

REVIEWS

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Jingyang Jiang & Haitao Liu (eds.), *Quantitative analysis of dependency structures* (Quantitative Linguistics 72). Berlin: De Gruyter Mouton, 2018. Pp. xii + 368.

Reviewed by HAORAN ZHU & LEI LEI, Huazhong University of Science and Technology

Dependency grammar captures the hierarchical aspects of syntactic organization. According to dependency grammar, a sentence is regarded as a tree that originates from the root verb and develops into a hierarchical structure. Each node of the tree represents a word, and a node is dependent on its parent node (i.e. the governor). In recent years, both qualitative and quantitative studies on dependency structures are thriving. Efforts have been made to explore the rules and mechanisms of dependency relations, dependency distance, and dependency directions (see Liu, Xu & Liang 2017 for a comprehensive review). With a collection of 16 recent studies centred around dependency structures, the book under review sheds light upon new directions in this line of research.

The book begins with a review article by Richard Hudson. After reviewing the history of dependency research, Hudson concludes that, compared with phrase structure, dependency structure is a better syntax-representing tool for corpus linguistics and cognitive sciences. Nonetheless, he argues that there are still challenges to be addressed, such as how to determine ‘which features are comparable across which languages’ (28). As the volume’s opening chapter, it not only lays theoretical foundations for the studies within the book but also informs readers on how dependency structures relate to corpus linguistics and cognitive sciences, thus providing practical guidance to those interested in conducting dependency-based empirical studies.

The 15 studies in the rest of the book can be grouped into four thematic sections. The first section is composed of six studies that deal with Dependency Distance (DD) (by Hongxin Zhan & Haitao Liu, Jingyang Jiang & Jinghui Ouyang, Jingqi Yan, Hua Wang, Jinlu Liu & Gaiying Chai and Chunshan Xu). DD is measured by the linear position difference between two syntactically related words, i.e. the governor and the dependent (Liu et al. 2017). DD is considered an important index of syntactic difficulty and cognitive burden. Recently, a series of studies have found a tendency of Dependency Distance Minimization (DDM) across different

languages and genres by comparing natural sentences with random sentences, i.e. sentences with scrambled words but intact dependency structures (Futrell, Mahowald & Gibson 2015, Liu et al. 2017). Many findings from three studies in the first section (by Jingyang Jiang & Jinghui Ouyang, Jingqi Yan and Chunshan Xu) echo Futrell et al.'s (2015) and Liu et al.'s (2017) argument that DDM is a human-driven language universal. Meanwhile, they have added new elements to our knowledge of DDM. For example, Jiang & Ouyang find that MDDs (mean dependency distance) of ESL (English as a second language) learners' language systems are significantly lower than their corresponding artificial languages in which the word order is randomized by computer programs. In a similar vein, Yan's study suggests that the tendency for DDM is present in the written language development of deaf and hard-of-hearing students. These findings have confirmed the universal presence of DDM, not only in typical native speakers' language, but also from new perspectives, such as the learning process of ESL learners and people with hearing impairments. Thus, the findings in the first section may be helpful in painting a fuller picture of DDM in human languages.

Another major issue in dependency research is dependency relation, which refers to the type of grammatical relationship between the governor and the dependent. The second section of the book consists of three studies that deal with dependency relations. While research into dependency relations is not new, studies in this section are worth reading for at least three reasons. First, this section has adopted information-theoretic approaches. Admittedly, researchers who are not quantitatively-oriented might encounter difficulties when reading this part as information theory involves complex mathematics. However, it would be beneficial for linguists to familiarize themselves with such concepts as entropy and complex networks by both reading this volume and referring to other resources, as these have proved useful tools in facilitating our understanding of natural language. Second, this section investigates certain important but under-studied aspects of dependency relations. While traditional dependency research has largely focused on the frequency and distribution of dependency relations, studies in this section mainly deal with complexity and information content. For instance, Anat Ninio investigates the relation between syntax and communicative functions, using the network of dependency relations as a tool, and Haruko Sanada adopts entropy-based metrics to compare the information content of dependency relation types and Parts-of-Speech (POS) in Japanese. Last, studies in the second section have linked dependency relations with classical linguistic theories, such as Construction Grammar and Zipf's (1949) Principle of Least Effort, and provided empirical evidence to verify the validity of these theories.

The third section consists of three studies that share the topic of valency. It is worth mentioning that valency is traditionally defined in two ways. The narrow sense of valency refers to the capability of a verb to govern its arguments, while valency in a broader sense can be attributed to word classes other than verbs. Studies in the third section mainly focus on the narrow sense of valency.

In this section, Andrei Beliankou & Reinhard Köhler examine the frequency distribution of valency structures based on a Russian dependency treebank. It is found that the distribution of valency structures follows the binomial law, a well-defined model in probability theory which also applies to many other languages. Huiyuan Jin & Haitao Liu build a corpus of spoken Chinese and analyse the phenomenon of verb valency ellipsis, that is, the omission of verbs with different valencies. The results show that power law governs both the frequency distribution of omitted verbs with different valencies and the distribution of elliptical patterns for different categories of verbs. Qian Lu, Yanni Lin & Haitao Liu investigate the relationship between dynamic valency (DV) and DD in Chinese and English. They have found that Chinese and English are different in syntactic dependency in that Chinese displays some ‘unique’ structures ‘that are not found in English’ (145). For instance, the head of an object is often placed at the right end of a Chinese sentence, with long pre-noun modifiers coming before subjects or objects, which is rarely found in English. A specific example of such structure is the Chinese sentence in (1).

- (1) zhèshì gè rén-rén jiē-shòu yuàn-yì zūn-shu de yuánzé.
 this.is one everybody accept willing follow ASSOC principle
 ‘This is a principle that everybody would accept and live by.’

In addition, a correlation between the variance of DV and MDD is found, but the contribution of higher DV to MDD may be overridden by other grammatical factors.

Discussions in the third section have left space for future research such as considering whether these findings on the narrow sense of valency apply to valency in the broad sense. In addition, the relation between DV and MDD is worth further investigation, namely what grammatical factors influence the interaction between DV and MDD, and in what specific ways.

The remaining three studies in the book are about inter-disciplinary application of dependency structures and comprise the fourth section. These studies demonstrate that dependency as a research tool has wide applications in other disciplines, and may uncover new linguistic patterns when combined with corpus techniques. Xinying Chen & Kim Gerdes define a new measurement named DDD (Directional Dependency Distance) for typological research and demonstrate that dependency can be used as an effective tool for distinguishing language groups. Yaqin Wang & Jianwei Yan employ quantitative features of dependency for genre analysis of essays and fiction. It is found that the two genres are similar in the distribution of dependency distance, while they can be distinguished by the distribution of certain dependency relations. These findings reveal the potential of dependency structures in stylometric studies. Alexander Mehler, Wahed Hemati, Tolga Uslu & Andy Lücking build a multidimensional model with dependency-based features, which allows for text-level authorship attribution. Their approach has also useful implications for dependency-based text classification.

This book presents to readers a panoramic view of current research on dependency grammar. It does a good job in integrating various topics concerning dependency structures – dependency distance, valency, direction, dependency types, etc. – into an organic whole. Meanwhile, discussions therein also involve many other subjects, such as genre analysis, typology, and authorship attribution. The inclusiveness and diversity of the topics in the book afford readers plenty of opportunities to make connections between dependency and other sub-fields of linguistics. Another notable contribution of the book is the proposal of some novel concepts and methods as new developments of traditional theories of dependency grammar. For example, the new linguistic unit Dependency Frame (DF), introduced by Radek Čech, Jiří Milička, Ján Mačutek, Michaela Koščová & Markéta Lopatková in this volume, is derived from dependency relations and proves a suitable measure for language regularities. Hence, future research may investigate if DFs outperform dependency relations in relevant empirical studies. Besides, we noticed several creative ideas that may further our understanding of dependency grammar. These include analysing DDM in imperfect language development (Yan), approaching dependency distance with graph theory (Lu et al.), and using dependency distance as writer fingerprints (Mehler et al.). To our knowledge, all these are topics rarely discussed in previous literature. Such trail-blazing efforts may open up new dimensions in quantitative analysis of dependency structures.

A possible criticism of the book might be the limited size of data sets in some of the studies. Conclusions are sometimes reached based on findings from corpus of only one language (e.g. Beliankou & Köhler and Sanada). An example is Sanada's investigation of information amount of dependency types and POS using Japanese as data. While Sanada's research yields interesting findings, one may question if the conclusions can be taken as linguistic universals since the word order of Japanese is sharply different from most other languages. Therefore, future studies may consider verifying such findings from this book with more languages and larger data sets.

Overall, this book represents a major contribution to the research of dependency grammar. Due to the frequent use of statistical methods, the readers may need a solid quantitative background to understand all the chapters. Nonetheless, the book is highly instructive for scholars in dependency research and quantitative linguistics, as well as those from other fields of linguistics with an interest in dependency-related interdisciplinary studies.

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Elliott Murphy, *The oscillatory nature of language*. Cambridge: Cambridge University Press, 2020. Pp. xiii + 321.

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As David Poeppel and David Embick explain (Poeppel & Embick 2005, Embick & Poeppel 2015), theoretical linguistics and psycho/neurolinguistics generally work with conceptual units of disparate granularity, often assuming that their research programs are mutually independent following rigid interpretations of the classical distinctions between COMPETENCE and PERFORMANCE (Chomsky 1965) or COMPUTATIONAL and ALGORITHMIC/IMPLEMENTATIONAL levels of analysis (Marr 1982).¹ Crucially, this conceptual mismatch between disciplines has hindered the development of integrative accounts that fruitfully combine their respective insights. In this book, Elliott Murphy pursues an interesting solution to this cross-disciplinary problem, focusing on the implications of a particular type of brain activity – neural oscillations – for a competence-based model of language aimed at explaining how the brain computes syntactic structures. Culminating Murphy's ideas developed in earlier publications (see e.g. Murphy 2015, Benítez-Burraco & Murphy 2019), this book represents a thoughtful attempt to integrate two alternative approaches to syntax – theoretical linguistics and neurolinguistics – within the broader context of evolution and cognitive neuroscience.

The book begins with an introductory chapter presenting the central concepts from linguistic theory and neural oscillations. Although the proposed model is primarily based on theoretical constructs from mainstream generative linguistics (Merge, Labelling, features, etc.), the explored issues are likely relevant for other linguistic frameworks. This chapter also advances the ambitious goal of affirmatively responding to a fundamental question: is there 'a neurally implemented computation that builds syntactic structure and does not compute any meaning' (Pylkkänen 2019: 64)? According to Murphy, neural oscillations – the OSCILLOME, in

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