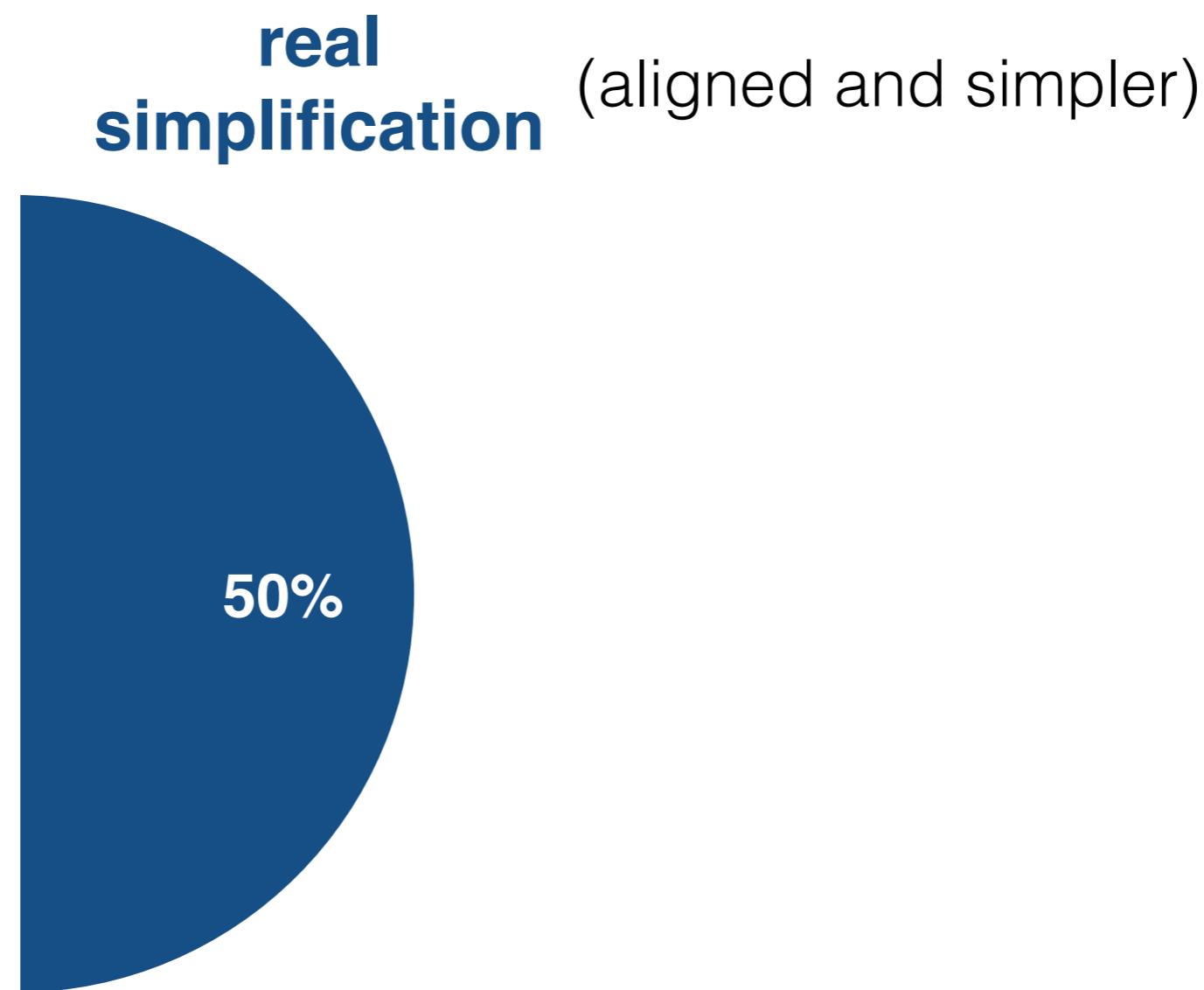


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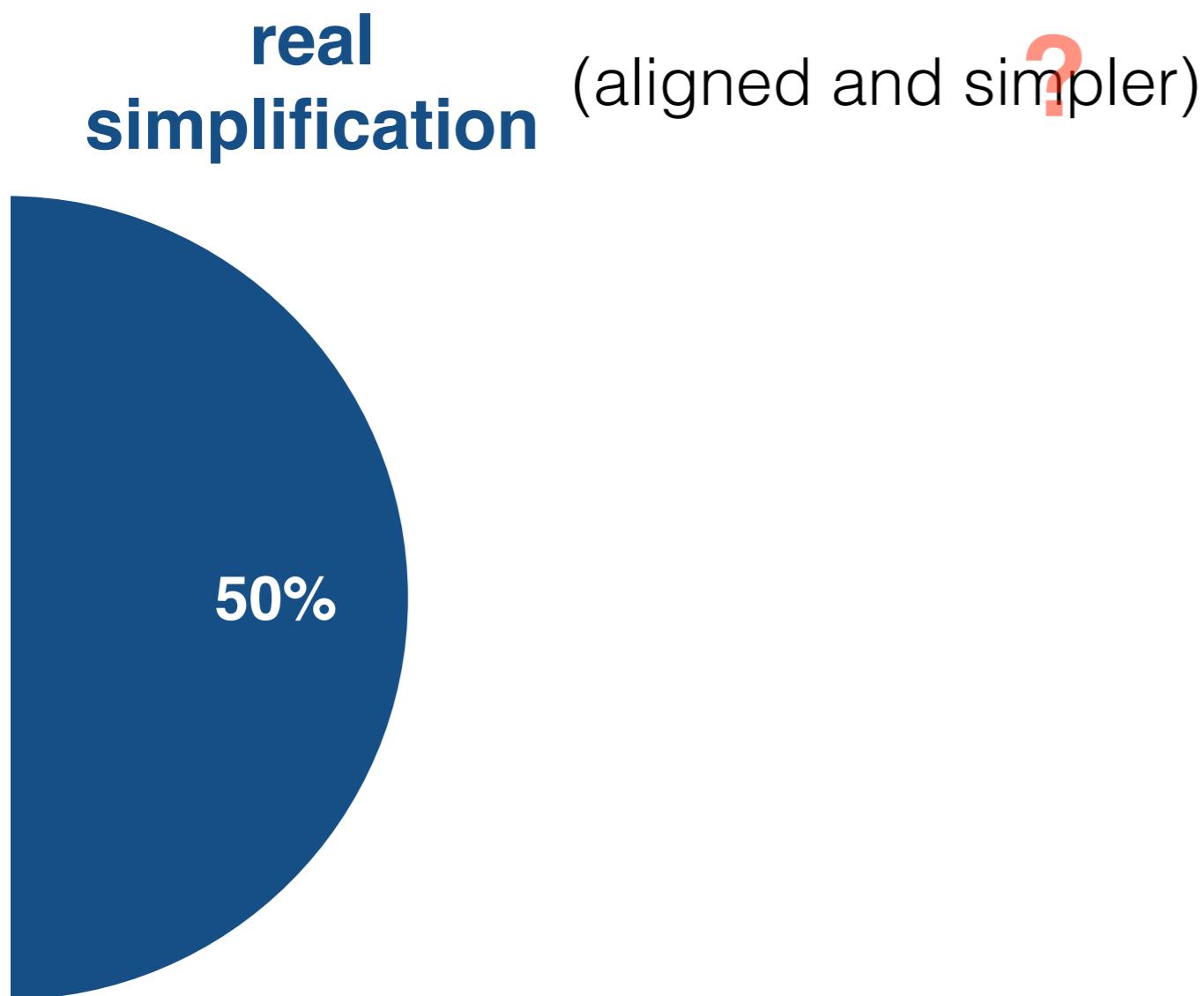
Best automatic sentence alignment gets about **0.7 F1** score (Hwang et al. 2015)

Sentences can have similar meaning but not simplification

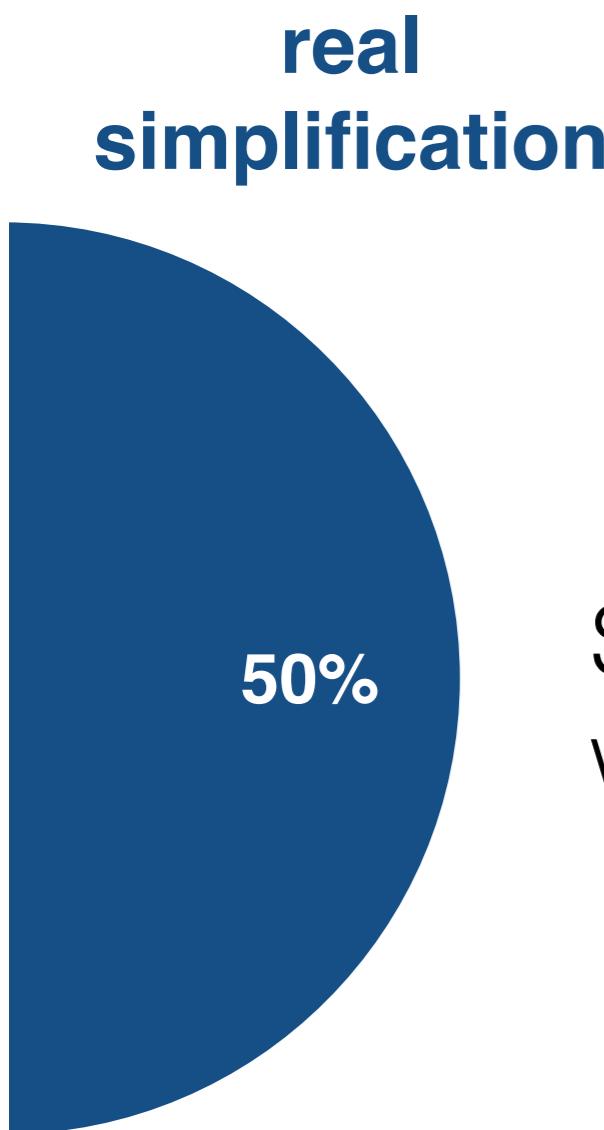
Inadequacy in Parallel Wikipedia Corpus*



Inadequacy in Parallel Wikipedia Corpus*



Inadequacy in Parallel Wikipedia Corpus*



**real
simplification** (aligned and simpler?)

Some sentences are simpler by only one word while the rest of sentence is still complex

Issues with Parallel Wikipedia Corpus

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- suboptimal for estimating “translation” probabilities

Issues with Parallel Wikipedia Corpus

- suboptimal for estimating “translation” probabilities
- suboptimal for developing automatic metrics

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- suboptimal for estimating “translation” probabilities
- suboptimal for developing automatic metrics
- suboptimal for tuning MT system

Issues with Parallel Wikipedia Corpus

- suboptimal for estimating “translation” probabilities
- suboptimal for developing automatic metrics
- suboptimal for tuning MT system
- unsuitable for document-level simplification

Opinion #3

New data **can** help

Newsela Dataset

NEWSELA

WAR & PEACE SCIENCE KIDS MONEY LAW HEALTH

SCIENCE 1738

Archaeologist may have found remains of ancient Egyptian Queen Nefertiti

By Robert Gebelhoff, Washington Post. 08.17.15



The 3,330-year-old bust of Nefertiti sits in an exhibition in the Kulturforum in Berlin, Germany, March 1, 2005. Photo: AP/Herbert Knosowski

Nefertiti — she's an ancient Egyptian queen and the source of a fantastic mystery regarding the iconic remnants of long-lost royalty.

For decades, archaeologists have speculated on the location of the queen's remains, the last royal mummy missing from the dynasty of the famous King Tutankhamun, better known as King Tut. But now, an archaeologist claims that he has found her

MAX
1140L
960L
720L
420L
 WRITE
 QUIZ

NEWSELA

WAR & PEACE SCIENCE KIDS MONEY LAW HEALTH

SCIENCE 1738

Mystery of ancient Egypt solved? Tomb of queen may be hidden near King Tu'

By Washington Post, adapted by Newsela staff 08.17.15



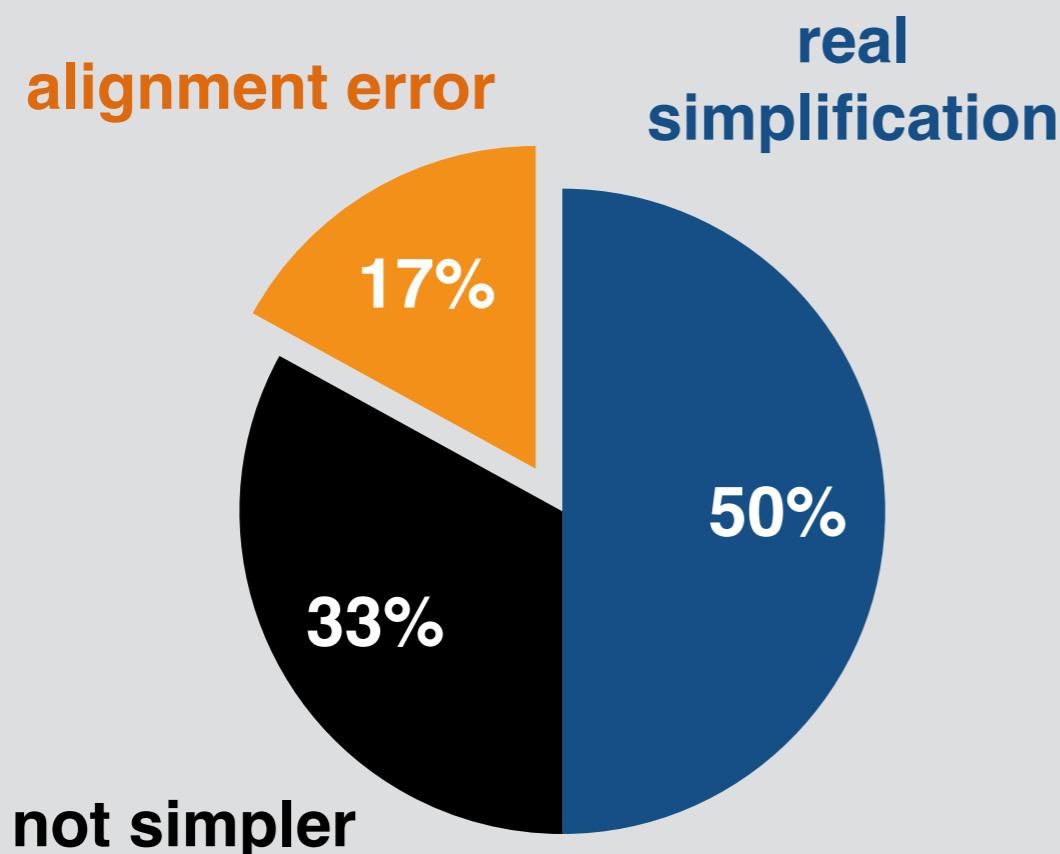
The 3,330-year-old bust of Nefertiti sits in an exhibition in the Kulturforum in Berlin, Germany, March 1, 2005. Photo: AP/Herbert Knosowski

The ancient Egyptian Queen Nefertiti has long been at the center of a mystery. For years, archaeologists have wondered where her tomb might be hidden. Nefertiti belonged to the family line of the famous King Tutankhamun, better known as King Tut. Indeed, some believe she was Tut's mother. While the other royals in her line are

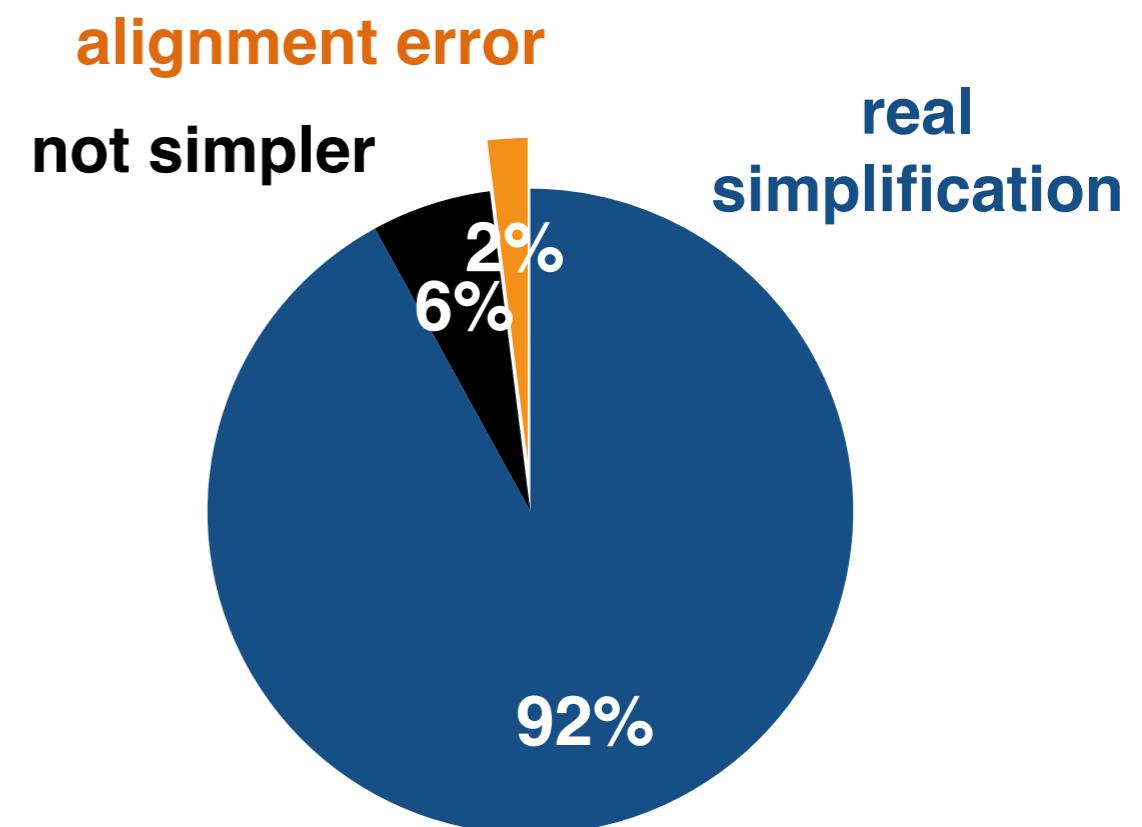
1140L
960L
720L
420L
 WRITE
 QUIZ

every article at **5 levels** of simplification
written by trained editors, comes with comprehension quizzes

Wikipedia*



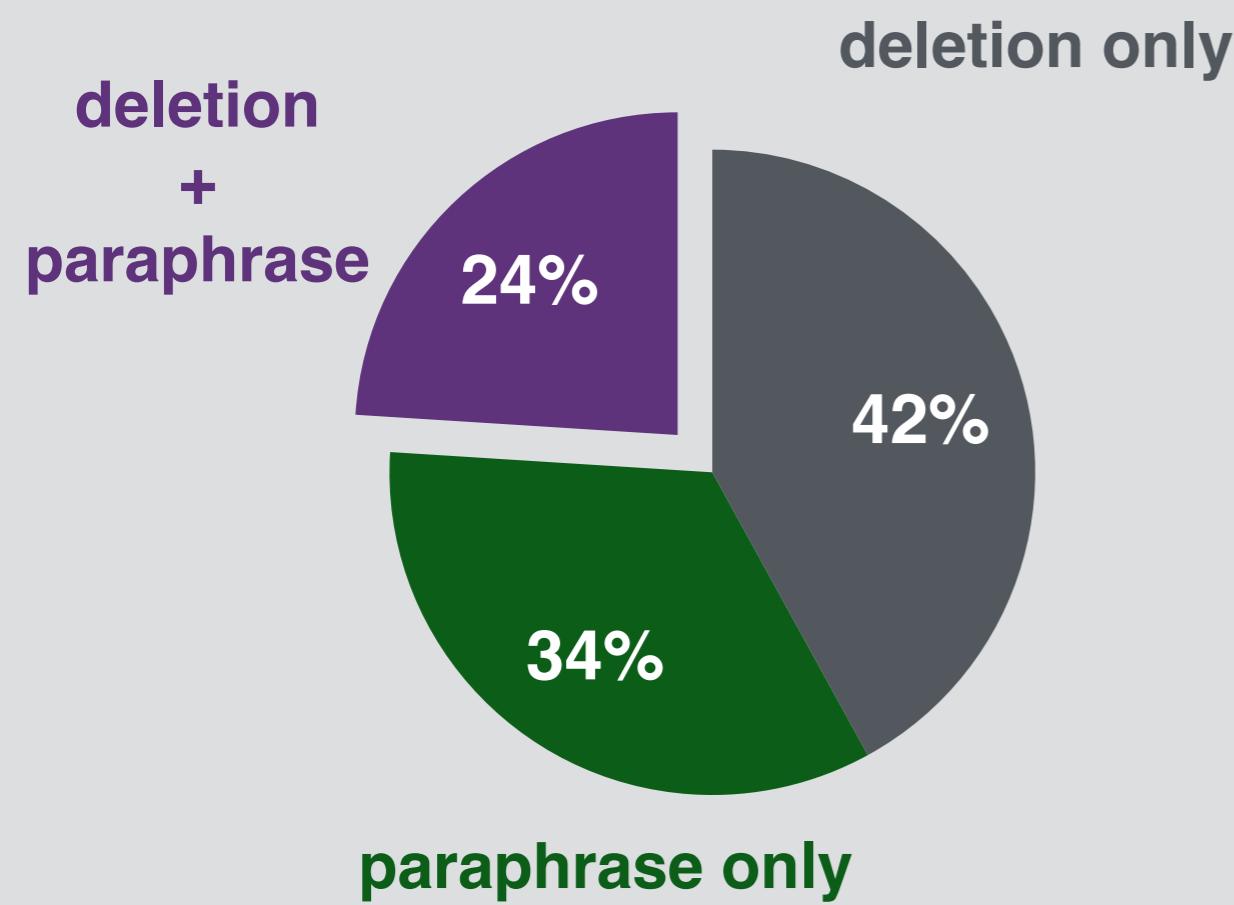
Newsela



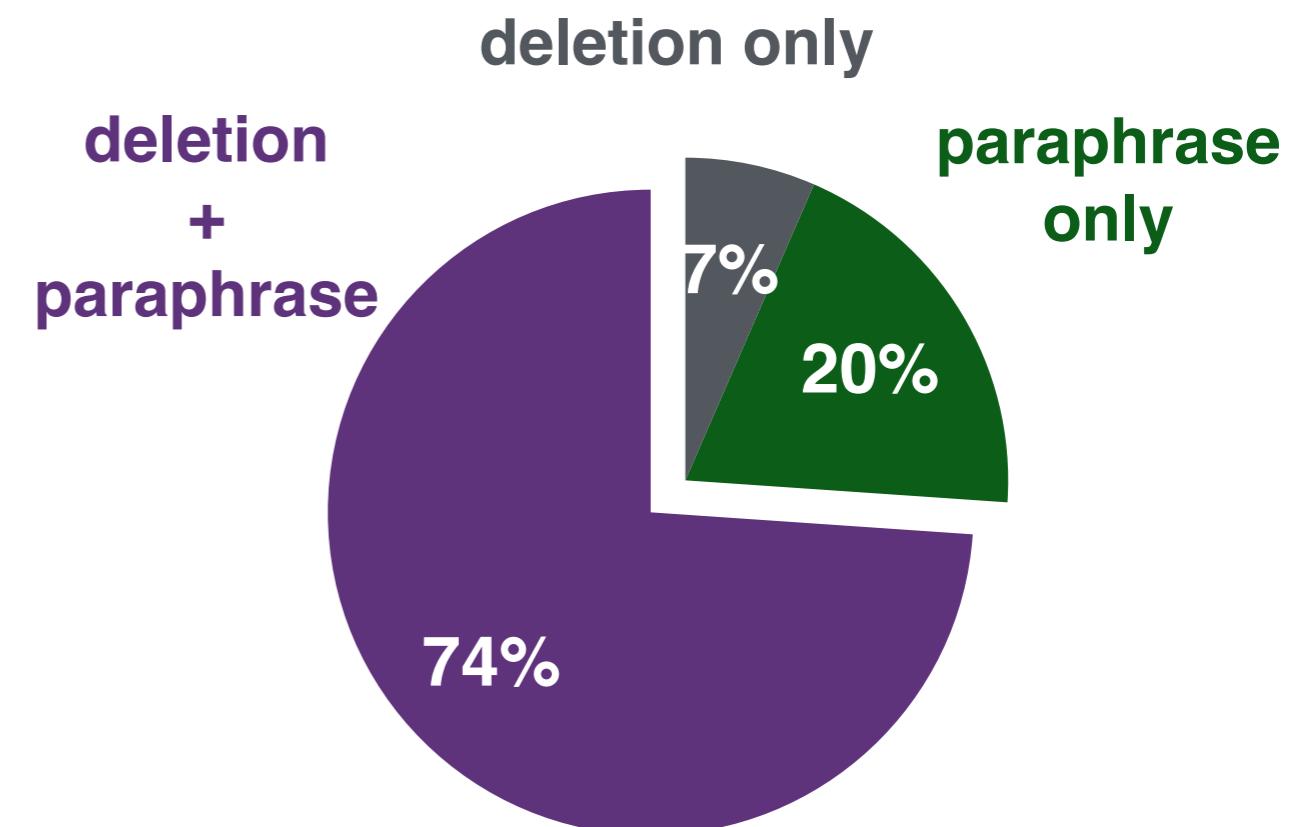
manual inspection of aligned sentence pairs

Wikipedia*

Good simplification needs more paraphrasing.



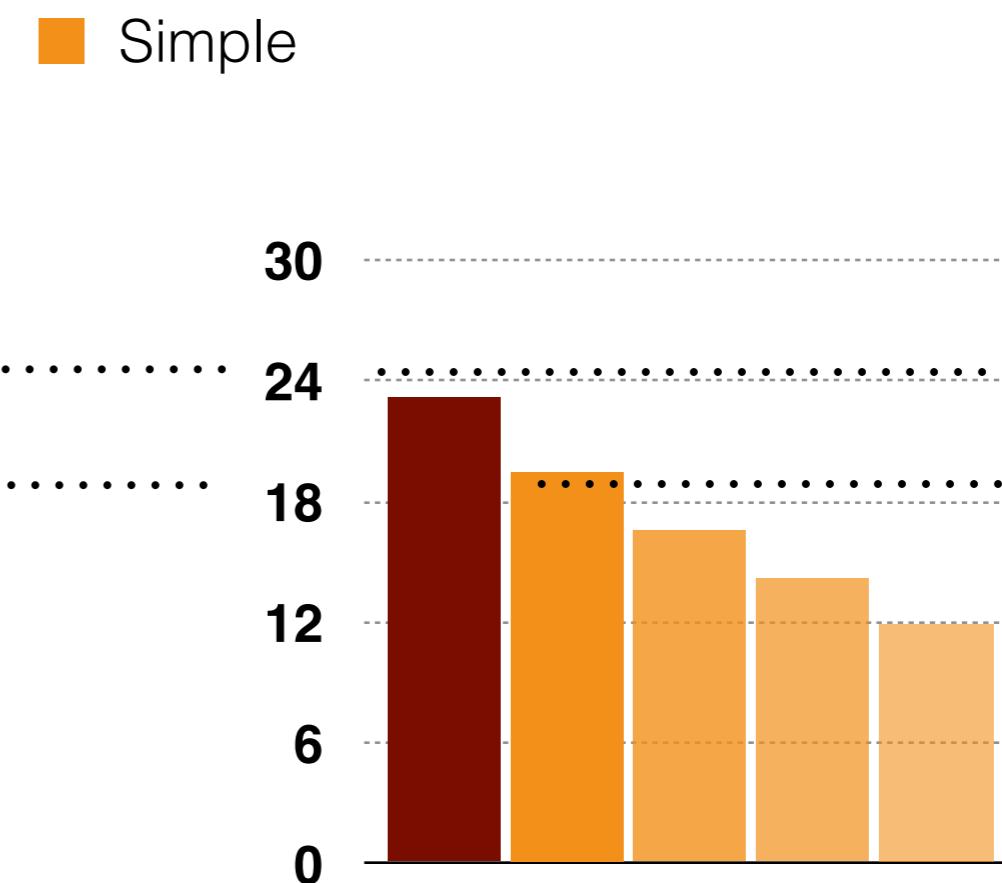
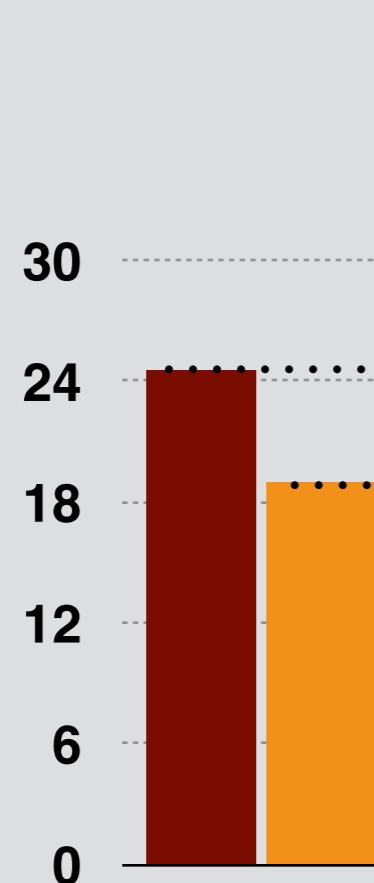
Newsela



degree of paraphrasing

Wikipedia*

Good simplification could be much shorter.

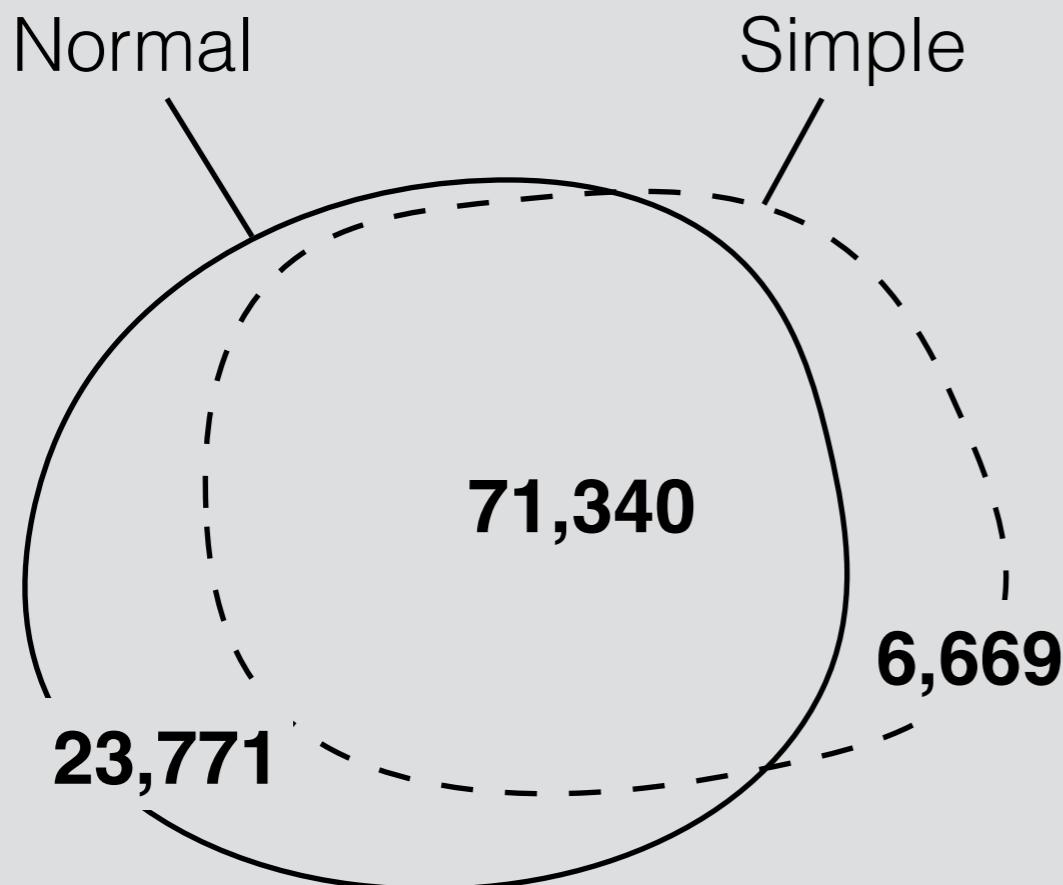


sentence length (#words)
see syntax analysis in the paper

Wikipedia*

(total 2.6 million tokens)

Good simplification uses a much smaller vocabulary.

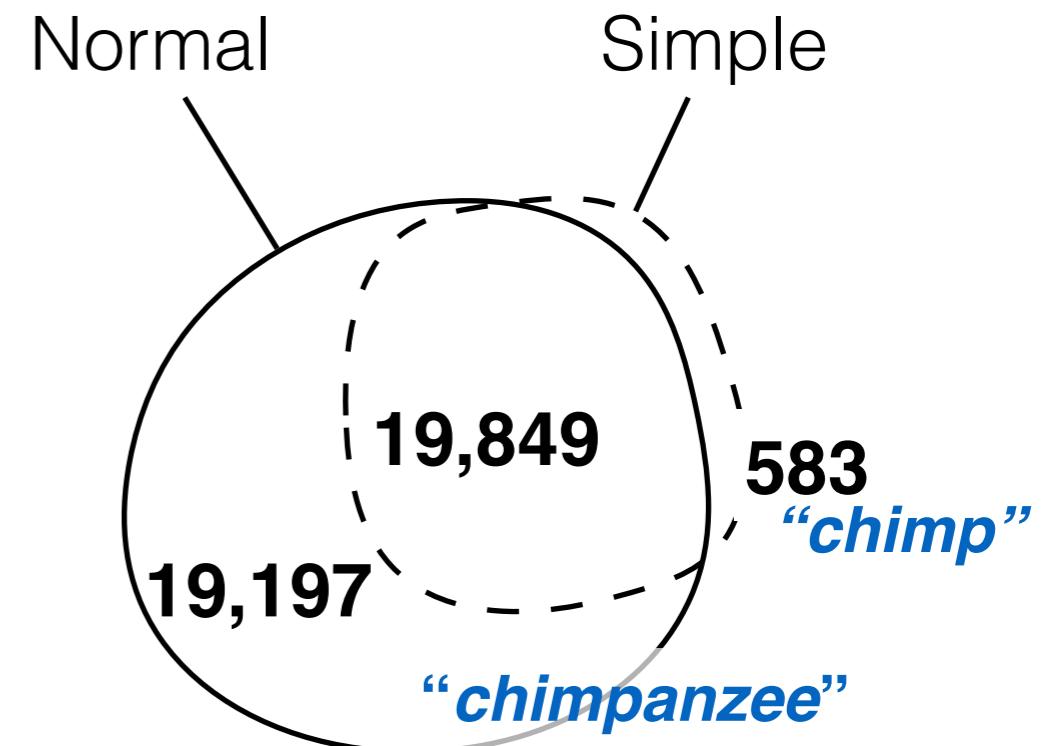


18% reduction

vocabulary size (#unique words)

Newsela

(total 1.3 million tokens)



48% reduction

Wikipedia*

Good simplification reduces certain function word usage.

commune
,

as

and

northern

northwestern

film

;

southwestern

footballer

Newsela

,

and

"

—

of

which

as

percent

including

director

most significantly reduced words
(weighted log-odds-ratio analysis w/ informative Dirichlet prior)

Wikipedia*

- █ Normal
- █ Simple

*Postal officials recently tried to , **which** could*

*Postal officials recently tried to **That** could*

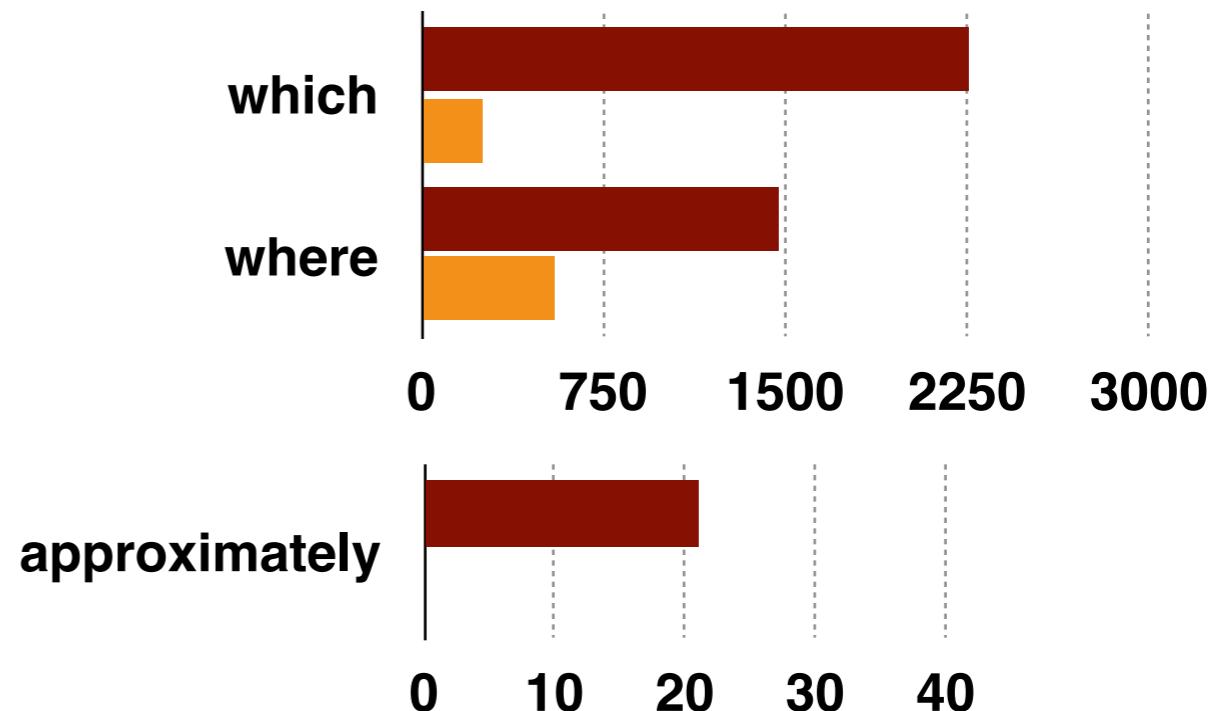
Newsela

most significantly reduced words
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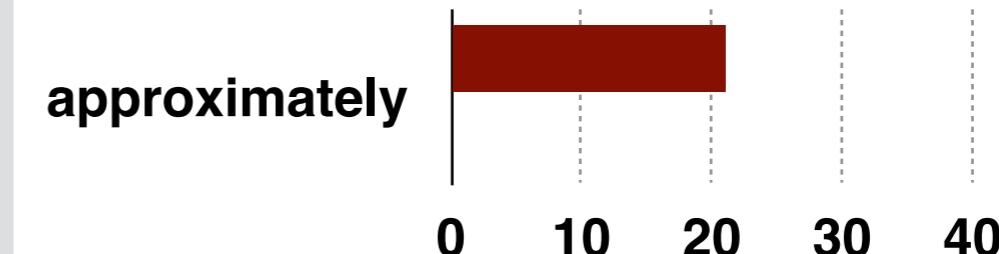
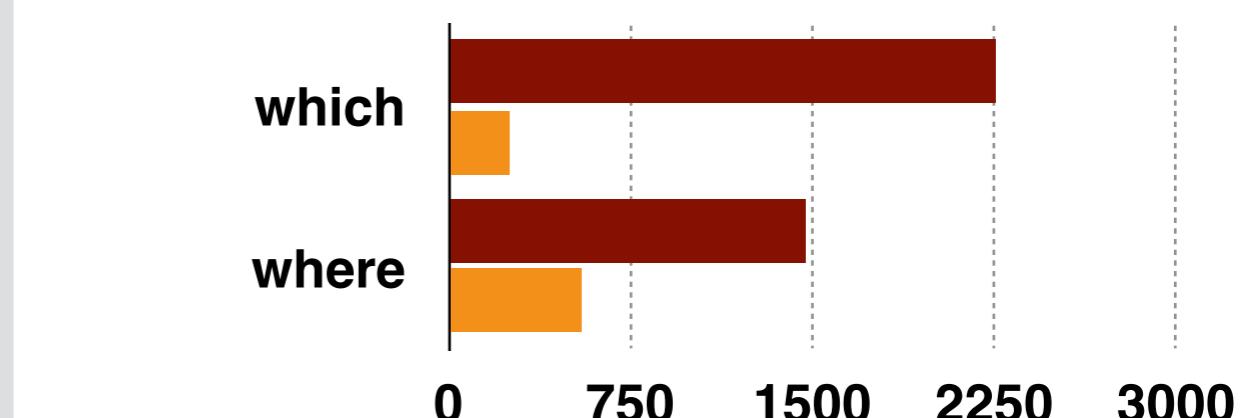
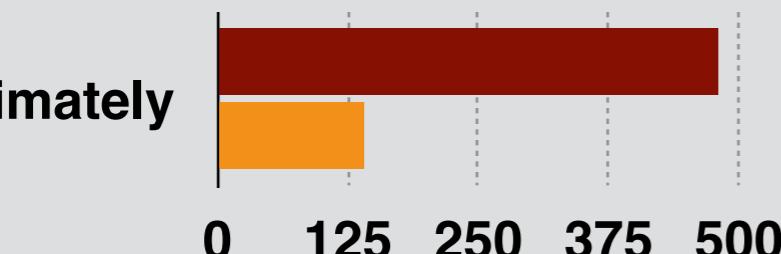
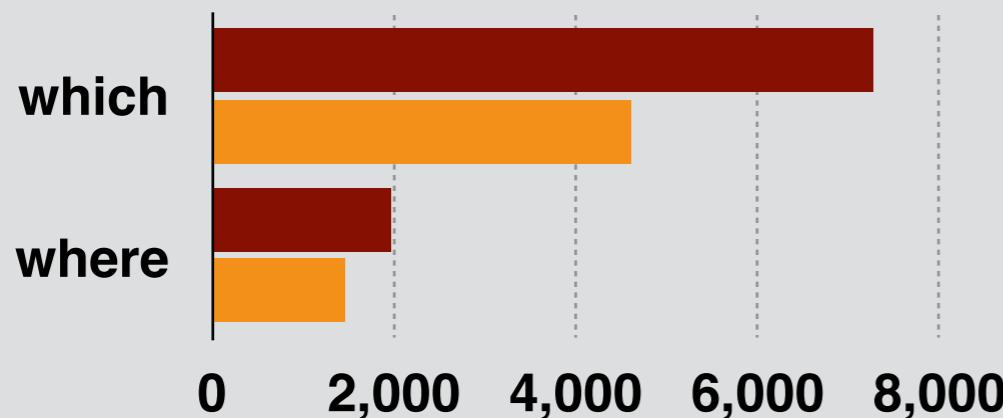


most significantly reduced words
see **syntax analysis in the paper**

Wikipedia*

- Normal
- Simple

*Postal officials recently tried to , **which** could
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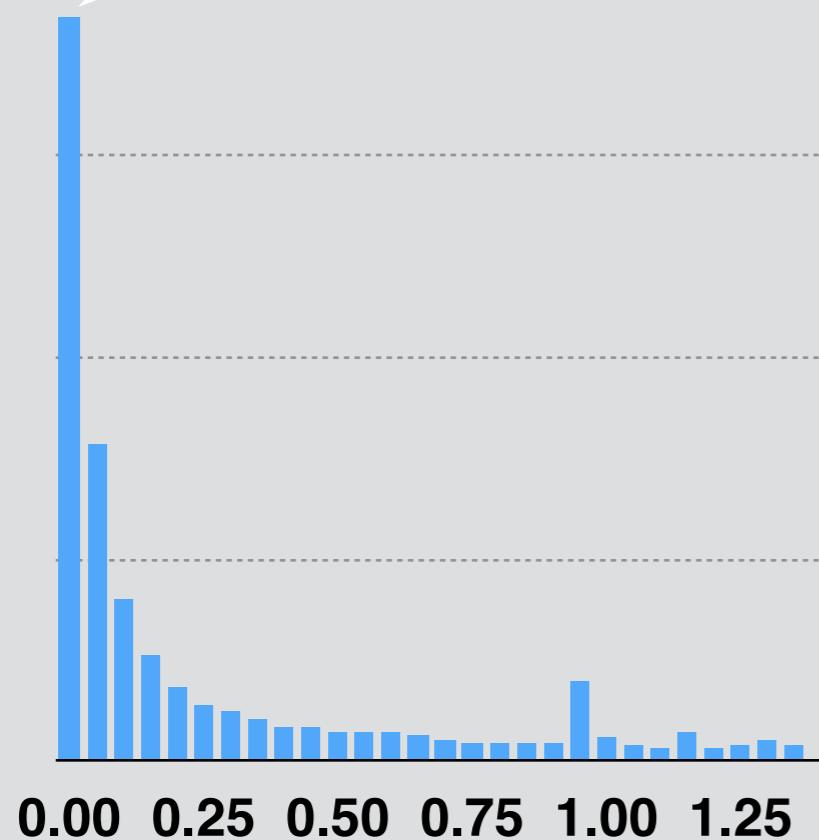


most significantly reduced words
see syntax analysis in the paper

Wikipedia*

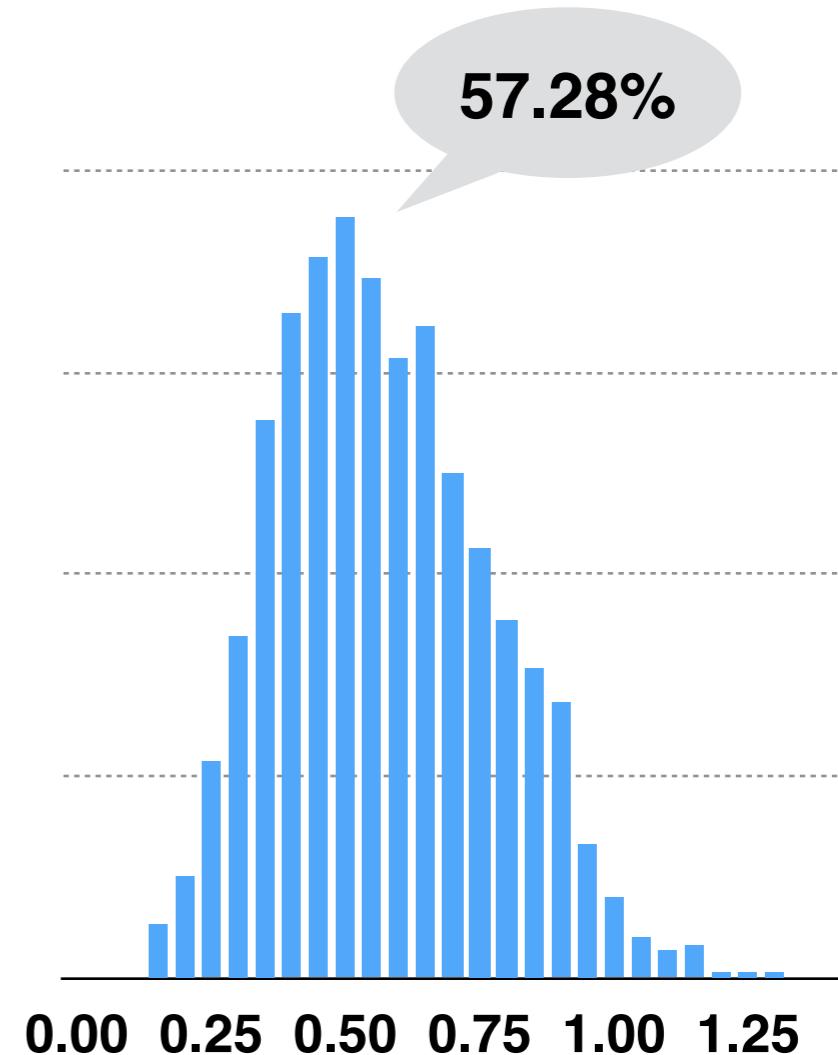
Wikipedia is not suitable for full-document simplification.

3.19%



Newsela

57.28%



document compression ratio (simple/normal)
see discourse analysis in the paper

Opinion #1

**Current evaluation
doesn't tell us what's going on.**

Opinion #2

Simple Wikipedia is **not that simple.**

Opinion #3

New data **can help.**

My Suggestions

My Suggestions

- **to reviewers:**

My Suggestions

- **to reviewers:**
 - be open-minded to papers that may not follow previous evaluation setup, may not outperform the “state-of-the-art” on Wikipedia

My Suggestions

- **to reviewers:**
 - be open-minded to papers that may not follow previous evaluation setup, may not outperform the “state-of-the-art” on Wikipedia
 - be sympathetic towards papers specially on data construction*, data analysis* and automatic evaluation metrics

* (Pellow & Maxine, 2014 HCOMP; Marcelo & Specia, 2014 PITR)

My Suggestions

- **to reviewers:**
 - be open-minded to papers that may not follow previous evaluation setup, may not outperform the “state-of-the-art” on Wikipedia
 - be sympathetic towards papers specially on data construction*, data analysis* and automatic evaluation metrics
 - read our paper

* (Pellow & Maxine, 2014 HCOMP; Marcelo & Specia, 2014 PITR)

My Suggestions

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- **to researchers:**

My Suggestions

- **to researchers:**
 - consider working on text simplification (“pre-BLEU age”)

My Suggestions

- **to researchers:**
 - consider working on text simplification (“pre-BLEU age”)
 - improve evaluation

My Suggestions

- **to researchers:**
 - consider working on text simplification (“pre-BLEU age”)
 - improve evaluation
 - make your system replicable

My Suggestions

- **to researchers:**
 - consider working on text simplification (“pre-BLEU age”)
 - improve evaluation
 - make your system replicable
 - read our paper

Thank you

Questions?
Opinions?

Sponsor: NSF
Newsela data are available at <https://newsela.com/data/>

Back Up

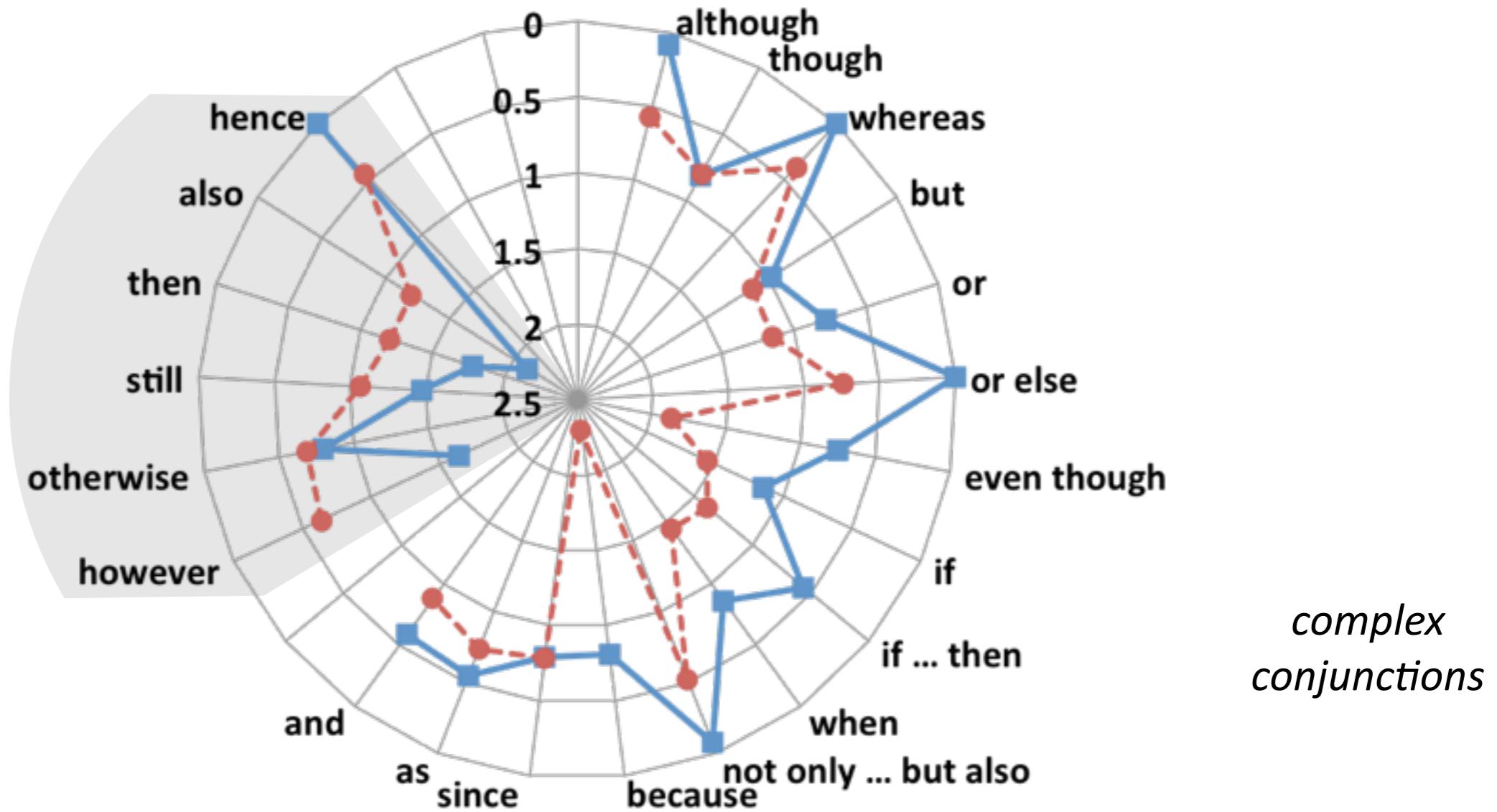
Wikipedia*



Newsela



*simple
cue
words*



change of discourse connectives (odds-ratio)

Reasons of Quality Issues

in Parallel Wikipedia Corpus

- The Simple Wikipedia was created by volunteers with no specific objective;
- Articles in Simple Wikipedia do not necessarily map Normal Wikipedia;
- As an encyclopedia, Wikipedia contains extremely difficult words and sentences.

NewseLA Dataset

Original

Slightly more fourth-graders nationwide are reading proficiently compared with a decade ago, but only a third of them are now reading well, according to a new report.

Simple-1

Fourth-graders in most states are better readers than they were a decade ago. But only a third of them actually are able to read well, according to a new report.

Simple-2

Fourth-graders in most states are better readers than they were a decade ago. But only a third of them actually are able to read well, according to a new report.

Simple-3

Most fourth-graders are better readers than they were 10 years ago. But few of them can actually read well.

Simple-4

Fourth-graders are better readers than 10 years ago. But few of them read well.

Newsela Dataset

1,130 news articles

Time: 2013 January ~ 2015 March

Source: Chicago Tribune, Seattle Times,
LA Times, The Baltimore Sun

Original: 56k sentences — Simple: 64k sentences