

# Predictive Translation Memory in the Wild: A Study of Interactive Machine Translation Use on Lilt

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# Why Interactive MT?

- **Problem:** MT systems cannot guarantee correctness.  
Errors can affect business reputation
- **A human in the loop** is needed to ensure correctness
- **Interactive MT:** optimizing interactions between the translator and MT system

# Post-editing: Translators edit MT output

An idea with a long history (Bisbey and Kay 1972)



# Post-editing: Translators edit MT output

Source text

The physicist Arthur Eddington drew on Borel's image further in *The Nature of the Physical World* (1928), writing: If I let my fingers wander idly over the keys of a typewriter it might happen that my screed made an intelligible sentence.

MT suggestion

Le physicien Arthur Eddington a attiré sur l'image de Borel dans le caractère du monde physique (1928), écrit: Si je laisse mes doigts se promener les bras croisés sur les touches de la machine à écrire, il peut arriver que mon chape fait une phrase intelligible.

Submit

Image Source

Green, Spence, Jeffrey Heer, and Christopher D. Manning. "The efficacy of human post-editing for language translation." *Proceedings of the SIGCHI conference on human factors in computing systems*. 2013.

# Post-editing: Translators edit MT output

## Pros

- Easy to implement (can use off-the-shelf MT system)
- Reduces translation time [1]

## Cons

- Post-edited text is more similar to MT than unassisted translations [1]
- Translators can find post-editing frustrating [2]

[1] Green, Spence, Jeffrey Heer, and Christopher D. Manning. "The efficacy of human post-editing for language translation." *Proceedings of the SIGCHI conference on human factors in computing systems*. 2013.

[2] Gaspari, Federico, et al. "Perception vs reality: Measuring machine translation post-editing productivity." *Proceedings of the 11th Conference of the Association for Machine Translation in the Americas: Workshop on Post-Editing Technology and Practice (WPTP3)*. Vancouver: AMTA, 2014.

# Predictive Translation Memory

MT system suggests text predictions that complete the translation the user has already entered

If the MT suggestion is correct, user can accept it; if it isn't, user can type as normal.

MT suggestions update and improve as users type.

# Transtype (Foster 2000)

The Canadian International Development Agency and the Canada Mortgage and Housing Corporation will be taking part in a conference which will deal with housing for the needy .

The conference will be held in the fall of 1987 .

The Canada Mortgage and Housing Corporation is now looking into the possibility of financing further conferences and forums of this

Opération afrique 2000 qui a été lancée par moi est une exemple de la détermination du Canada pour aider les gens des régions rurales d' Afrique à surmonter la famine et à briser le cycle de pauvreté

L' a gence canadienne de développement international  
ccord  
u  
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gence

MT suggestion starting with “L'a”

# Lilt's Interactive MT

**21** Fan Replacement Instructions (PDF)

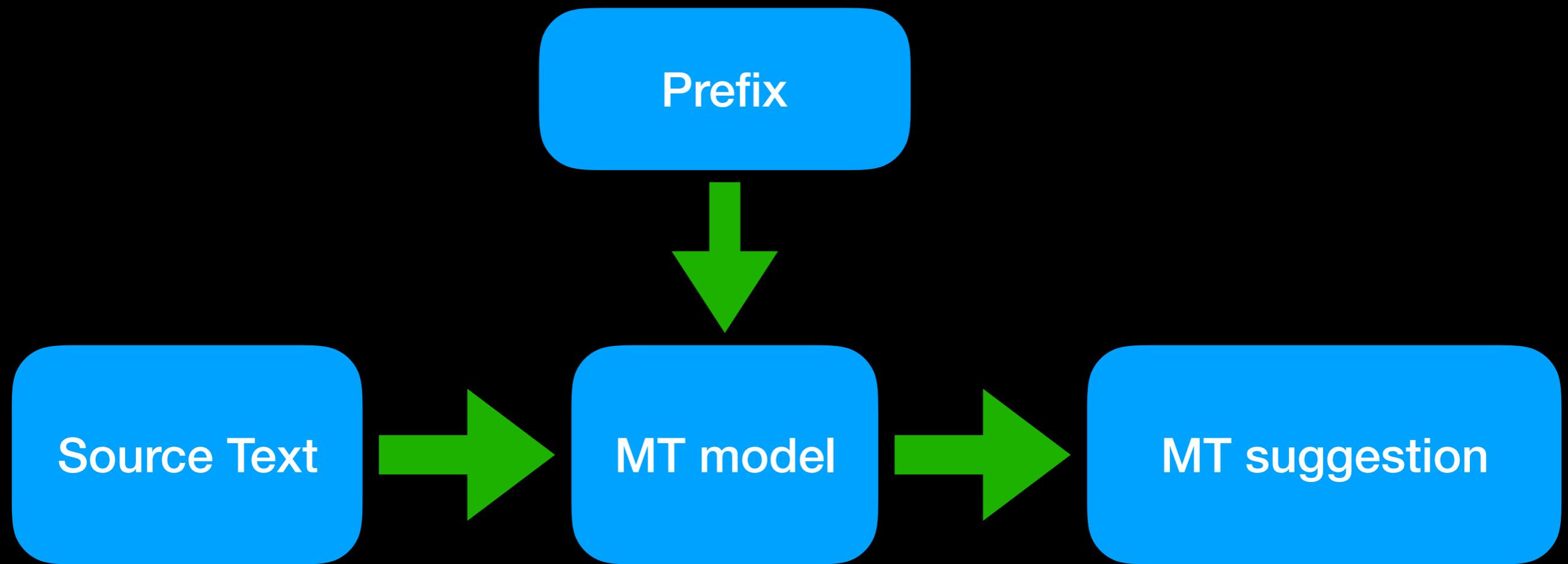


Istruzioni di sostituzione della ventola (PDF)



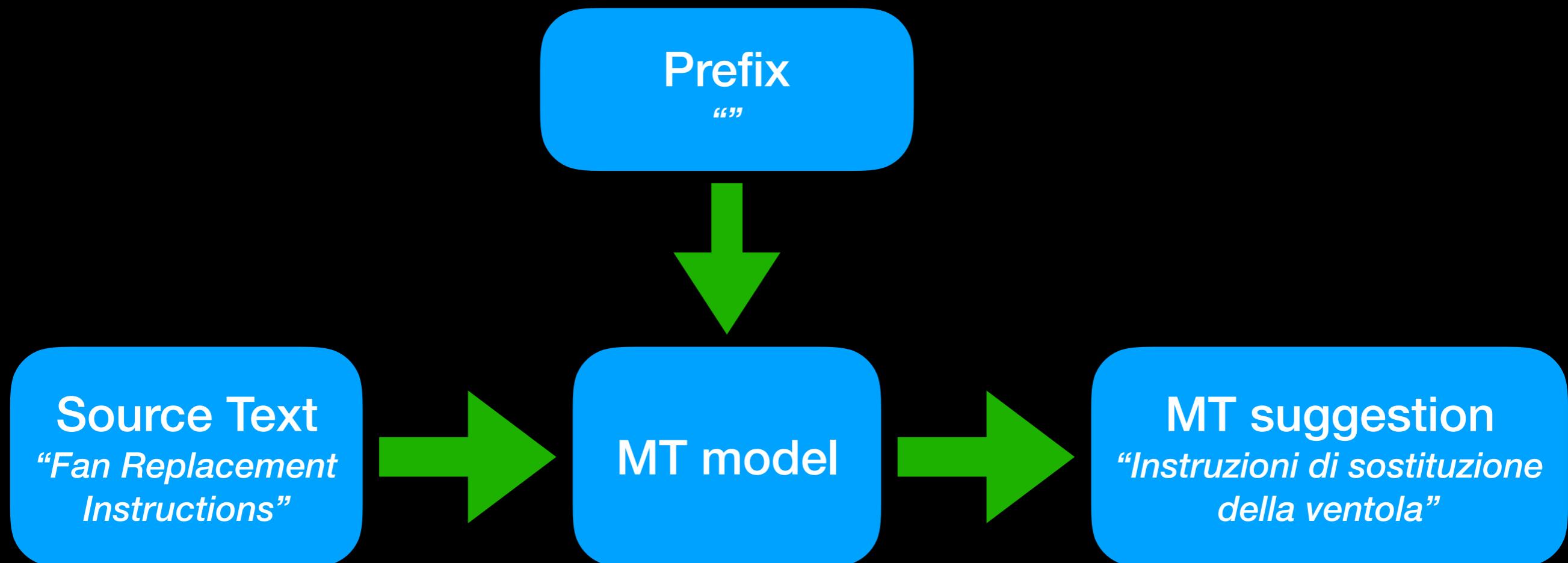
# Interactive MT Implementation

Prefix-constrained MT model (based on Transformer architecture). Details at [lilt.com/research](http://lilt.com/research)



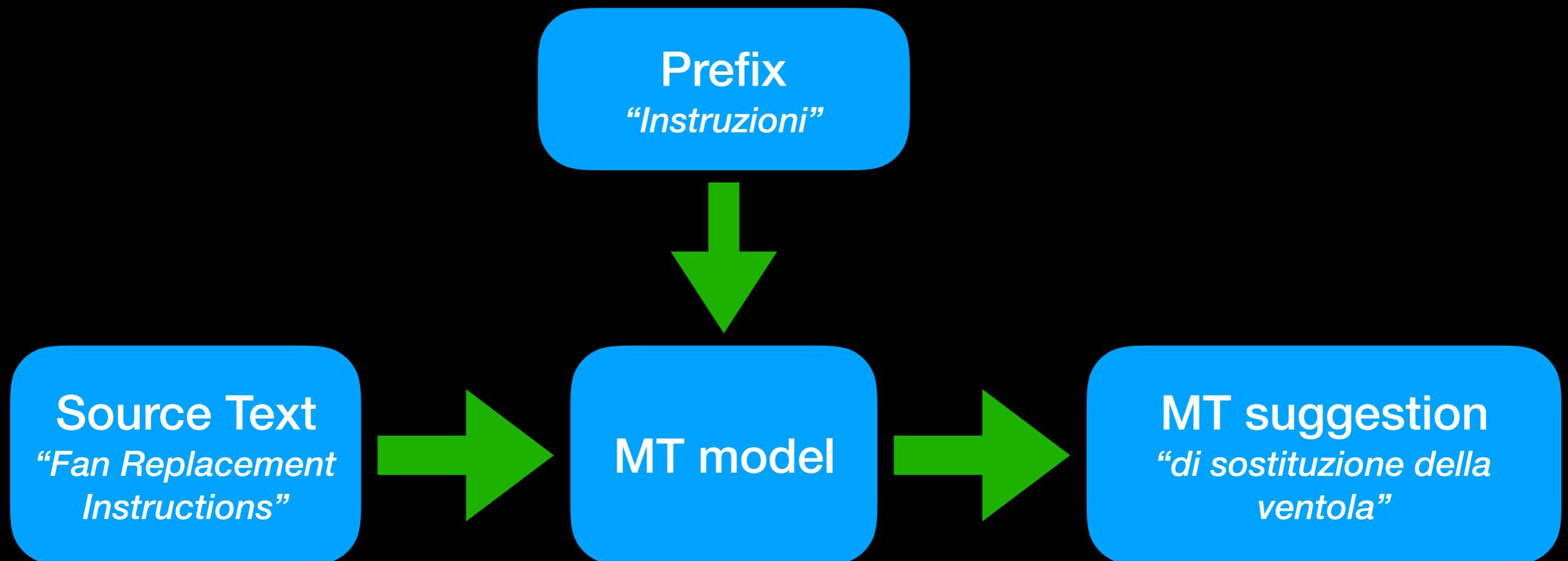
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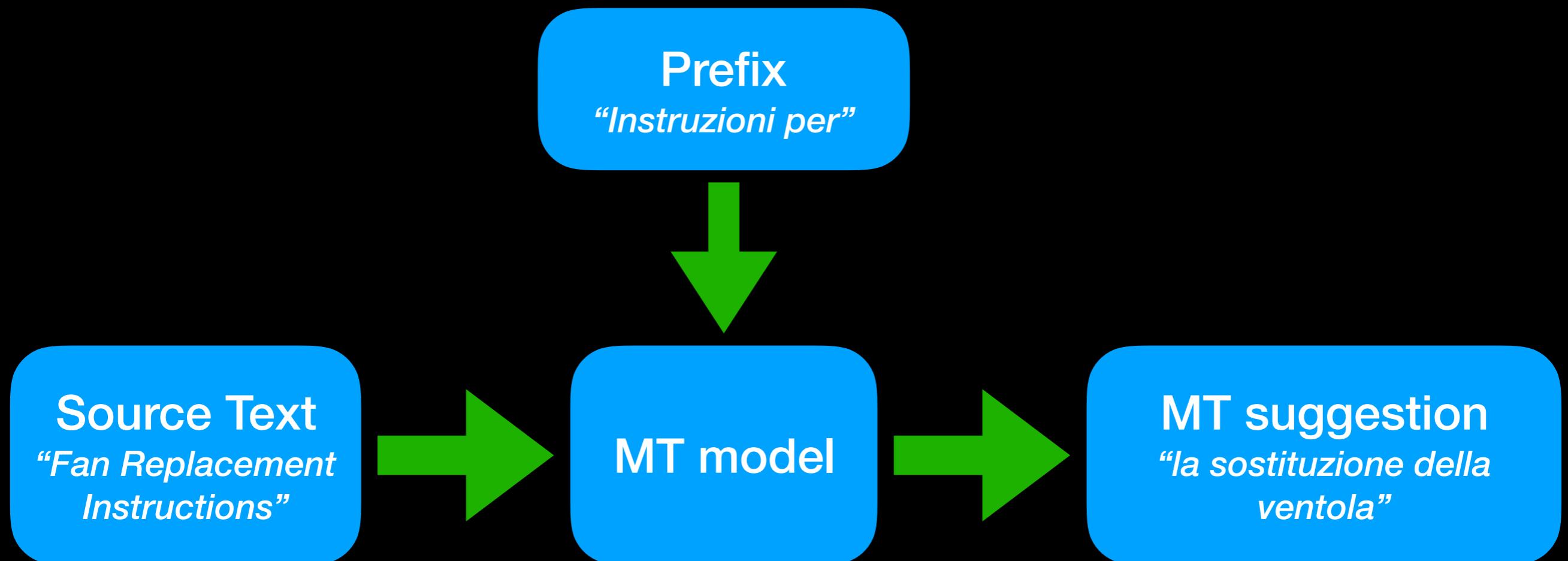
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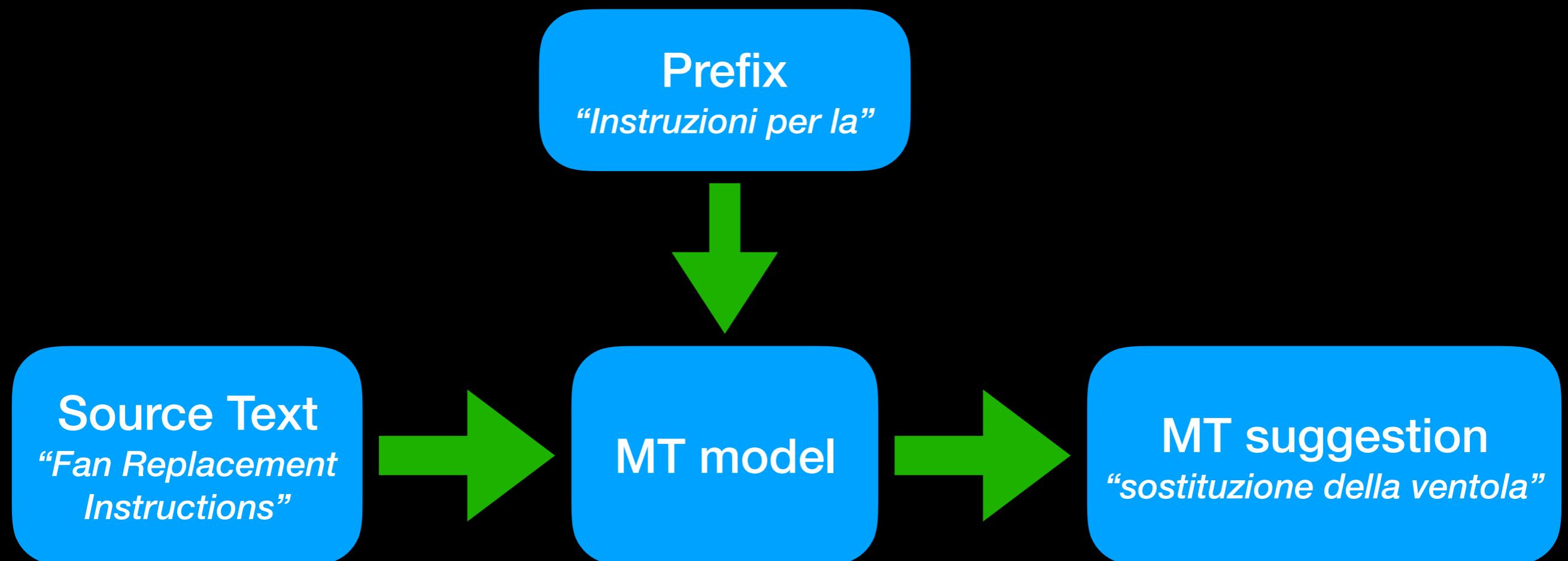
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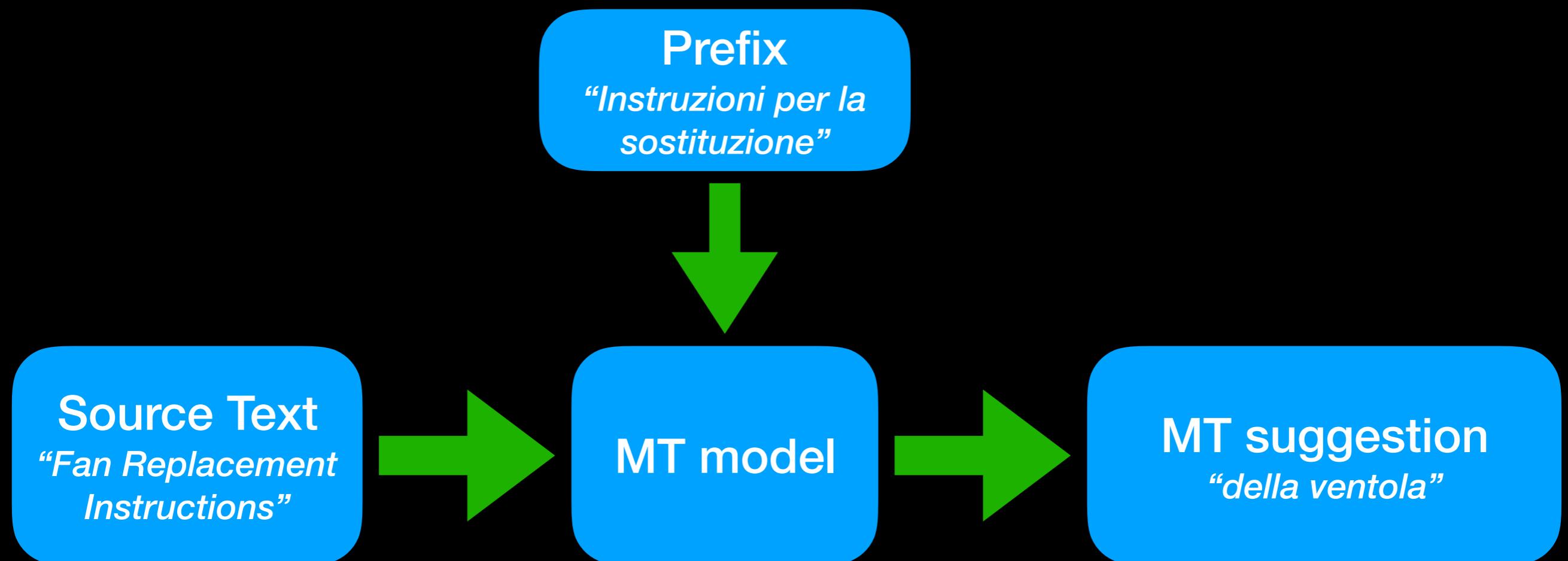
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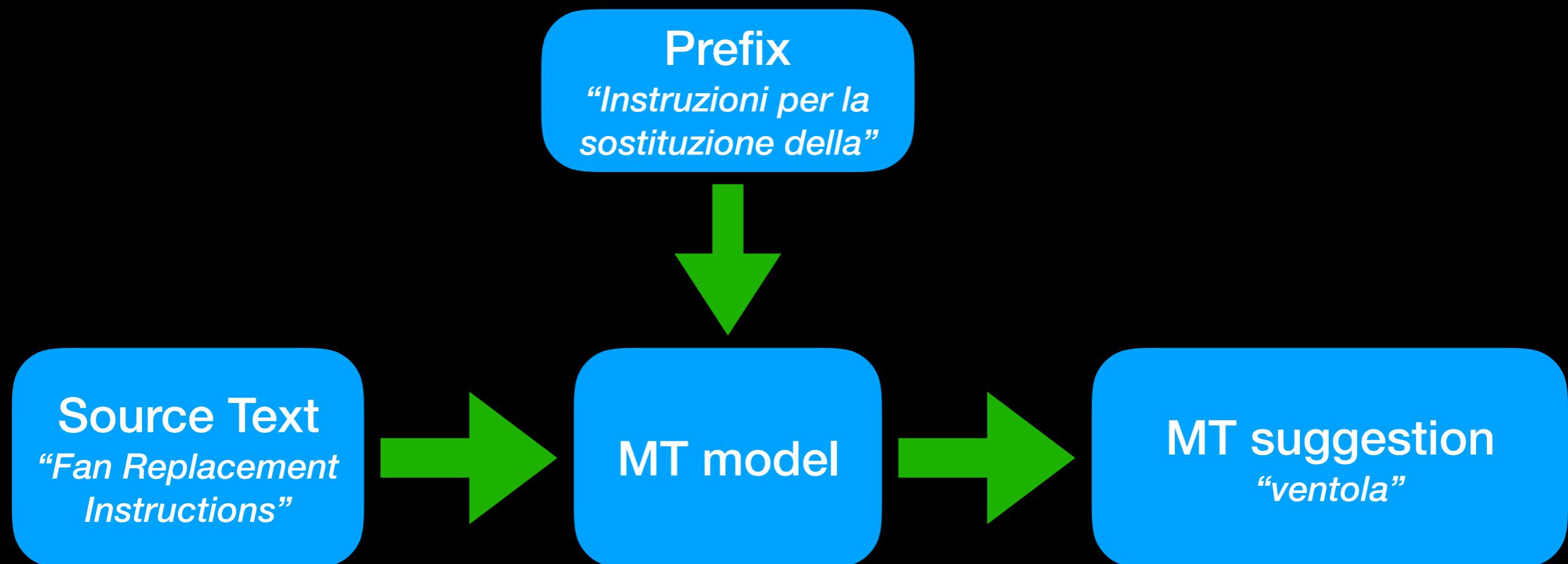
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# Interactive MT Implementation

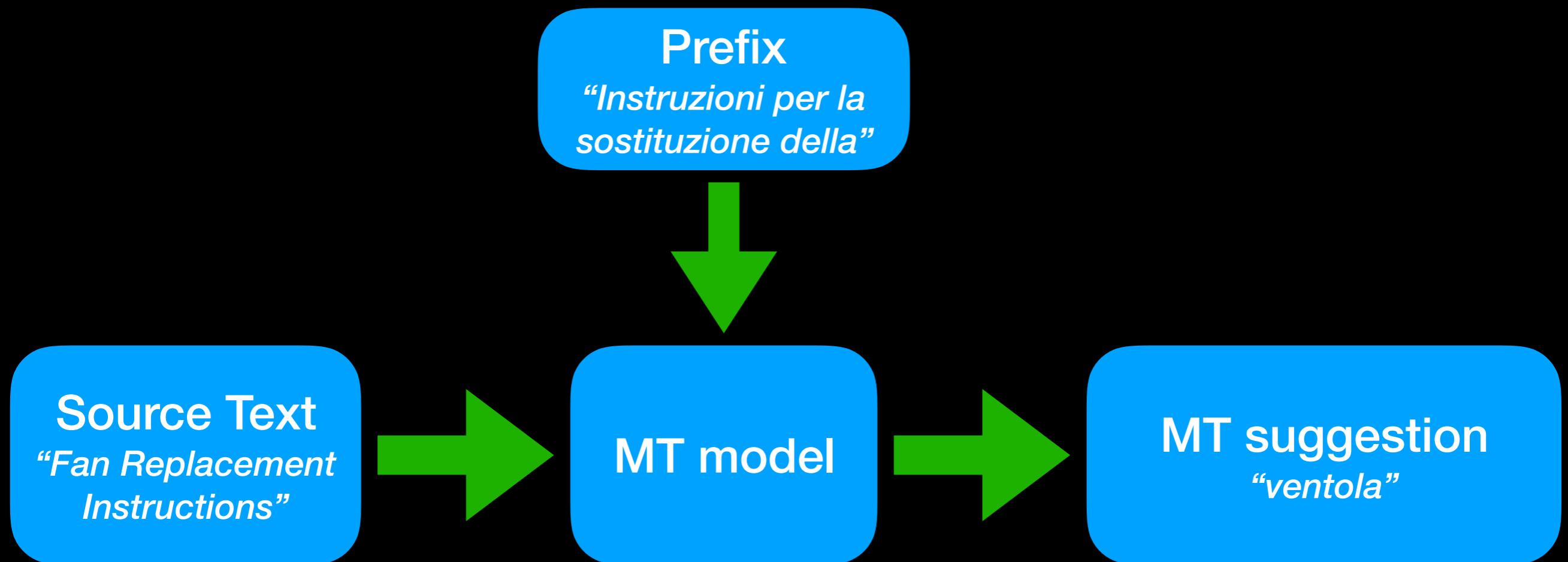
Prefix-constrained MT model (based on Transformer architecture). Details at [lilt.com/research](http://lilt.com/research)



# Interactive MT needs to be fast

New MT suggestion needs to be computed whenever the user's entered text no longer matches the MT prediction.

90% of our MT requests are computed in less than 500ms



File View Tools Settings

383 words per hour



- 17 Click 1 /1 or the topic for details:

QA

Fare clic su 1 /1 o sull'argomento per informazioni dettagliate:

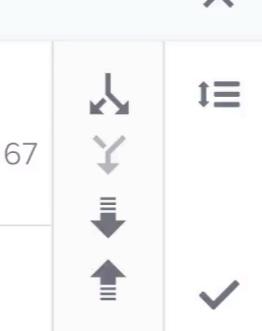
- 18 Option 1: Receive and install a new fan.

QA

Opzione 1: ottieni e installa una nuova ventola.

- 19 You can request a replacement fan kit and replace the fan yourself.

Puoi richiedere un kit di sostituzione della ventola e sostituirla.



- 20 Review the fan replacement instructions before deciding on this option.

- 21 Fan Replacement Instructions (PDF)

- 22 PDF icon

QA

# How helpful is Lilt's Interactive MT?

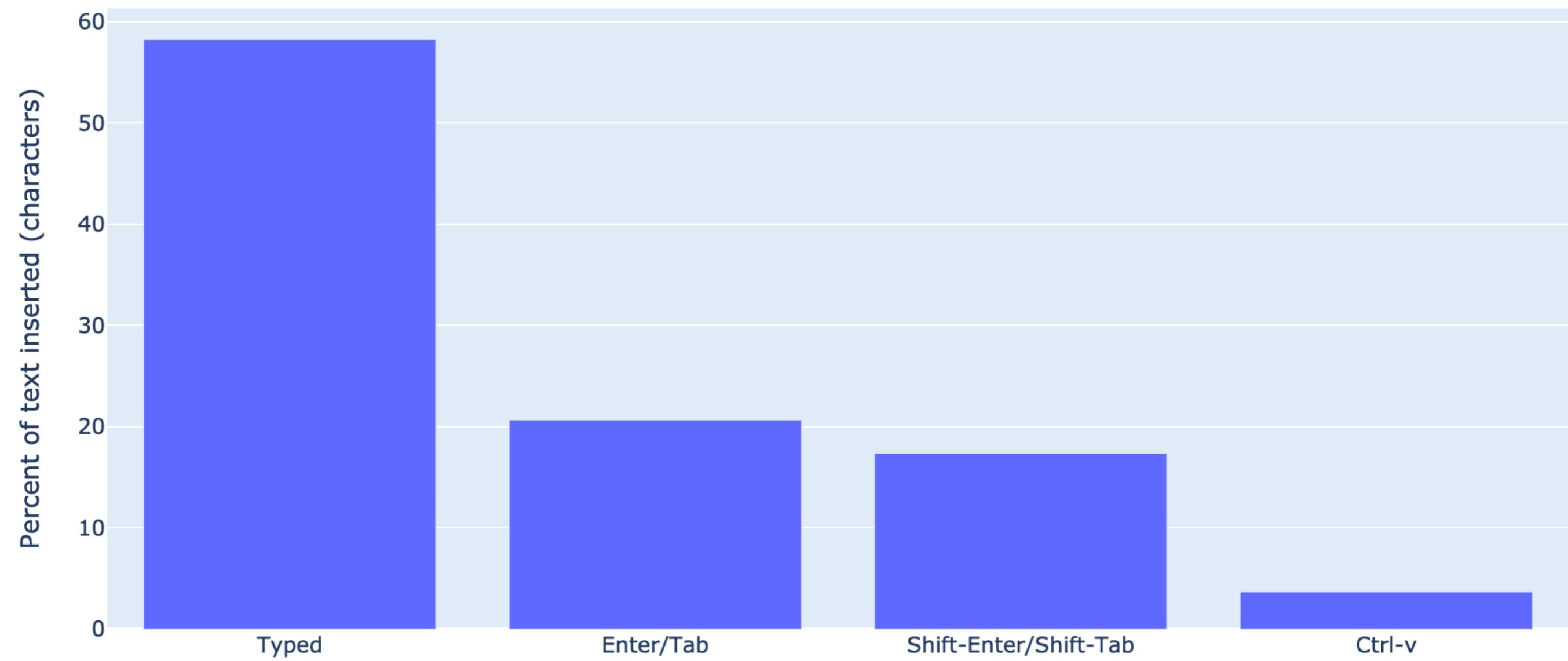
- How often do translators use our MT suggestions?
- How often are our MT suggestions available and correct?
- How much do translators use our word-level suggestions, and how much do they post-edit?
- How do translators spend time on Lilt?

# How often do translators use our MT suggestions?

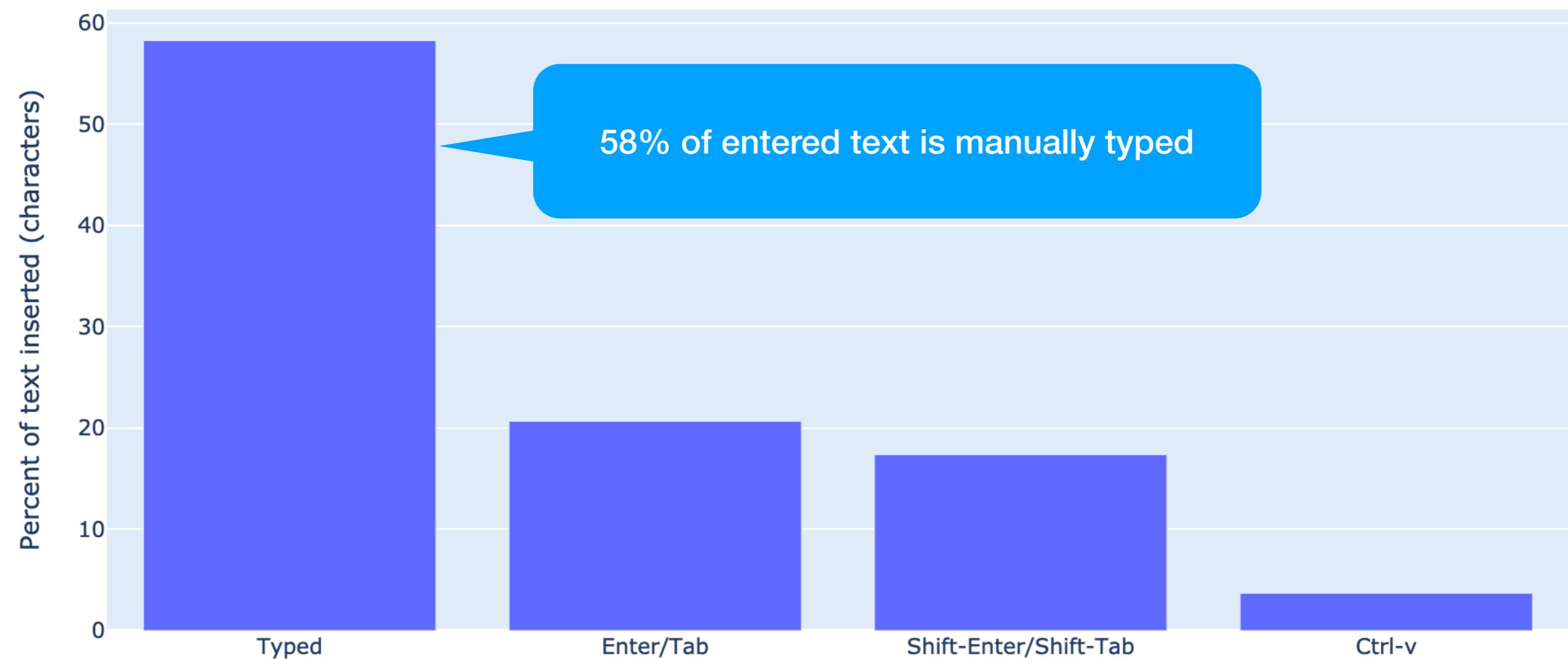
- Check how much text is inserted via Enter and Shift-Enter
- Data is from August to September 2020
- We consider only newly-generated\* segments

\*newly-generated segments = no TM matches, no segments majority copy-pasted

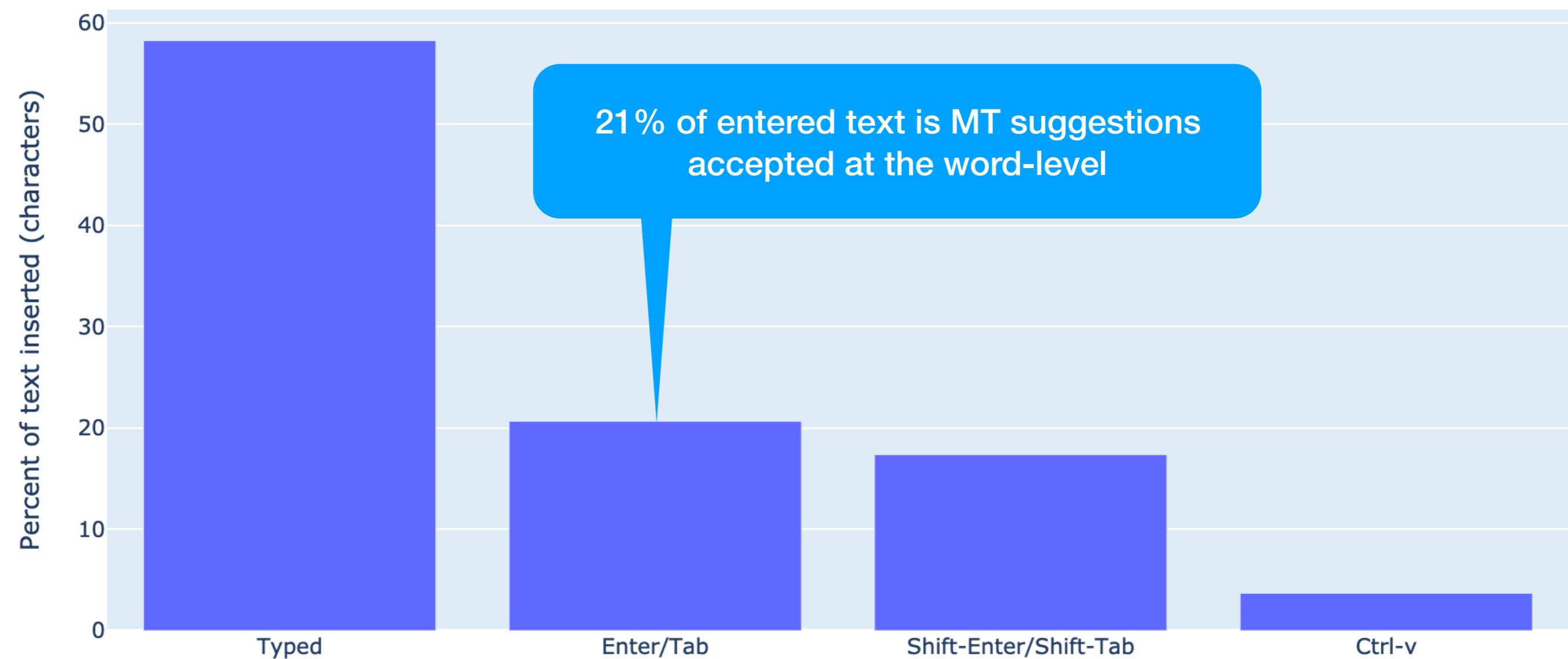
# Keys through which text is inserted



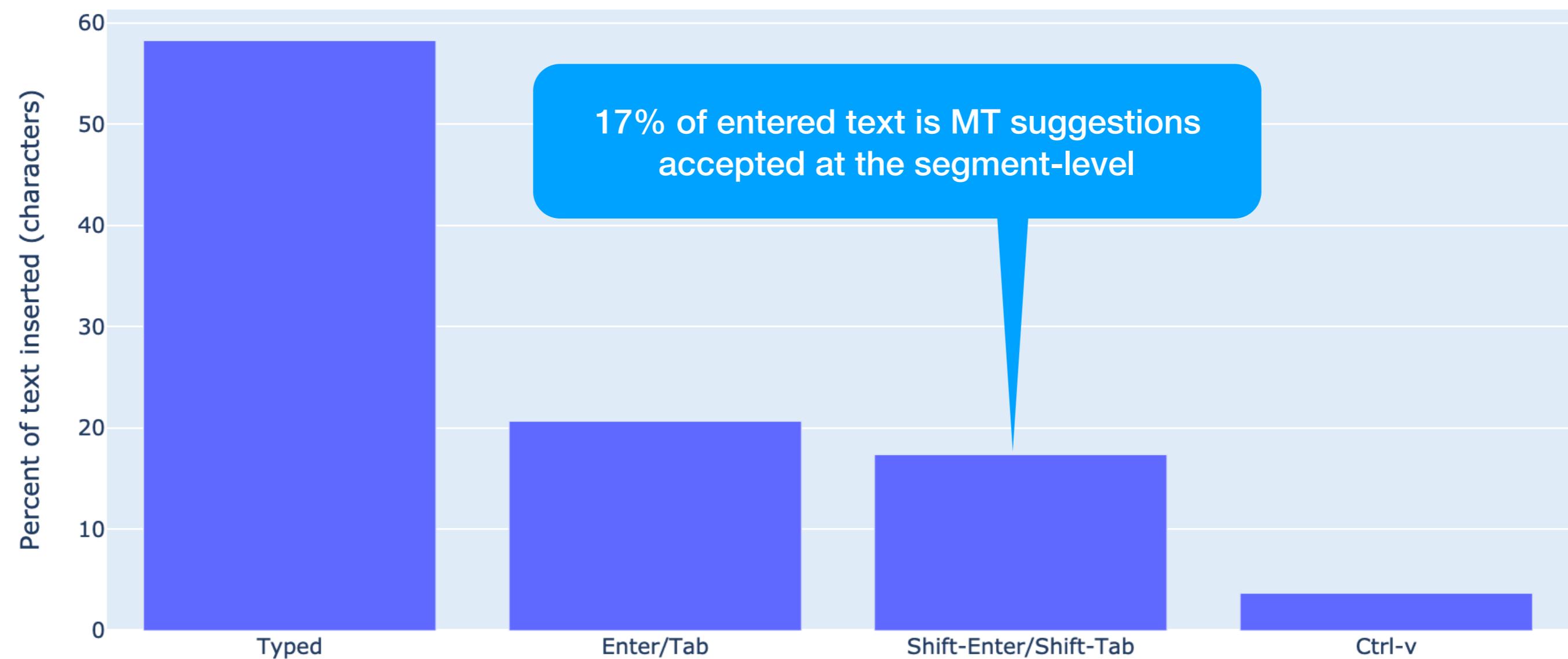
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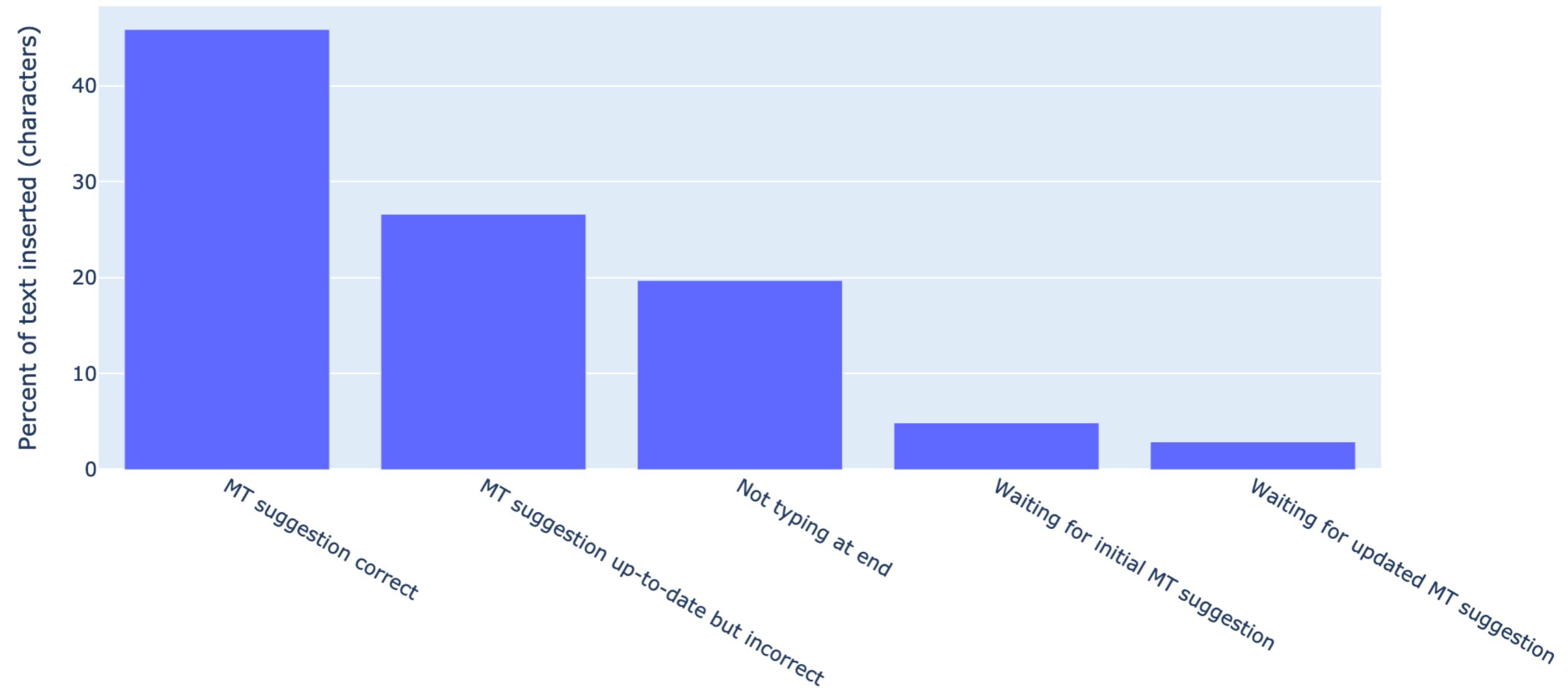
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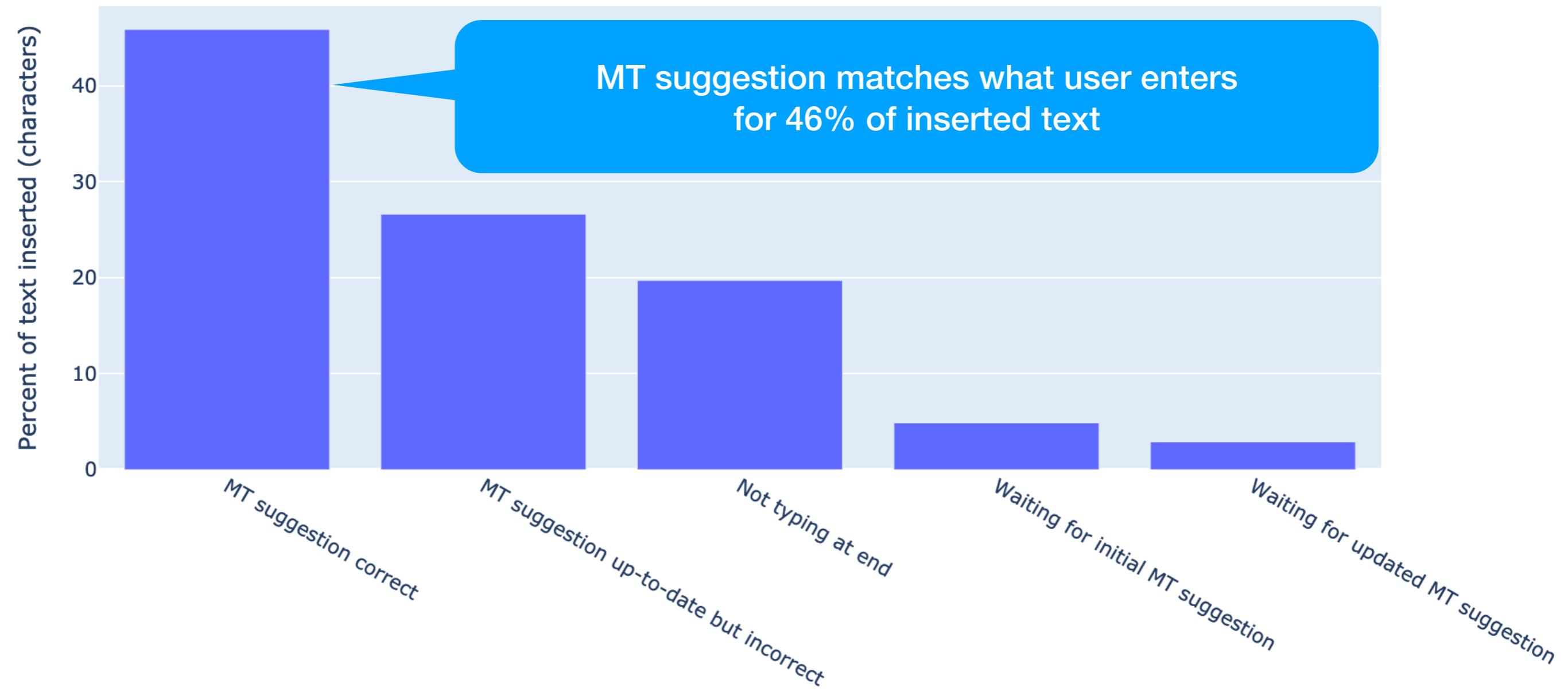
# Why aren't translators using our MT suggestions more?

- Maybe translators aren't aware they can press Enter?
- Maybe they aren't editing at the end of the segment?
- Maybe the MT suggestion takes too long to show up?
- Maybe the MT suggestions don't match what the translator wants to type?

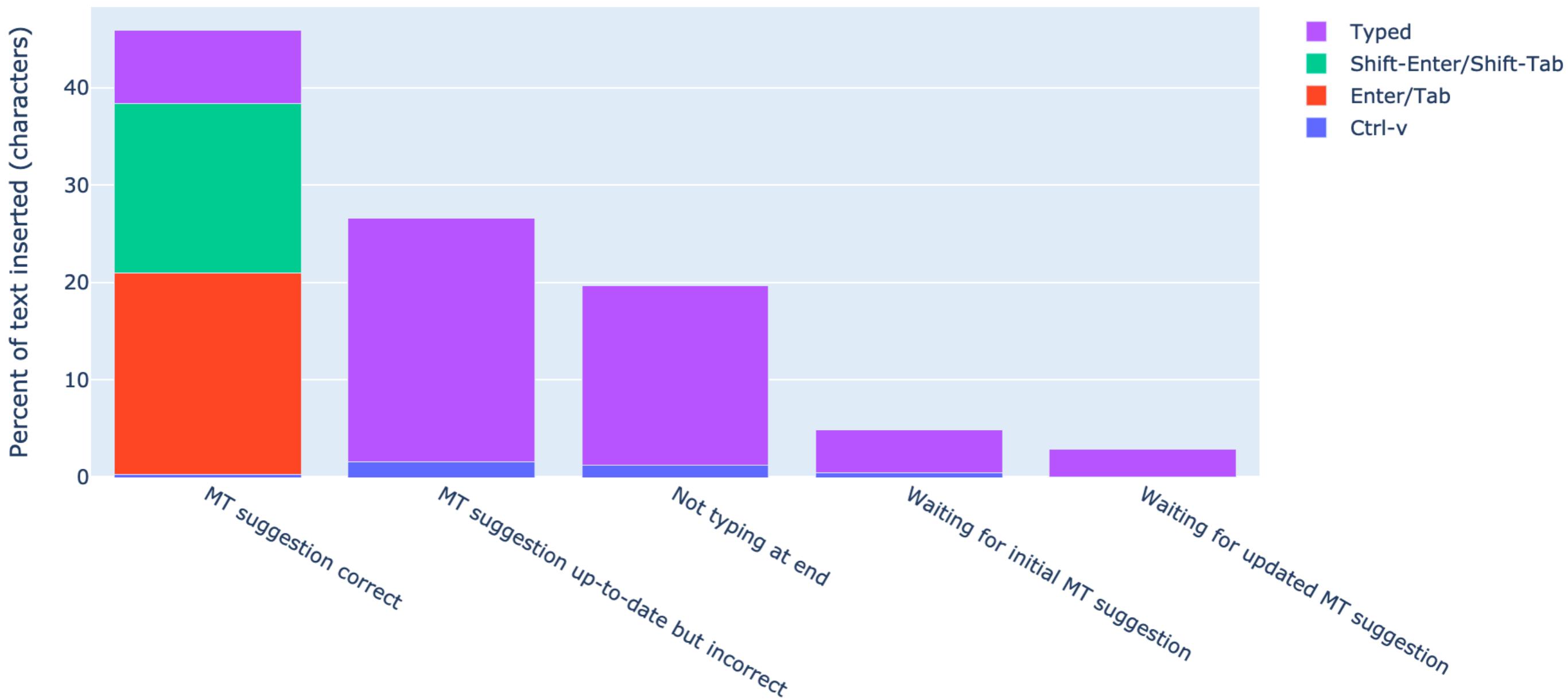
# How often are our MT suggestions available and correct?



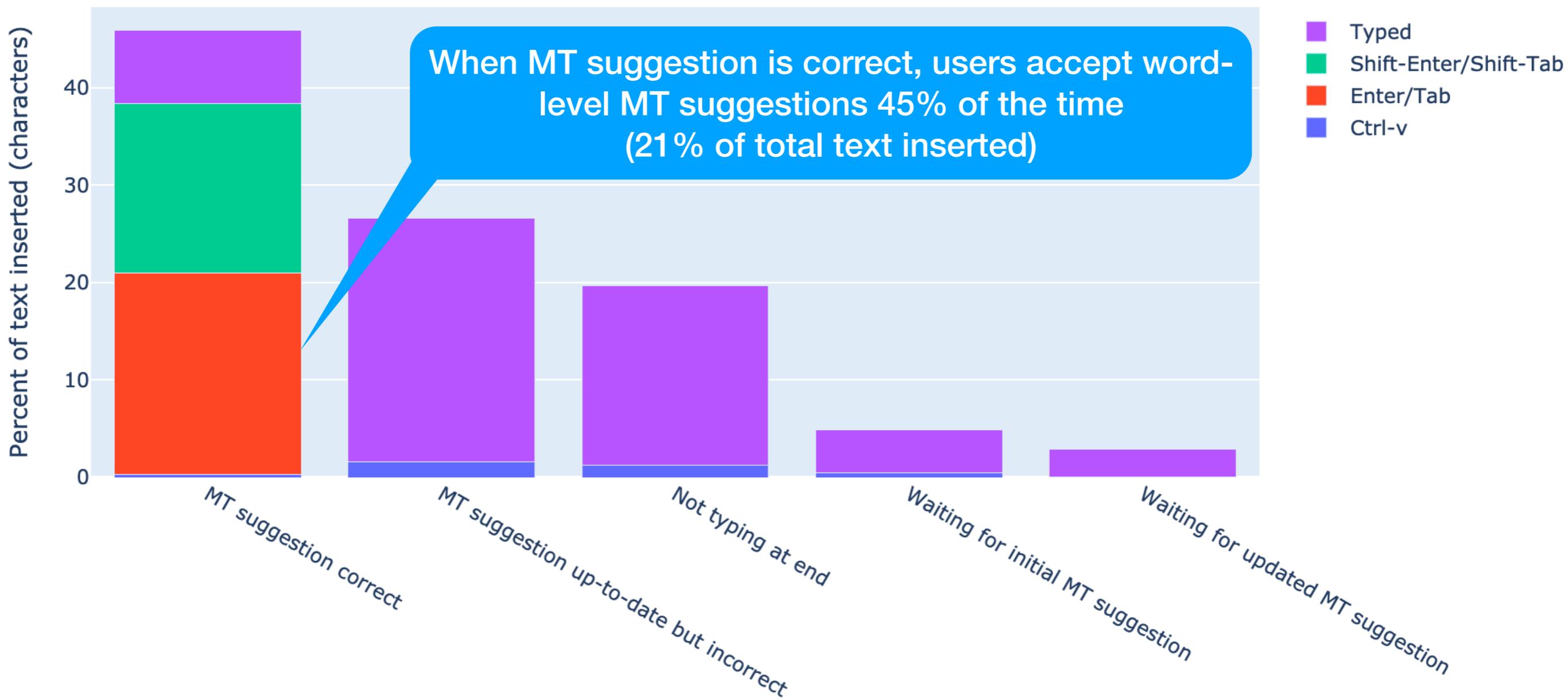
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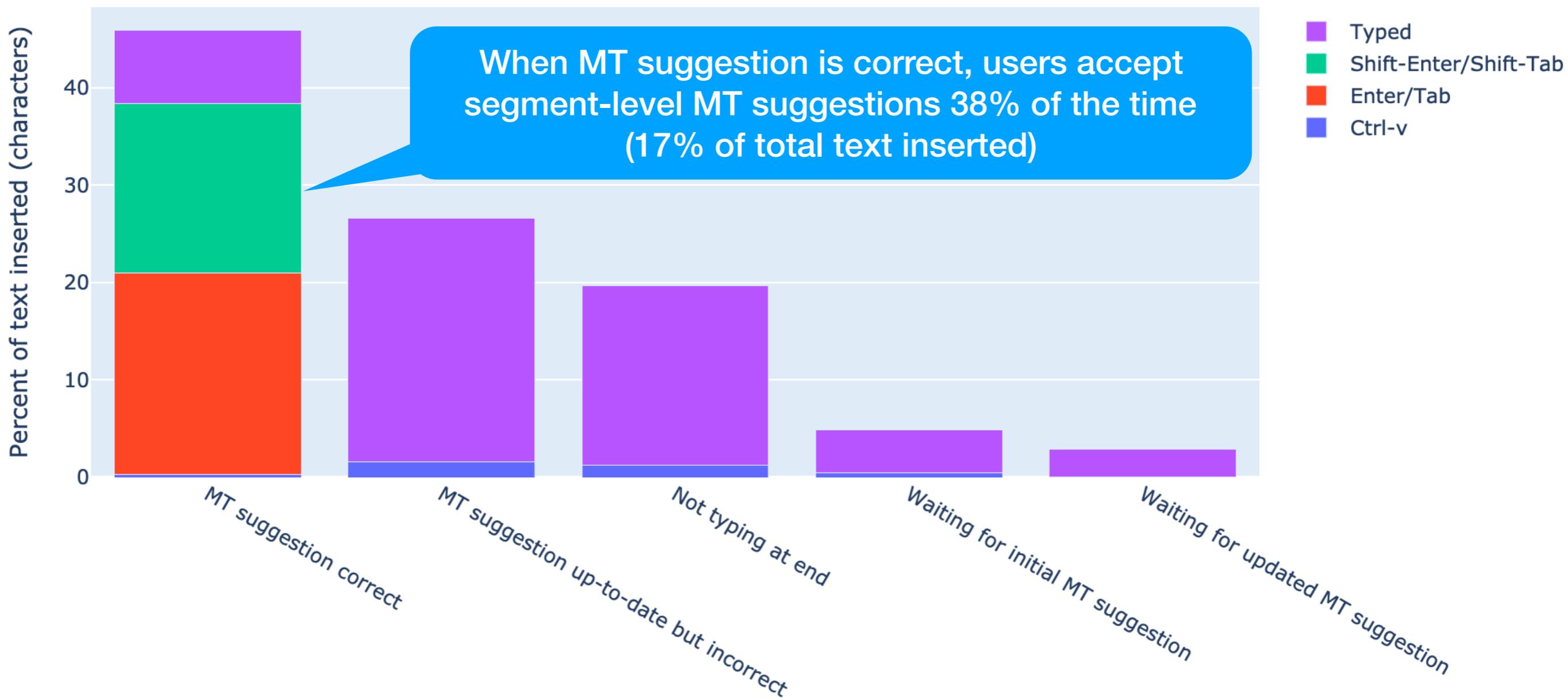
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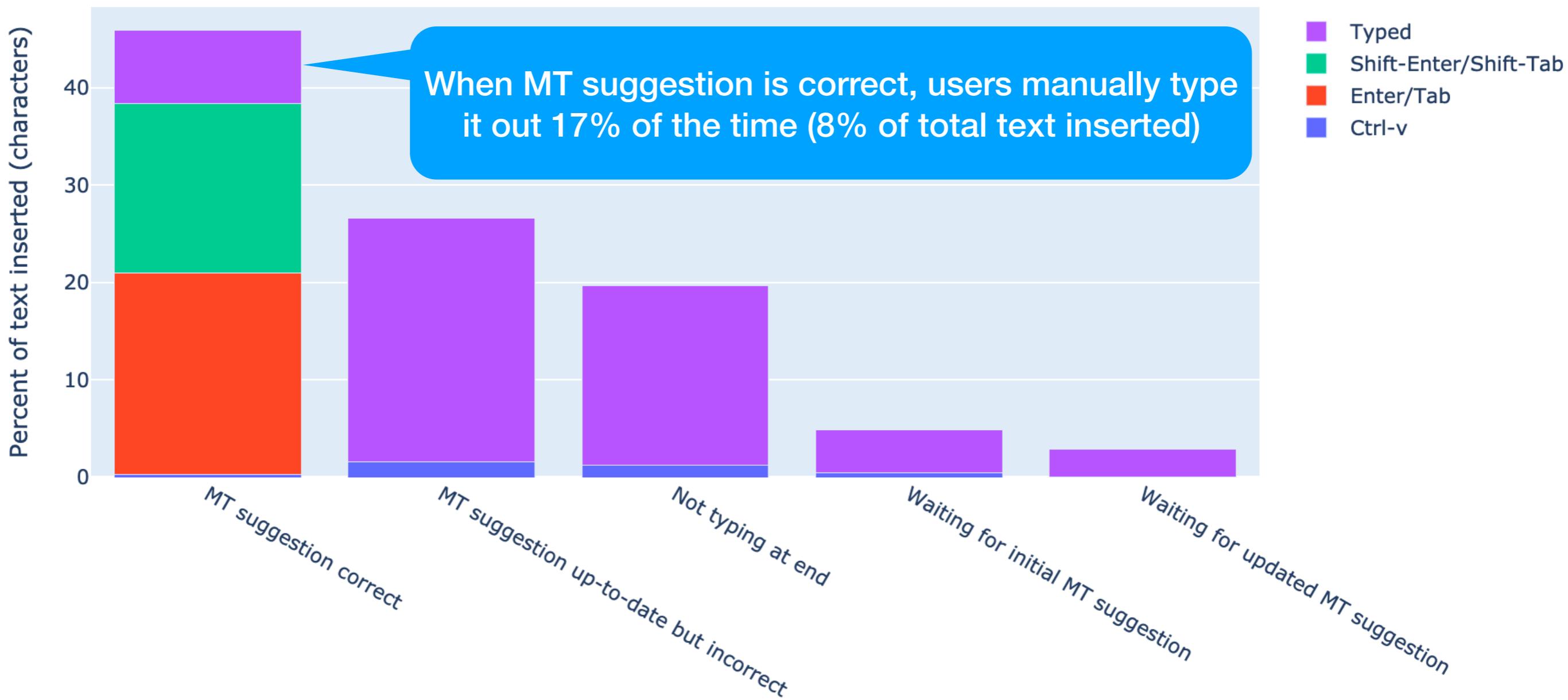
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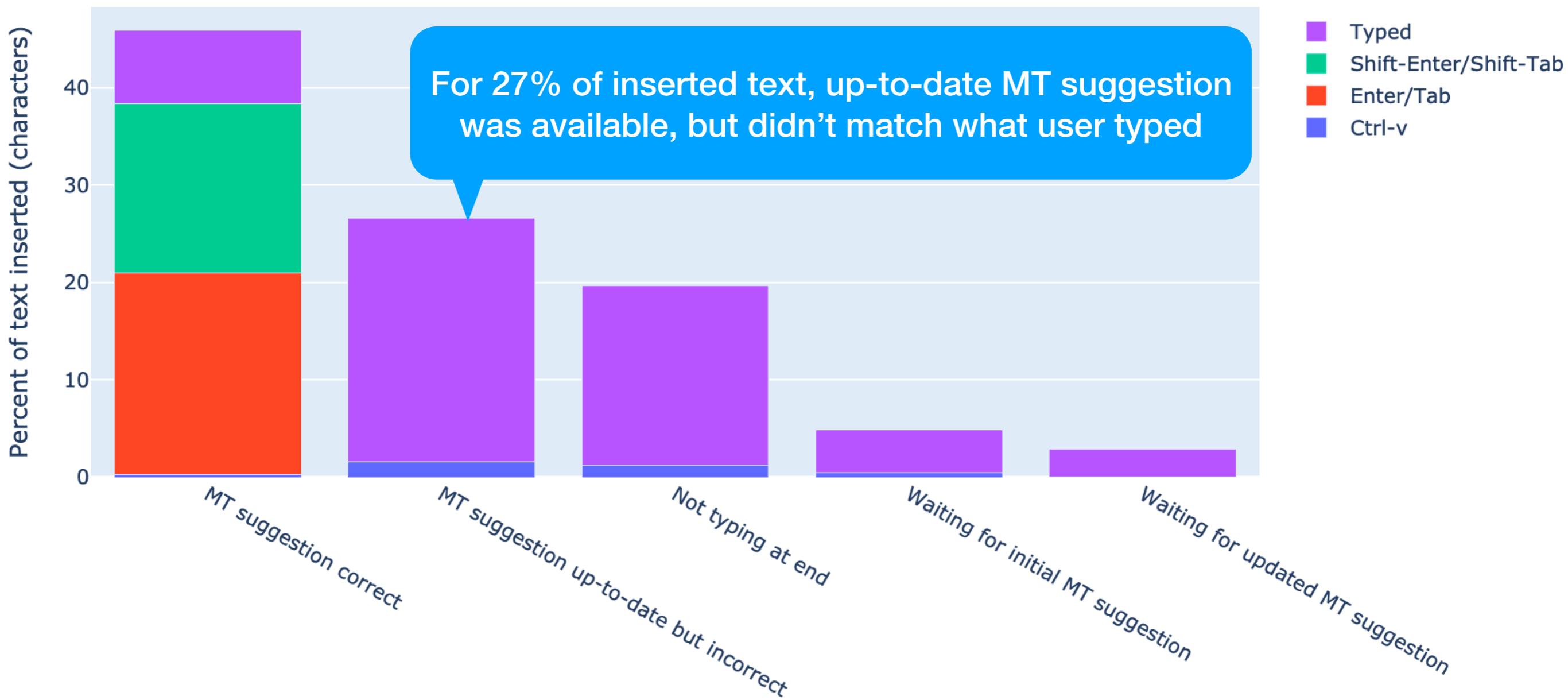
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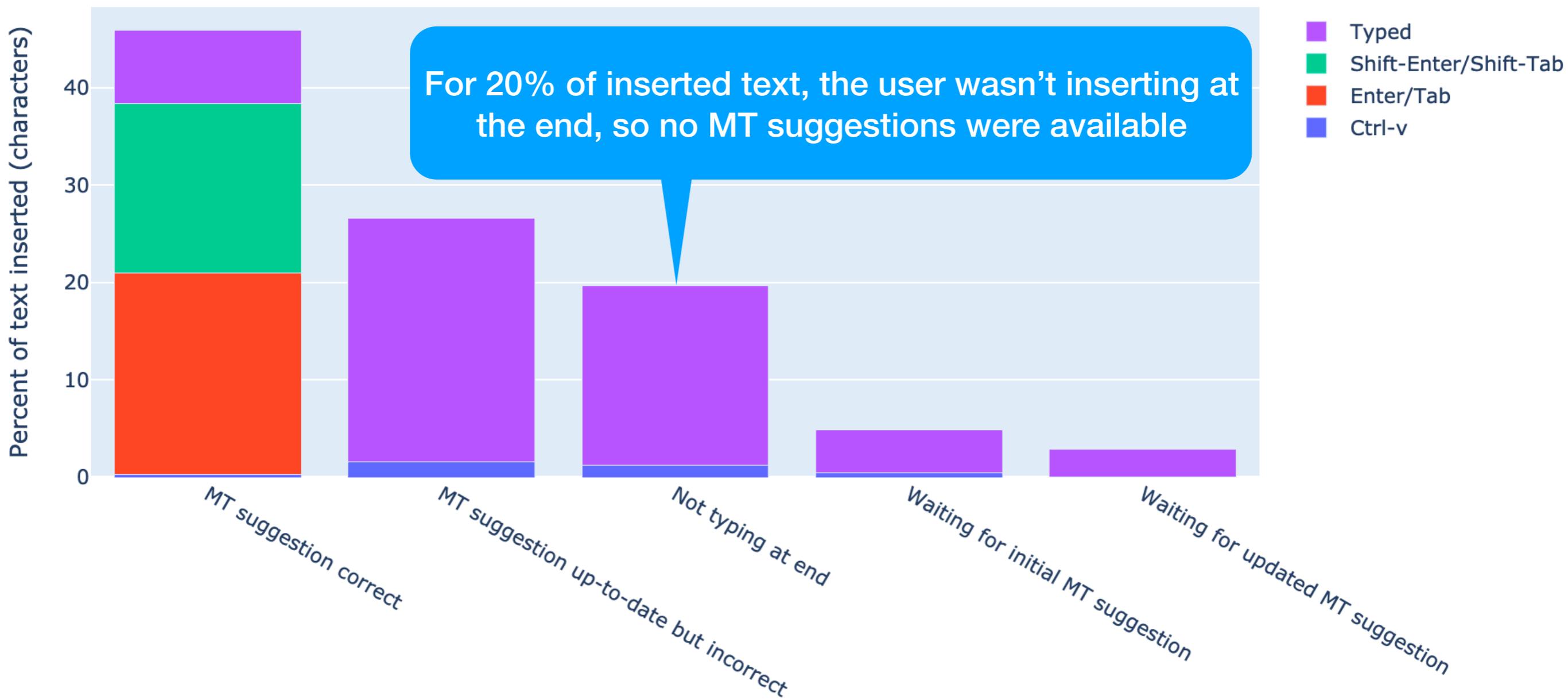
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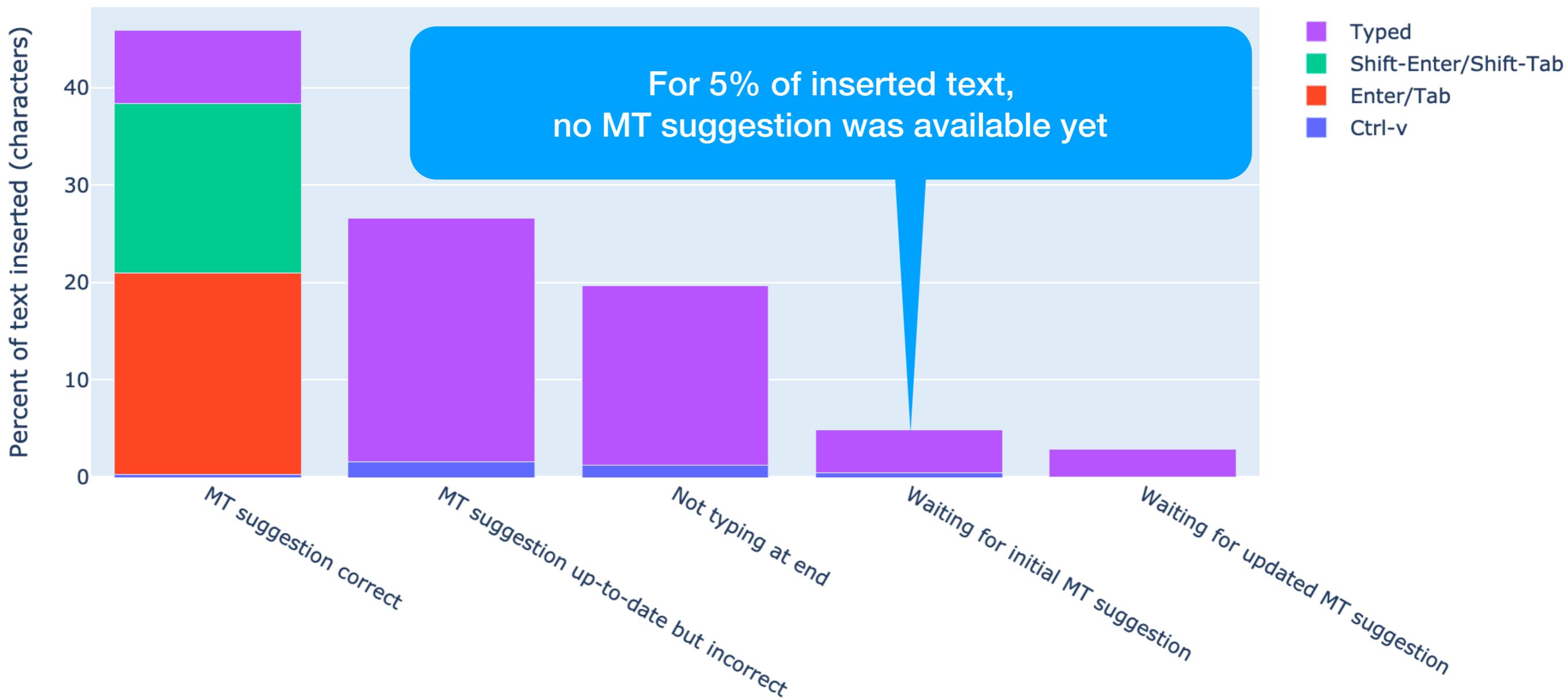
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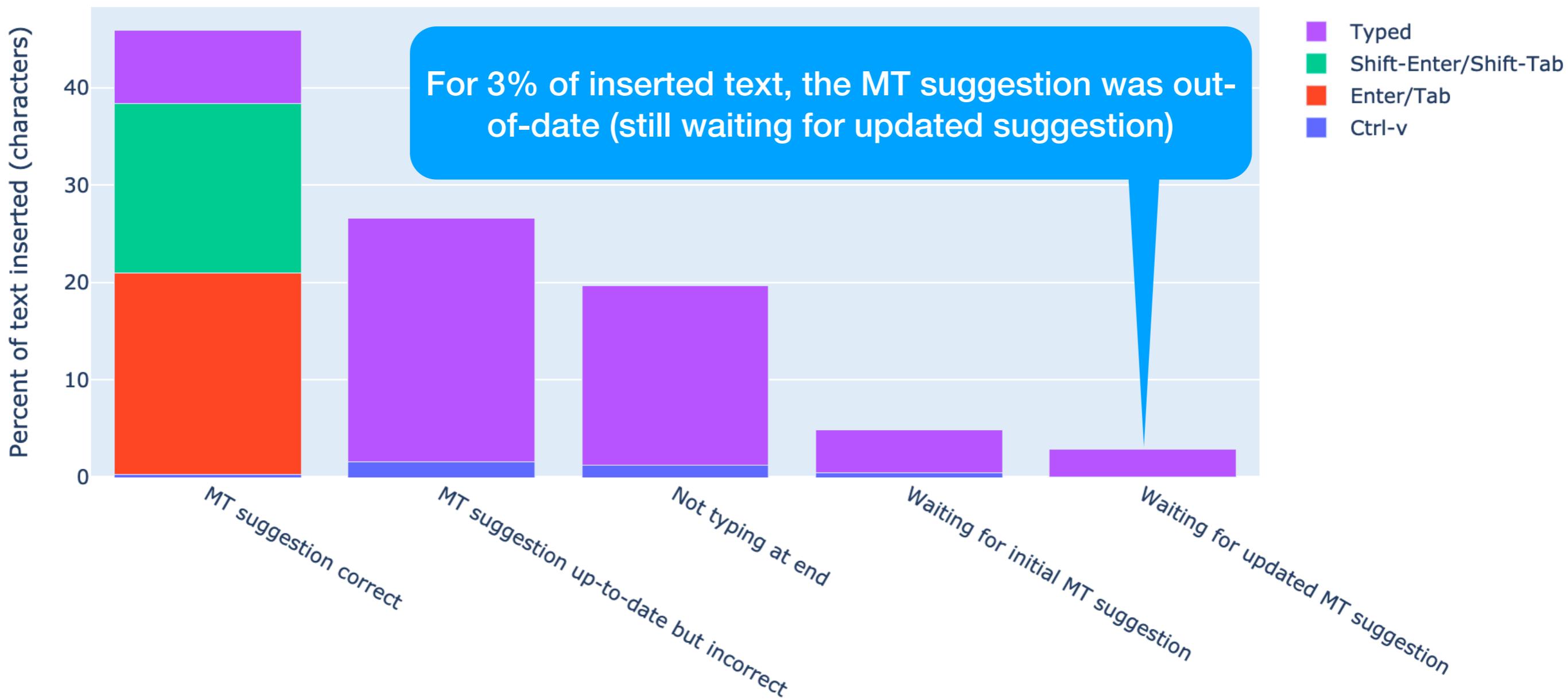
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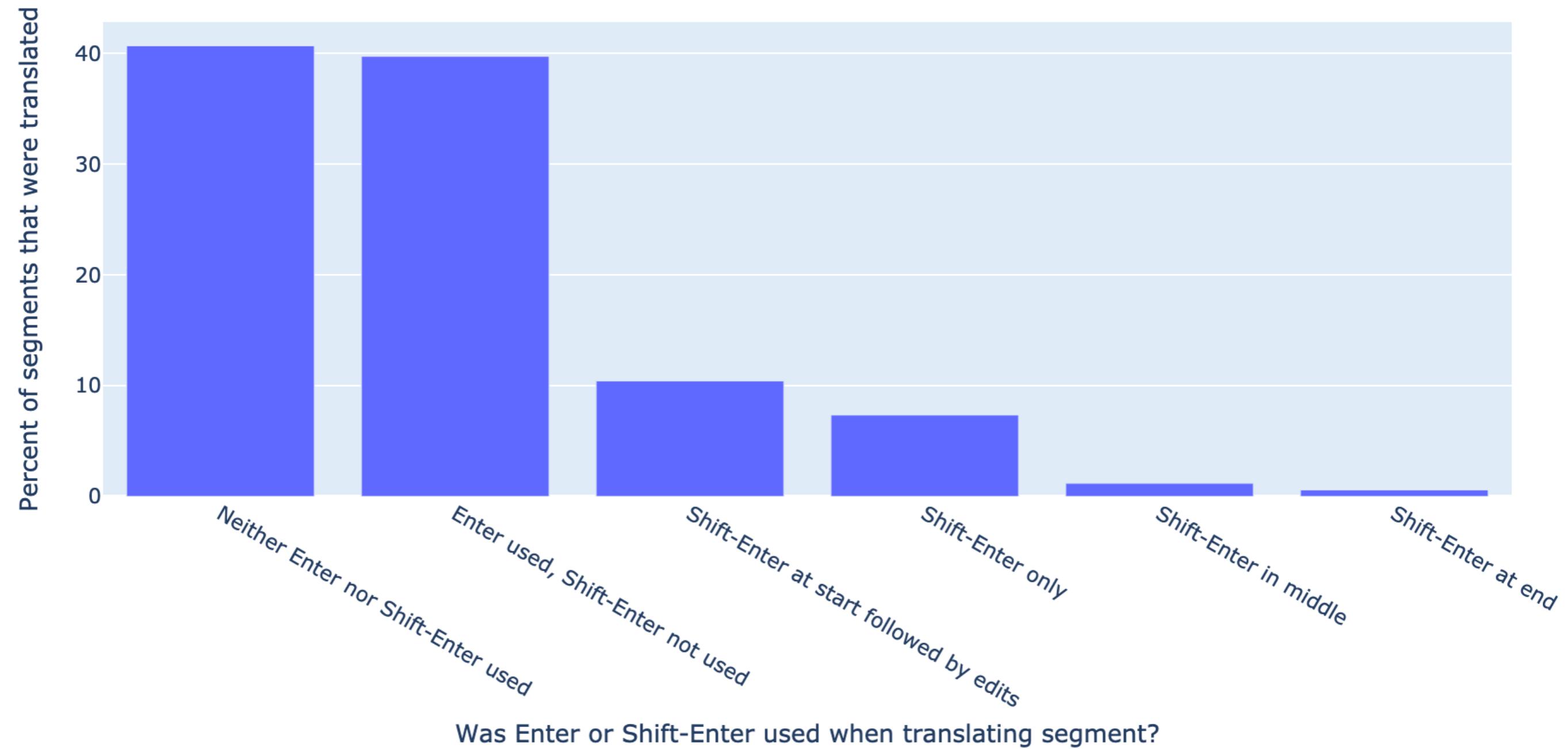
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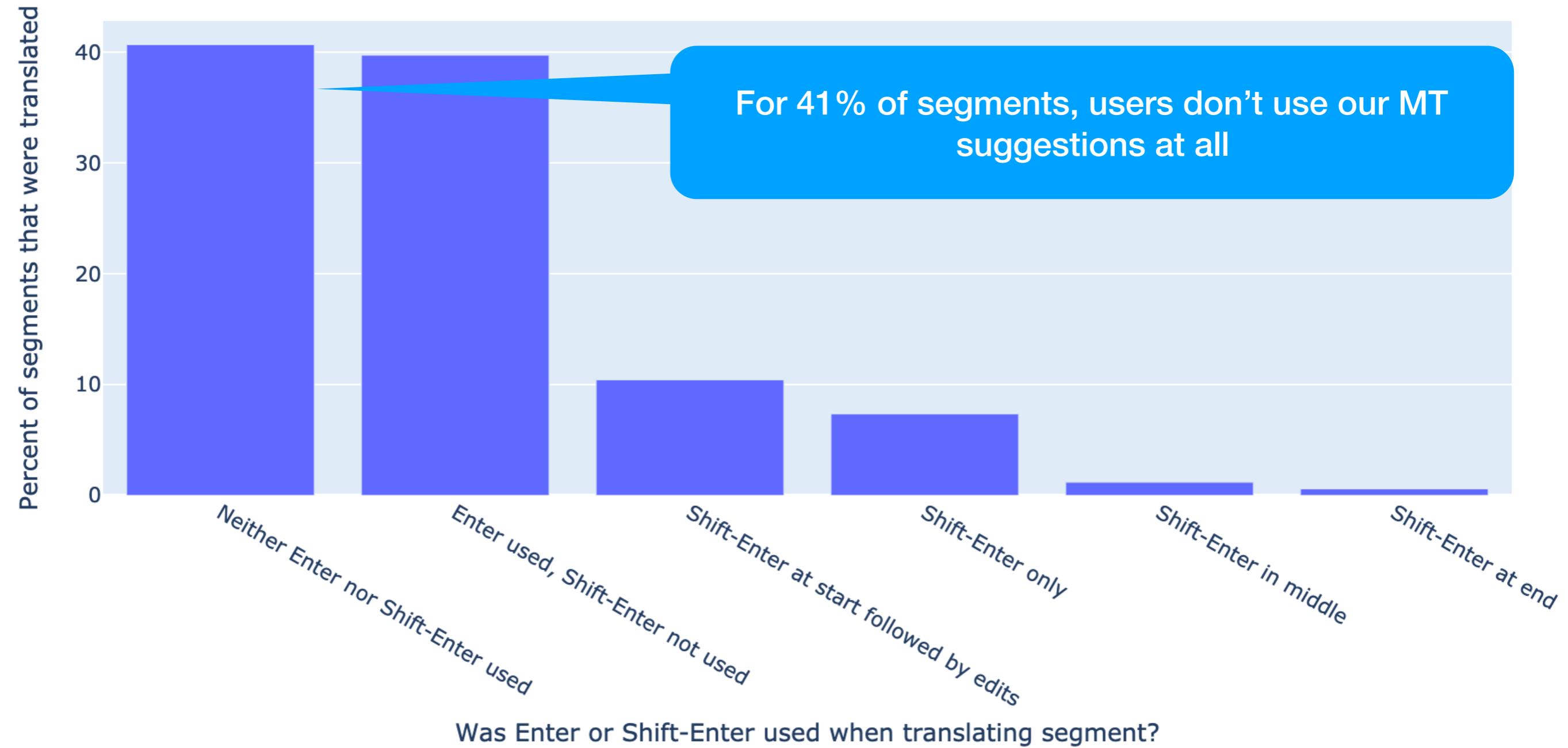
# Are users using Lilt interactively, or as a post-editing system?

- We see a lot of users are using Shift-Enter (accept the entire remaining MT suggestion)
- We also see a lot of users making insertions outside the end of the segment
- Are more users using Lilt in an interactive, suffix-suggestion style, or post-editing?

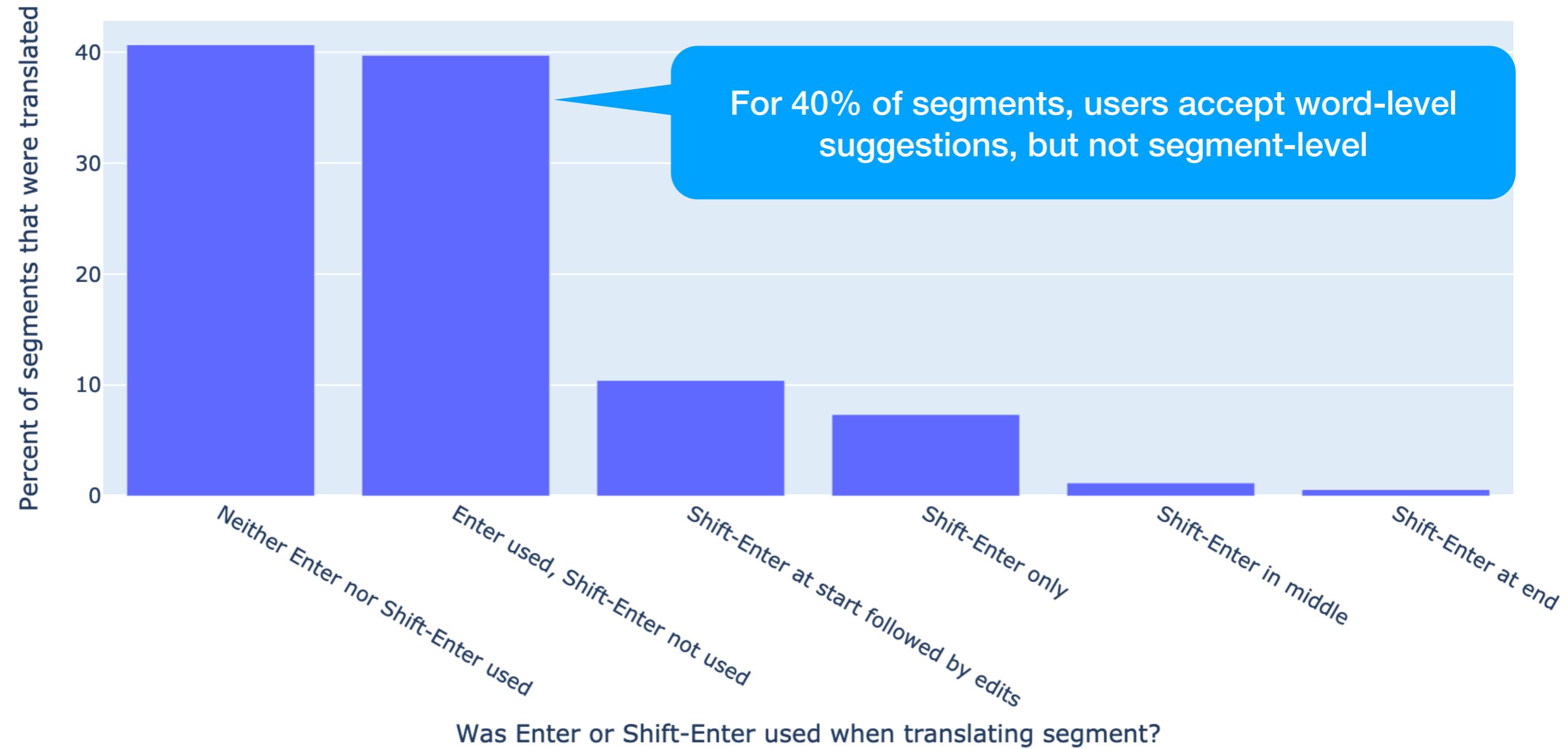
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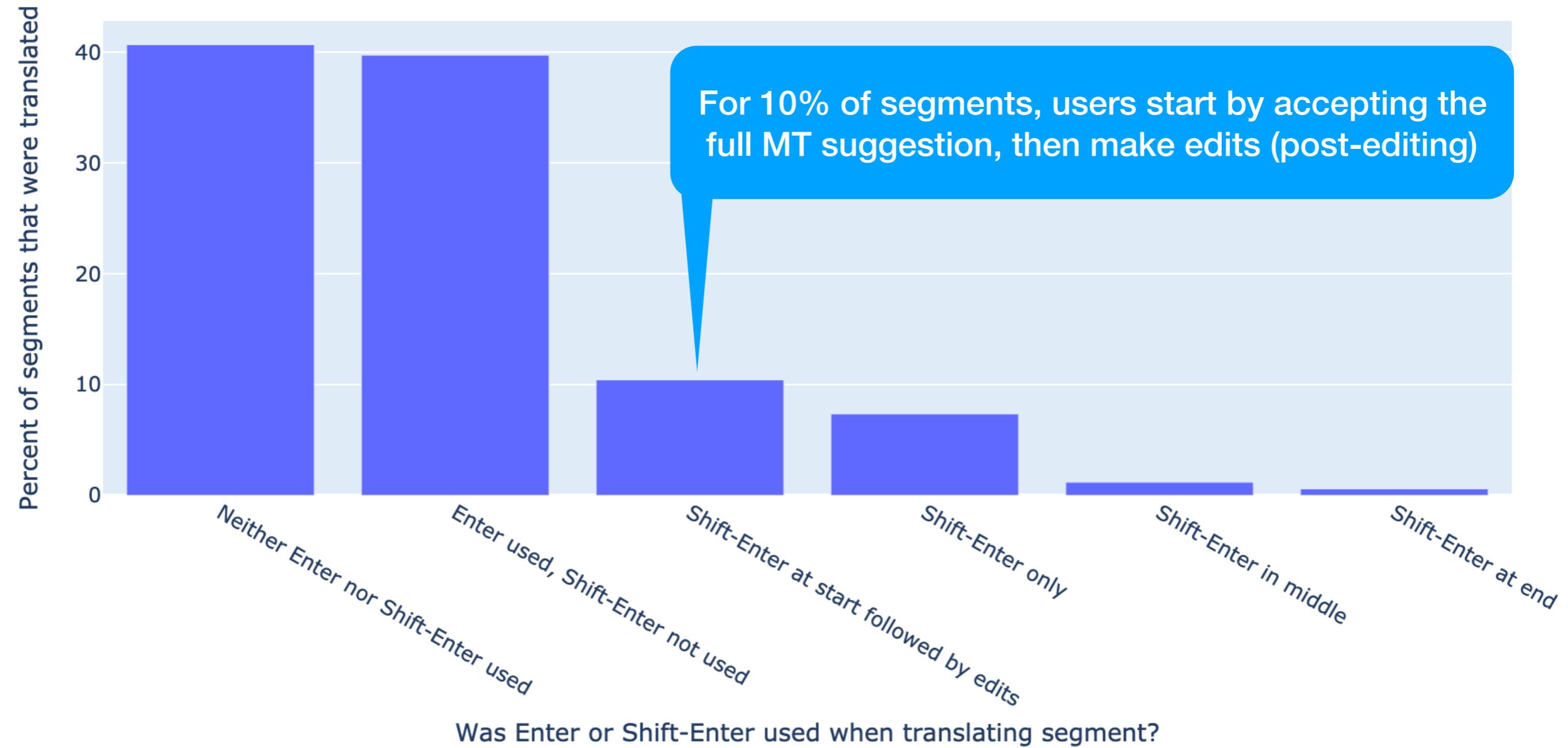
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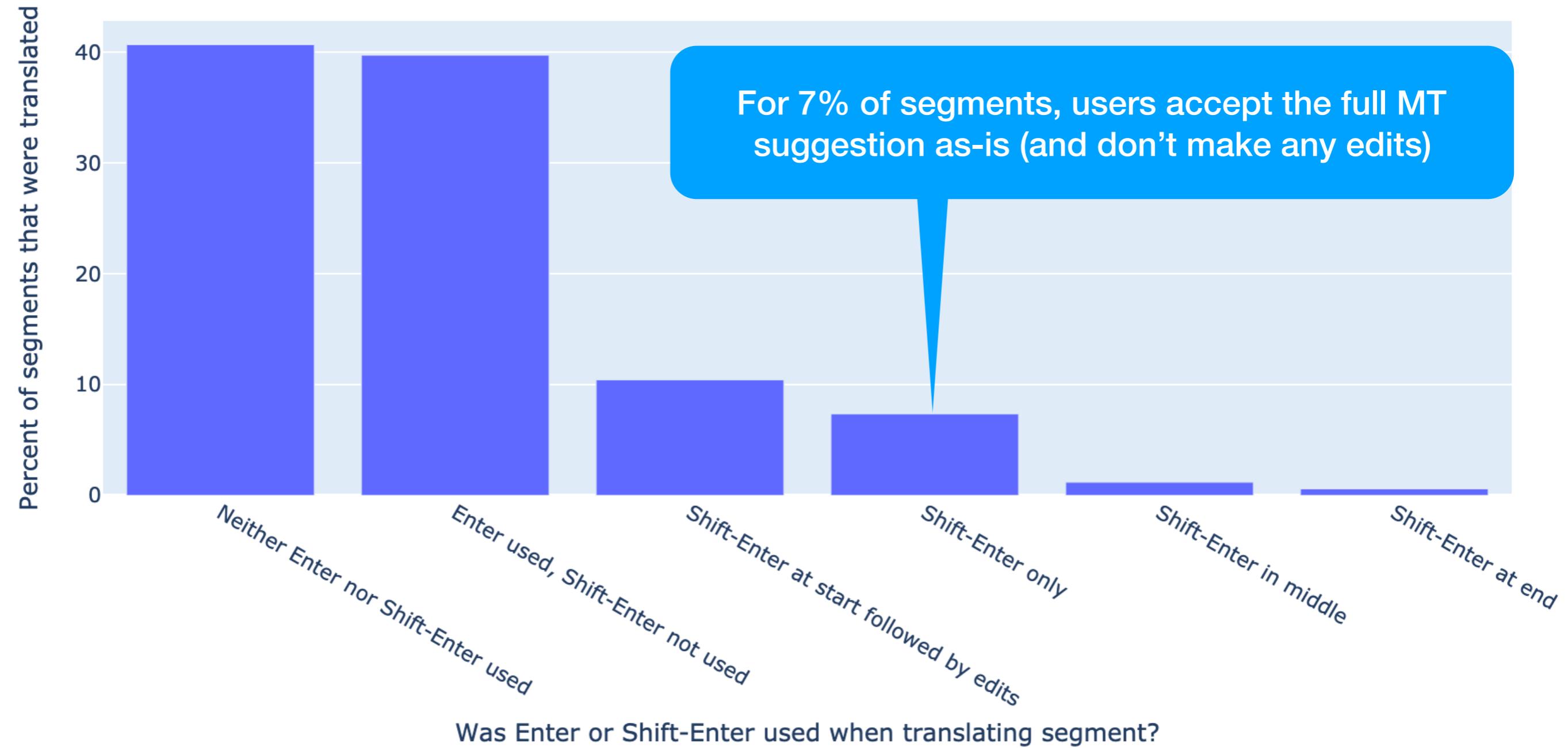
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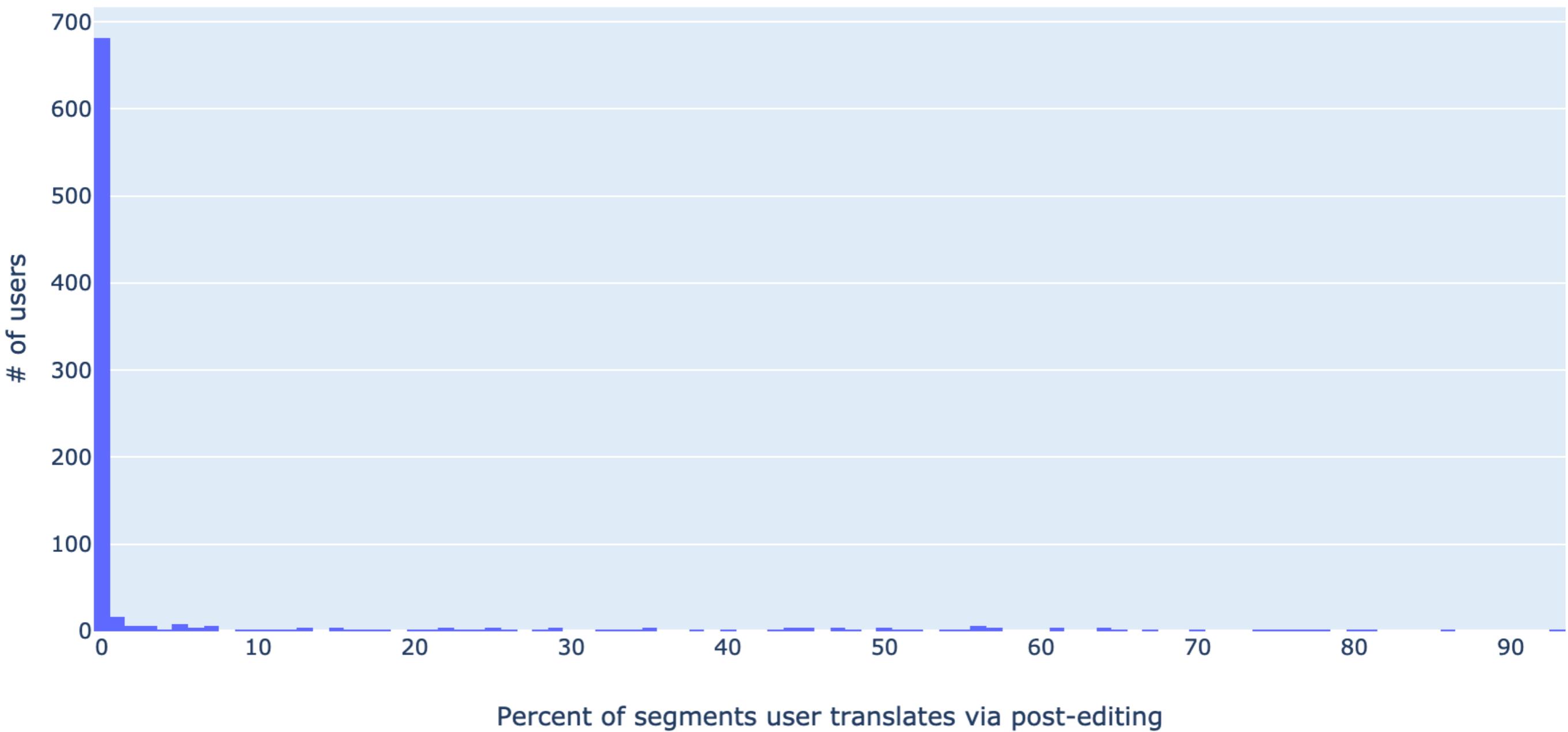
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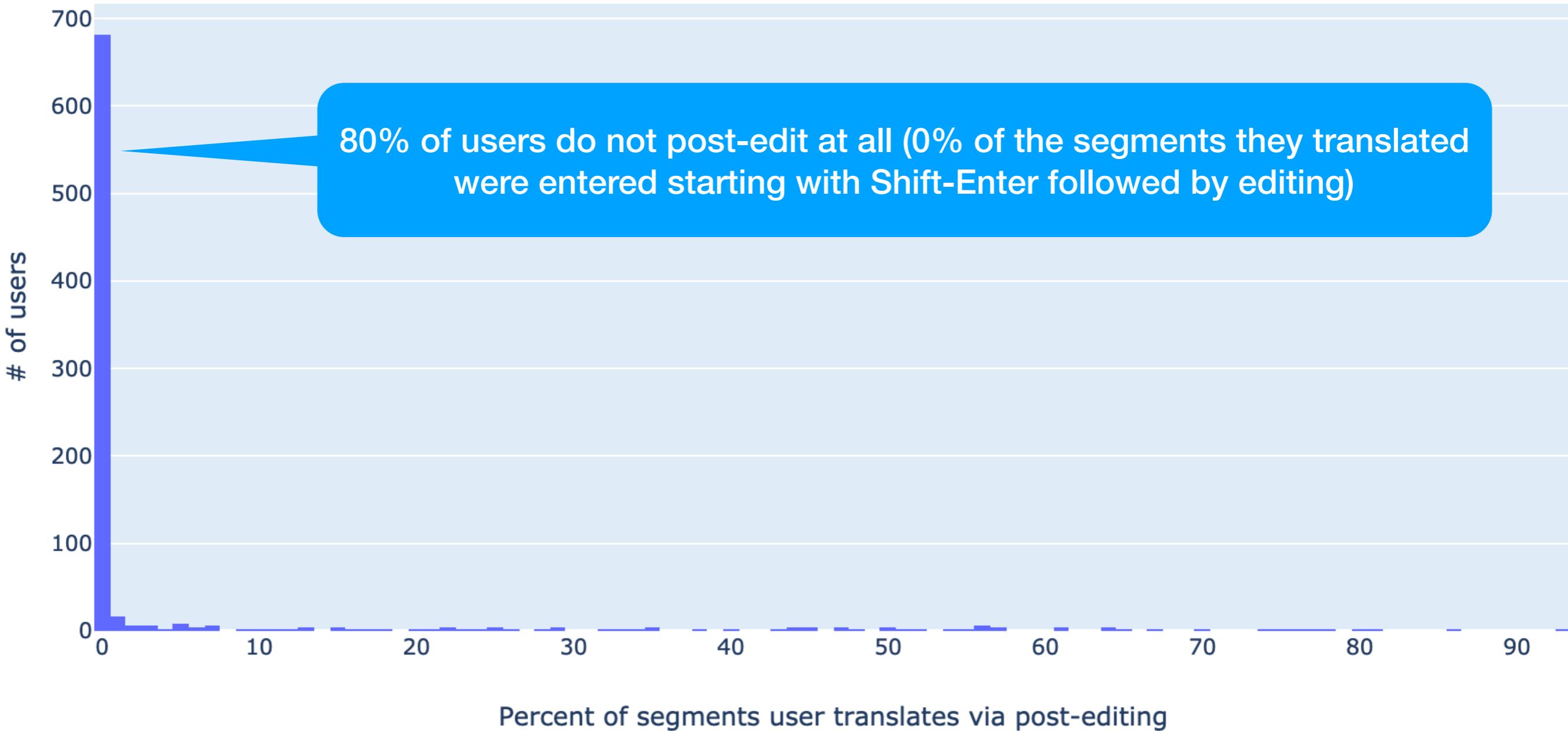
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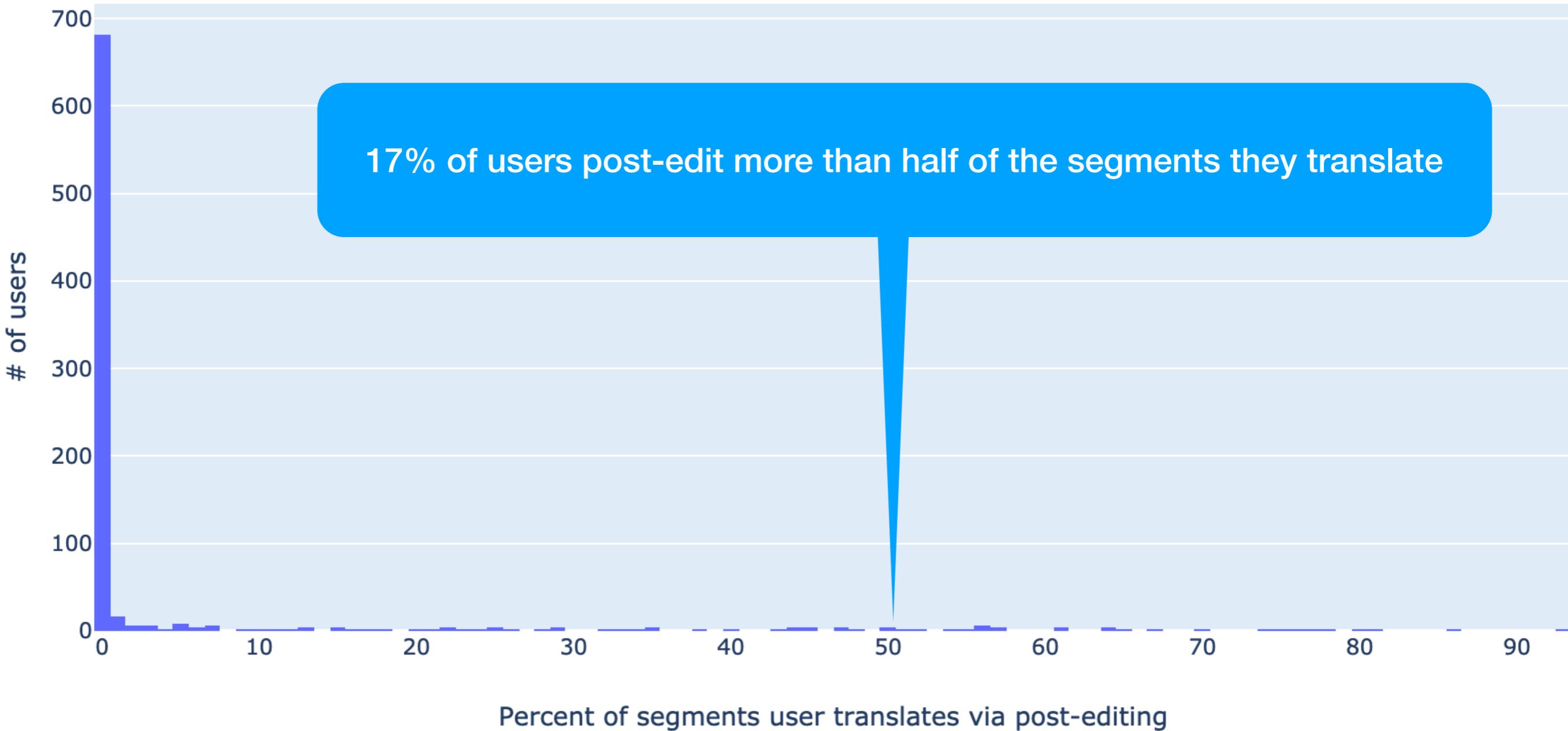
# Histogram of users by percent of segments they post-edit



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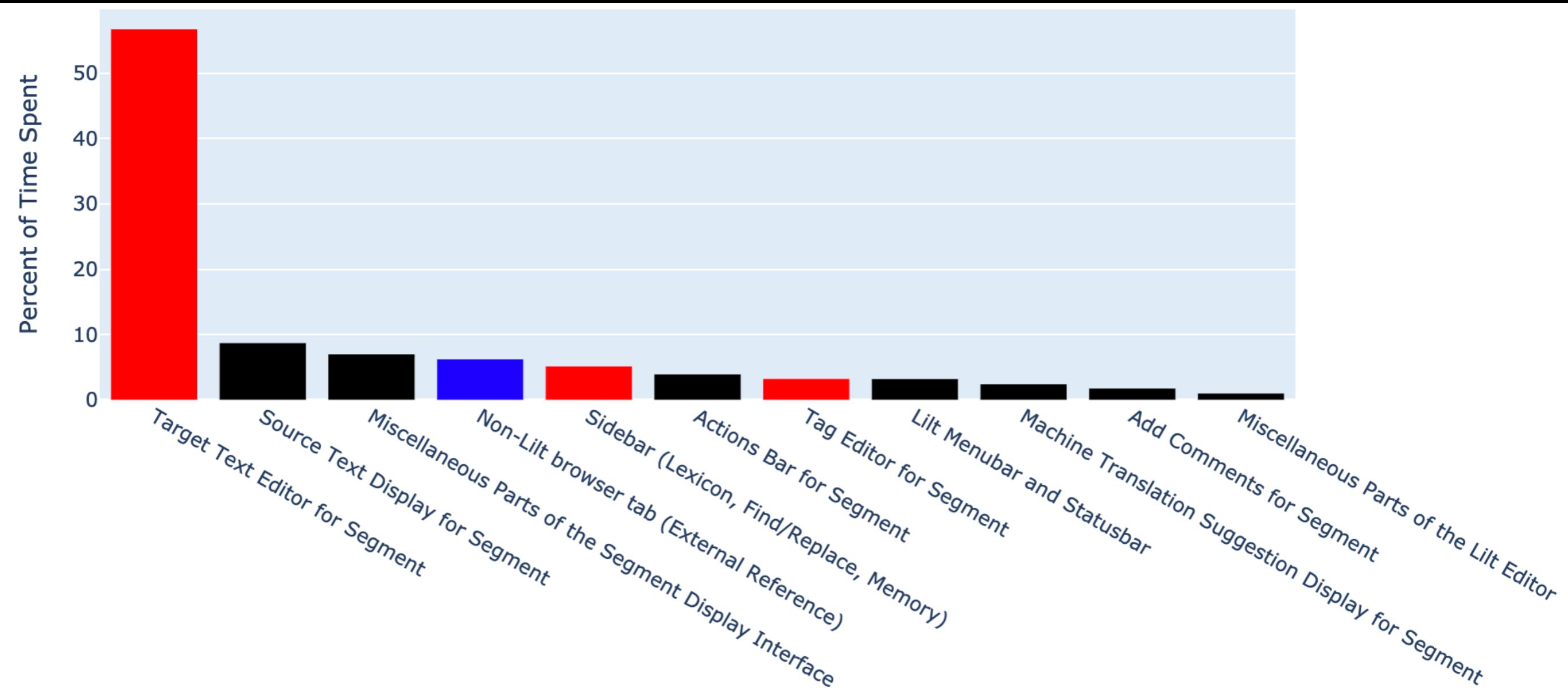


# How do translators spend their time on Lilt?

Our efforts have focused on helping translators type translations faster via interactive MT. Is that actually most time-consuming part?

Data based on mouse and keyboard activity while using Lilt in translation mode, permitting up to 30 seconds of idle time between events

# How do translators spend their time on Lilt?



# How do translators spend their time on Lilt?



File View Tools Settings

-- words per hour



1 Support for Tumblr Photo Sets



2 Support for Tumblr Photo Sets

3 Overview

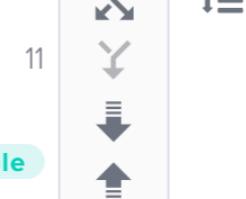
4 Publishing Photo Sets to Tumblr is now supported.

Target Text Editor for Segment: 57% of time spent

5 Use this feature to publish a collection of photos to Tumblr in one post.

6 Note: /1 To learn more about this feature, contact your Success Manager.

Nota: Para |



11

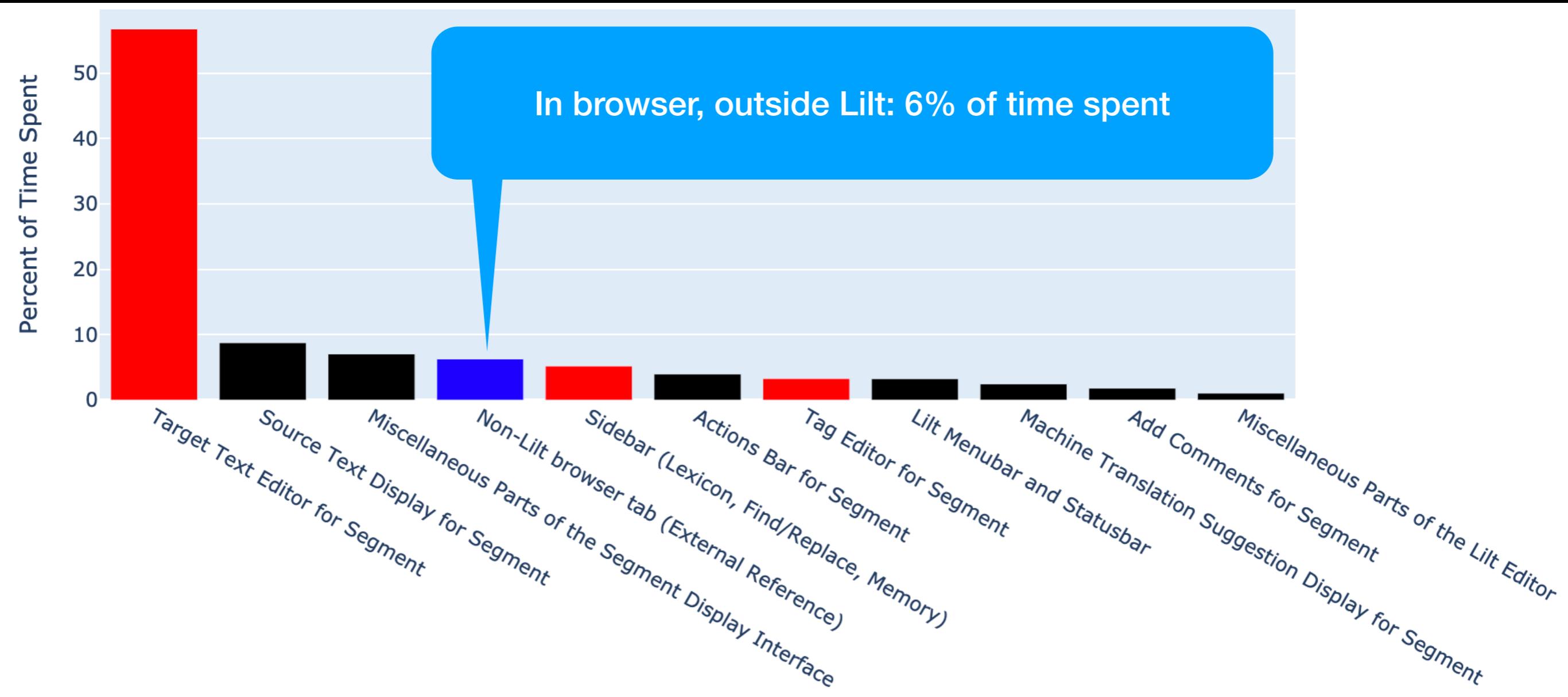
Links available

Nota: Para obtener más información sobre esta función, póngase en contacto con su Administrador de Éxito.

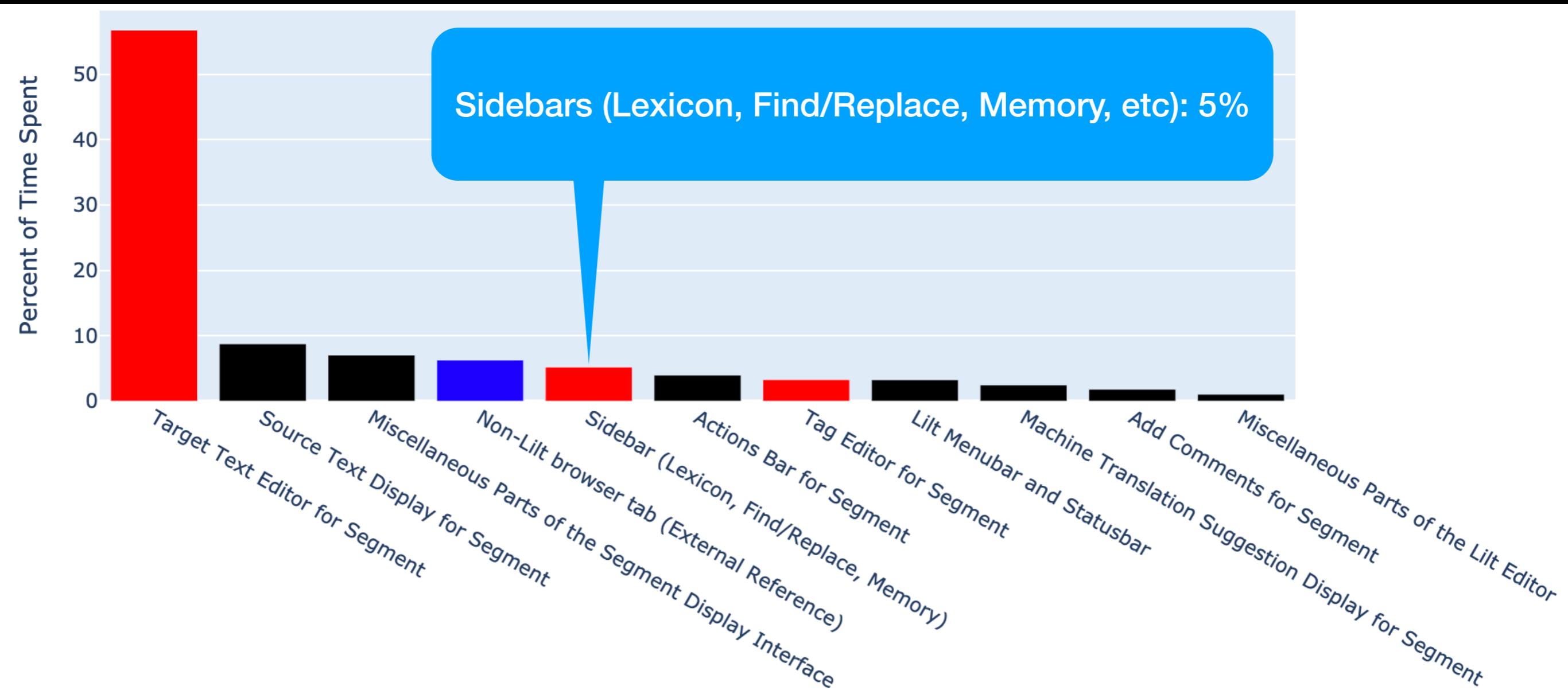
7 Publish a Photo Set to Tumblr

帮助

# How do translators spend their time on Lilt?



# How do translators spend their time on Lilt?



## Sidebars (Lexicon, Find/Replace, Memory, etc): 5%

- 5 Use this feature to publish a collection of photos to Tumblr in one post.

- 6 Note: To learn more about this feature, contact your Success Manager.

Nota: Para

Links available

Nota: Para obtener más información sobre esta función, póngase en contacto con su Administrador de Éxito.

- 7 Publish a Photo Set to Tumblr

### Lexicon

ENGLISH SPANISH

note

Search

English

note

Spanish

nota

notar

billete

anotar

observar

apuntar

bilete

boleto

constatar

cupón

comentario

eminencia

distinguir

comentar

advertir

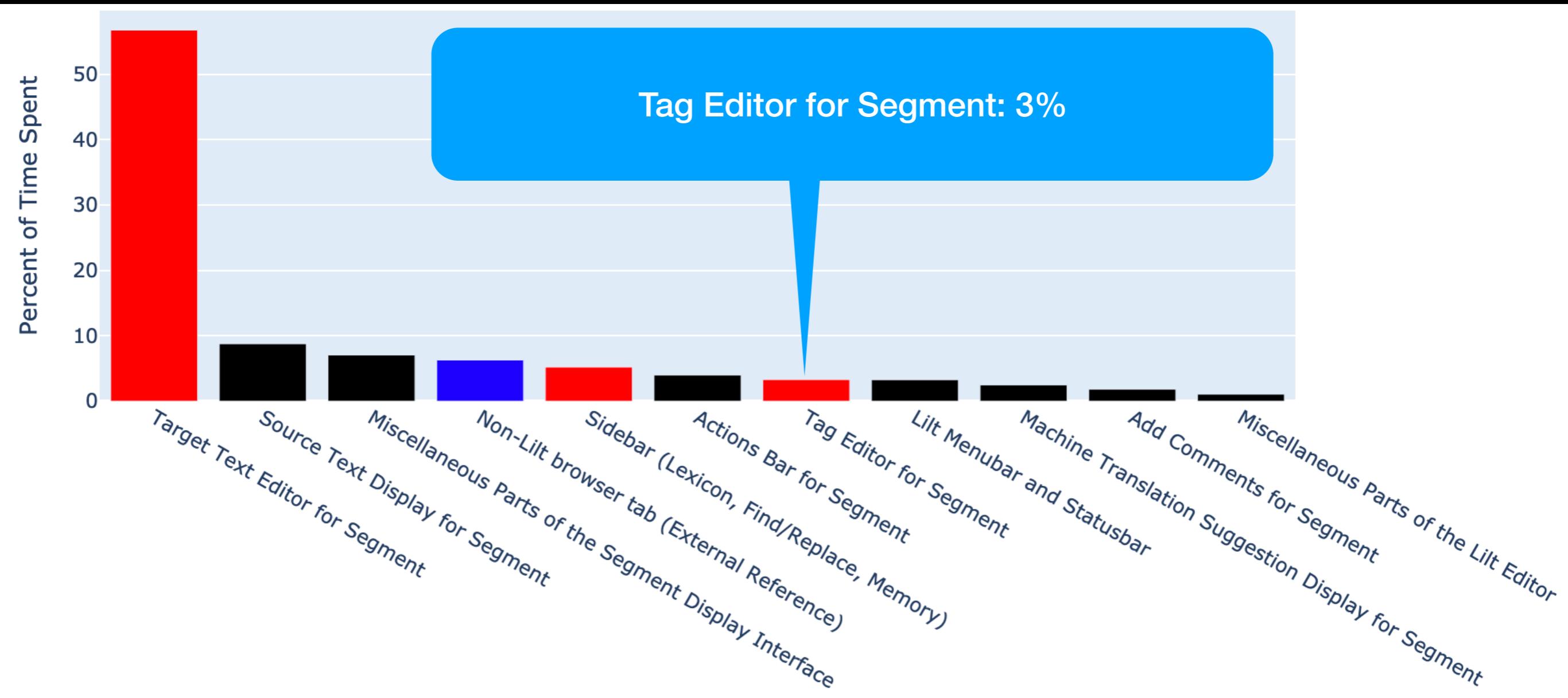
glosa

anotación

percibir

帮助

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- 5 Use this feature to publish a collection of photos to Tumblr in one post.



- 6 1 Note: /1 To learn more about this feature, contact your Success Manager.

QA

- 1 Nota: /1 Para obtener más información sobre esta función, póngase en contacto con su Administrador de Éxito.

X

- 7 Publish a Photo Set to Tumblr



- 8 1. Click on the <1 /> icon in the top navigation bar and select 2 Quick Publish  
/2 /3 /4 /5

QA

1. Haga clic en el <1 /> ícono de la en la barra de navegación superior y seleccione 2 Publicación rápida /2 /3 /4 /5

Links available

X

Tag Editor for Segment: 3%

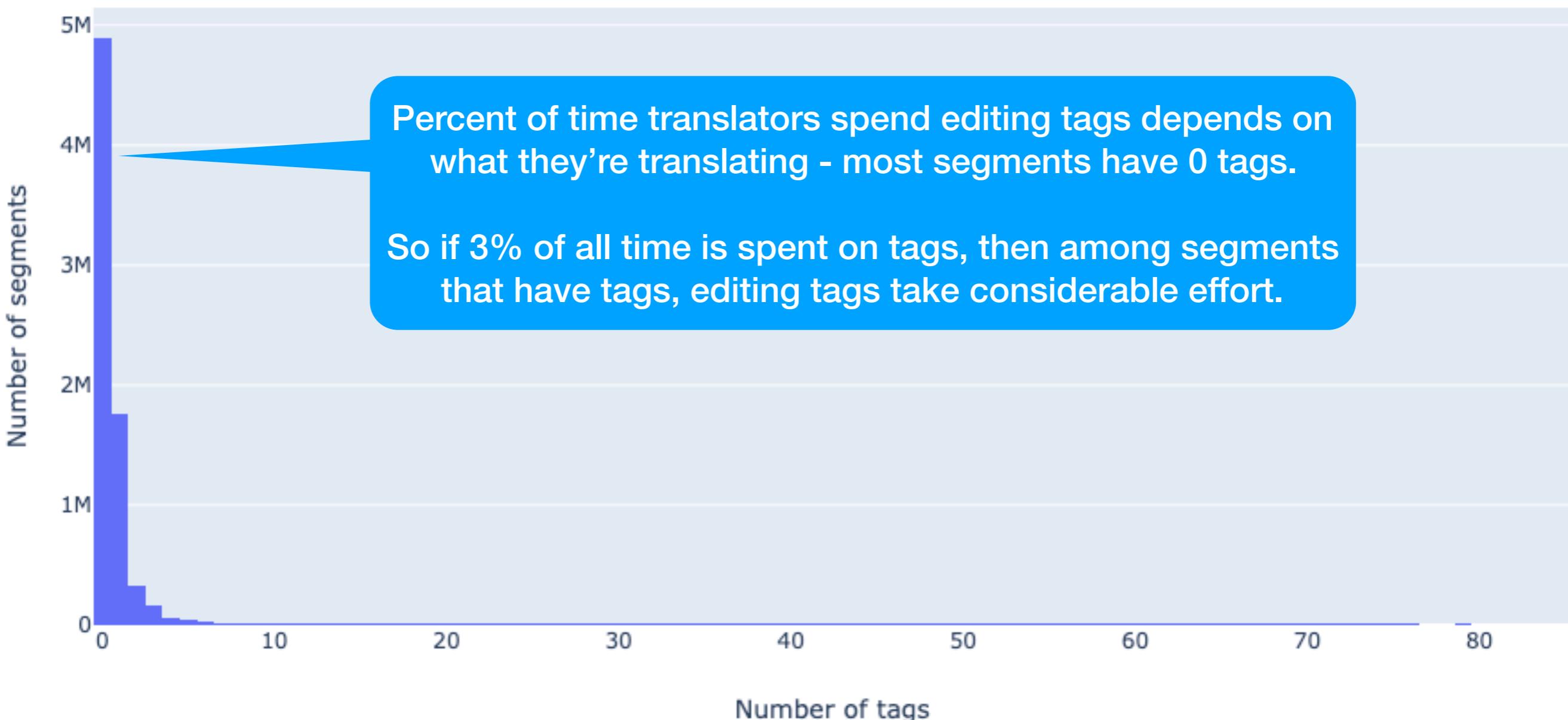
- 9 2. In the Select Accounts field, select the Tumblr account you would like to publish from <1 /> 2 /2 /3

- 10 3. Click Photo to open the 1 Add Photos /1 window <2 /> 3 /3  
<4 />

- 11 4. In the 1 Add Photos /1 window, click on the photos you would like to include in your photo set. Selected images will have a check mark in the upper right corner.

帮助

# Histogram of segments by the number of tags



45 Dólar

- 46** La empresa operaba, en **1** mayo de 2014 **/1**, más de 408 tiendas propias en nueve países, **2** **3** **4** **[ /4 4 5 ]** **/2** **/3** **/5** miles de distribuidores (destacándose los distribuidores premium o **6** **Apple Premium Resellers** **/6**) y una tienda en línea (disponible en varios países) donde se venden sus productos y se presta asistencia técnica.

In May 2014, the company operated over 408 own stores in nine countries,[4] thousands of distributors (outstanding premium distributors or Apple Premium Resellers) and an online store (available in several countries) where their products are sold and technical assistance is provided.

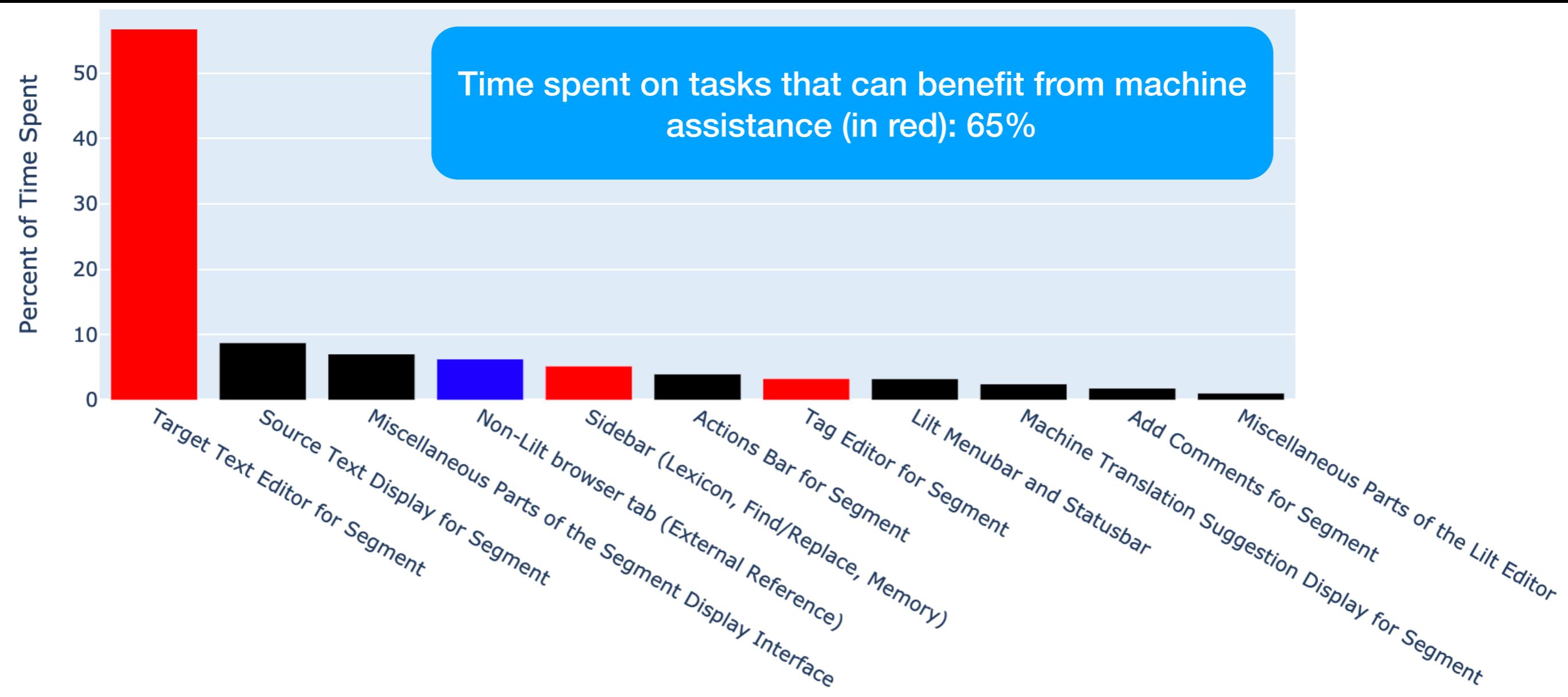
**47** De acuerdo con la revista Fortune /1 /2 , Apple fue la

Lilt does automatic tag placement when segments are confirmed, which users can correct.

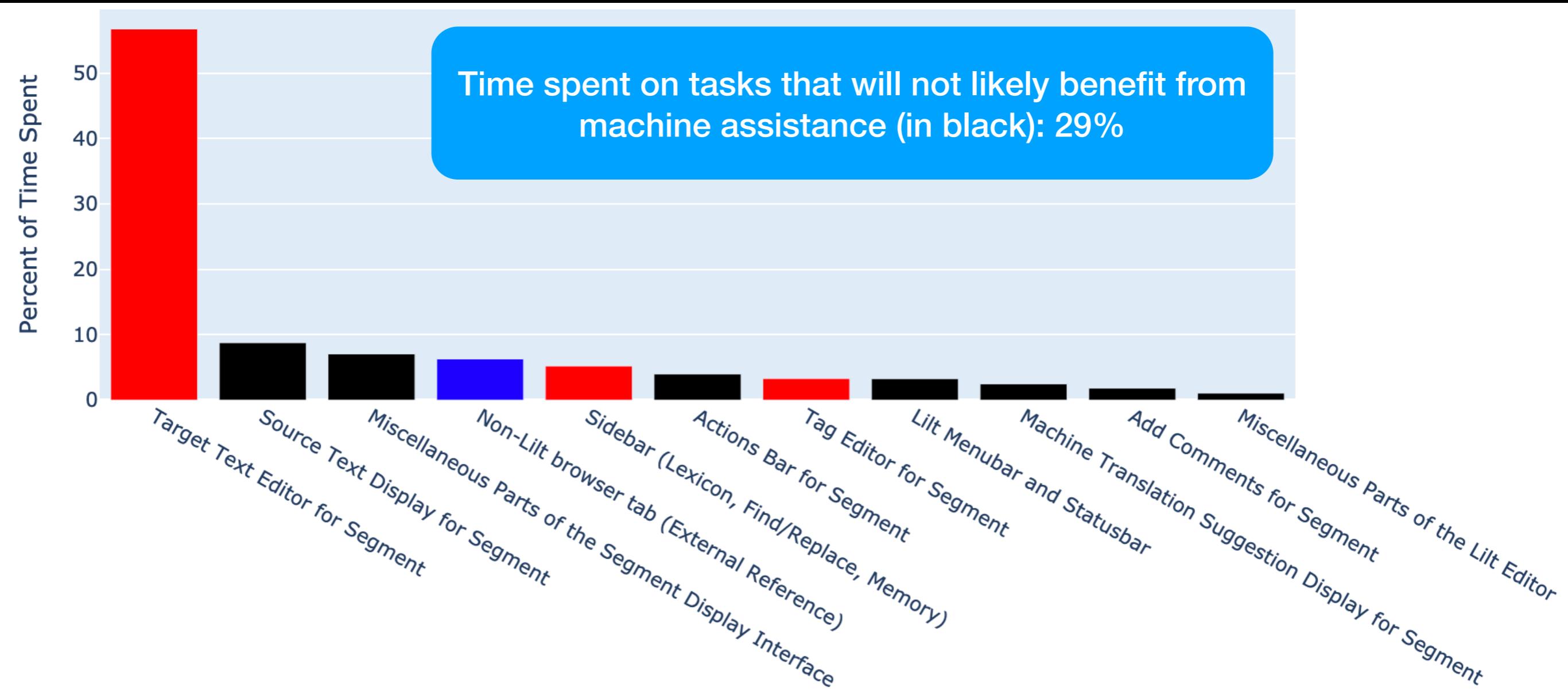
See [lilt.com/research](https://lilt.com/research) for details (Zenkel 2020)



# How do translators spend their time on Lilt?



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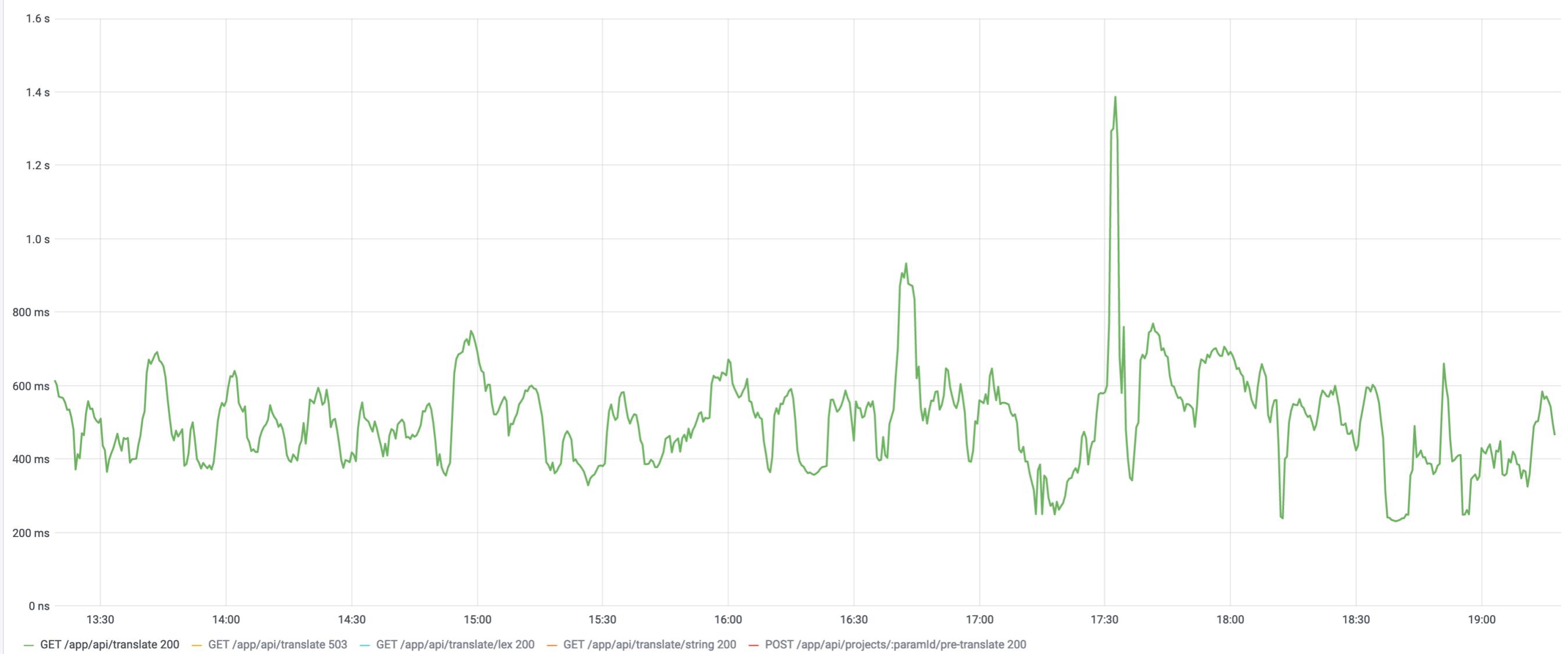


# Conclusion: A Study of Interactive Machine Translation Use on Lilt

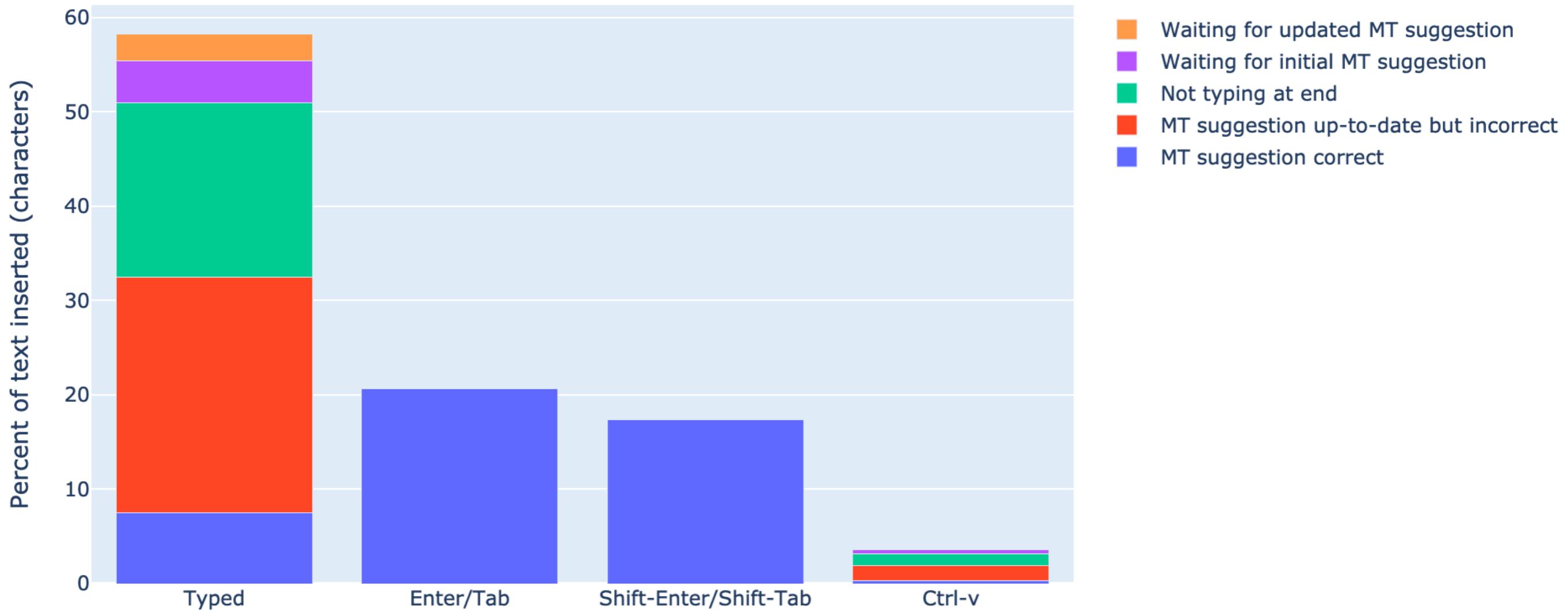
- 57% of translator time is spent on actually writing the translation, which we can optimize with interactive MT.
- Our prefix-constrained interactive MT shows the correct suggestion to translators for 46% of the text they type. Of this, they use our autocomplete for 83% of the text.
- Main areas for improvement are MT quality and showing suggestions when user isn't typing at the end. Latency is very good (< 500ms).
- While Lilt is used in an interactive style 4x more than post-editing, 17% of our users primarily use it for post-editing.

# Backup slides

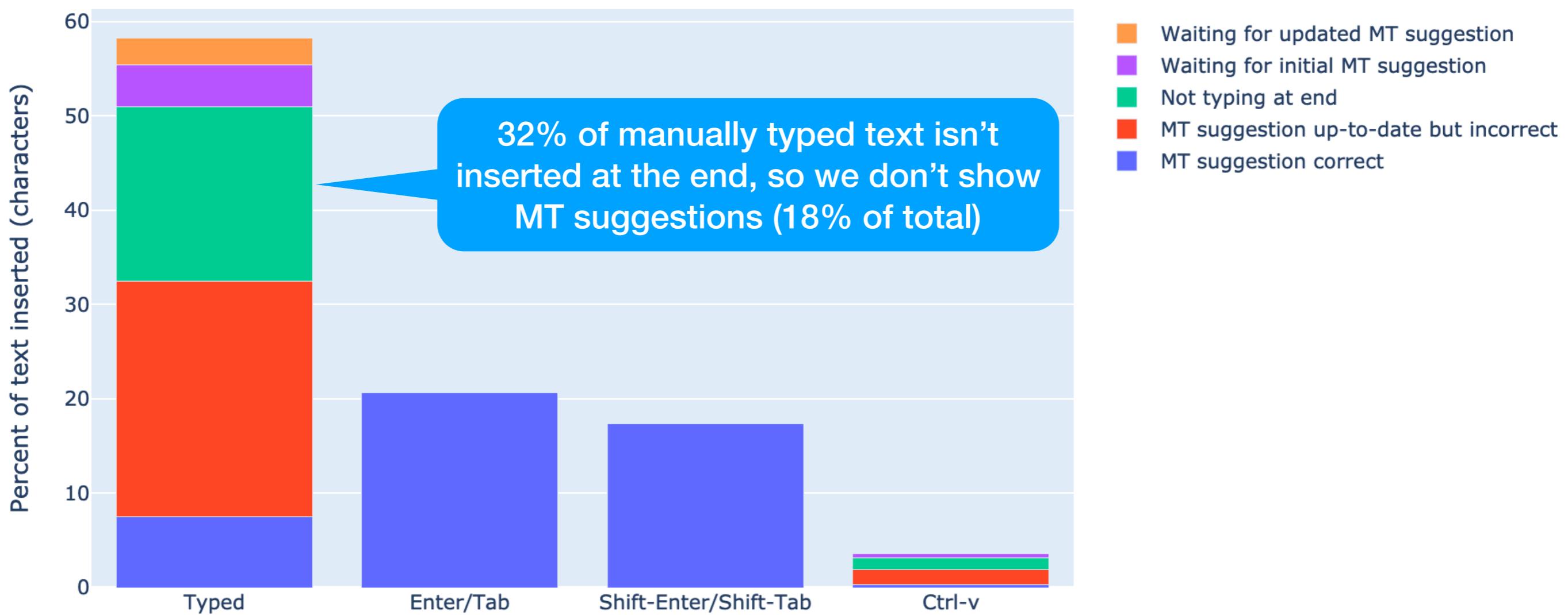
### latency's 90th percentile [5m]



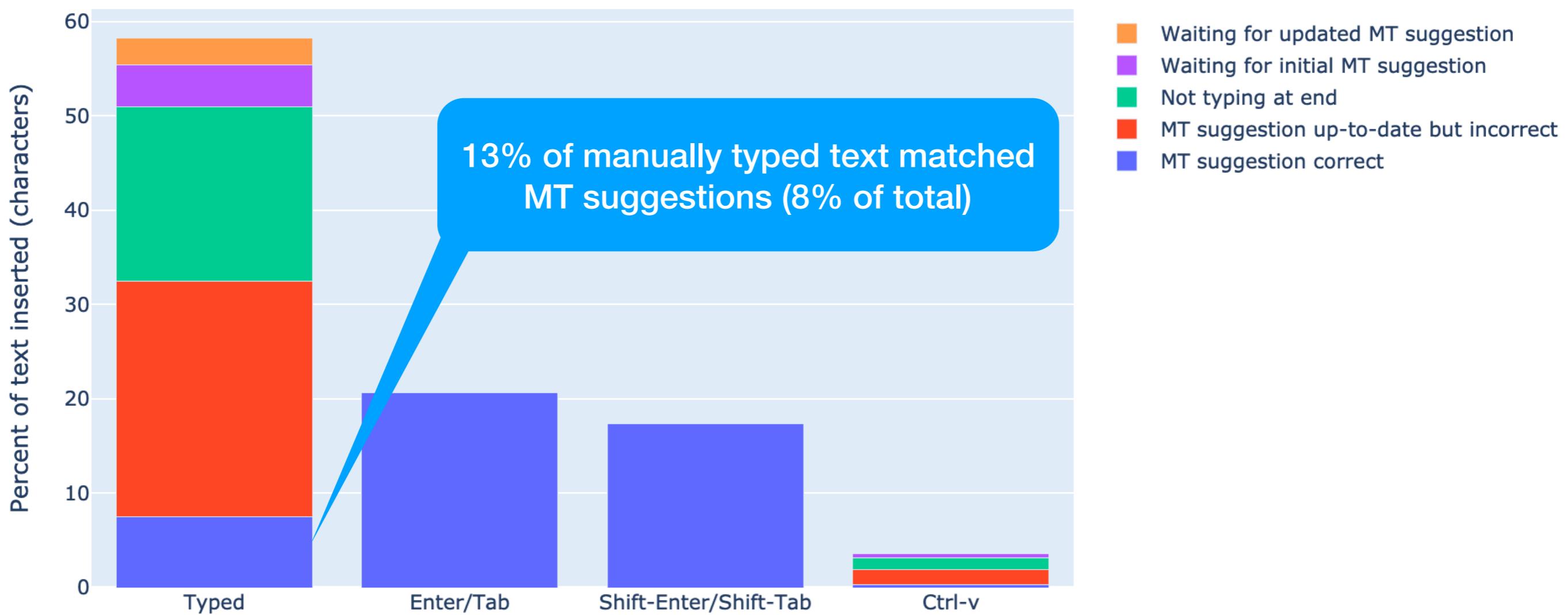
# Keys through which text is inserted, broken down by MT state



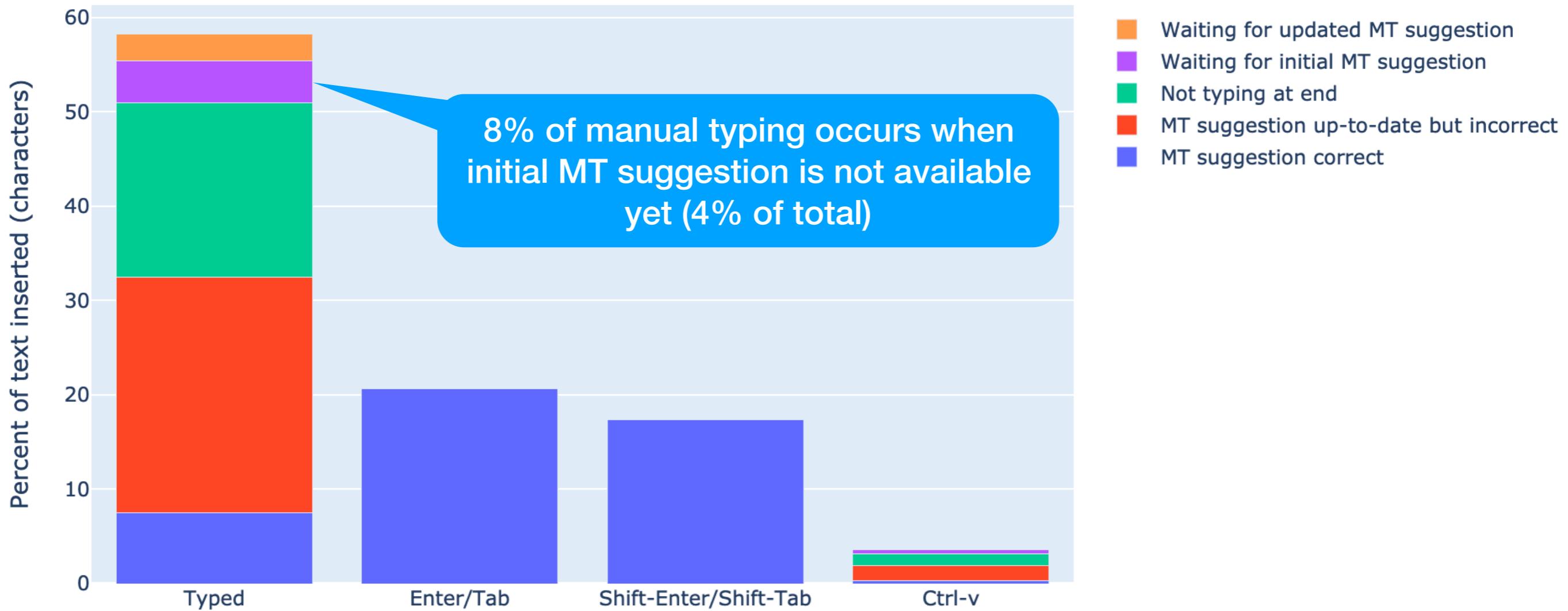
# Keys through which text is inserted, broken down by MT state



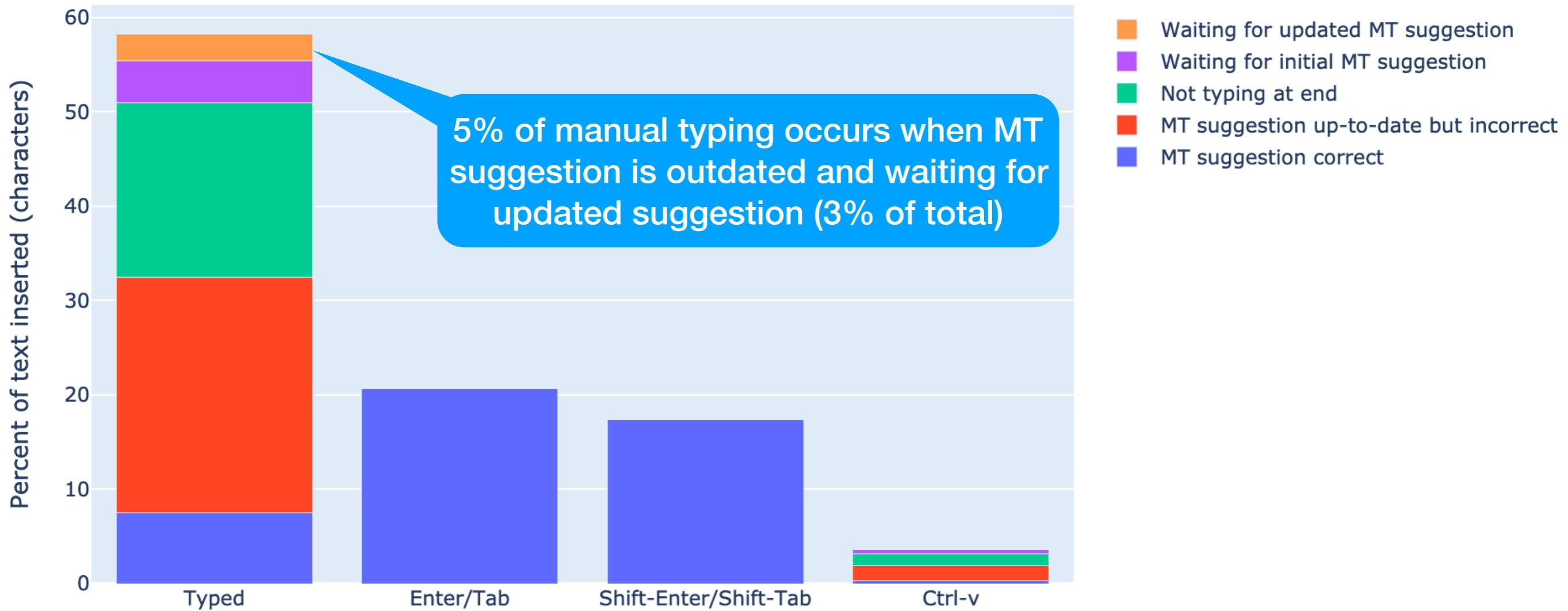
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