

Detecting translingual plagiarism and the backlash against translation plagiarists

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Abstract. *Plagiarism detection methods have improved significantly over the last decades, and as a result of the advanced research conducted by computational and mostly forensic linguists, simple and sophisticated textual borrowing strategies can now be identified more easily. In particular, simple text comparison algorithms developed by computational linguists allow literal, word-for-word plagiarism (i.e. where identical strings of text are reused across different documents) to be easily detected (semi-)automatically (e.g. Turnitin or SafeAssign), although these methods tend to perform less well when the borrowing is obfuscated by introducing edits to the original text. In this case, more sophisticated linguistic techniques, such as an analysis of lexical overlap (Johnson, 1997), are required to detect the borrowing. However, these have limited applicability in cases of ‘translingual’ plagiarism, where a text is translated and borrowed without acknowledgment from an original in another language. Considering that (a) traditionally non-professional translation (e.g. literal or free machine translation) is the method used to plagiarise; (b) the plagiarist usually edits the text for grammar and syntax, especially when machine-translated; and (c) lexical items are those that tend to be translated more correctly, and carried over to the derivative text, this paper proposes a method for ‘translingual’ plagiarism detection that is grounded on translation and interlanguage theories (Selinker, 1972; Bassnett and Lefevere, 1998), as well as on the principle of ‘linguistic uniqueness’ (Coulthard, 2004). Empirical evidence from the CorRUPT corpus (Corpus of Reused and Plagiarised Texts), a corpus of real academic and non-academic texts that were investigated and accused of plagiarising originals in other languages, is used to illustrate the applicability of the methodology proposed for ‘translingual’ plagiarism detection. Finally, applications of the method as an investigative tool in forensic contexts are discussed.*

Keywords: *Translingual, plagiarism, translation, detection, forensic linguistics, computational.*

Resumo. *Os métodos de detecção de plágio registaram melhorias significativas ao longo das últimas décadas e, decorrente da investigação avançada realizada por linguistas computacionais e, sobretudo, por linguistas forenses, é, agora, mais fácil identificar estratégias de reutilização de texto simples e sofisticadas. Especificamente, simples algoritmos de comparação de texto criados por linguistas*

computacionais permitem detectar fácil e (semi-)automaticamente plágio literal, “ipsis verbis” (i.e. que consiste na reutilização de trechos de texto idênticos em diferentes documentos) – como é o caso do Turnitin ou o SafeAssign –, embora o desempenho destes métodos tenha tendência a piorar quando a reutilização é disfarçada através da introdução de alterações ao texto original. Neste caso, são necessárias técnicas linguísticas mais sofisticadas, como a análise de sobreposição lexical (Johnson, 1997), para detectar a reutilização. Contudo, estas técnicas são de aplicação muito limitada em casos de plágio ‘translingue’, em que determinado texto é traduzido e reutilizado sem atribuição da autoria ao texto original, proveniente de outra língua. Considerando que (a) normalmente, a tradução amadora (e.g. tradução literal ou tradução automática gratuita) é o método utilizado para plagiar; (b) é comum os plagiadores fazerem alterações ao texto, nomeadamente gramaticais e sintáticas, sobretudo após a tradução automática; e (c) os elementos lexicais são aqueles que a tradução automática processa mais correctamente, antes da sua reutilização no texto derivado, este artigo propõe um método de detecção de plágio ‘translingue’ informado pelas teorias da tradução e da interlíngua (Selinker, 1972; Bassnett and Lefevere, 1998), bem como pelo princípio de ‘singularidade linguística’ (Coulthard, 2004). Recorrendo a dados empíricos do corpus CorRUPT (“Corpus of Reused and Plagiarised Texts”), um corpus de textos académicos e não académicos reais, que foram investigados e acusados de plagiar textos originais noutras línguas, demonstra-se a utilidade da metodologia proposta para a detecção de plágio ‘translingue’. Finalmente, discute-se possíveis aplicações deste método como ferramenta de investigação em contextos forenses.

Palavras-chave: Plágio, translingue, tradução, detecção, linguística forense, computacional.

Plagiarism, translation and lifting

Plagiarism has been on the agenda of national and international organisations for decades. Even if for different reasons and driven by distinct motives, publishers, the media, and, especially, higher education institutions from all over the world and in different contexts (e.g. Western/Eastern cultures, industry/education, etc.), across different genres (e.g. academic, literary, etc.) and disciplines (e.g. engineering, business, linguistics, etc), attempt to effectively address the improper reuse of someone else’s words. Whereas organisations, publishers and the media are mainly concerned with the possible implications and consequences of the copyright violations underlying instances of plagiarism in published works, educational institutions are driven, simultaneously, by the need to develop student skills and teach them how to write academically, to promote academic integrity, and enforce tight controls that discourage, prevent and punish cheating (Anderson, 1998; Angèlil-Carter, 2000; Bennett, 2005; Bertram Gallant, 2014; Howard, 1995; Jameson, 1993; Pecorari, 2008). Although some reports suggest that plagiarism is on the rise (Caroll, 2004), this has not yet been proven.

However, there has certainly been an increase in the perceptions of plagiarism, in part due to the media attention attracted by high profile cases, such as those of the journalist Johann Hari of *The Independent*, or those involving politicians, such as the German Defence Minister Karl-Theodor zu Guttenberg (2011), the Romanian Prime Minister Victor Ponta (2012), and the German Education Minister Annette Schavan (2013). As a result of this per-

ceived increase, a considerably high number of organisations are now equipped with anti-plagiarism and integrity policies, as well as plagiarism and text reuse detection software programmes (such as Turnitin, CopyCatch and WCopyFind, among others). In parallel, these technological developments have been matched by developments in research that not only found new linguistic methods of plagiarism detection (Johnson, 1997), but also provided a level of linguistic description that suits the forensic context (Turell, 2004, 2007). These build upon two assumptions. The first is the proven principle of *idiolect* (Coulthard, 2004), i.e. that each speaker or writer of a language makes their own, individual use of that language, thus making it very unlikely that two speakers or writers of a language independently produce identical utterances/phrases. The other assumption is that, as the most common form of plagiarism is textual plagiarism, this can be demonstrated via linguistic analysis (Coulthard and Johnson, 2007).

Plagiarism, however, is not limited to the type of plagiarism that linguists are able to detect, i.e. textual plagiarism. Other forms of plagiarism have been on the agenda in recent years, which involve the improper reuse of works and ideas, rather than words. Instances of plagiarism of this type include plagiarism of computer source code (Chester, 2001; Culwin *et al.*, 2001), visual and multimodal plagiarism (Anderson and Mill, 2014; Porter, 2014), or even music plagiarism (Dittmar *et al.*, 2012). These are instances of plagiarism of works and ideas whose detection is usually beyond the skills of linguists, but linguists are able to detect some instances of plagiarism of works and ideas. One of these is where one translation lifts from another translation of the same original.

Previous research has demonstrated that plagiarism of ideas, like linguistic plagiarism, can be investigated, described, explained and proved by resorting to linguistic analysis. This has been shown in particular by Turell (2004), who compared four translations of Shakespeare's *Julius Caesar* that were published in Spain to show that the use of quantitative linguistic evidence can help determine plagiarism between translations. Interestingly, Turell's study did not compare one text in one given target language (TL) to an original in another, source language (SL). Instead, Turell compared the four TL texts translated from the same SL text to determine the extent of plagiarism, by explaining how much overlap could be expected among the TL texts. She concluded, not that the ideas that were lifted were not those of the original English text, but on the contrary those of another translation into Spanish. This is an illustrative example of plagiarism analysis that used a textual comparison to demonstrate an instance of plagiarism of ideas, where some ideas were translated using the same TL words, even when such wording is unexpected. Where translation and plagiarism have been researched (e.g. Turell (2004, 2007)), the analysis has therefore focused mainly on comparing the translations of the same original to find instances of plagiarism among the translated texts, by using a method that is strikingly similar to monolingual plagiarism detection. In other words, the suspect translation is not checked for identity and similarity to the other language original, but against another translation of the same original. This may imply using the original for reference, but the main task consists of analysing same-language texts.

Another case of plagiarism of ideas that linguists are able to detect is where the plagiarists lift the text from one language, have it translated into another language, and subsequently reuse it as their own. This type of plagiarism, to which I called *translingual plagiarism* (Sousa-Silva, 2013), is distinct from the previous one, and has been hardly discussed until recently. Several reasons may explain why this area remains relatively under-

researched. The first may be the fact that the concept of plagiarism adopted may consider that translating from another language is not *stricto sensu* textual plagiarism since the text (re)used is neither textually identical, nor similar to the original. Indeed, an investigation of texts suspected to have plagiarised an original in another language challenges linguistic concepts such as the ones proposed by Johnson (1997), as the instances of plagiarism cannot be detected using (common) text comparison techniques. Since the original and the suspect instance of plagiarism are in different languages, the identity and/or similarity between words, strings and grammar becomes significantly more difficult to demonstrate, and the computational detection task can hardly obtain satisfactory results. Additionally, plagiarism of this type, where 'a language A text written by author A is translated into language B and the translator appears as the author of the original translated text' (Turell, 2004: 7) – and which Turell (2008: 271) calls 'plagiarism in translation' – does not reuse the 'linguistic text' from the original. The text that is lifted from the original could be roughly considered to be a *semiotic text*, more than a linguistic text, thus being often considered either *plagiarism of ideas* or *plagiarism of works*, rather than *linguistic plagiarism*. Unsurprisingly, therefore, most investigations into linguistic plagiarism until this date have been limited to monolingual plagiarism, where a text borrows from another original in the same language, and relatively little research attention has been paid to plagiarism across different languages, by means of translation.

The use of translation as a plagiarism strategy is nevertheless a known issue, in academic as well as non-academic contexts. In non-academic contexts, two reporters of the Portuguese quality newspaper *Público* were recently found to have plagiarised from other news pieces. In 2007, one of the journalists was accused of having plagiarised *Wikipedia* and the *NewScientist* in her piece on sunscreens, published in the newspaper's Sunday supplement. The case received considerable attention. A webpage was dedicated to it, including the original and the derived texts, and the newspaper used it as an example of malpractice. In the academy students, too, have been reported to have translated from other languages and passed off the text as their own. In this context, translation has been a concern of institutions worldwide (especially in non-English speaking countries), which include a reference to translation in their plagiarism definitions – and how to cite properly – in order to avoid student plagiarism. However, translation has been rarely approached as a plagiarism strategy, and research into this area has been very limited, or has demonstrated disappointing results.

Jones (2009), arguing that students have the creativity to devise new methods to plagiarise on a regular basis, reported that, among native speakers of English, it is becoming increasingly common to back-translate a text originally written in English into another language, and then translate it again into English (using a MT tool) to change the wording of the original, effortlessly. Translation, in this case, is used more as an obfuscation technique, than a plagiarism strategy. Unsurprisingly, then, he concluded that detecting plagiarism in this case is very difficult, if not impossible, and advised lecturers/tutors to devise assessment tasks that avoid this type of strategy.

On the computational side, research into detection of plagiarism across texts in different languages has demonstrated a limited success. Ceska *et al.* (2008) proposed an approach that consists of pre-processing the two texts, in order to transform them into a language-independent form and subsequently compare the two. The performance of this method depends, however, on the availability of a parallel thesaurus of the two languages

involved, as well as on the size of that thesaurus, which limits the number of words that the system is able to successfully index. Additionally, since the suspect and potential original texts need to be pre-processed before making the comparison, the suspect original needs to be known in advance. Similarly, Corezola Pereira *et al.* (2010) offered a method that consists of a 5-phase complex procedure that includes language normalisation, retrieval of candidate documents, classifier training, plagiarism analysis, and post-processing. The results reported are admittedly poorer than those achieved over the monolingual plagiarism detection procedure, even using an artificial plagiarism corpus. Limited results have also been reported by Barrón-Cedeño *et al.* (2010), who compared a new detection method consisting of a combination of machine translation and monolingual similarity analysis against two previous methods devised by Potthast *et al.* (2008). Although they reported good results with their two methods, with one performing better with syntactically identical language pairs, and the other showing a good performance with 'exact' translations, Barrón-Cedeño *et al.* (2010) concluded that both methods presented poor results with their corpus. Their analysis confirmed that these methods were largely dependent on the syntactic identity between the suspect text and the original, on the size of the resources available and on the computational capacity (with better results demanding extremely high processing capabilities). On the other hand, their machine translation and monolingual similarity comparison method was demonstrated to perform better than those offered by Potthast *et al.* (2011), but it requires previous translation of all documents, which may become expensive and is unrealistic. More recently, Pataki (2012) offered a translated plagiarism detection method that is based on a distant function search, in order to search for 'all possible translations'. The method, again returning poor results, is based on sentence chunking, so that the comparison between the suspect text and the possible translations is made on a sentence-by-sentence basis.

The limited success of these computational approaches could potentially be improved by approaching the instances of plagiarism as a linguistic problem, rather than a computational one. A method that is grounded in forensic linguistics, as described in the following sections, can certainly help in this respect.

The case for translingual plagiarism

Detecting translingual plagiarism is hampered by the limitations imposed on the linguistic analyses, since the type of plagiarism that linguists are mostly competent to deal with, as was so clearly argued by Coulthard and Johnson (2007), is *linguistic plagiarism*. Therefore, a very strong effort is required to detect surreptitious lifting from other languages, owing to the fact that although the ideas are the same, the wording is necessarily different. On the other hand, given the distinct wording, finding duplicates and near-duplicates, which is an ordinary procedure in computational plagiarism detection, as discussed elsewhere (Sousa-Silva, 2013), is limited by the (technical) ability to cope with it. It adds to this that most research into plagiarism is *English-centred*, not only being conducted mostly in English-speaking countries, but more importantly focusing on texts written in English. If we take the Internet in general as an example, according to the World-wide Internet Usage Facts and Statistics – 2013, a large percentage of texts are nowadays written in English: the English language accounted for 62% of the Internet contents, followed by Russian (7%), German (5%) and Chinese (4%). Although the percentages are not consistent across different websites and reports, English always comes first, so the demand for texts in other languages is comparatively much smaller.

The absence of research motivation in this area is very likely to change in the future, especially as even English universities are growingly acknowledging the need for approaches to plagiarism detection across texts in different languages. A post to the Plagiarism mailing list (PlagiarismAdvice.Org), on 15/11/2011, raised the question of whether a bibliography of foreign-language texts should be accepted, on the grounds that the lecturer would be unable to 'translate the material', and that this might make it impossible 'to verify the source'. More recently, Elsmore and Hampton (2014) discussed the problem currently faced by British universities of students using proofreading and translation services for producing their academic assignments, and whether this runs against academic integrity. Cases of (this type of) academic plagiarism rarely attract media attention, but several educators stated, via personal communication, that the phenomenon is either on the rise, or more attention is being paid to it – or both. Text reuse from originals in another language is admittedly a problem in non-academic contexts as well, as the case of the *Público* journalists described above demonstrates.

Owing to the technological developments of the last decades, as was argued by Coulthard and Johnson (2007), the Internet eased the access to more information more readily, making that information particularly susceptible to plagiarism. But the problem is not limited to monolingual texts. As Maurer *et al.* argued, these technological developments facilitated the access to 'global and multilingual contents' (2006: 1079), and current machine detection systems, even those that work well with monolingual textual material, tend to break down '[w]hen plagiarism crosses language boundaries' (2006: 1080). This, they anticipated, will remain a challenge for many years. Indeed, the textual comparison of two texts in different languages presents additional problems. Firstly, the text is not duplicated or nearly duplicated from another translation in the same language, but it is an 'interpretation' of the original in another language. This challenges the textual analysis since, as was argued by Johnson (1997), a case of plagiarism cannot be proved unless 'clear lexical parallels' and 'identical lexical strings' can be found between the texts. The effectiveness of this detection and investigative method is limited by the fact that textual analysis cannot be used at this stage to help confirm or discard the hypothesis that there has been plagiarism of ideas, as much as it is by the fact that the possibilities of translation of one textual string are almost endless. The relationship between one SL and another TL string is one-to-many, so that one string in one source language text may have numerous translation possibilities into a target language text.

Notwithstanding, if plagiarism is considered to be any surreptitious theft of words, works and ideas, 'translingual plagiarism' cannot be put aside as a lesser plagiarism strategy.

Translingual plagiarism was found to be more precise terminologically than other alternatives to refer to this type of plagiarism, such as 'cross-lingual plagiarism' and 'translated plagiarism'. 'Translated plagiarism' is imprecise, since it may be used to refer both to cases where one TL text was translated and lifted without acknowledgement from another source language text, as well as to cases where one translated text lifts from another translation in the same target language. 'Cross-lingual plagiarism', on the other hand, is closer to the analysis of texts that are derivative from an original in another language, but as the prefix 'cross' indicates, it focuses on the particular *intersection*, rather than on the *transection* of the texts. Hence, it may include all languages considered, avoiding any concepts of directionality. 'Translingual plagiarism' therefore suggests that the interaction

between the two texts is transversal, crossing each other, one being active and the other one being passive, rather than the two texts being equal, contrary to what the prefix 'cross' might suggest. In terms of directionality, it suggests that the analysis is conducted from one language to another.

In this paper, a method is proposed to detect and investigate *translingual plagiarism*. However, first it is important to consider translation historically and conceptually, in order to define translation and understand how this can impact translingual plagiarism description and detection. The impact of interlanguage on both human and machine translation is discussed subsequently.

Translation: from human to machine-assisted

How translation is envisaged, how it is briefed, and its purpose largely determine the extent to which a translated text may or may not be considered plagiarism. Firstly, the brief helps contextualise the translation task; it allows the translator to learn more about the project, to understand their customer's requirements, and to perform the job. Secondly, a translation is also impacted by the translator's and the customer's purposes, as much as it is by its own purpose. In this sense, a translation performed by a professional translator for a company is bound to be different from an amateur translation, done for one's own personal use. In parallel, a translation is dependent on a translator's and/or customer's agenda, i.e. the matters to which the translation seeks to attend. These might be selling a company's goods or services, in the case of a professional translator working on a marketing document for a company, or translating the text from another language and passing it off as one's own, in the case of a student plagiarising an essay. In the former, the translator would be expected to provide a text that targets the product or service, and that is aimed at selling; in the latter, the student could be expected to produce a translation that is literal, word-for-word, but not necessarily so. These aspects, as translation studies have demonstrated over the last decades, not only influence how translation is approached, but at the same time are also influenced by the translation procedure.

Traditional translation theories and human translation

Translation has been studied from several different, often contradictory perspectives over time, usually based on the concepts of transfer and equivalence from one language to another – whether that transfer operates at the level of semantics, (surface) structure or other elements of the source language text – and, consequently, faithfulness. The translator is frequently seen as a traitor who is not faithful to the original text (Bassnett, 2002). Traditionally, three translation models have dominated translation studies: the *Horace* model, the *Jerome* model, and the *Schleiermacher* model.

Faithfulness lies at the heart of the *Horace* model of translation, which is historically and chronologically the first major translation model, dating from a few centuries BC. The model is based on the simple premise of *fidus interpres*, i.e. the premise of faithfulness, not to the text, but rather to the customers, for the satisfaction of both parties involved in an act of interpreting. According to this model, the concept of equivalence relies on elements such as the function, the design and even the target audience of the text, which are still recognised by contemporary theories of translation. For centuries, however, the Horatian model was overshadowed by the subsequent model of translation, the *Jerome* model (Lefevere and Bassnett, 1998). The *Jerome* model, which dominated the West from around the 4th until the 18th Century, is named after Saint Jerome, a Christian church father

who translated the Bible into Latin. Saint Jerome believed that translating such a sacred text, which embodied the word of God, demanded being faithful to the source language text, with as little interference as possible. Ideally, the text should be transposed linearly and mechanically into the target language, i.e. by matching each word in the original with the corresponding word in the target text, in such a way that anyone with access to a dictionary or word list would be able to perform it.

Although syntactically this strategy could cause serious problems that rendered a text unintelligible, as argued by Lefevere and Bassnett (1998), it remained the ideal model of translation (including of texts other than biblical) until recent centuries. In practice, this is still one of the strategies used by underskilled translators. The linguistic text thus occupied the central place, which owing to its sacred nature was unchangeable, demanding absolute faithfulness. The influence of the Bible then ceased to be as powerful as it had once been, so the debate over faithfulness in translation moved on to a perspective where equivalence no longer operated as an imposition, but rather as a strategy freely adopted by translators to 'ensure ... that a given text is received by the target audience in optimal conditions' (Lefevere and Bassnett, 1998: 3).

Schleiermacher, however, was worried that having a translation read as a 'natural' text in the target language would lead to a loss of the translated text. He thus argued for a 'qualitative distinction between a 'true' and a 'mechanical' translation' (Gentzler, 2011: 62). The principle behind the *Schleiermacher* model is that translation should be performed in such a way that the reader is able to grasp the language behind the original text. Ultimately, a translation should read like a translation in order not to 'trick' the reader into believing that they were reading an original text.

The argument for the combination of different translation strategies and theories gained strength, to a great extent as a result of Derrida's post-structuralist theories, and paved the way to more recent, 'post-colonial' research on translation (Bassnett, 2002). The work of Bassnett and Lefevere on cultural interaction is a good example of this post-structuralist approach. Rather than arguing for 'faithfulness' to the original, these theories approach translation as a process of making meaning in a new language, and consequently not as 'the transfer of texts from one language into another' (Bassnett, 2002: 6), but as meaning negotiation between two different languages.

Notwithstanding, (linguistic) texts are made of language material – grammar, semantics, pragmatics, discourse – and the translator's work consists of disassembling and unpacking this material and reassembling the signs of the original to compose a new text (rather than copying the original), in a new language. As a consequence, the translated text remains bizarrely tied to the source text, with features of two different syntactic structures. And although Toury (1995) argues that such bizarreness is not necessarily indicative of a poorly translated text, but rather as a conscious postmodern attempt to produce an original as if it were a translation (a *pseudotranslation*), this argument loses weight when, on the contrary, the aim is to produce an obfuscated translation as if it were an original. The relevance of Toury's theory to research into translation and plagiarism lies, not so much with the reasons why authors choose pseudotranslations, but rather with its potential to help understand and explain the linguistic devices – i.e. the non-standard linguistic forms at the basis of any (written) (linguistic) text – that can be expected from a translation. A good translation that can be passed off as one's own raises questions of authority and power, as the translation becomes the original in the eyes of the reader, when the

reader does not speak the language in which that original was written (Lefevere, 1998). But this also means that the translation is sufficiently obfuscated to disguise its authorship. Conversely, it is (also) the linguistic forms that reflect non-standard language, and as a consequence they have the potential to operate as the giveaway that a text is an unacknowledged translation.

The translator is the one who holds the power, who knows to whom the original belongs, where it came from, and, ultimately, the one who chooses the strategy (most probably, in a subconscious manner) to obfuscate it. The issues of power and the translator's agenda therefore hold for amateur translators working for personal use, as they do for professional translators, especially because the diversity of translation strategies, and their influence on someone's writing, prevents someone from being accused of plagiarism simply because the text is written in a certain way that 'reads like a translation'.

Translation theories and machine translation

Translation theories have been applied, more or less indirectly, to machine translation (MT) systems. These systems, which are intended to translate text to optimal quality with the minimum possible human intervention, have evolved over the last decades, now achieving results that are immeasurably better than those of the ideal systems of the 1960s, when machines were expected to perform translation in a way that is similar to humans. The need for human pre- and post-processing of machine translated texts has been acknowledged in the meantime (Slocum, 1984), but the main principle of MT remains the same: being able to perform a complete translation independently, with no human intervention, using specific software, grammars, and sets of rules (Seneff, 1992).

Feeding a set of rules into the system to 'teach' it how to translate is the basis of rule-based approaches. However, after several years of experiments it was demonstrated that using just rule-based methods proved to be inflexible, and raised problems of reusability. Once the system was used in domains other than those for which it was trained, results were of poor quality and rules had to be re-written (Macherey *et al.*, 2001). Research into the field of rule-based translation was not dropped altogether, but the focus shifted to data-driven methods, in particular statistical MT approaches (Koehn, 2010). Contrary to rule-based systems, statistical MT approaches consist of computing text statistics and integrating them into MT systems, usually aligning naturally-occurring text by matching source and target texts, to make 'intelligent guesses'. These methods may vary, depending on the linguistic units that they aim to process, such as words, phrases or sentences; they can also build upon 'language models,' which consider for example n-grams, or even lexical models, that consider lexical translation and, when more sophisticated, can also take into account alterations (e.g. deletions, additions, duplications). This alignment information is then retrieved based on probabilistic models, which consider the relative, rather than absolute position of the words. In other words, these MT systems tend to compute, not only the words, but also the differences in word positions (Vogel *et al.*, 1996). But they can also take into account standard distributions to model the system, or even collect statistical information e.g. on the word co-selection and calculate the probability distributions accordingly (Koehn, 2010).

Different statistical machine translation methods have been developed over the last decades, but not all of them offered promising results. The system proposed by Vogel *et al.* (1996), for example, consisted of aligning the source and target texts on a word-to-word basis. The model was found to be limited in that it established a correspondence

of each word in the source to one word in the target text, failing to identify and process groups of words (Och *et al.*, 1999). Additionally, this posed the risk that words be taken as a grammatical unit in translation, with one single function, and hence invariable. In an attempt to address this problem, later research proposed methods to align source and target texts above word level; in this respect, Och *et al.* (1999) demonstrated that the text could be aligned at phrase level, first, and then at word level. Statistical machine translation systems then evolved to working on a many-to-many basis (Macherey *et al.*, 2001), where many word combinations in one source could possibly correspond to many word combinations in the target. This provided results considered significantly better than the ones of rule-based systems.

One example of the application of statistical machine translation is *Google Translate*. The tool was developed to translate words, sentences and pages instantly – and for free – from and to 80 different languages. As described in the project's page, it uses previous human translations to align the source and the target, and thus collect a set of patterns. *Google's* translation tool gained a popularity that other systems missed. (According to the 'Google Translate Usage Statistics Website' (<http://trends.builtwith.com/widgets/Google-Translate-Widget>), on 01/05/2014 over 400,000 websites used *Google Translate Widget* alone, including more than 11,000 of the top million visited websites in the World.) *Google*, however, recognises a limitation that not all users of their translation system seem to be aware of: that the translation is generated by machines, and hence is not perfect. These machines use *web crawling* to crawl webpages in order to find source and target texts, translated by humans. Consequently, the higher the number of human translated texts available, the higher the likelihood that the translation has been evaluated by humans, and consequently that it is good – or, at least, closer to human translation. *Google's* solution to this quality assurance lies with post-processing and assessment of the quality of the translation that, it can be speculated, is hardly ever performed by skilled professionals. Conversely, using the method of web crawling increases the risk that machine-translated, non-processed texts are fed into the system, thus increasing the amount of poor translations, which are replicated as the usage of the system increases.

Interlanguage: the giveaway?

The assessment of the quality of a translation has traditionally considered only judgements of the results, and it is common to judge a translation as literal or word-for-word based on the use of non-standard linguistic forms, while neglecting the possibility that such forms might result from other constraints (such as subconscious, non-standard linguistic forms). Frequently, however, these forms occupy a 'middle ground' between the source and the target language, which Selinker (1972) calls *interlanguage*, and are not necessarily indicative of a poor translation.

Studies on bilingualism and second language acquisition have tried, for several decades, to describe the use of non-standard forms by non-native speakers of a language. Such non-standard forms have been attributed to a phenomenon that Weinreich (1953) called 'interference'. Interference consists of a deviation from a standard language norm, and reflects the introduction of foreign elements at various linguistic levels, such as morphology, syntax and vocabulary. It results in the rearrangement of patterns which are attributed to the fact that a bilingual speaker is the one who is familiar with more than one language, and can alternately use two languages, with such an alternation giving rise

to a language contact situation. Selinker (1972), partly in response to the belief that Weinreich's theory left some unanswered questions, built on Weinreich's practical assumption of *interlingual identifications* to argue that second language learning involves three linguistic systems; the system of the mother tongue; the system of a target language; and the competence of a speaker in a second language – the 'interlanguage' (IL). Interlanguage is 'a separate linguistic system based on the observable output which results from a learner's attempted production of a TL norm' (Selinker, 1972: 214). He argued that speaking a second language involves an attempt to achieve a 'meaningful performance' in the system of the target language, i.e. 'an attempt to express meanings which he may already have, in a language which he is in a process of learning' (Selinker, 1972: 210). Selinker's argument that those 'interlingual identifications' exist within a latent psychological structure that is 'activated when one attempts to learn a second language' (1972: 211) are at the basis of his interlanguage theory.

The *Interlanguage* theory builds upon the principle that the same meanings are not expressed identically, i.e. using identical sets of utterances, by a native speaker and a learner of that language. Based on the analysis of (a) utterances in the learner's native language (NL) produced by the learner, (b) interlanguage (IL) utterances produced by the learner, and (c) target language (TL) utterances produced by the native speakers of that TL, Selinker compared the competent native-speaker, who acquires the language and its principles of organisation without being explicitly taught, to the incompetent learner, who focuses on one norm of the language s/he is attempting to perform, and overgeneralises TL linguistic material, to claim that speakers of a particular NL tend to keep, in their IL relative to a particular TL, 'fossilizable linguistic phenomena' (Selinker, 1972: 215), i.e. rules, subsystems and linguistic items of that NL. Fossilisation, as Finegan explains, 'underlies the nonnative speech characteristics of someone who may have spoken the target language for some time but has stopped the process of learning'; once the learning process stops, interlanguage stabilises, and additional language acquisition ceases, except for vocabulary (2012: 522). An 'interlingual situation' arises when a particular combination of NL, TL and IL elements is obtained, often resulting from a speaker or writer's conscious or subconscious realisation that they lack 'linguistic competence with regard to some aspect of the TL' (Selinker, 1972: 219), and which reflects more on certain linguistic aspects than others. Therefore, he concluded, second-language learners tend to 'backslide' from a TL norm toward an IL norm, and not actually toward the speaker's NL or randomly.

In his earlier studies, in particular, Selinker considers that the influence of interlanguage operates unidirectionally, rather than bidirectionally, so that consequently the impact of interlanguage is studied only on the second language, and not on the native language of the speaker or writer; hence, his focus on investigating second-language acquisition, which has typically considered the native-language interference in second language learning. However, the hypothesis that IL can also influence the native language has been considered by studies of bilingualism as a scenario of 'two coexistent systems', rather than a 'merged single system' (Weinreich, 1953: 9). Although it has been argued, as discussed by Pavlenko (2000), that, once 'mature', language systems are not subject to change, and that the weaker linguistic system is attached to that of the stronger language and is dominated by it (Weinreich, 1953), more recent research has demonstrated that the IL can also influence the NL of the speaker or writer. In his study with adults, Major (1992) documented that native language loss can occur even in cases where there is language contact,

or where a subject is learning a second language. Likewise, Pavlenko (2000) later argued that adults' 'matured', native language systems are unstable and permeable.

This interpretation of Selinker's interlanguage theory, and in particular of the process of IL influence on another language, as a bidirectional process, is a possibility that Selinker later seemed to accept (Selinker and Lakshmanan, 1992). This is consistent with other studies. Fillmore (1991), for example, described how children who were non-native speakers of English had both the process of learning English and the retention and use of their primary language affected, after a massive exposure to English. Similarly, Pavlenko (2000) later demonstrated that, not only can the interference (i.e. involuntary influence) of the native language (L1) be noticeable in a second language (L2), but also L2 is taken to influence L1. She found that L2 can impact the competence, performance, processing and conceptual representations based on L1, including aspects of phonology, morphosyntax, lexis, semantics, pragmatics, and rhetoric, thus challenging Selinker's argument that the lack of 'native-speaker'-like competence reflects mainly in syntax. Additionally, she suggested that such influence is greater as a result of a longer exposure to L2 or of a high level of L2 proficiency, although other extralinguistic factors have also been found by previous studies (e.g. Seliger and Vago (1991)) to account for that influence – including language prestige, social status and the desire to integrate and assimilate the L2 environment. As these latter approaches to interlanguage – which consider language loss and language transfer – indicate, IL may be taken to impact the native language, as much as it does the second language, especially as native speakers of nearly any language are heavily exposed to existing multilingual contexts (Major, 1992).

These theories are also inevitably bound to influence the translation process, and even more so when this translation is not performed by a skilled, trained translator, who is conscious about the preventive measures to adopt in order to produce a version of the original document that is – or attempts to be – free from non-standard linguistic forms. Regardless of whether translation is seen as transfer or as equivalence between two different cultural and linguistic systems, it necessarily implies an interaction between two languages, one being influenced by the other, either owing to the existence of one intermediary language (the interlanguage), or owing to language transfer influencing both native languages (in the case of bilingual speakers/writers), or the native and second language. The concept of the bilingual translator, who has an impermeable native-language competence in at least two languages, is thus a rare and sometimes 'idealised' version of reality, since to a certain extent, every speaker or writer is exposed to one language more prominently than to another, and this prominence, if we consider previous research on interlanguage, tends to overtake the other (Fillmore, 1991; Pavlenko, 2000). The 'overtaking language' would then play the role of dominant language (i.e. the language to which a speaker or writer is more prominently exposed at a certain time, and not necessarily his/her native language, or the language they are more comfortable with), and be expected to operate at different levels, depending on the speaker. Speculatively, the effect of the dominant language would be greater if the speaker or writer is not bilingual, or a professional, trained translator, owing to the fact that the individual speaker or writer focuses mainly on trying to reproduce the source language text. This is the most likely scenario in cases of translingual plagiarism, and consequently the use of non-standard forms and 'indices of foreignness' can be a giveaway to plagiarism.

Translingual plagiarism: an analytical framework

Translingual plagiarism can involve mainly two scenarios. The first is where a plagiarist takes an original work published in another language, translates it into his/her language and publishes it. A second scenario is where the plagiarist takes an original work published in another language, translates it into his/her own language, or the language in which the derivative text is expected to be written, and passes it off as their own. Contrary to the first scenario, which is aimed for wider audiences, the second scenario describes a case where plagiarism is for personal use, and is usually intended to be read by smaller audiences. Consequently, the first scenario usually has legal implications, involving publishing issues and copyright violation, whereas the second scenario is often judged morally. The translation job is also expected to be performed differently in the two scenarios; in the first scenario, a professional, careful translation would be expected; conversely, in the second scenario a less proficient translation is more likely to be the result. As lack of time, pressure, mental fatigue or even lack of academic writing skills, or simply laziness, are often identified as the most likely reasons why students plagiarise (Dias and Bastos, 2014), when resorting to translation the plagiarist could hardly be expected to produce a high quality text. Under these circumstances, it is very likely that the student would make a minimal effort, and spend the least possible amount of time on the task; speculatively, his/her main concern would be translating the meanings, by doing their own interpretation of the text and rewriting it in another language. Another way to perform this task quickly – and for free – would be to copy the original text into a publicly available machine translation system and instantaneously obtain the translated text. The latter suits the plagiarist intentions well, since it permits translating the main ideas in a short space of time (Slocum, 1984), while allowing the reader to have a gist of the text even when the translation produced is rough (Koehn, 2010). More careful plagiarism could then be completed by editing and revising the text for the surface structure.

However, as discussed above, translating consists of more than simply transferring text from one language into another; it involves a complex process of meaning negotiation, which accordingly requires negotiating lexico-grammar, both at sentence- and discourse-level. Moreover, given the mutual language transfer and influence of two linguistic systems, it is not always easy, even for trained translators, to (re-)write a text in another language that conveys the meaning(s) of the original without ‘compromising’ the translation, by avoiding hints to the fact that the text originated in a foreign language. As a consequence, translated texts are often permeated with linguistic forms of the original, source language text, i.e. non-standard linguistic elements and ‘indices of foreignness’, and hence are said to ‘read like a translation’. One such example is the case of passivisation in Portuguese and French, on the one hand, and in English on the other; Portuguese and French use passive structures differently from English because they have an ‘impersonal’ grammatical strategy to convey information that can only be conveyed in English using passive structures. Likewise, the traditional SVO order in English, albeit allowing a slight degree of flexibility, can be reordered diversely in Portuguese, and accomplish more indirect realisations than English. The mismatches resulting from uncommon reorganisations of the words, especially when in large volumes, can lead a native speaker of the target language into intuitively evaluating the text as a ‘poor translation’ – i.e. unnatural, prone to errors, and often indicative of the original source language. In this sense, a poor translation can be easily identified as not being an original text, and raise suspicion that

the text may have been plagiarised.

This is the type of plagiarism involving texts translated from other languages that is easiest to detect, despite the skills required to distinguish a poorly translated text from a poorly written one. On the contrary, a good translation (one that ‘reads like an original’, and seems to have been produced independently of any other source text) is less prone to raise that type of suspicion, unless, of course, the reader has previously read the original text. Good translations tend to mediate meanings impeccably between a source and a target language, in such a way that the original text tends to lose its original surface structure, which is then replaced with that of the target language. Therefore, a poor translation could mean violating the target language standards at all levels of language, including morphology, morphosyntax, semantics, pragmatics and/or discourse, for example by combining short sentences into longer ones, making different use of personal pronouns, using passives when impersonal structures are more common, translating multi-word units, phrases and idioms literally when their use is not common in the target language, etc.

Interlingual transfer and influence

In order to describe and explain the changes operated by means of the interlingual transfer and influence of a source language on a target language, a systematic approach is necessary. Among the scarce research conducted in the field – and usually as part of studies on bilingualism and second language acquisition (SLA) – the work of Pavlenko (2000) in particular was found to be highly relevant, since it proposes a 5-class – yet, admittedly open – classificatory framework, which she named ‘unitary classificatory framework’ (Pavlenko, 2000), to describe the linguistic processes that operate at the level of language transfer and language influence, namely L2 influence on L1 phonology, morphosyntax, lexicon and semantics, concepts, pragmatics and rhetoric.

The framework used in this article is an adaptation of Pavlenko’s framework, since not all categories and linguistic processes used by her original model are applicable to the analysis of linguistic plagiarism. Firstly, this framework will be used for a purpose other than the one used by bilingualism, multilingualism or SLA theories: to describe the linguistic systems used, and not to assess the linguistic competence of speakers and writers. Secondly, in order to avoid the identification of L1 with native language and L2 (and possibly L3, L4, L5, ...) with target language(s), L1 will be renamed TL (target language) and L2 will be renamed SL (source language). This is because translingual plagiarism detection builds on the assumption that the plagiarising text derives from a *source* in another language, so the latter is the SL text, whereas the derivative text, being translated into another *target* language, is the TL text. This shall also facilitate the description of the directionality of the text reuse. Additionally, the focus shifts from the writer to the text, so that rather than concentrating on the L1 (native language) writer, the analysis can focus on a SL text and on one or more TL texts.

Considerations of which language is the writer’s native language and which one is the writer’s second language are not as relevant at this stage as those involved in the identification of the source and target language texts. Conceptually, this also permits categorising cases where a plagiarist uses texts from more than one source language. Moreover, the linguistic devices required by translingual plagiarism detection do not exactly match the ones used by the unitary classificatory framework to analyse language transfer and influence in bilingualism theories. Influence on morphosyntax, lexicon and semantics, concepts and pragmatics – and, possibly, rhetoric – remains relevant, whereas influence on phonology

can be discarded. At the same time, new devices need to be considered, such as punctuation, spelling, and discourse grammar. Influence on morphosyntax will consider, for example: sentence structure (word order rules that are missed or restructured); extension of SL rules for agreement, prepositions, adverbs, adjectives, pronouns, pre-/post-positioning; paradigmatic TL conjugations; and verb usage. SL influence on lexicon and semantics can operate at the levels of the lexicon, semantic networks or lexical processing, and will therefore consider especially forms of lexical lifting, such as loanwords (these are lexical borrowings *per se*, i.e. lexical items from one language adapted phonologically or morphologically for use in another); loan blends (hybrid forms which combine elements of both languages); loan shifts (which are often referred to as ‘semantic extension’, i.e. TL words which acquire the SL meaning); and loan translations (also known as calques, i.e. literal translations of SL words, phrases, or expressions). The influence of SL on TL concepts will focus on the linguistic, rather than the psycholinguistic aspect, and includes cases where concepts of the source language are transposed linguistically (but not necessarily coherently) to the target language. Other instances that need consideration are punctuation and spelling (e.g. to describe cases where the source language punctuation conventions and particular spelling are brought to the target language text), as well as discourse grammar and informational organisation and packaging, to enable issues of coherence and cohesion, and aspects of theme and rheme, to be addressed.

The following are the five categories proposed, adapted from Pavlenko’s ‘unitary classificatory framework’:

- *borrowing transfer*: consists of adding new SL elements to the TL text;
- *convergence*: consists of creating a unitary system that includes elements that belong neither to the SL, nor to the TL;
- *shift*: departs from structures or values of the TL, by approximating to those of the SL;
- *restructuring transfer*: consists of incorporating SL elements into the TL, originating changes, substitutions, or partial shifts;
- *attrition*: loss of some TL elements as a result of the SL influence.

This classificatory framework is mostly relevant to linguistically explain the strategies and the moves used by the plagiarist when lifting from an original in another language. However, as the next section will demonstrate, cases of translingual plagiarism can also be demonstrated by simple comparison, after the source is identified. A method aimed at this identification is discussed in the next section.

Detecting translingual plagiarism

The distinction between *linguistic plagiarism* and *plagiarism of ideas* – or copying ideas – is key to investigating cases of plagiarism in translation, since the detection of linguistic plagiarism can lead to the detection of the plagiarism of ideas. The lifting of ideas is often considered in cases of copyright infringement, which applies for instance when someone gets copyrighted material translated into another language and published without the consent of the copyright holder, i.e. the person(s) holding ‘the exclusive right to reproduce, adapt, distribute, perform and display the work’ (Garner, 2009: 386); that is, usually the author or the publisher. In several countries, ‘copyright’ is referred to in law as ‘author’s rights’, but it has been argued (Ascensão, 1992) that the law should change to protect more the non-transferable moral rights of the authors, and less the financial rights of the publishers. In any case, a copyrighted work can be plagiarised if someone else uses it and

passes it off as their own – in which case the copyright is also infringed. However, given a hypothetical case where the original author gives someone else permission to use their own work without acknowledgement, this may not represent copyright infringement, but is still plagiarism.

Cases of translingual plagiarism are among those that are the most complex to detect. Nevertheless, taking Selinker's concept of interlanguage, its influence on the surface structure of a text, and the principle that interlanguage may influence both the native and the second language, together with Pavlenko's claims that such influence reflects on both the second and the native language (whenever they act as the target language), it is hypothesised that instances of plagiarism can be detected by means of an analysis that reverses the translation process. This process works by back-translating a suspect text into the suspected original language, or using a software package to 'guess' the most probable language of the original. The linguistic markers and discursive devices described below can then be used to find empirical evidence that contributes to a theory aimed at describing translingual plagiarism, using different language pair combinations (e.g. Portuguese/English, English/Portuguese, Portuguese/Spanish). These criteria are used to provide investigative, descriptive and analytical clues to plagiarism. Subsequently, a computational approach is proposed to detect this type of plagiarism that suits forensic linguistic research into plagiarism.

Translingual plagiarism can result from (a) a professional translation of an original into another language; (b) an 'amateur' translation produced by an untrained person; or (c) a work performed using machine translation (possibly more common in the current IT era). Contrary to professional translation, the results of 'amateur' translation and MT are often considered to be poor in that they tend to be (too) literal, word-for-word, and reflect the surface structure of the original, often impacting syntax, semantics and lexico-grammar. As I discussed elsewhere (Sousa-Silva *et al.*, 2009), news texts written in one language (*Language A*), based on newspaper articles/newswires originally written in another language (*Language B*), tend to retain a structure that is more similar to texts written in the language of the original source (i.e. *Language B*) than to other texts (regardless of their genre), written in the target language in which they are published (i.e. *Language A*). Hence, a news report on national politics would be written in a style that is different from another report on international politics, despite the possibility that both might be signed by native speakers of the same language, and the (more or less) tight editorial decisions made nowadays by newsrooms.

This supports, for the most part, the arguments for language transfer and language influence of the source language on the target language, confirming Selinker's assumption that interlanguage acts mainly at the level of the surface structure of the text (1972). And particularly in translation, it is relatively easy to fail to meet language standards, for instance at the level of syntax, lexico-grammar, morphology and informational organisation, as well as of cohesion and coherence. These, together with considerations of misinterpretation of the source text, terminology and named entities and punctuation, are some of the linguistic markers and discursive strategies that can hypothetically contribute to the detection of translingual plagiarism, while at the same time providing clues of directionality, i.e. in order to determine which text is the original and which one is the derivative. Determination of directionality is particularly relevant in cases where text production is proven to be contemporary (Turell, 2008), or where the likelihood that one person had access to

the other person's text is not evident.

Consequently, by translating the suspect texts back to the probable language of the original, linguists may trigger potential cases of plagiarism for investigation, as this procedure allows one first to find the putative original, and then to compare the two texts for lexical parallels and identical lexical strings that are said to prove the instances of plagiarism. A few empirical experiments have been conducted. These results indicate that free machine translation, e.g. *Google Translate* (which is used in this research for its degree of popularity, and for the continuing, daily updates to the system), performs well in finding the potential source. For the purposes of these experiments, a machine translation system is preferred to human translation because it returns the results instantaneously, and avoids any possible human translator bias. In practice, it involves:

1. Taking a (suspect) text written in *Language A* (in this case, Portuguese);
2. Translating it into *Language B* (in this case, English) using *Google Translate*;
3. Checking the translated text for non-standard linguistic forms;
4. 'Googling' the translated strings.

The third step, checking the translated text for non-standard linguistic forms, is not absolutely necessary, but allows narrowing down the search strings in more fuzzy cases, and hence increases search efficiency.

As a result of the procedure above, the more fluent the machine-translated text (i.e. the less it violates the surface structure, as well as the discourse structure of the target language, *Language B*), the greater the likelihood that the text has been produced using a discursive strategy that is close to the one of the target language. This can be explained by the fact that machine translation has now reached a stage where lexical items and even terminology and named entities are frequently replaced with a considerable degree of correctness, but the surface structures are often missed or transferred incorrectly. Conversely, if the machine-translated text is *odd*—and assuming that the right TL has been chosen—, then the more likely it is that it has been originally produced in a language other than the selected target language, and consequently may indicate that the text is original. The following example of a headline posted on *The Guardian* website on 11th June 2009 illustrates this point:

Three guilty of Ben Kinsella murder.

Google Translate returned the following translation to Portuguese:

Três acusados de homicídio Ben Kinsella.

The headline in Portuguese is grammatically correct—despite the lack of the preposition 'de' before 'Ben'—and could be found in a Portuguese newspaper, but any newspaper reader would easily notice that the headline shows indices of foreignness; if the news had been originally written in Portuguese, a different headline would be expected. To confirm this assumption, a media professional was asked to rewrite the headline in Portuguese based on the information conveyed by the English headline. The version that she suggested was:

Três assassinos de Ben Kinsella condenados.

Syntactically, this sentence sounds more 'natural' in Portuguese than the translated version above; semantically, the original headline provides information that the translated

headline misses, but the rewritten headline emphasises: the adjective ‘guilty’ indicates that the murderers were convicted, but the machine translated headline only indicates that they were ‘accused’; the rewritten headline (‘Three convicted for murder of Ben Kinsella’) is semantically similar to the original headline, and conveys the core information. But machine-translating the sentence

Três acusados de homicídio Ben Kinsella.

back to English returned the headline

Three charged with Ben Kinsella murder.

The following examples, in tables 1 and 2, also illustrate this method.

PT	Faz com que a melanina se combine com o oxigénio, o que produz o escurecimento da pele.
PT-EN	Causes the melanin to combine with oxygen, which causes darkening of the skin.
EN	causes the melanin to combine with oxygen (oxidize), which creates the actual tan color in the skin.

Table 1. Example of translingual plagiarism.

PT	Pode ser quase completamente bloqueada pelos protectores solares.
PT-EN	It can be almost completely blocked by sunscreen
EN	is almost completely blocked by virtually all sunscreens

Table 2. Example of translingual plagiarism.

The sentences used are from a case of newspaper plagiarism, involving the Portuguese quality newspaper *Público* described above, and are part of the CorRUPT corpus (my personal Corpus of ReUsed and Plagiarised Texts). For each table, the alleged instance of plagiarism is indicated in the first row (‘PT’), followed by the corresponding machine-translated version (‘PT-EN’) in the second line; the English original is provided in the third line (‘EN’) for comparison. The identical, overlapping text is highlighted in **bold** typeface. Only the exact matches are highlighted in bold; consequently, the amount of overlapping text would increase if synonyms and words with the same lemma were also considered. These examples demonstrate that most instances of the machine-translated text (row ‘PT-EN’) are identical to the English original (in row ‘EN’). Therefore, although the translation sometimes shows some errors (which derive mainly from the edits introduced in the suspect translated text, or by MT issues), they could easily be read and understood by a native speaker of English. More importantly, an analysis of the overlapping vocabulary, such as the one described by Johnson (1997), is particularly useful for translingual plagiarism detection, as lexis tends to be translated accurately by MT systems. This method is also illustrated by tables 3 to 5:

PT	A chave deste novo autobronzeador está num extracto de plantas chamado forskolina que, nas experiências da equipa, protegeu ratinhos sem pêlo de radiação ultravioleta e permitiu-lhes desenvolver um bronzado natural, estimulando os seus melanócitos.
PT-EN	The key to this new self-tanning is a plant extract called forskolin that the experience of the team, protected hairless mice to ultraviolet radiation and allowed them to develop a natural tan by stimulating their melanocytes .
EN	The key chemical, a plant extract called forskolin , protected mice against UV rays and allowed them to develop a natural tan by stimulating pigment-producing cells called melanocytes .

Table 3. Example of translingual plagiarism.

PT	A capacidade de se bronzear - (...) - é controlada pela hormona de estimulação dos melanócitos, que se liga a uma proteína que existe no exterior destas células. Esta proteína, que se chama receptor de melanocortina 1, funciona mal em muitas pessoas que têm a pele clara e o cabelo ruivo. É por isso que não se conseguem bronzear, e ainda por cima correm maiores riscos de desenvolver cancro de pele.
PT-EN	The ability to tan - (...) - is controlled by hormone stimulation of melanocytes, which binds to a protein that exists outside these cells. This protein, called the melanocortin 1 receptor , malfunctions in many people who have fair skin and red hair . That is why we can not tan , and on top of a higher risk of developing skin cancer .
EN	The ability to tan is largely controlled by a hormone called melanocyte-stimulating hormone, which binds to the melanocortin 1 receptor (MC1R) on the outside of melanocytes. Many people with red hair and fair skin have a defect in this receptor, meaning they find it almost impossible to tan and are prone to skin cancer .

Table 4. Example of translingual plagiarism.

PT	Numa segunda série de experiências os cientistas usaram ratinhos susceptíveis ao cancro, expondo-os ao equivalente a uma a duas horas de Sol na altura do meio-dia solar, diariamente, durante 20 semanas.
PT-EN	In a second series of experiments the scientists used mice susceptible to cancer, exposing them to the equivalent of one to two hours of sunshine at the time of solar noon each day for 20 weeks .
EN	In a second experiment , a particularly cancer-prone strain of mice , also bred to lack effective MC1Rs, were exposed to the equivalent of 1 to 2 hours of midday Florida sunlight each day for 20 weeks .

Table 5. Example of translingual plagiarism.

These results demonstrate a high degree of lexical overlap, besides the identity in surface structure, indicating that machine translation is able to handle lexical items efficiently.

Figure 1 proposes a method for describing a procedure of translingual plagiarism detection:

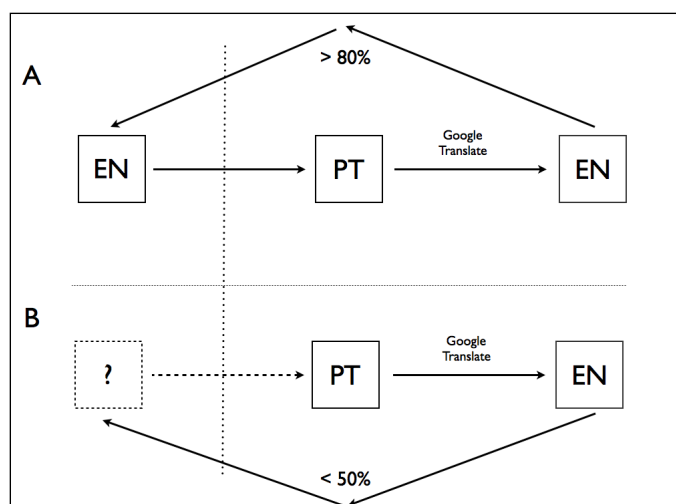


Figure 1. Diagram of translingual plagiarism.

Section 'A' of the diagram describes a suspect text written in Portuguese that was machine-translated into English. Although the text shows some (mainly) grammatical errors, it is sufficiently fluent to be easily understood by a native speaker of English. However, an Internet search using the machine-translated string confirms that the text is almost identical to a previous text, with a lexical overlap of (say) 80%. This percentage of overlap should be seen as a relative, rather than an absolute value on the grounds that it is not possible at this stage to determine the threshold of overlap at which a text would be considered plagiarism.

Section 'B' of the diagram shows a case where the same procedure described in 'A' is applied, but where the machine translation returns a text with a higher index of foreignness. This text is prone to be less fluent than the one described in 'A', and presents a higher degree of difficulty to native speakers of English. Searching the Internet for the translated text returns hits with some degree of overlap, but this is equal to or lower than 50%. 'A' therefore shows a higher likelihood than 'B' to be plagiarism, demonstrating that error checking has a strong discriminatory power to help identify texts that derive from originals in other languages. By this token, a higher index of foreignness is a good indicator that the text derives from literal translation or from wrong language transfer.

In cases of suspected translingual plagiarism, it is necessary to compare the source and target texts. From a linguistic perspective, especially if it is considered that linguistics should deal only with textual comparison, leaving aside all instances of plagiarism of ideas (including translation), the only way to compare two texts is having them in the same language. Therefore, based on Selinker's concept of surface structure, it seems plausible to machine-translate a suspect text to the language of the original and then compare the two texts. This method offers several advantages, when compared to the sophisticated MT procedures previously described. Firstly, contrary to the methods above, it is very simple and uses tools publicly available, with the advantage of using the same tools as the plagiarists. Secondly, it does not require specific computational resources, such as thesauri and dictionaries, that are costly and of limited availability. Thirdly, since this system works based on crowdsourcing techniques, it remains updated over time, with no additional invest-

ment required. Additionally, although a comparison of the plagiarising (i.e. derivative) text against the plagiarised (i.e. the original) version is ultimately necessary to explain and justify the reuse, a known source is not necessary to initiate the detection procedure, since the machine-translated version of the suspect text is used to search the Internet for similar or identical texts.

This method demonstrates the potential to provide good results, mostly from an investigative, but also evidential perspective. The analysis of the comparison of the two texts (the original and the derivative) using plagiarism detection software (in this case, *CopyCatch Gold*) showed a word overlap of almost 70%. These results assist the detection procedure, but may be impacted by differences e.g. in lexical density; cases of translated texts that are heavily edited can represent an additional challenge. Based on a small study with collected texts which showed that handwritten texts tend to be less dense than wordprocessed texts, Grant (2005) strongly argued that, as texts are reworked, they tend to become lexically denser (per thousand words). Supporting his claims with the work of Laviosa (1998), he contends that this density is particularly increased by translation. Laviosa (1998) concluded that, although the percentage of content words in translated narratives is lower than that of grammatical words, the lexical density in translated narratives tends to be higher than in their original versions. Consequently, in these cases, derivative texts tend to distance themselves from the original. However, since: (a) Laviosa's findings resulted from the analysis of professionally, carefully, commercially translated narratives, rather than amateur or machine translation; (b) the likelihood that a text is heavily edited lexically is very low, especially in a case of student plagiarism where the best results are sought with the minimum effort; and (c) although the amount of lexical overlap can decrease as the lexical density increases, that overlap can still provide clues to the lifting; then the performance of the method should not be impacted significantly. This approach therefore supports previous claims by Coulthard and Johnson (2007) that the tools that help plagiarise also help detect plagiarism.

Final remarks

The use of translation as a plagiarism strategy is a growing concern in academic and non-academic contexts alike. By resorting to *translingual plagiarism*, i.e. by translating an original into another language and using it as their own, plagiarists can pass unnoticed, since it is very difficult to detect, for various reasons. Firstly, not all translated texts are intuitively identified as such. Secondly, it is not possible to establish a linguistic comparison of two texts in two different languages. Thirdly, the translation can be diametrically opposed to the original, on the basis that the translator is free to make their own choices, both syntactically and lexically. Therefore, even plagiarism detection or text-matching software is unable to detect texts in two different languages. This type of plagiarism, which is sometimes equated with plagiarism of ideas, is a challenge that computer scientists and computational linguists have tried to address. But taking into account the considerable effort that has been made, and the large volume of research that has been conducted into detecting this type of plagiarism, the results have been disappointing. Most approaches tend to perform well when addressing a small part of the problem, but fail when addressing the issue as a whole.

This article argued for a linguistic solution to resolving *translingual plagiarism*, and proposed a method of analysis that was empirically demonstrated. It was shown that an understanding of translation theories, in general, and of human and machine translation,

in particular, is able to identify the operations behind the use of translation as a plagiarism strategy. This article argued that it is necessary to rely on ‘sentence-based grammars’, as well as on the ‘discourse grammar’, as these impact the informational packaging of the text, as well as the use of cohesion and coherence, and concluded that several linguistic elements (such as morphosyntax, lexis, semantics, pragmatics, informational packaging, discourse grammar and conceptual representations) are part of a speaker’s or writer’s interlanguage, and get transferred from the source to the target text. This type of plagiarism can then be investigated by reversing the operations performed by the plagiarist, which is also able to provide evidence of the lifting. This operation can be reversed manually or by machine translation to allow for a comparison between the derivative and the original texts, manually or by using any plagiarism detection or text-matching software. However, the results of the analysis showed that machine translation does not perform equally well with all aspects of lexico-grammar, and this determines the success of the detection procedure. It was argued that, since machine translation handles lexis relatively well, but tends to break down when translating syntax, the detection needs to focus on the lexical elements, rather than on syntax. Since the plagiarism detection and text-matching procedure performs better when comparing lexical items, rather than identical strings, an analysis and subsequent comparison of lexical overlap is particularly relevant.

Despite the success of the empirical analysis presented, linguistic analysis is crucial, in addition to the automatic/machine-assisted detection procedure, to investigate, analyse, describe, explain and demonstrate textual reuse. This is especially the case in forensic contexts, where theoretical explanations are required.

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