

Digital and Network-Based Methods for Narrative Criticism

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INTRODUCTION

This paper explores possible intersections between computational natural language analysis and narrative exegesis of biblical texts, attempts to provide an overview of established methods and possible synergies, and offers a critical review.¹ The main research question guiding this process is: Is it possible to automatically extract a social network from literary texts or is it only possible to extract a constellation of characters?

Before introducing social networks and Social Network Analysis (SNA), we will first focus on narrative criticism of biblical texts, sometimes called *narrative exegesis*. Narrative exegesis is diverse not only in its methods but also in its terminology.² What is in common, however, is a focus on the biblical text as a literary work, and that methods of literary studies are used to interpret narrative texts. Some different trends can be identified (see Table 1):³

¹ According to the best of my knowledge, only little research has been carried out in this field, see my “Computergestützte Verfahren für die Narrative Exegese,” *BeTh* 6 (2022): 157–178.

² Manfred Oeming, *Biblische Hermeneutik: Eine Einführung* (Darmstadt: WBG, 2007), 70, mentions New (Literary) Criticism, Literary Approach/Criticism, Holistic Approach, Rhetorical Criticism, Close Reading, Synchronical Approach, Narratology and Narrative Criticism.

³ Following Anja Cornils, *Vom Geist Gottes erzählen: Analysen zur Apostelgeschichte* (Tübingen: Francke, 2006).

Methods Oriented Toward Texts	Reader-Oriented Approaches
New (Literary) Criticism, Formalism, Narratology	Affective, Phenomenological, and Psychoanalytical Criticism
Semiotics, Structuralism	Poststructuralism and Deconstruction
Rhetorical Criticism	Reception Aesthetics
Linguistics	Reader Response Criticism

Table 1: *Trends in Narrative Exegesis*

Parallel to this, there are also different schools committed to different literary theories and associated with different geographical areas.⁴ This leads to an enormously complex field. Two observations can be made: On the one hand, computer-assisted methods are becoming increasingly popular in biblical exegesis;⁵ on the other hand, the advances in digital language processing have hardly been received. In recent years, however, progress has been made regarding the processing of literary texts, and at the intersection between general religious data and texts.⁶ Digital methods are also being used more frequently in literary studies.⁷

⁴ See Oeming, *Hermeneutik*, 70–71, although a precise classification is often not possible. Oeming speaks of America, Anglo-Saxons, the Netherlands, and Israel; Cornils, *Geist*, 30–32, differentiates between Francophone and German speaking regions.

⁵ See, for example, Jens Dörpinghaus and Carsten Düing, “Automated Creation of Parallel Bible Corpora with Cross-Lingual Semantic Concordance,” in *2021 16th Conference on Computer Science and Intelligence Systems (FedCSIS)* (Sofia: IEEE, 2021), 111–114; Dirk Roorda, “Coding the Hebrew Bible: Linguistics and Literature,” *Research Data Journal for the Humanities and Social Sciences* 3/1 (2018): 27–41. In practice, one often finds only the enumeration of individual words (for example, in Greek, Hebrew or Aramaic) and the elaboration of charts.

⁶ See, for example, Toni Bernhart et al., eds., *Quantitative Ansätze in den Literatur- und Geisteswissenschaften: Systematische und historische Perspektiven* (Berlin: de Gruyter, 2018); Nils Reiter, Axel Pichler, and Jonas Kuhn, eds., *Reflektierte algorithmische Textanalyse: Interdisziplinäre(s) Arbeiten in der CRETA-Werkstatt* (Berlin: de Gruyter, 2020); Tim Hutchings and Claire Clivaz, eds., *Digital Humanities and Christianity: An Introduction* (Berlin: de Gruyter, 2021).

⁷ As an example, in the field of digital humanities, Jonas Kuhn, “Computer-lingu-

The aim of this paper is not to give a comprehensive presentation of narrative exegesis or quantitative approaches and methods from the Digital Humanities for literary studies, but to provide an overview of a selection of possible intersections, as stated above: Which aspects of these computational methods are relevant to biblical exegesis, which methods are already being used, and what additional synergies can be suggested? In particular, I will focus on SNA, which uses digital methods and exegesis, and discuss methodological advantages, limitations, and potential problems.

Natural Language Processing

The tasks of computer-based analysis of natural language (“Natural Language Processing,” NLP), automatic translation, and extraction of information from texts (“text mining”) are not new within computer science.⁸ Human language and digitised texts initially consist only of individual letters or their binary references, and are therefore unstructured data. In order to process them, they have to be transformed into structured data. This is done by NLP. Linking the resulting structure

istische Textanalyse in Der Literaturwissenschaft? Oder: ‘The Importance of Being Earnest’ bei Quantitativen Untersuchungen,” in Bernhart et al., *Quantitative Ansätze*, 11, describes the situation as follows:

Die Computerlinguistik und die Sprachtechnologieforschung entwickeln ihre Modelle und Methoden Überwiegend für Gebrauchstexte wie Zeitungsartikel, Produktbesprechungen auf Internetseiten, Forenbeiträge in den Sozialen Medien etc. Dennoch üben literarische Texte mit ihren vielfältigen Herausforderungen an die Textanalyse eine große Anziehungskraft auf Computerlinguistinnen und -linguisten aus und in den wichtigsten Publikationsorganen, den Tagungsbänden der großen Computerlinguistikkonferenzen, erscheinen seit vielen Jahren vereinzelt, aber immer wieder Beiträge zur Erweiterung von computerlinguistischen Analysemodellen, die auf Charakteristika literarischer Texte abzielen.

⁸ See Michael W. Berry and Jacob Kogan, *Text Mining: Applications and Theory* (Hoboken: Wiley, 2010); Gary Miner et al., ed., *Practical Text Mining and Statistical Analysis for Non-Structured Text Data Applications* (Waltham: Academic Press, 2012); Chris Biemann and Alexander Mehler, *Text Mining: From Ontology Learning to Automated Text Processing Applications* (Cham: Springer, 2014).

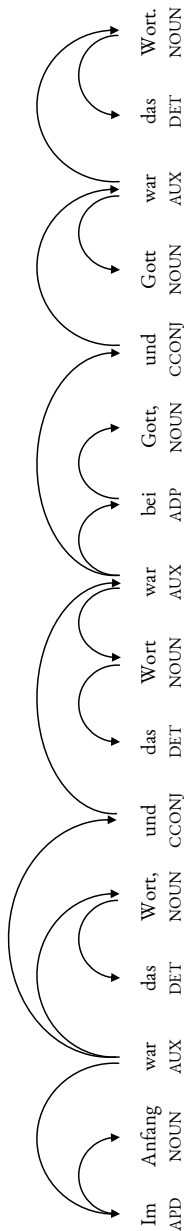


Figure 1: A Plot of the Dependency Parsing (DP) of John 1:1 in German, Showing the Dependencies Between the Building Blocks of a Sentence to Its Grammatical Structure

with other information (for example, dictionaries) or extracting further information is the task of a second step, text mining. Both tasks have experienced a great upswing in recent decades due to growing storage and computing resources. Furthermore, the digitisation and interoperability of different databases and archives is the basis for accessing and processing an ever-increasing amount of data, to which biblical studies also has access. The direct linking of individual data (*linked data*) not only leads to convenient query options (“Which scholarly literature deals with biblical passage X under consideration of the Greek form Y?”), but also enables visualization through open data formats. Such a knowledge network (*Knowledge Graph*) has its limits—not only in biblical studies—because of the following problems, which will be described in more detail later: 1) Data availability; 2) Data complexity; and 3) Data speed.

Basically, the analysis and processing of natural language always consist of several steps. The first step is the recognition of sentences, words, and lemmata (sentence splitting, lemmatization, stemming). In this process, parts of speech and their grammatical forms can be studied: $\theta\epsilon\acute{o}\varsigma$ can be extracted from $\Theta\epsilon\acute{o}\nu$, the form of the noun in accusative singular, for example. Next, an important task is Named-Entity Recognition (NER), where standardized entries in dictionaries or structured

lists are assigned to various terms: Θεόν is here assigned Strong's number 2316, for example.

Putting these entities into structured relationships (that is, recognizing subject-verb-object relations) is even more difficult ("relation extraction"). This can also be visualized as a so-called Dependency Parsing (DP, see Figure 1 above). For these tasks, which are quite difficult from a computer science point of view, there exists plenty of program libraries and both AI and non-AI models for different modern languages. However, only a few resources are available for ancient languages like Koine Greek.⁹ Since no universally valid models exist, different languages and types of literature have very different requirements.¹⁰

Besides text translation, there are also various types of text categorization, such as assigning keywords to documents, automatic sorting and filtering (of, for example, e-mails), and recognition of emotions (for example, good, bad, or aggressive online reviews).

However, although a wide range of methods and approaches for algorithmically complex tasks are available in computer science, interdisciplinary work is required to apply them to other fields of study, since the relation between research questions and methods vary significantly. What is asked (and how it is asked) depends on a multitude of disciplinary factors that are not always made explicit.¹¹ Thus, even though biblical and literary studies share a methodological toolbox, there are still additional aspects to be considered in exegetical research.¹²

⁹ There are quite a few libraries available for Python (a high-level, general-purpose programming language). The most popular are currently Natural Language Toolkit (NLTK, <https://www.nltk.org>) and spaCy <https://spacy.io>. Java and R are also used.

¹⁰ See, for example, Andre Blessing et al., "Dramenwerkbank-Automatische Sprachverarbeitung zur Analyse von Figurenrede," in *Digital Humanities im deutschsprachigen Raum* (2016): 281–284.

¹¹ Cf. Axel Pichler and Nils Reiter, "Reflektierte Textanalyse," in Rieter, Pichler, and Kuhn, *Textanalyse*, 46.

¹² See, for example, the "double act of interpretation" in my "Digital Theology: New Perspectives on Interdisciplinary Research Between the Humanities and Theology," *Interdisciplinary Journal of Research on Religion* 18 (2022): 1–17.

Structure

The remainder of the article is structured in five parts: 1) First, some areas from the field of digital humanities and computational linguistics relevant for narrative exegesis will be presented, focussing on their potential value for biblical studies; 2) next, issues related to contextual and structural classification of texts and their textual analysis will be discussed; 3) then, some results from SNA will be surveyed; followed by 4) some critical reflections on digital methods in narrative theology and exegesis; and 5) a conclusion and outlook.

DIGITAL HUMANITIES, COMPUTER LINGUISTICS, AND NARRATIVE EXEGESIS

Computer-based literary text analysis can, like narrative exegesis, be structured in several ways. Following Christine Ivanovic, a threefold approach can be suggested that focus on 1) structural comprehension; 2) hermeneutic understanding; and 3) contextual location of a text.¹³ Since automatization of the second aspect—the hermeneutic understanding of a text—is quite complex, it is currently only a marginal topic in research.¹⁴ Instead, scholars focus on the first and third aspect (structural comprehension and contextual location). However, based on the work of Evelyn Gius,¹⁵ a more comprehensive model can be suggested which is expanded into a five-step approach as the following:

¹³ See Christine Ivanovic, “Die Vernetzung Des Textes: Im Möglichkeitsraum Digitaler Literaturanalyse,” *Zeitschrift für digitale Geisteswissenschaften* 2 (2017): n.p.; cf. the contrasting Matthew L. Jockers, *Macroanalysis: Digital Methods and Literary History* (Illinois: University of Illinois Press, 2013).

¹⁴ Cf. Reinhard Krüger and Beatrice Nickel, Schöferei, *Computer, Internet: Digital Humanities und frühneuzeitliche Pastoralliteratur* (Göttingen: Vandenhoeck & Ruprecht, 2016), 22; Maurice Erb, “Alles oder gar nichts Lesen? Foucault, Moretti und die Verheißungen des Algorithmus,” *Le Foucaldien* 2/1 (2016): 6.

¹⁵ Evelyn Gius, “Computationelle Textanalysen als fünfdimensionales Problem: Ein Modell zur Beschreibung von Komplexität,” *LitLab Pamphlet* 8 (2019): 1–20.

1) Question		
2) Data		
Single Text	Multiple Texts	Contextualization
3) NLP Methods Isolation, Description, and Classification of Phenomena or Properties		
4) Assignment to Appropriate Systems		
5) Interpretation of the Results		

Table 2: *A Fivefold Approach to Computer-Based Literary Text Analysis*

Steps 1 and 5 are, evidently, part of the original scientific discipline, that is, of either biblical or literary studies.¹⁶ However, it is not possible to assign steps only to one discipline,¹⁷ since, for example, the hermeneutical decisions in step 1 impact the methods used in steps 3 and 4, which, in turn, need to be considered in step 5. In this model, steps 2–4 are computer generated (or aided) methods. The basic data is generated by the research question, and step 2 describes it in light of this question. As seen in Table 2, this data may consist of a single text, multiple texts, or additional contextual information such as metadata, different versions of a text etcetera. For such contextual information, external knowledge or data sources are required.¹⁸ Moving to steps 3 and 4, their sub-aspects are each to be understood as part of computational linguistics. Horizontally to this vertical scheme lie different methods from computer science, such as plot and figure detection, speech reproduction, genre analyses, and stylometry. They can be applied to different questions and are usually integrated in multiple steps, at least steps 3 and 4.¹⁹

¹⁶ Following Axel Pichler and Nils Reiter, “Reflektierte Textanalyse,” in Rieter, Pichler, and Kuhn, *Textanalyse*, 46–47, operationalization is also important, which, for example, structures questions in such a way that reviews and evaluations can take place.

¹⁷ This interdisciplinary approach always includes a methodological transfer from a scientific domain such as biblical or literary studies to computer science and vice versa.

¹⁸ See Gius, “Textanalysen,” 16.

¹⁹ Thus, clustering is used as a method for grouping similar elements not only to find

Described in such a way, these steps underline the complexity of the selected topics, and it is not obvious how to approach them. Sorting by questions leads to a one-to-many relationship with methods; sorting by methods leads to a one-to-many relationship with different questions. Therefore, a slightly different approach needs to be taken, which is described below in four parts of the next section, dealing with the contextual and structural classification of texts and their textual analysis. The methods used in biblical studies will be discussed in the light of perspectives from computational linguistics. Since the focus is primarily on countable elements, a first sub-section will be on quantitative drama analysis, followed by other aspects that can be used for narrative exegesis: character analysis; scenes and perspectives as structural elements; and course of action and action analysis. Such a selection of methods and questions is by necessity arbitrary and incomplete, but guided by their possible application in biblical studies. It should also be noted that all these concepts are contested within literary theory, thus again underlining the need for interpretation and reinterpretation between the steps of analysis as discussed above.

TEXTS AND TEXT ANALYSES: CONTEXTUAL AND STRUCTURAL CLASSIFICATION

When analyzing texts and text excerpts, the focus is often on questions related to content: What is it about? What is the topic? In this context, text-immanent aspects are used, that is, the structural comprehension of texts. For example, one can also ask: What characterizes the text?²⁰

similar documents, but also for text analysis (clustering of word vectors) and topic modeling, for example.

²⁰ But also how the style or character of a text can be compared. In other words, it would include questions of genre and author, as well as historical processes and “sprachlich und kulturell bedingte Ordnungen” (cf. Ivanovic, “Vernetzung,” n.p.). This methodology is also called *stylometry*.

Methodically, such questions are often solved by topic or corpus detection and—in the broadest sense—by clustering or categorization. A growing amount of digitally accessible scientific publications raise, for example, the question of how a researcher can get an overview of information relevant to him or her as quickly as possible.²¹ However, when applied to the analysis of literature, this means to take into account the specifics of the texts,²² and the impact has been rather modest.²³ In biblical studies, for example, the use of enumerative procedures is often limited to word frequencies or the naming of individual terms.²⁴ It is true that word frequencies are an obvious starting-point, especially on small text extracts. However, when applying (methodically arbitrarily se-

²¹ See, for example, “Text Retrieval Conference” (TREC), a conference that has been organized since 1992 and gathers competences and research in the field of information retrieval; cf. Kirk Roberts et al., “Overview of the TREC 2015 Clinical Decision Support Track,” *TREC* (2015): 1–12. The amount of work on corpus or topic detection is, however, simply staggering, cf. Miner, *Text Mining*; Jens Dörpinghaus, Sebastian Schaaf, and Marc Jacobs, “Soft Document Clustering Using a Novel Graph Covering Approach,” *BioData Mining* 11/1 (2018): 11; Jens Dörpinghaus and Marc Jacobs, “Knowledge Detection and Discovery Using Semantic Graph Embeddings on Large Knowledge Graphs Generated on Text Mining Results,” in *15th Conference on Computer Science and Information Systems (FedCSIS)*, ed. Maria Ganzha, Leszek Maciaszek, and Macin Paprzycki (Warsaw: Polskie Towarzystwo Informatyczne, 2020), 169–178.

²² Cf. Ivanovic, “Vernetzung,” n.p.

²³ Andrew Frank and Christine Ivanovic, “LitText: Building Literary Corpora for Computational Literary Analysis: A Prototype to Bridge the Gap between CL and DH,” in *Proceedings of the Eleventh International Conference on Language Resources and Evaluation (LREC 2018)*, ed. Nicoletta Calzolari et al. (Miyazaki: European Language Resources Association, 2018), 798.

²⁴ See, for example, the analysis of “Pneuma-Nennungen in der Figuren-Rede” in the Book of Acts by Cornils, *Geist Gottes*, 92–93. A certain methodological arbitrariness is often to be found here. Immanuel Matthäus Martella, “Geschwisterrivalitäten im Buch Genesis: Eine literatur-wissenschaftliche Analyse ausgewählter Geschwisterrivalitäten” (PhD diss.: University of South Africa, 2015), 108, for example, often examines only the number of verses in which a word occurs, or normalizes to the number of verses in the chapter.

lected) normalizations, that is, when adjusting values to a predefined range and using them on a larger scale, the question of their applications in computational linguistics has to be asked.²⁵

For these tasks—measuring, for example, similarities between documents and texts, or their structural or contextual classification—certain properties, so-called *features*, of text elements or documents in a document space have to be mapped by a function into numbers that can be processed by a computer. A classical approach is the so-called *Vector Space Model*. Two important observations can be made here, first that the model is used manually in biblical studies in the form of word frequencies, and second, vector space models show the (mathematical) complexity of the methods presented here, even when they are partially replaced by more technically advanced approaches. Instead of word frequencies, other representations such as the weighted vector of words of a text form coordinates in an *n*-dimensional vector space.²⁶ However, it is also possible to represent other entities, such as locations or persons (see Figure 2).

Filippos, till exempel, gick till huvudstaden i Samarien LOC och talade till människorna där om att Jesus PRS är Kristus PRS, den utlovade kungen.

Figure 2: *Visualization of Named Entities in Acts 8:5 (Translation from the Swedish Nya Levande Bibeln)*

²⁵ See also Andre Blessing et al., “Computerlinguistische Werkzeuge zur Erschließung und Exploration großer Textsammlungen aus der Perspektive fachspezifischer Theorie,” *Grenzen und Möglichkeiten der Digital Humanities*, ed. Constanze Baum and Thomas Stäcker, Sonderband der Zeitschrift für digitale Geisteswissenschaften 1 (2015), n.p.; but also George A. Miller, “On Knowing a Word,” *Annual Review of Psychology* 50/1 (1999): 1–19 (5): “Nevertheless, there is a consensus that the sense enumeration found in a standard dictionary is not the kind of lexicon required for linguistic or psycholinguistic theory.”

²⁶ See Fotis Jannidis, Hubertus Kohle, and Malte Rehbein, *Digital Humanities: Eine Einführung* (Cham: Springer, 2017), 275.

In this text, a location (LOC) and two persons (PRS) are identified which could form a vector with three entries. However, some entities are missing (for example Filippus), and other need interpretation. Moreover, while methods for contemporary languages such as Swedish exist, it is vital to be able to carry out these analyses on the original languages.

In biblical studies, word frequency is mainly the analysis of particular words in certain biblical texts, and in such a context, one may want to weigh rare words higher and ignore more common ones (so-called “stop words”). Here, the term *document frequency* refers to the number of occurrences in one or all documents or texts. The method that rewards words with a low document frequency is called *inverse document frequency*,²⁷ and combined, this results in what is called the Term Frequency-Inverse Document Frequency Measure (TF.IDF). Other measures—each with their own methodological advantages and disadvantages—are also used. It is also important to note that since the dimensions are reduced, the results are always approximations, since calculations with word vectors would otherwise be too time-consuming.

Ultimately, this demonstrates the complexity of this task. Not only does one need a (mathematical) measure after having transferred a representation of the text into a vector space, one also needs a (mathematical) similarity function. Such a procedure is in itself highly complex and often leads to errors in the results, even though they may be mathematically correct (see Figure 3 below).²⁸ Consequently, when Immanuel Matthäus Martella, for example, considers word frequencies in a particular part of the Book of Genesis, he must justify not only his textual

²⁷ See ChengXiang Zhai and Sean Massung, *Text Data Management and Analysis: A Practical Introduction to Information Retrieval and Text Mining* (Kentfield: Morgan & Claypool, 2016), 99.

²⁸ See Jens Dörpinghaus, Johannes Darms, and Marc Jacobs, “What was the Question? A Systematization of Information Retrieval and NLP Problems,” in *Proceedings of the 2018 Federated Conference on Computer Science and Information Systems*, ed. Maria Ganzha, Leszek Maciaszek, and Macin Paprzycki (Poznań: IEEE, 2018), 471–478.

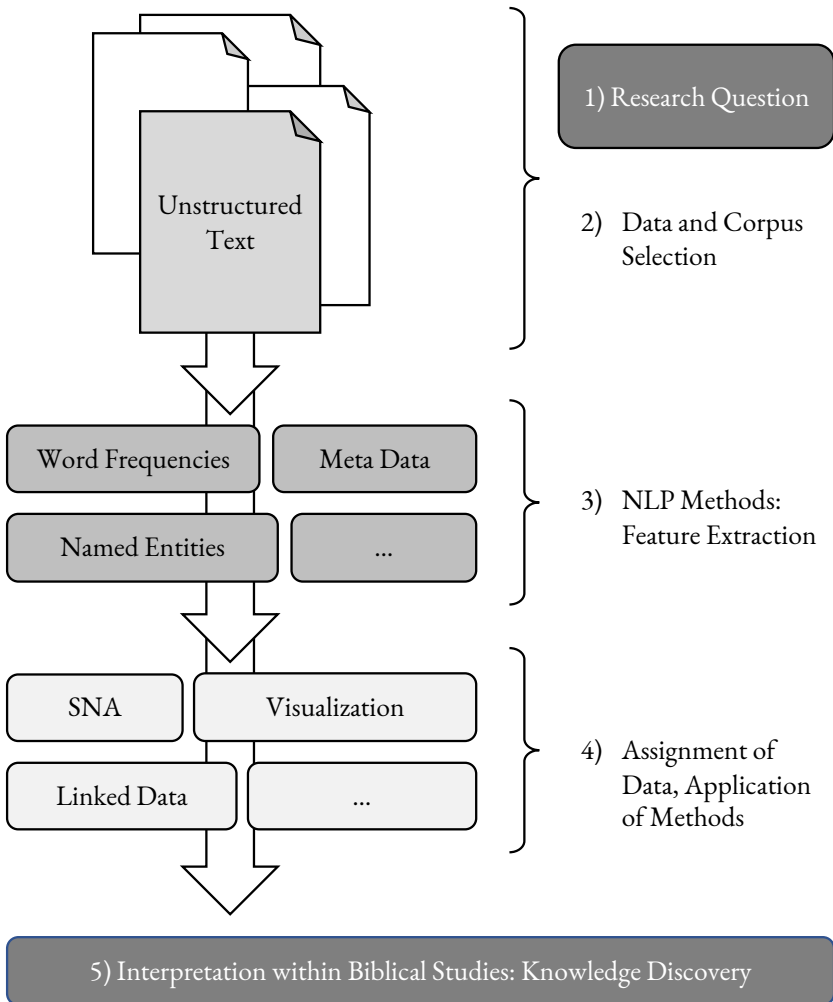


Figure 3: *Schematic Representation of Steps 1 to 5*²⁹

²⁹ The darkest boxes indicate steps within biblical studies. After step 2 (“Data and Corpus Selection”), different features are extracted that can be stored in a vector space model and a certain method, leading to information gain.

choice, but also why he normalizes, with what, and why, since obviously, there was a bias that he wanted to clean up.³⁰

It can be observed that stylometric studies can be found in biblical studies; these approaches had their peak in the 1980s, but some newer studies can also be found. These are mainly concerned with the question of authorship of biblical texts, but also with classification of sources.³¹ However, only a few stylometric studies of parts of the Hebrew Bible have been published. This may point to a weakness in computational linguistics: most models and methods were developed for contemporary languages with many speakers. Very few (if any) models exist for ancient languages.³² At the same time, these studies also show some method-

³⁰ This is a methodological criticism, but it can be broadly generalized. The substantive, practical, and technical difficulties of word frequencies is often discussed, see, for example, Gabriel Viehhauser, “Historische Stilometrie? Methodische Vorschläge für eine Annäherung textanalytischer Zugänge an die mediävistische Textualitätsdebatte,” in Baumann Stäcker, *Grenzen*, n.p. Friederike Schruhl, “Quantifizieren in Der Interpretationspraxis Der Digital Humanities,” in Toni Bernhart et al., eds., *Quantitative Ansätze*, 261, which is well worth reading, should also be mentioned in this regard, concluding that ...

[i]n dieser Hinsicht lenkt die Digitalisierung die Aufmerksamkeit nicht nur auf den technischen Fortschritt. Vielmehr gerät die beeindruckende Komplexität literaturwissenschaftlicher Praxiszusammenhänge in den Fokus. Was durch die Quantifizierungen offensichtlich wird, ist “also der Sachverhalt und nicht die ‘Sache selbst.’”

³¹ See for example Anthony Kenny, *A Stylometric Study of the New Testament* (Oxford: University Press, 1986); Harry Erwin and Michael Oakes, “Correspondence Analysis of the New Testament” (paper presented at Language Resources and Evaluation for Religious Texts, Istanbul, 22 May, 2012), 30; David L. Mealand, “Hellenistic Greek and the New Testament: A Stylometric Perspective,” *JSNT* 34/4 (2012): 323–345.

³² For one of the few examples, see <http://etcbc.nl/data>. Cf. Valerio Perrone et al., “GASC: Genre-Aware Semantic Change for Ancient Greek,” *ArXiv Preprint ArXiv:1903.05587* (2019): n.p.; Dörpinghaus and Düing, “Automated Creation”; David Bamman, “Natural Language Processing for the Long Tail,” *Book of Abstracts of Digital Humanities* (2017): 1–5; S. Vijayarani et al., “Text Mining: Open Source Tokenization Tools, an Analysis,” *Advanced Computational Intelligence: An International Journal (ACII)* 3/1 (2016): 37–47; Roorda, “Coding.”

ological flaws in formulating research questions and in the evaluations.³³ It should also be noted that the approach of word vectors is used less and less in computational linguistics, emerging is instead the extraction or annotation of so-called *named entities* (that is, words and synonyms from controlled vocabularies or ontologies).³⁴

However, not all methods are reproducible. Dimensionality reduction methods do, for example, summarise words by eliminating dimensions that represent individual words, a process that is also used manually in biblical studies. In addition, methods based on machine learning do not allow any conclusions to be drawn about rules once they have been trained. However, a careful and methodologically valid procedure helps to extract relevant parameters and make them available for further discussion.³⁵ For narrative exegesis, this opens up many possibilities that

³³ See, for example, Maciej Eder, “Computational Stylistics and Biblical Translation: How Reliable Can a Dendrogram Be,” *The Translator and the Computer* (2013): 6: “It can be safely assumed, then, that the problems concerning the authorship of subsequent books of the New Testament have been thoroughly examined from linguistic, historical, theological, and rhetorical points of view. For this reason, the Scripture seems to be an ideal material for stylometric benchmarks, because the traditional scholarship can serve as a straightforward validation of the results obtained by using the computational approach.” It should be noted, however, that there is often not one single view on authorship. On the other hand, it does not make sense from the point of view of statement logic to use these theses to validate the results.

³⁴ See, for example, Evelyn Gius et al., “SANTA: Systematische Analyse Narrativer Texte Durch Annotation,” in *Digital Humanities im deutschsprachigen Raum* (2018): n.p.; Jens Dörpinghaus and Andreas Stefan, “Knowledge Extraction and Applications Utilizing Context Data in Knowledge Graphs,” in *2019 Federated Conference on Computer Science and Information Systems (FedCSIS)*, ed. Maria Ganzha et al. (IEEE, 2019), 265–272. An entity is a concrete, definable, abstract object from the real world whose information can be stored and processed. An ontology usually comprises a formally ordered representation and definition of properties and relationships between entities. Ontologies in computer science is a digital version of the classical ontology concept in philosophy. They are usually realised using RDF or the Web Ontology Language (OWL); see Pascal Hitzler et al., *Semantic Web: Grundlagen* (Cham: Springer, 2007).

³⁵ Cf. Florian Barth, “Zwischen Elisabeth Hauptmann und Bertolt Brecht:

go beyond the mere enumeration of words. Besides stylometric studies, content, themes, and emotions could be extracted and analysed, and genre studies could be conducted since narratives can be categorised by quantitative analyses.³⁶ In the scheme described above, these methods concern steps 3 and 4, but must be methodically validated in terms of steps 1 and 5.³⁷ Consequently, even if the methodological foundations still need to be discussed, quantitative drama analysis could be important for narrative exegesis, to which I now turn.

Quantitative Drama Analytics

Because of its literary genre, a drama may at first seem irrelevant for the analysis of biblical texts. Dramas are usually characterized by literal speech and strong textual structuring. This makes them both attractive and difficult for automatic language processing.³⁸ Two aspects are particularly important from the point of view of biblical studies. On the one hand, some biblical books definitely bear features of a modern drama.³⁹

Stilometrische Studien einer Zusammenarbeit,” in Toni Bernhart et al., eds., *Quantitative Ansätze*, 95–120.

³⁶ See Evgeny Kim and Roman Klinger, “A Survey on Sentiment and Emotion Analysis for Computational Literary Studies,” *ArXiv Preprint ArXiv:1808.03137* (2018); Gabriel Viehhauser, “Digitale Gattungsgeschichten: Minnesang zwischen Generischer Konstanz und Wende,” *ZfdG* (2017).

³⁷ H. H. Greenwood, “St Paul Revisited: Word Clusters in Multidimensional Space,” *Literary and Linguistic Computing* 8/4 (1993): 217 states, for example, that “the frequencies of common words, sentence lengths, and other simple parameters offer a prescription for determining patterns of authorship within texts that is not comfortably assimilated within the spirit of classical scholarship.”

³⁸ See Blessing, “Sprachverarbeitung,” 281.

³⁹ The Gospels, for example, contain special structural elements and dialogues, although not in the form of classical dramas. Cf. Francis R. M. Hitchcock, “Is the Fourth Gospel a Drama?,” in *The Gospel of John as Literature*, ed. Mark W. G. Stibbe (Leiden: Brill, 1993), 15–24; Luke Timothy Johnson and Todd C. Penner, *The Writings of the New Testament: An Interpretation* (Minneapolis: Fortress, 1999), 183, 533; David Stacey, *Prophetic Drama in the Old Testament* (Eugene: Wipf and Stock, 2018).

On the other hand, the drama—as a highly structured text form—can offer starting points for narrative exegesis, not only in terms of style of language, time, and space, but also related to characters, their characterizations, course of action, and plot.⁴⁰ A selection will be discussed below.

Character Analysis

Looking first at character analysis, it can be divided into a quantitative and a qualitative question: 1) when is a character present (“stage presence”) and 2) with whom does he interact? From a qualitative perspective, we consider content (“character speech”) or characterisation. The first question is answered by the “character constellation” and its “configurational structure” (introduced by Manfred Pfister as “Figurenkonstellation” and “Konfigurationsstruktur”). In the former, the person and their interactions are inferred, in the latter, they are juxtaposed. While the extraction of characters as word entities is not difficult, a correct automated analysis of interactions is challenging. Current studies therefore focus on “co-presence”: which characters appear together at which point in time?⁴¹ Models describing these interactions precisely are

⁴⁰ The analysis of the basic elements in narrative exegesis, as well as in literary studies, is of great interest. Thus, Manfred Pfister, *Das Drama* (München: Wilhelm Fink, 1988), 67–69, dedicates an entire chapter to the “Informationsvergabe” and points, for example, with the “Personenkonfiguration” to structural elements that offers a large methodological overlap; cf. Cornils, *Geist Gottes*, 75. Furthermore, Adele Berlin, *Poetics and Interpretation of Biblical Narrative* (Winona Lake: Eisenbrauns, 1994), 23–27, describes only characters and narrative perspectives. B. A. Uspenskij, *Poetik Der Komposition* (Frankfurt am Main: Suhrkamp Verlag, 1975), however, as a representative of semiotics, presents a much finer subdivision and shows that borrowing of approaches from poetics is possible. See also Klaus Seybold, *Poetik der Prophetischen Literatur im Alten Testament* (Stuttgart: Kohlhammer, 2010), 69–72; Robert Alter, *The Art of Biblical Narrative* (New York: Basic Books, 2011). It is therefore necessary to investigate where there is overlap and thus to apply these methods where possible.

⁴¹ Benjamin Krautter et al., “[E]in Vater, dächte ich, ist doch immer ein Vater”: Figurentypen im Drama und ihre Operationalisierung,” *Zeitschrift für digitale Geisteswissenschaften* (2020): n.p.

rare.⁴² In New Testament studies, figure constellations have so far been generated manually (see more below).⁴³

Pfister's hint is exciting, because it opens the possibility of applying methods of sociometry—which quantitatively measures social relations, as they were developed for the study of social group structures—to the analysis of the structure of drama personnel.⁴⁴ And, in fact, methods of Social Network Analysis (whose precursors were called sociometry) can be applied to it, again enabling new computer-based analysis techniques to be used.⁴⁵ The exciting question, which was asked in the introduction to this article, and which has not yet been finally answered, is: Is it possible to automatically extract a social network from literary texts or merely a character constellation?

For qualitative character analysis, the analysis of action verbs, sentiment (that is, feelings), and other character information is needed.⁴⁶ A possible automatized classification into protagonists and secondary char-

⁴² See, for example, David Elson, Nicholas Dames, and Kathleen McKeown, "Extracting Social Networks from Literary Fiction," in *Proceedings of the 48th Annual Meeting of the Association for Computational Linguistics*, ed. Jan Hajič et al. (Uppsala: ACL, 2010), 138–147; Nathalie Wiedmer, Janis Pagel, and Nils Reiter, "Romeo, Freund des Mercutio: Semi-Automatische Extraktion von Beziehungen Zwischen Dramatischen Figuren," *Digital Humanities im deutschsprachigen Raum* (2020): n.p.; Micha Elsner, "Character-Based Kernels for Novelistic Plot Structure," in *Proceedings of the 13th Conference of the European Chapter of the Association for Computational Linguistics*, ed. Walter Daelemans (Avignon: EACL, 2012), 634–644; Frank and Ivanovic, "LitText"; David K. Elson, *Modeling Narrative Discourse* (Columbia: Columbia University, 2012).

⁴³ Cornils, *Geist Gottes*, 75.

⁴⁴ Pfister, *Drama*, 233.

⁴⁵ This is so far a marginal phenomenon in research; cf. Jens Dörpinghaus, "Die Soziale Netzwerkanalyse: Neue Perspektiven für die Auslegung biblischer Texte?," *BeTh Jahrbuch für Theologische Studien* 2021 5 (2021): 75–96; Peer Trilcke, "Social Network Analysis (SNA) als Methode einer textempirischen Literaturwissenschaft," in *Empirie in Der Literaturwissenschaft*, ed. Philip Ajouri, Katja Mellmann, and Christoph Rauen (Leiden: Brill, 2013), 201–247.

⁴⁶ See Krautter et al., "Figurentypen."

acters has been successfully investigated by Benjamin Krautter.⁴⁷ However, more research needs to be done, as noted by Fotis Jannidis:

Narratologische Basiskategorien wie Ereignis, Plot oder indirekte Charakterisierung sind bislang kaum automatisch extrahierbar. Das gilt umso mehr für höherstufige Operationen, z. B. die Identifikation und Deutung von komplexen Formen uneigentlicher Rede wie Symbolen oder die Verbindung von Erzähltexten mit Kontexten wie der Ideen-, Diskurs-, Sozial- oder Kulturgeschichte.⁴⁸

In addition, research has not yet focused on biblical texts. This may be because of the need to consider the textual basis: Is the analysis based on the original Greek, Hebrew or Aramaic texts, or on translations, with all the problems that entails? I will return to this problem later. In summary, we can identify the mention of *plot* and *action* as crucial concepts.

Scenes and Perspectives as Structural Elements

Moving on, scenes and perspectives are elementary structural elements of literary texts, and particularly prominent in dramas. Even so, the automatic detection of these elements is not trivial, although there have been some promising studies.⁴⁹ Basically, digital approaches can either work with so-called discourse clues (“Diskurshinweise”)—in which case the perspective on the plot is lost—or try to generate tables of contents—in which case local plot structures are lost.⁵⁰ In principle, most

⁴⁷ Benjamin Krautter et al., “Titelhelden und Protagonisten–Interpretierbare Figurenklassifikation in Deutschsprachigen Dramen,” *Litlab Pamphlet* 7 (2018): 1–56.

⁴⁸ Fotis Jannidis, “Computergestützte Erzähltextforschung,” in *Grundthemen Der Literaturwissenschaft: Erzählen*, ed. Martin Huber and Wolf Schmid (Berlin: de Gruyter, 2017), 606.

⁴⁹ See Janis Pagel, Nidhi Sihag, and Nils Reiter, “Predicting Structural Elements in German Drama,” in *Proceedings of the Second Conference on Computational Humanities Research*, ed. M. Ehrmann et al. (Amsterdam: CHR, 2021), 225.

⁵⁰ See Marti A. Hearst, “Text Tiling: Segmenting Text into Multi-Paragraph Subtopic Passages,” *Computational Linguistics* 23/1 (1997): 33–64; Antoine Doucet et al., “Overview of the ICDAR 2013 Competition OnBook Structure Extraction,” in *Twelfth International Conference on Document Analysis and Recognition (ICDAR, 2013)*,

Bible translations—just like dramas—already offer headings and divisions, but this raises two new questions: How are these to be interpreted from a literary perspective, and are they even available digitally for processing? Even though many methodological approaches exist, they are highly specific and hardly applicable in a generalized way.⁵¹ Here arises the problem of complex modeling: “in der Differenz zwischen dem, was im Text, verstanden als eine Folge von Buchstaben, gegeben ist, und der vollständigen Repräsentation und Interpretation einer narrativen Welt.”⁵² The limits of what is now feasible is seen clearly. However, the situation gets even more complex when considering the response of a text as communication act, for example in reader response. For computational methods, an idea of text purpose needs to be fixed.

Course of Action and Action Analysis

The limits of what is possible are also reached when trying to analyse plots in an automated way. This is much more complex, because the narratological concept of a plot as a sequence of events is difficult to operationalize due to the problematic concept of events.⁵³ However, different methods have already been used, and have generated quite different results.⁵⁴ For narrative exegesis, the course of action is also not

ed. Lisa O’Conner (Washington: IEEE, 2013), 1438–1443; Pagel, Sihag, and Reiter, “Structural Elements,” 218.

⁵¹ See also Eva Hanser et al., “Text-to-Animation: Affective, Intelligent and Multimodal Visualisation of Natural Language Scripts,” *Computer Science* (2009): 1–34.

⁵² Jannidis, “Erzähltextforschung,” 607.

⁵³ Jannidis, “Erzähltextforschung,” 599; see also Silke Lahn and Jan Christoph Meister, *Einführung in die Erzähltextanalyse* (Stuttgart: J. B. Metzler, 2016), 215.

⁵⁴ Cf. Jonas Kuhn, “Computerlinguistische Textanalyse in der Literaturwissenschaft? Oder: ‘The Importance of Being Earnest’ bei quantitativen Untersuchungen?” in *Quantitative Ansätze in den Literatur- und Geisteswissenschaften: Systematische und historische Perspektiven*, ed. Toni Bernhart et al. (Berlin: de Gruyter, 2018), 22–24; Benjamin Krautter, “Über Die Attribution Hinaus,” in Toni Bernhart et al., eds., *Quantitative Ansätze*, 307.

clearly defined.⁵⁵ Important remarks are the difficulty—especially in Hebrew Bible narrative texts—to establish storylines,⁵⁶ and the hypothesis that action is closely related to characterizations.⁵⁷ Time is also “un trait caractéristique non seulement du récit cinématographique, mais aussi du récit oral, à tous ses niveaux d’élaboration esthétique.”⁵⁸ Moreover, narrative time does not relate linearly to the text or plot, and is often difficult to discern even for human readers. The same applies to places, which could provide possible clues for the analysis of narrative units.⁵⁹ This raises the question for narrative exegesis whether the course of action can be operationalized at all, and whether a course of action does not primarily result from the question (step 1), but must instead be interpreted in relation to the evaluation (step 5). Without clarity in these questions, computational linguistics can only provide limited results.

However, another perspective arises here. Through the manifold methods of computational linguistics, new approaches for plot developments may present themselves. If, for example, the character constellation is used to support the method,⁶⁰ to, for example, analyse actions, this must be added to the original research question. The same is true if

⁵⁵ Cf. the definitions of “plot,” “plot development,” etc. in Shimon Bar-Efrat, *Wie Die Bibel Erzählt* (Gütersloh: Gütersloher Verlagshaus, 2006), 107; Friedemann W. Golka, Jakob, *Biblische Gestalt Und Literarische Figur: Thomas Manns Beitrag Zur Bibelexegese* (Stuttgart: Calwer Verlag, 1999), 19; Berlin, *Poetics*, 39.

⁵⁶ However, this is a fundamental problem of ancient literature: “Dans ce cas, les marques de composition sont toutes intérieures au texte, c’est-à-dire linguistiques” (Roland Meynet et al., *Rhétorique Sémitique* [Paris: Patrimoine, 1998], 82). This aspect will be discussed in more detail in the next section.

⁵⁷ Berlin, *Poetics*, 39.

⁵⁸ Gérard Genette, *Figures III* (Paris: Seuil, 2014), 75.

⁵⁹ See Bar-Efrat, *Bibel*, 200; 202; cf. Heiko Hausendorf and Reinhold Schmitt, “Sprachliche Interaktion im Raum,” in *Sprache im kommunikativen, interaktiven und kulturellen Kontext*, ed. Arnulf Deppermann and Silke Reineke (Berlin: de Gruyter, 2018), 87–118.

⁶⁰ Cf. Wendy G. Lehnert, “Plot Units: A Narrative Summarization Strategy,” *Strategies for Natural Language Processing* (1982): 375–414.

one uses chains of verbs.⁶¹ In this respect, then, a new research question must be posed: Does a meaningful interpretation of the text result from the use of multiple plotlines that can be combined into a complete one?

SOCIAL NETWORK ANALYSIS AND NARRATIVE EXEGESIS

I have already mentioned Social Network Analysis (SNA) several times in relation to character analysis—in particular character constellation. It is also uniquely linked to narrative exegesis, since it uses two elements in particular: characters and locations. SNA aims at an analytical representation of human interactions. Its development began in the 1940s as “sociometry” and had its breakthrough in the USA in the 1970s. According to Christian Stegbauer and Roger Häußling, SNA can be defined in different ways:⁶² 1) as the analysis of social relations between different actors as part of the social order; 2) as to describe the systematic evaluation of empirical data; 3) as to describe the graphical representation of the data; and 4) as to describe mathematical models that describe the data. It is thus a highly interdisciplinary approach.

SNA always includes persons. These may be fictitious or real, in the sense that information about them can be worked out from historical sources.⁶³ Thus, the social network paradigm can technically be applied to narrative texts without any problem. An example of a first systematization of these relations, is found in the so-called *figure configuration* used by Cornils for Acts—a listing of characters appearing simultane-

⁶¹ See Nathanael Chambers and Dan Jurafsky, “Unsupervised Learning of Narrative Schemas and Their Participants,” in *Proceedings of the Joint Conference of the 47th Annual Meeting of the ACL and the 4th International Joint Conference on Natural Language Processing of the AFNLP*, ed. Keh-Yih Su et al. (Suntec: ACL, 2009), 602–610.

⁶² Christian Stegbauer and Roger Häußling, *Handbuch Netzwerkforschung* (New York: Springer Link, 2010), 21.

⁶³ Cf. Christian Rollinger, “Prolegomena. Problems and Perspectives of Historical Network Research and Ancient History,” *Journal of Historical Network Research* 4 (2020): 1–35.

ously in a narrative. A computer-based evaluation of such data would, then, be the next logical step.⁶⁴

The character is the main (or minor) actor described in the text. This is equivalent to the actor in SNA, but narrative criticism provides a more detailed view:

Characters reveal themselves in their speech (what they say and how they say it), in their actions (what they do), by their clothing (what they wear), in their gestures and posture (how they present themselves).⁶⁵

There are, therefore, several dimensions of characters that are difficult to integrate into social networks. James L. Resseguie also points to another, social perspective by mentioning the position of the characters within society. Thus, it is also important to think about the constellation of characters—their position in a network and relationship to the plot. This shows the link between methods and approaches discussed earlier.

A possible limit of this approach lies, however, in its significance: The network is a *reproduction or a representation* of literary findings. The information provided by SNA must always be interpreted in the context of its construction, for example, in a narrative context. Consequently, the evaluation does not position itself historically, since it interprets the narrative within its immanent framework. It does, however, contribute to the understanding of narratives and opens up new perspectives for interpretation and interdisciplinary models.

Network approaches have been used in historical studies for some decades. Often labeled Historical Network Analysis (HNA), the methods used are regularly manual work—archaeological and exegetical.⁶⁶

⁶⁴ Cornils, *Geist Gottes*, 75.

⁶⁵ James L. Resseguie, *Narrative Criticism of the New Testament: An Introduction* (Grand Rapids: Baker Publishing Group, 2005), 121.

⁶⁶ See for example Christian Rollinger, *Amicitia Sanctissime Colenda: Freundschaft Und Soziale Netzwerke in Der Späten Republik*, Studien zur alten Geschichte 19 (Heidelberg: Verlag Antike, 2014); Anna Collar, *Religious Networks in the Roman Empire* (Cambridge: University Press, 2013).

Some scholars also use the term Religious Network Analysis (RNA) as another field. RNA is often combined with HNA, often rendering it somewhat unclear which methods are applied and if there is a methodological difference. There are several examples to be considered. Manuel Vásquez, for one, presents the theoretical background for the analysis of contemporary religious networks and argues that one needs to assume that “complexity, connectivity, and fluidity are preponderant features of our present age, without ignoring the strong countervailing global logics of segregation, surveillance, and control.”⁶⁷ Further approaches are represented by Irad Malkin, Christy Constantakopoulou, and Katerina Panagopoulou, who examine the spreading of religious ideas in the ancient Mediterranean on the basis of the cult of Demeter Eleusinia,⁶⁸ and Greg Woolf, who examines the application of network approaches to religious change in the Roman Empire.⁶⁹ In doing so, he uses the model of conversion both as a form of contagion and as a spread of ideas.

Networks in early Christianity have not yet been fully investigated. Dennis C. Duling summarizes the situation as follows: “interest in SNA by biblical scholars has been sporadic, but steady, and is apparently growing”.⁷⁰ A first set of approaches can be found in Elizabeth A. Clark and Michael B. Thompsons works.⁷¹ They examine the communication of information in the network of early Christians between the years 30

⁶⁷ Manuel Vásquez, “Studying Religion in Motion: A Networks Approach,” *Method & Theory in the Study of Religion* 20/2 (2008): 151.

⁶⁸ Irad Malkin, Christy Constantakopoulou, and Katerina Panagopoulou, *Greek and Roman Networks in the Mediterranean* (Routledge, 2013).

⁶⁹ Greg Woolf, “Only Connect? Network Analysis and Religious Change in the Roman World,” *Hélade: Revista de História Antiga* 2/2 (2016): 43–58.

⁷⁰ Dennis C. Duling, “Paul’s Aegean Network: The Strength of Strong Ties,” *BTB* 43/3 (2013): 136.

⁷¹ Elizabeth A. Clark, *The Origenist Controversy: The Cultural Construction of an Early Christian Debate* (Princeton Univ. Press, 1992); Michael B. Thompson, “The Holy Internet: Communication Between Churches in the First Christian Generation,” in *Gospels for All Christians*, ed. Richard Bauckham (London: Bloomsbury Academic, 1998), 49–70.

and 70 CE. Further attempts to explore these questions with the help of Social Network Analysis have been carried out by Duling.⁷² However, this study only includes the direct network (so called “ego-network”) around Jesus. In general, therefore, Duling’s work remains unfinished, although others have continued along similar lines of inquiry.⁷³ According to Duling, one aspect that remains is that one

needs to work out the many persons and relationships in the intimate, effective, and extended social networks, and graph the nodes and lines throughout the network. The above illustration is only a beginning.⁷⁴

Another scholar working with SNA is Jennifer M. McClure, who concludes her study as the following:

The results provide a unique window into the relational dynamics portrayed by the Gospels, producing a variety of insights, some which may not surprise biblical scholars but others which hopefully will inspire further consideration.⁷⁵

She seconds the approach of Green, that Luke’s Gospel emphasizes the stigmatization of actors. Furthermore, she points at

actors whose narrative and historical roles have been discussed by biblical scholars but whose roles in the Gospels’ relational structures have needed further examination.⁷⁶

⁷² Dennis C. Duling, “The Jesus Movement and Social Network Analysis (Part I: The Spatial Network),” *BTB* 29/4 (1999): 156–175; idem, “The Jesus Movement and Social Network Analysis (Part II: The Social Network),” *BTB* 30/1 (2000): 3–14; idem, “Network.”

⁷³ See, for example, John S. Kloppenborg, “Recruitment to Elective Cults: Network Structure and Ecology,” *NTS* 66/3 (2020): 323–350; István Czachesz, “Women, Charity, and Mobility in Early Christianity: Weak Links and the Historical Transformation of Religions,” in *Changing Minds: Religion and Cognition through the Ages*, ed. Istvan Czachesz and Tamas Biro (Leuven: Peeters, 2011), 129–154; Vojtěch Kaše et al., “Righteousness in Early Christian Literature: Distant Reading and Textual Networks,” *Annali Di Storia Dell’esegesi* 38/1 (2022): 87–120.

⁷⁴ Duling, “Jesus Movement,” 11.

⁷⁵ Jennifer M. McClure, “Introducing Jesus’s Social Network: Support, Conflict, and Compassion,” *Interdisciplinary Journal of Research on Religion* 12 (2016): 35.

⁷⁶ McClure, “Social Network,” 49.

Even newer works are based on manually curated networks based on exegetical methods.⁷⁷

In summary, a complete, computable network of biblical texts is still missing. However, my brief review highlights the methodological overlap between narrative approaches and Social Network Analysis, as well as the digital methods for narrative texts presented earlier. Better digital approaches to biblical texts could help to push the boundaries of Social Network Analysis of biblical texts. However, it also shows that network approaches can be applied manually without digital approaches. Exegetical work is indeed different from general literary work, and we should, therefore, also consider some critical observations.

SOME CRITICAL REFLECTIONS

In the brief selection of methods surveyed above, some steps have had to be left out. Steps 1 and 2, for example, concern primarily possible research questions and possible data sets with which these questions can be answered. The survey has shown that digital content has become more important for biblical studies. However, things are progressing slowly. In 2017, Claire Clivaz wrote unenthusiastically that some researchers had “already” presented survey articles on the encounter between biblical studies and the digital turn,⁷⁸ but as recently as in 2020, Clifford Anderson stated that

theologians have shown scant interest to this point in the tools for linking data, mapping, network analysis, text mining, and visualizing information that are fueling digital scholarship in other disciplines.⁷⁹

⁷⁷ See Jens Dörpinghaus, “Soziale Netzwerke im frühen Christentum nach der Darstellung in Apg 1–12 (Master diss., University of South Africa, 2020); idem, “Soziale Netzwerkanalyse.”

⁷⁸ Claire Clivaz, “Die Bibel im digitalen Zeitalter: Multimodale Schriften in Gemeinschaften,” *ZNT* 20/39 (2017): 36.

⁷⁹ Clifford Anderson, “Digital Humanities and the Future of Theology,” *Zeitschrift für Explorative Theologie* (2018): 2.

In fact, real progress is only visible in the area of digitized manuscripts and in the area of digital academic research and publishing.⁸⁰

A first challenge relates to what text is supposed to be analyzed. As discussed above, any analysis of Greek, Hebrew or Aramaic texts are problematic.⁸¹ Analysing translations is, however, not a self evident alternative, since every translation has its own presuppositions that need to be reflected in the research question. Since the various sub-disciplines to biblical studies also work with digitally recorded empirical data, as well as with digital sources (for example, historical texts, Hebrew and Greek texts, and other literature that is now freely available), the question of their availability must also be raised. Oftentimes, access is only granted through expensive commercial software products, with restrictive licensing policies for Bible translations,⁸² and these products do not provide an API to traditional methods of quantitative text analysis, NLP, and text mining.⁸³ The syntax trees by Robert D. Holmstedt and Marco V. Fabbri are, for example, only available within Accordance. Some free syntax projects are on their way, but have not yet been integrated in other software, and are thus currently unavailable for NLP methods.⁸⁴ Only one open source library exists that can be used for this

⁸⁰ Claire Clivaz, “Digital Humanities in Biblical, Early Jewish and Early Christian Studies,” in *Digital Humanities in Biblical, Early Jewish, and Early Christian Studies*, ed. Andrew Gregory, David Hamidović, and Claire Clivaz (Leiden: Brill, 2013), 1–8.

⁸¹ Whereby the approaches of so-called *corpus linguistics* might be usefully applicable here, cf. Christian Mair, “Erfolgsgeschichte Korpuslinguistik?” in *Korpuslinguistik*, ed. Marc Kupietz and Thomas Schmidt (Berlin: de Gruyter, 2018), 5–26.

⁸² In the German speaking world, compare the information provided by the Deutsche Bibel Gesellschaft (DBG, <https://www.die-bibel.de/ueber-uns/verlag/lizenzen>) and the open principles of the “Offene Bibel” (“Open Bible”) project (https://offene-bibel.de/wiki/Unsere_Ziele#Freie_Verf.C3.Bcgbarkeit).

⁸³ For more details, see Döpinghaus and Düing, “Automated Creation.” All software products do not allow automated external access to their data.

⁸⁴ See, for example, <http://opentext.org>; Jonathan Robie, “Biblical Scholarship in the GitHub Jungle,” in *Proceedings of Balisage: The Markup Conference 2022*, vol. 27 *Balisage Series on Markup Technologies*, ed. B. Tommie Usdin (Washington: Masthead, 2022), 27.

purpose—the SWORD project (<http://crosswire.org/sword>), which provides a full API and is licensed under GNU. However, it lacks almost all biblical texts that are subject to licensing. There is thus a serious obstacle to be overcome in making texts accessible.

Another aspect to consider is that if the question in step 1 is formulated within biblical studies, step 2 must include a transfer to computational linguistics. The opposite is also true; in step 5, the results of computational linguistics have to be interpreted in terms of biblical studies. Furthermore, if one adopts the models of digital humanities for other genres or languages, an interdisciplinary conversation between three disciplines must take place.⁸⁵ This applies to any use of computer-assisted procedures that go beyond mere enumeration—the challenges in model building, representativeness, domain adaptation, and evaluation mentioned by Jannidis apply equally to theology.⁸⁶

At the same time, there are other opportunities for interdisciplinary exchange between digital humanities, computational linguistics, and biblical studies. Firstly, biblical studies has multilingual, well-researched texts and questions. All scientific fields could certainly benefit from such data and such questions.⁸⁷ Secondly, if biblical study sources were made available in an open digital format, this would open up the frontiers of research and, ultimately, the application of technologies to knowledge graphs.⁸⁸ Thirdly, there is an promising link to practical theology, since

⁸⁵ See the discussion in Dörpinghaus, “Digital Theology.”

⁸⁶ Jannidis, “Erzähltextforschung,” 607.

⁸⁷ Cf. Bernhard Wölchli, “Similarity Semantics and Building Probabilistic Semantic Maps from Parallel Texts,” *Linguistic Discovery* 8/1 (2010): 331–371. Biblical texts are also used as the basis for automated translations, see more in Christos Christodoulou-poulos and Mark Steedman, “A Massively Parallel Corpus: The Bible in 100 Languages,” *Language Resources and Evaluation* 49/2 (2015): 375–395.

⁸⁸ Since the methodological discussion of computer science usually plays a subordinate role in biblical studies and the term Open Data or FAIR Data are still relatively unknown, the results can only rarely be reproduced or are available for Data Fusion, that is connected with other data sources. On this, see Mark D. Wilkinson et

methods of computational linguistics already dominate digital life. Digital methods and approaches to work with biblical texts could thus also be applied in churches—there are further scholarly questions that move beyond narrative exegesis and into narrative theology.⁸⁹

CONCLUSION AND OUTLOOK

Several conclusions can be drawn from the survey above. Firstly, it has been shown that computational analysis of natural language is an emerging topic in computational linguistics and literary studies. It is therefore not surprising that some of the simpler methods from these disciplines are starting to be used in biblical studies. Secondly, although these methods are clearly embedded in interdisciplinary contexts, there is currently not much interdisciplinary exchange and discussion. At the same time, exciting work has been done with state-of-the-art methods in the field of narrative exegesis, focusing questions like “How can space and time be investigated with methods of computational linguistics?”; “Would sentiment analysis provide new perspectives on narrative?”; “What is the methodological relationship between social network analysis and narrative exegesis?”, and “What are the possibilities of the various partial tension arcs determined by computational methods for looking at the tension arc of narrative texts?”

The article has also shown several unresolved problems, such as the detection of narrative time and the handling of uncertainties. This could be seen as an opportunity for biblical studies to contribute new research questions. The initial research question of this article was whether SNA

al., “The FAIR Guiding Principles for Scientific Data Management and Stewardship,” *Scientific Data* 3 (2016): 160018.

⁸⁹ See, for example, the work of the ODEC Research Centre at Durham University: Peter Phillips, Kyle Schiefelbein-Guerrero, and Jonas Kurlberg, “Defining Digital Theology: Digital Humanities, Digital Religion, and the Particular Work of the Codec Research Centre and Network,” *Open Theology* 5/1 (2019): 29–43.

on biblical texts could be automated. The answer is that it seems unlikely that this process can be fully automated. However, there are automated methods for several steps in the process that could help biblical scholars, and since manual reconstructions of social networks will be of much higher quality, they could provide a solid foundation for such a development, in training and evaluation novel AI models, for example, or other methods that will help push the boundaries for various domains, including larger historical text corpora that could not possibly be analysed by hand.

Another question worth to be studied further is whether it is possible to use the methods presented above to automate exegesis, or rather to assist the biblical scholar. The most important question to be discussed is whether methods from the humanities can be applied within biblical studies without any methodological presuppositions. Interdisciplinary exchange and, in particular, hermeneutics in the interpretation of results are crucial. The development of methods and language models would support biblical scholars. As shown in the article, this applies in particular to methods related to computational linguistics such as Social Network Analysis, which are helpful for narrative exegesis. However, these methods do not need to be digital, but can be used in manual work. Consequently, synergies can also be found between the field of narrative studies in general and narrative exegesis of biblical texts on the one hand, and computational linguistics on the other. It is therefore important to note that it is not only the results of computational linguistics that can open up new perspectives, but also the discussion of the methods themselves. If we define the field even more broadly, the interdisciplinary field of digital humanities should also be mentioned as a possible source of new impulses.