Uncovering Principles of Sustainability in Literature

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The climate crisis and the potential way out of it through sustainability has been an important discourse in the last few years. In 1987 the Brundtland commission stated that "[s]ustainable development is a development that meets the needs of the present without compromising the ability of future generations to meet their own needs." (cf. Brundtland 1987, 41) However first ideas of using nature in a sustainable way date back to 1713 when German forester Hannß Carl von Carlowitz wrote in Sylvicultura oeconomica that the forest should be used in a sustainable, i.e. renewable way (von Carlowitz 1713: 105). Our main interest lies in an (upcoming) cultural anchorage of principles of sustainability. Thus, in this study, we are looking for early mentions of basic principles of sustainability in literary texts using machine learning. We trained a conditional random fields classifier (CRF-classifier) to automatically detect, classify and annotate mentions of nature and nature-related phenomena in narratives (we used the StanfordNER implementation by Finkel et al.). Using this CRF-classifier we annotated a corpus of about 70 novels from German romanticism [1]. We chose romanticism as an epoch that a) temporarily closely followed the work of Carlowitz and b) is known to use references to nature in a high frequency (cf. e.g. Bühler 2016, 85, Ulshöfer 2010, Wanning 2005, Kremer 2003, Langer et al. 2021). We then analysed passages with frequent references to nature in order to find hints on ideas of sustainability. We thus test whether the application of machine learning used to operationalise high-frequency phenomena can also help uncover less frequent and highly interpretive aspects of narrative texts.

Sustainability and Literary Studies

With Ecocriticism (cf. e.g. Bühler 2016, Dürbeck and Stobbe 2015) and econarratology (James 2015 and 2020) in literary studies there already has been substantial work on descriptions and narrations of nature. As Bühler (2016) shows this field of research has analysed representations of the interplay between humanity and nature in various forms and on various research objects. Recent computational approaches focus on biodiversity (Langer et al. 2021 and 2022) and the potential agency of nature in narratives (Gius and Uglanova forthcoming). However, the environmental science concept of sustainability has not yet been analysed in Computational Literary Studies. In our study we take the first step in this direction, concentrating on two fundamental principles of sustainability:

1. the aforementioned renewability brought up by Carlowitz (2000 [1713]) and

2. intergenerational equity which has been most prominently discussed by the World Commission on Environment and Development (Brundtland 1987).

Narrating Nature

In order to single out literary texts dealing with ideas of sustainability we first concentrate on descriptions of nature. To automate the annotation of references to nature in literary texts, we developed a category system in a bottom-up approach by annotating test texts. We thus came up with the seven categories habitat, living nature, non-living nature, cultivated nature, industrialised nature, weather, and natural catastrophes.

We trained the CRF-classifier for these categories using an annotated training corpus consisting of the first 10.000-token passages from 15 sample texts that were made out to be especially rich in referencing nature by preceding research (cf. Gius and Uglanova forthcoming). We then tested the CRF-classifier on 20.000-token initial passages taken from two texts. Overall, the CRF-classifier reaches an accuracy of 0.69 (F1-Score). Using this CRF-classifier we automatically annotated our corpus of about 70 romantic novels. Afterwards, we analysed passages with a high density of references to nature annotated by the CRF-classifier in order to find mentions of ideas of sustainability.

In our corpus mentions of habitats are most frequent. The most common habitats are the world, the sky, the earth, nature, the countryside, and the area. The second most frequent category is the one of non-living nature containing e.g. mentions of plants or stones. Animals as a form of living nature are reaching the third highest frequency in the corpus. Relevant in this context is also that habitats as a mostly untouched form of nature are much more frequently mentioned than cultivated nature such as gardens or fields. One passage that shows traits of the idea of renewability and thus can be read with regard to the first principle of sustainability outlined above can be found in Dorothea Schlegel's Florentin (cf. Fig. 1).

Hiermit sprang er ab, machte Riemen und Schnallen am Sattelzeuge weiter und führte das Pferd hinter sich am Zaum. Der Schimmel wieherte und stampfte , als wollte er Zeichen seiner Zufriedenheit geben. Sein Führer drehte sich zu ihm herum, stand still, legte seine beiden Hände an den Kopf des Pferdes und blickte es ernsthaft an .

"Laß dich umarmen, Schimmel", sagte er, "du bist ein königliches Tier! ein Tier für Könige! Was fehlt uns beiden, um in der Geschichte verewigt zu werden, du als ein Muster der Treue und Unterwürfigkeit, ich als ein Beispiel von menschenfreundlicher Herablassung, als daß ich einen Thron besäße, und du wärest mein Untertan? Gewiß bist du ganz verwundert und froh, und ohne Zweifel fühlst du dich überaus glücklich, gerade von mir und von niemand anders bis ans Ende deines treuen Lebens geritten zu werden! **Ahndest du etwa, daß ich deine Last bloß deswegen etwas leichter machte, damit du mir nicht völlig unterlägst, und darüber zugrunde gingest, ehe ich dich missen kann?** Ich weiß es freilich, aber du sollst es nie erfahren, denn **du sollst glücklich sein**; du sollst, verlaß dich auf meine Wachsamkeit, gewiß nie in dem klugen Glauben gestört werden, daß du in deiner Unvernunft und demütigen Genügsamkeit ein glückliches Tier bist."

Fig. 1: Passage of Dorothea Schlegel's Florentin showing a narrative variation of the principle of renewability

In this passage, the protagonist gets off his tired horse in order to spare its power so that he can still use it as riding horse for a long time in the future. This reasoning is similar to Carlowitz's idea of renewable forestry. As can be seen from Fig. 1 the CRF-classifier annotated references to living nature, i.e. mentions of the horse of the protagonist, but in the passage which actually shows traits of the principle of renewability (in bold letters) nothing is annotated. Also, the principle of renewability is not mentioned very implicitely in this passage. Based on these examples from our study, we developed a heuristic to single out passages with a high frequency of automatically classified annotations followed by passages wi-

thout any of such annotations. We then analysed those passages with regard to the two principles of sustainability named above.

Conclusion

In our contribution, we will present deeper insights into this case study on descriptions of nature and ideas of sustainability in literary texts from German romanticism. We will show that the application of machine learning used to operationalise high-frequency phenomena can also help uncover less frequent and highly interpretive aspects of narrative texts such as mentions of ideas of sustainability. We will thus make an attempt at a corpus-based approach to sustainability in literature. With romanticism, we use a period in literary history that developed in close temporal proximity to the first mention of the term “sustainable” in a German written text. We see this as the first step in the investigation of historical precursors of the concept of sustainability in literary texts

Notes

1. We used the d-RoRo corpus of novels from German romanticism, integrating into our research the core corpus and the additional corpus I, so that we cover a timespan from 1790-1841 and canonized as well as non-canonized texts and authors (cf. Schumacher, Gius and Uglanova 2022).

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