On the Limits of Performance: Can Artificial Intelligence Translate *Tamaghrabit*?

حدود الأداء: هل يمكن للذكاء الاصطناعي ترجمة "تمغاربيت"؟

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Abstract:

In a context where the use of artificial intelligence (AI) in **subtitling** is on the rise, the present study seeks to analyse the quality of Moroccan Arabic-to-English subtitles generated by ChatGPT (GPT-5) for two excerpts taken from ***Couscous Maghribi***, a documentary produced and broadcast by 2M, as part of the docuseries *Tamaghrabit* (2022). Drawing on Pedersen's (2017) FAR model for subtitle quality analysis, the study holistically assesses AI-generated subtitles across three areas: **functional equivalence**, **accessibility**, and **readability**. Key findings highlight the impact of prompting on subtitling output, as well as the continuing need for human expertise in translating audiovisual texts fraught with culture-specific references.

Keywords: subtitling; artificial intelligence (AI); *Tamaghrabit*; the FAR model; culture-specific references

الملخص:

في سياق يتنامى فيه استخدام تقنيات الذكاء الاصطناعي في مجال الترجمة، يهدف هذه البحث إلى تحليل جودة الترجمة السمعية البصرية (وتحديدا السترجة) من الدارجة المغربية إلى الإنجليزية، والتي قام بها ChatGPT (GPT-5) لمقتطفين مأخوذين من "كسكس مغربي"، وهو فيلم وثائقي أنتجته قناة 2M في إطار سلسلة الأفلام الوثائقية "تمغرابيت"، وذلك بالاعتماد على نموذج FAR الذي وضعه بيدرسن (2017) لتقييم جودة السترجة. ويقيّم البحث بشكل شمولي الترجمة التي أنتجها الذكاء الاصطناعي على ثلاثة مستويات: التكافؤ الوظيفي، وسهولة الفهم، وسهولة القراءة. وتسلط نتائج البحث الضوء على تأثير طريقة كتابة الأوامر لنماذج الذكاء الاصطناعي على جودة الترجمة التي تنتجها، فضلاً عن الحاجة المستمرة إلى الخبرة البشرية لترجمة النصوص السمعية البصرية التي تحتوي على المفاهيم ذات الخصوصية الثقافية.

الكلمات المفتاحية: السترجة، الذكاء الاصطناعي، تمغرابيت، نموذج FAR، المفاهيم ذات الخصوصية الثقافية.

Introduction:

As one of the most widely used modes of Audiovisual Translation (AVT), subtitling is a complex process that involves many steps to ensure semiotic cohesion and audience engagement. In recent years, it has become increasingly accessible to both professionals and amateurs thanks to emerging AI-powered tools. While such tools promise to reduce time and effort, their integration in AVT is changing how translators engage with subtitling, which was once thought of as a time-consuming process filled with technical constraints. In this vein, it is now possible to upload the source text (ST) to a platform to generate both transcriptions and subtitles. However, despite the allure of automation, AI-generated subtitling remains laden with issues: from missed cultural and linguistic subtleties to multimodal discrepancies that may ruin the viewer's experience of the audiovisual target text (TT). Hence, it becomes essential to evaluate the output of such tools in the highly multimodal context of subtitling.

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Against this backdrop, the present article examines the quality of AI-generated subtitles (Moroccan Arabic into English) through the lens of Pedersen's FAR model, a quality-assessment model that evaluates subtitles based on three criteria: functional equivalence, accessibility, and readability. Two excerpts from the first episode of *Tamaghrabit* (2022), a docuseries produced and broadcast by 2M, were selected as case studies. In this episode, the light is shed on Couscous-making traditions across Morocco's different regions. Therefore, thanks to its focus on themes related to local cuisine, we believe the episode would be the perfect ground to test the strengths and shortcomings of AI when dealing with audiovisual content fraught with culture-specific references, idiomatic expressions, and regional peculiarities. The ultimate aim is to gauge the extent to which human intervention remains indispensable in translating cultural idiosyncrasies. What further renders this study relevant is its inclusion of multimodal considerations in its subtitle quality assessment and their impact on the final subtitling output, which tend to be often overlooked in AVT (Gambier, 2020).

Another aim behind conducting this study is to test the strengths and limitations of the FAR subtitle quality assessment model on the first episode of the docuseries *Tamaghrabit* before using it to analyse AI-generated subtitles for the other five episodes, something that we are planning to undertake in our PhD thesis. In this sense, the present study serves as a pilot that will guide an entire research project focused on the use of AI, particularly Large Language Models (LLMs), for subtitle generation.

1. The Literature Review:

1.1 The Challenges of Subtitling:

Subtitling, one of the most commonly used AVT modes, involves an intersemiotic shift from speech into writing and consists of translating the information in the audiovisual channels from one language into another (Diaz-Cintas & Remael, 2014). As such, it entails, by default, adhering to spatio-temporal constraints, for subtitles tend to be "positioned at the bottom of the screen, arranged in no more than two lines, and not exceeding the 31-character limit" (Benali, 2026). This is because "by their very nature, subtitles interfere with the image and the extent of this interference depends largely on their aesthetic credentials, especially the chosen font type, size and colour". (Díaz-Cintas, 2020, p.153). Owing to these constraints, subtitling is oftentimes perceived as a time-consuming process requiring synchronisation between on-screen images and the audio channel, which can be achieved through 'spotting', a technique through which translators determine the

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precise moment when a subtitle should appear on screen and when it should disappear, according to a series of temporal and visual considerations (Díaz-Cintas, 2020, p.154).

Another key challenge in subtitling, in addition to preserving synchrony, is the transfer of humour, culture-specific elements, and paralinguistic aspects of speech within the constraints of the audiovisual channels. Because viewers have direct access to the ST, any attempt to adapt or omit the above-mentioned elements without reference to on-screen images can affect the viewing experience, as it may lead to glaring misalignments between ST and TT. One example of this common trap is a scene taken from the first season of the sitcom *Friends,* discussed by Taylor (2016), where Ross declares he would not go with Joey and Chandler to a hockey game unless they buy him "a big foam finger", a culture-specific reference to an oversized glove used to show support for a team. In the Italian version, the translators attempted to adapt this reference to the target audience's culture, aiming for equivalence, by translating it as "large beer" (p. 226). The result was a jarring disconnect between the subtitle and the information in the audiovisual channels, as the laugh track plays in the background while Ross is seen waving his foam finger at the stadium.

1.2 Quality in AI-generated Subtitles:

Due to the multitude of technical steps in the subtitling process, reliance on automation, especially AI tools, is on the rise (Pym & Torres-Simon, 2021). In this regard, these tools are primarily used to facilitate the notoriously time-consuming processes of transcription, segmentation, and spotting required to produce high-quality subtitles. Nevertheless, now that these tools can handle the entire subtitling process, from transcription to translation, they are no longer seen as mere assistants but as potential competitors to human translators. After all, why bother hiring humans when machines can perform the tasks efficiently and effectively with a fraction of the cost? This is why professional translators are concerned about the growing reliance on AI and its potential impact on both translation quality and the future of the translation profession.

Regarding translation quality, one of the most extensively discussed concepts in the history of translation studies (TS), AVT scholars disagree with the dominant tendency to approach quality solely through a linguistic lens. Unlike House's (2014) view of quality as the degree to which the TT is equivalent to the ST, Pedersen (2017) and Taylor (2013) argue that the quality of a translated audiovisual text, and because of its multimodal nature, is shaped by considerations other than equivalence, such as the synchronicity between different channels of information and adherence to spatio-temporal constraints. For this reason, Pedersen (2017) believes that it is quite challenging

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to apply popular translation quality assessment models to AVT, particularly subtitling, as they would flag omissions and alterations made to achieve semiotic cohesion as errors. Still, translation quality assessment models are crucial for pinpointing areas where AI falters and for establishing a solid framework for collaboration between translators and machines to produce high-quality output efficiently.

Speech recognition is another area where AI flounders, causing serious translation issues in the output if the transcription is not revised and edited. This latter, which constitutes the first step in subtitling, is notorious for being time-consuming, involving translating information transmitted through the audiovisual channel into writing, as well as determining the timestamps for when each subtitle should begin and end (Díaz-Cintas, 2020). In light of Jakobson's typology of translation (1953), the shift from speech to writing constitutes a form of intersemiotic translation that naturally entails challenges related to human speech, such as noise, accents, and speech patterns. These challenges make it difficult for Automatic Speech Recognition (ASR) systems to accurately transcribe speech, especially when the ST is in a low-resource language. In this light, many subtitling mistakes in the output result not from AI's inability to transcribe videos but from unedited transcription (Benali, 2026).

1.3 Current State:

Currently, while far from achieving perfection, Machine translation systems (MT) and Large Language Models (LLMs) still grapple with transferring contextual and semiotic nuances that characterise any audiovisual text. However, Qui and Pym (2025) found that viewers consuming subtitled media were open to ignoring translation issues if they did not interfere with the ST, and that is because in this case "they use multiple channels of information to construe meanings, such that a translation error can be overridden by other communicative clues" (p. 14). Furthermore, according to Egamberdieva and Chikhanova (2024), both human translators and machines fall into the same traps when moving between two languages. The difference is that the former reviews their output for correction, resulting in better translation quality. Despite the optimism and growing confidence in AI's ability to translate, Abu-Rayyash and Lacruz (2025) warn that the fluency which automatic subtitling appears to possess, especially when carried out by LLMs, is superficial, as LLMs tend to distort meaning and lack intercultural awareness.

Based on the above, human intelligence is still needed to guide and supervise artificial intelligence in subtitling and ensure it adheres to quality standards. In fact, AI-translator collaboration is emerging as a viable model in the world of AVT, as many professionals are leaning towards this

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workflow that saves time and effort (Koglin et al., 2022). In this model, translators delegate the process of subtitling to the machine, from transcription to translation, only to interfere later to edit the output. By doing so, another stage is added to the traditional translation process: machine translation post-editing (MTPE). It is therefore essential to determine the parameters translators should consider when evaluating and post-editing AI-generated subtitles. This is what Pedersen (2017) attempts to do in his FAR model, which was originally designed to assess human translation but has been successfully used by researchers in MTPE (Ludera et al., 2024; Qiu & Pym, 2025; Koglin et al., 2022).

2.The FAR Model for Subtitle Quality Assessment:

In light of the above discussion, the study presents a qualitative assessment of subtitles translated from Moroccan Arabic into English, generated by OpenAI's ChatGPT Plus (model GPT-5)[1]. In this regard, the generated subtitles for two sample clips[2] from the first episode of *Tamaghrabit* (2022), a docuseries produced and broadcast by 2M exploring the different facets of Moroccan identity, are analysed. This episode, titled "Couscous Maghrabi", takes its viewers on a journey across the regions of Morocco to bring to light the variety of couscous-making traditions. The motive behind selecting ChatGPT to generate subtitles for the documentary is its models' constant exposure to Moroccan Arabic data thanks to its widespread use among Moroccans (Khantouri, 2026).

The first of the chosen clips takes place in an unnamed village in the North, where the subject, a farmer, discusses growing vegetables for Couscous, while the second clip features a fisherman in Chlihat, bringing home a fish for his mother to make couscous. Both clips were purposively selected thanks to their richness in references to Moroccan cuisine and farming. Another reason for their selection is the contrast and variety they provide in terms of dialects. While the subject in the first clip speaks a Jebli dialect, the subject in the second uses a Gharbawi dialect.

As for subtitling quality assessment, Pedersen's FAR model is used to provide quality scores by penalising errors across three areas. The first is functional equivalence, an area that includes semantic errors, which are penalised more heavily because of their limiting impact on the audience's ability to understand the ST. The second area concerns accessibility errors, including errors in grammar, spelling, and the translation of idioms and culture-specific references.

[1] The premium version requiring a monthly subscription of 20$ per month
[2] Six minutes for the first clip; five minutes for the second

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Readability is the final area of assessment and includes multimodal errors that affect the audience's viewing experience of subtitled media, such as spotting errors, limited synchrony between the subtitles and the audiovisual channels, and exceeding the subtitle reading speed.

Table 1: *The FAR model*

Severity	**Minor** (Minor impact on the viewer)	**Standard** (Viewers slightly question the subtitles but continue following the TT)	**Serious** (When it becomes impossible to understand and follow the TT)
Functional Equivalence: Semantic and stylistic errors.	0.5	1	2
Accessibility: Grammar, spelling, and idioms.	0.25	0.5	1
Readability: Segmentation, spotting, punctuation, and reading speed.	0.25	0.5	1

The score for each category is calculated by dividing the sum of penalties for minor, standard, and serious errors by the number of subtitles in the clip, then multiplying the result by 100%. The resulting sum represents the percentage of flawed subtitles in that category and can be subtracted from the total score to obtain the average score. To calculate the overall score[3], the following formula should be used:

$$100\% - (F + A + R / \text{Number of subtitles} * 100\%)$$

[3] It is noteworthy that the overall score is cumulative in nature and does not, hence, represent an average.

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3.Data Analysis:

3.1 Functional Equivalence:

In the first excerpt, eight subtitling errors have been spotted: half of which are serious semantic errors, and three are standard errors. The remaining error is minor. After calculating penalties according to Pedersen's formula, the overall score for this category is 82.84 per cent, meaning that 17.16 per cent of subtitles were not functionally equivalent to the ST, while the remaining subtitles conveyed the ST's content. The second excerpt yielded a similar quality score of 82.29 per cent, with seven identified subtitling errors: four are standard, two are serious, and one is minor.

- Excerpt 1:

$$\{(0.5*1)+(1*3)+(2*4)/67\}*100 = 17.16$$

Overall score: *100%-17.16% = 82.84 %*

- Excerpt 2:

$$\{(0.5*1)+(1*4)+(2*2)/48\}*100 = 17.71$$

Overall score: *100%- 17.71%= 82.29 %*

Examples:

Timestamp	ST	TT
[35] [00:02:27 - 00:02:30]	كيتفور وهاهو رجع **طعام**.	That's how it became **food**.
[3] [00.00.12- 00.00.14]	لخطانا البحر، مشينا فيها.	We followed the sea, it carried us with it.

In the first example, the culturally specific item **"طعام"**, which, in Moroccan Arabic and unlike standard Arabic, refers particularly to couscous, is mistranslated as "**food**". This error is evident in the excerpt, as the speaker recounts how couscous was made during times of famine. By translating "**طعام**" as "food", the subtitle risks confusing viewers who are unfamiliar with the Moroccan use of the word. Hence, a more accurate and meaningful rendering would be *"That's how it became couscous."* As for the second example, it is an example of a serious functional

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equivalence error since the meaning is completely distorted. The speaker in the excerpt, an elderly housewife, is explaining the importance of the sea, which was the only path to survival for her family. This is not the meaning communicated in the subtitle. A more accurate translation would be "Without the sea, we would be ruined."

3.2 Accessibility:

In the first excerpt, seven subtitling errors were identified: four were minor, two were standard, and one was serious. After calculating the penalties according to Pedersen's formula, the resulting score was 95.52 per cent, with the remaining 4.48 per cent of subtitles exhibiting naturalness and idiomaticity issues. As for the second excerpt, it has six errors: four are standard, one is minor, and the remaining error is serious. The obtained overall score for this category is therefore 93.23 per cent.

- Excerpt 1:

*{(0.25*4)+(0.5*2)+(1*1)/ 67}* 100 = 4.48*

Overall score: *100%-4.48%= 95.52 %*

- Excerpt 2:

*{(0.25*1)+(0.5*4)+(1*1)/ 48}* 100 = 6.77*

Overall score: *100%-6.77%= 93.23 %*

Examples:

Timestamps	ST	TT
[15] [00:00:51 - 00:00:53]	في الهبطة دغيا **كتكركب**	The way down is **fast**
[33] [00.02.10- 00.02.12]	خلقت **فالحوت**	I was born **in fish.**

Translating "كتكركب" as "fast" is an example of a standard error. Despite being grammatically correct, describing a "way" or "path" as "fast" sounds unnatural in English, for a way is not usually described as "fast". It is the action of descent that can actually be described as such. Moreover, the verb "كتكركب" in Moroccan Arabic carries an important nuance, for it implies a rapid and

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uncontrolled sense of downward movement. A more natural translation in this instance, therefore, would be "You roll down fast." The second example is an instance of a word-for-word translation. The speaker describes her family's generational connection to fishing. The emotional and cultural nuance is lost in translation, resulting in the subtitle "I was born in fish," which sounds illogical and unnatural in English. One possible translation is "I was born into a life of fish".

3.3 Readability:

Before presenting the findings in this category, it is worth noting that ChatGPT does not transcribe speech on its own and requires third-party integrations to do so. So far, none of the integrations we tried, mainly OpenAI's Whisper and Turboscribe, can effectively transcribe content in Darija, which can be attributed to its status as a low-resource language. To address this issue, we decided to edit and correct the transcription content, leaving the timestamps as marked by the AI. Any further modifications, such as omitting or condensing information, were strictly avoided to limit the impact on the readability category. Therefore, results in this category are jointly shaped by the initial transcription provided by AI and the modifications introduced afterwards. This is why our attention in the assessment process was primarily focused on two parameters: the number of characters per line (42) and the correspondence between TT and the audiovisual channels.

Overall, the quality score for both excerpts is as follows: 97 per cent for the first and 95.84 per cent for the second. The first excerpt has five readability errors, one of which is a serious one (the example of translating الطعام as food previously mentioned in the first category since it contradicts the images displayed on screen of Couscous), while the second has four errors, all of which are standard and relate to exceeding the limit of forty-two characters per line, which lead to slight delays in the display of the following subtitles and their early disappearance to maintain synchronicity with the audiovisual channels, not providing, as a result, enough time for viewers to read them.

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Example:

Timestamps	TT
[26] [00:01:59 - 00:02:01]	We do a bit of farming: lentils, chickpeas, barley, fava beans… **62 characters (limit 42 characters per line)**

4.Discussion of Findings:

The findings indicate that ChatGPT achieved some degree of functional equivalence, accessibility, and readability in subtitling both clips. After adding the penalty scores for each category for the excerpts and dividing the total by the number of subtitles, the overall cumulative score is 61.63 per cent for the first excerpt and 41 per cent for the second excerpt, with an average of 51.31 per cent for both. For comparison, Ludera et al. (2024) report that the average quality score for subtitles produced by human translators ranges from 86 per cent to 96 per cent, depending on their subtitling expertise (p. 64). It is noteworthy that the drop in the cumulative FAR score for both excerpts, despite a higher score in each category, reflects both the serious penalty weight caused by errors in functional equivalence and the formula's sensitivity when the analysed sample is short, resulting in a higher error density the shorter the excerpt is [4].

Though far from being excellent, many of the subtitles are functionally accurate, even when the speakers mix between two languages or mispronounce foreign words. For instance, in one scene from the first excerpt, the speaker describes the crops they grow, typically used to make Couscous:

[4] The average rate of errors per subitle

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TT	ST
[41] Here we are, Sidi. This is Turnip-all natural.	**[41]** هاحنا اسيدي، ها هو اللفت كلشي ناتوريل
[42] All organic	**[42]** كلشي بوي

The speaker wanted to say ‘bio’, a French word meaning ‘organic’, but mispronounced it as ‘boui’ (as shown by the transcription on the right). Interestingly, GPT-5 not only identified the word but also accurately translated it into “organic”.

One thing that stands out in the analysis is how dependent subtitle quality is on the prompts used to initiate translation. On the one hand, when using general prompts, such as “provide English subtitles to this clip,” without adding context or specifying translation goals, the output is generic and includes more functional-equivalence and accessibility errors. On the other hand, using detailed prompts such as “provide functional and good-quality subtitles into English for this clip that features a farmer and his wife from the North of Morocco talking about farming Couscous vegetables” yields significantly higher-quality results.

Furthermore, the analysis revealed that the FAR model can provide a solid basis for post-editing AI-generated subtitles. By categorising errors and outlining specific quality criteria, the model can serve as a tool for error detection and prioritisation based on their impact on the audience's viewing experience. However, this model’s biggest issue lies in its subjectivity in judging the severity of the errors. Consequently, the analysis above offers only preliminary insights that should be further investigated through studies of audience reception to assess the actual impact on understanding and engagement, something that has been attempted by Koglin et al. (2022) and Qui and Pym (2025), and that we will attempt to do in our PhD project to check the degree to which these findings hold true when tested from a reception perspective.

It is also noteworthy that these findings reflect the performance of one LLM system, specifically ChatGPT, and one language pair (Darija to English) in a specific time frame (November 2025), and hence do not account for other LLM systems or language pairs, nor do they provide an overview of quality development across time. For comparison, a previous study we conducted in March 2025 on English-to-Standard Arabic subtitling (on CaptionHub) yielded a significantly

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lower overall subtitle quality score of 57%, highlighting how language pair, platform, and time can affect quality scores (Benali, 2025).

Conclusion:

To conclude, this study confirms that ChatGPT (GPT-5), in its current stage, can, to a certain extent, subtitle Darija content into English with a moderate level of competence that is surprising for an LLM dealing with a low-resource language, demonstrating a notable ability to generate decent subtitles even when faced with unclear dialogue and challenging cultural references. These findings echo those in current AVT research, which highlights improved performance in fluency and adequacy in subtitling from/into high-resource languages such as English, attributable to advances in machine learning. One implication of this finding is that AI may currently function as an aid to human subtitlers rather than a replacement, since it is far from mastering the complexities of cultural transfer.

Despite the observed progress, the data above show that AI-generated subtitles still have quality issues. Although a significant part of the subtitles is rated as acceptable or functional, the remaining part unveils shortcomings in AI's ability to perform cultural and linguistic processing tasks. These findings also demonstrate that quality in subtitling cannot be measured solely by surface-level accuracy; it must also be achieved by maintaining functional equivalence, accessibility, and readability, all of which ChatGPT still struggle to fully integrate. Consequently, it is premature to presume that AI systems will replace human translators, as their intervention remains necessary, particularly when sensitive content is involved.

One key element this pilot study highlights is that strategic and efficient prompting enhances the quality of the generated subtitling output, therefore proving that prompt literacy is becoming a crucial skill for translators. When prompts incorporate more contextual clues about the source text (ST) and desired outcomes, the functionality, accessibility, and readability of the generated subtitles improve noticeably. In this light, and as stated by Díaz Cintas (2013), the subtitling profession is likely to be a hybrid space where synergies with machines that rely on "the participation and savoir-faire of the subtitlers" will be the industry norm (p.131). The findings of this study support this view by demonstrating that the AVT industry can benefit from the efficiency and cost-effectiveness of this collaborative workflow without compromising subtitling quality.

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