

# The Lexical Features and Translation Strategies of Metaphorical Terms in German Artificial Intelligence Discourse

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In the field of artificial intelligence (AI), terminology is commonly used to simplify and accurately convey information. Utilizing metaphorical expressions to articulate concepts in professional domains is a common practice in scientific terminology naming, and accurately translating metaphorical terms can ensure efficient information transmission. This paper, through case analysis, summarizes the lexical features of metaphorical terms in German artificial intelligence discourse and discusses translation strategies, aiming to provide reference for the translation of technical German texts into Chinese.

*Keywords:* artificial intelligence, metaphorical terms, translation strategies

## Introduction

As a cutting-edge domain of technological innovation, artificial intelligence (AI) exerts a potentially transformative influence on social norms, human behavior, and even overall lifestyles, making it a critical component of the development strategies of many nations. It has garnered significant attention from the United Nations, the European Union, and governments worldwide, prompting the formulation of corresponding AI strategies. Germany, as a manufacturing powerhouse, is striving to establish a leading position in the field of artificial intelligence. This study examines recent AI-related literature published in German official media, including *KI in der Industrie 4.0 (Artificial Intelligence in Industry 4.0)*, *Strategie Künstliche Intelligenz der Bundesregierung (Federal Government AI Strategy)*, *Digitalisierung der Hochschulbildung (Digitalization of Higher Education)*, and *BMBF-Aktionsplan Künstliche Intelligenz (BMBF Action Plan for Artificial Intelligence)*. These documents span both federal-level policies and sector-specific administrative plans. By analyzing these texts, this paper aims to summarize the lexical characteristics of metaphorical terminology in the field of artificial intelligence and, on this basis, explore Chinese translation strategies. The findings are intended to enhance the understanding and application of AI technologies and to foster technical exchange and mutual learning between China and Germany.

## Metaphorical Terminology

In 1980, cognitive linguists Lakoff and Johnson co-authored *Metaphors We Live By*, proposing that metaphor is not merely a rhetorical device but also a cognitive tool and a mode of thinking (Lakoff & Johnson, 2008). As terminology represents the manifestation of human cognitive activities in natural language, metaphor

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serves as one of the primary mechanisms for semantic motivation in terminology (Jiang & Wei, 2021). By leveraging similarities between entities, metaphor facilitates cross-domain mapping from the “source domain” to the “target domain”, making it a significant approach to term formation (Feng, 2006). The “metaphorical method” of term formation can be categorized into two types: The first involves the entry of ordinary words into specialized fields to create metaphorical terms, while the second entails the conceptual borrowing or transplantation of terms across disciplines to form metaphorical terms (Meng, 2007). For instance, in the field of artificial intelligence, the term “der Entscheidungsbaum” (decision tree) employs the “tree” as the source domain to imply that the algorithm’s structure resembles a tree, with the root representing the starting point of decision-making and the branches and leaf nodes representing different decision paths and outcomes. This metaphor transforms the abstract decision-making process into a concrete image, making it easier for individuals to understand and apply decision tree algorithms. Similarly, “Cloud Computing” uses the “cloud” as the source domain, allowing people to conceptualize abstract data storage and processing methods as cloud-like entities. Just as clouds change with weather conditions, users can flexibly adjust the scale and configuration of data resources according to their needs. Thus, metaphorical terminology holds significant importance in technical translation, as it not only enhances the comprehensibility and accuracy of translated texts, but also maintains linguistic consistency and facilitates scientific and technical exchange. Therefore, metaphorical terms should be given due attention and application in technical translation.

### Lexical Characteristics of Metaphorical Terminology

#### Prevalence of Compound Words

As a language renowned for its flexible word-formation mechanisms, German features compound words as a significant component of its lexical characteristics. In technical German, one of the lexical features of metaphorical terminology is the frequent use of compound words. As illustrated in Figure 1, compound words are formed by combining two or more base words, enabling them to concisely and accurately express complex scientific and technical concepts. This characteristic facilitates the formation of metaphorical terminology. Furthermore, the semantic overlap of two or more base words within a compound provides a more precise meaning, allowing readers to grasp the implied significance directly from the word itself without relying on additional contextual information. This intuitiveness and conciseness make compound words one of the prevalent forms of metaphorical terminology in technical German (see Table 1).

Table 1

#### *Compound Words in Metaphorical Terminology*

Example Term	Source Domain	Target Domain	Translation
der Daten-raum	Physical Space	Virtual Data Management and Storage Space	数据空间
der Wartung-s-fenster	Window	Time Required for Algorithm Maintenance	维护窗口
der Information-s-pool	Space Containing Liquids	Information Storage	信息池
das Transfer-lernen	Physical Migration	Migration of Knowledge and Skills	迁移学习

#### Prevalence of Derivative Words

Another lexical feature of metaphorical terminology in German AI discourse is the prevalence of derivative words. By adding prefixes (such as über-, ent-, ein-, ab-, etc.) or suffixes (-keit, -heit, -bar, -ung, etc.), new terms are created, often situated between technical and non-technical vocabulary. These derived terms carry domain-

specific connotations and can accurately express complex concepts. In the field of science and technology, metaphorical terminology formed through derivation can extend new concepts from the original words or derive deeper meanings, thereby enriching the lexical and conceptual framework of the domain (see Table 2).

Table 2

*Derivative Words in Metaphorical Terminology*

Example Term	Source Domain	Target Domain	Translation
die Durchgängigkeit	Passage on Roads	Access to Data and Models	可访问性
die Überanpassung	Over-Adaptation of Individuals to Specific Environments in Social Contexts	Performance of Models on Training Data in Machine Learning	过拟合
die Volatilität	Fluctuation in Asset Prices	Variability in Data Mining	波动性
die Robustheit	Adaptability and Stability of Organisms in Adverse Environments	Stability of Systems or Algorithms	鲁棒性

**Prevalence of Abbreviations**

In German AI discourse, another lexical feature of metaphorical terminology is the frequent use of abbreviations. This is due to the abundance of specialized and technical terms in the field of science and technology, particularly in artificial intelligence. To convey information concisely and effectively, there is a tendency to use abbreviations to represent complex concepts. These abbreviations are typically formed by combining the initial letters of words, enabling the rapid and precise expression of related concepts, which aligns with the stylistic characteristics of technical texts (see Table 3).

Table 3

*Abbreviations in Metaphorical Terminology*

Example Term	Source Domain	Target Domain	Translation
KI (Künstliche Intelligenz)	Artificial Intelligence	Ability of Computer Systems to Perform Intelligent Tasks and Activities	人工智能
ML (Maschinelles Lernen)	Human Learning Process	Learning in Computer Systems	机器学习
IDS (International Data Space)	Physical Space	Sharing and Utilization of Data Resources	国际数据空间
GAN (Generatives Adversariales Netzwerk)	Competitive and Adversarial Scenarios	Adversarial Nature of Data Generation Training Process	生成对抗网络
DNN (Deep Neural Network)	Structure of the Human Nervous System	Hierarchical Structure of Neural Networks	深度神经网络

**Prevalence of Loanwords**

With the deepening of international collaboration across various disciplines, professional exchanges within the same research fields among different countries have become increasingly frequent, significantly promoting the internationalization of specialized terminology. During the process of information dissemination, these terms are translated into various languages. In the course of translation, terms originating from the source country are often retained, becoming a distinctive feature of terminology formation within a specific field or conceptual system (Zhu & Ye, 2016). Artificial intelligence, which traces its origins to the mid-1950s in the United States, has led to the incorporation of numerous English loanwords into German, an international language, to meet the professional and communicative demands of the AI field (see Table 4).

Table 4

*Loanwords in Metaphorical Terminology*

Example Term	Source Domain	Target Domain	Translation
Cloud Computing	The form of clouds	Data storage and processing methods	云计算
KI-Think-Tank	A tank (for storing liquids or gases)	A group of experts focused on the field of artificial intelligence	人工智能智库
Deep Learning	Multiple hidden layers in human neural networks	A deep abstraction process in digital processing	深度学习
Supervised Learning	The process of a teacher guiding students' learning	The process of model training where performance is gradually improved through continuous observation and feedback	监督式学习
Data Mining	The process of miners extracting ore	The process of deeply excavating large amounts of data to discover hidden patterns, relationships, and rules	数据挖掘
Down-Time	The downward spatial direction	The period when a system or equipment is out of operation or in an unusable state	(计算机) 停机时间

### Translation Strategies for Metaphorical Terminology in Chinese

Metaphorical terminology often employs figurative language to convey complex concepts or technologies. When translating such terminology, translators must thoroughly understand the metaphorical meaning of the source terms and clearly identify the source and target domains involved. Based on the cognitive differences between the source and target languages regarding these domains, as well as the linguistic style of technical texts, an appropriate translation strategy should be comprehensively selected.

#### Literal Translation: Word-for-Word Translation

When the source and target domains of metaphorical terminology are similarly perceived in both Chinese and German cultures, indicating a high degree of commonality between the source and target language cultures, people share similar ways of understanding metaphors. Therefore, direct translation can effectively convey the meaning of the source terminology.

Example 1: „Künstliche Intelligenz“ (KI) oder auch „Artificial Intelligence“ (AI) wird im Zeitalter der Digitalisierung und der damit erzeugten zunehmenden **Datentransparenz** einen wesentlichen Beitrag für den Produktnutzen und damit auch für nachhaltige Geschäftsmodelle liefern.

Translation 1: 数字化时代下的**数据透明度**日益增强, 在此背景下, “人工智能”(AI)在提高产品效益及促进可持续商业模式发展上发挥着重要作用。

The term “Datentransparenz” consists of two parts: “Daten” meaning data, and “Transparenz” meaning transparency. In the fields of computing and artificial intelligence, this term is commonly used to describe the openness and reliability of information or data. By associating the visibility of data with transparent materials or objects, such as windows, a metaphor is formed. Readers from both Chinese and German cultures share the same understanding of this metaphorical mechanism. Translating it word-for-word as “数据透明度” accurately conveys the term’s meaning, using concise language to deliver the most appropriate amount of information. This translation adheres to the “N+N” compound word structure in Chinese, clearly and succinctly communicating the term’s content.

Example 2: Obwohl im Text nicht auf einzelne KI-Methoden Bezug genommen wird, wird gelegentlich auf

Methodenfamilien verwiesen, beispielsweise für die Erkennung von Anomalien (anomaly detection), für generative Modelle (generative models), für das **Transferlernen** (transfer learning)...

Translation 2: 尽管报告并未涉及具体的人工智能应用方法, 但对于机器学习方法族有所提及, 如异常检测、生成模型、**迁移学习**……

The term “Transferlernen” describes the process of applying knowledge and skills learned in one domain to another domain or new context. By linking the transfer of knowledge and skills to the physical transfer of materials, a metaphor is formed. Translating this term directly as “迁移学习” accurately conveys its meaning, preserving the original word order in a concise four-character structure that aligns with the verb-object compound word pattern in Chinese.

### **Free Translation: Emphasizing Term Monosemy**

From the perspective of terminology itself, accuracy, monosemy, and specialization are its fundamental characteristics. Metaphorical terminology is formed within specific domains, and its meaning often represents a specialized extension of ordinary vocabulary. If a word-for-word translation approach is applied to metaphorical terms derived from the specialization of common words, it may compromise their monosemy and specialization, leading to reduced accuracy in the target language. Therefore, free translation should be employed to enhance communicative effectiveness.

Example 3: Einerseits sind Daten zur Optimierung eines Vorgangs nötig, andererseits ist aber eine **Überanpassung** (sogenanntes Overfitting) zu vermeiden.

Translation 3: 一方面, 数据是优化流程所必需的; 但另一方面, **过拟合**会导致现有解决方案恶化。

“Überanpassung” is a widely used term in machine learning, describing a phenomenon where a model excessively adapts to the training data, resulting in diminished performance when encountering new data. Although “Überanpassung” and “过拟合” are not literal translations, this expression fully captures the linguistic characteristics of AI discourse. Its professional nature can effectively draw the attention of target readers, guiding them to further explore the concepts discussed in the source text while maintaining consistency with standard terminology in the relevant field.

Example 4: Die primären Ziele der Anwendung von KI sind Kostenreduktion, Zeitersparnis, Qualitätsverbesserung und Erhöhung der **Robustheit** industrieller Prozesse.

Translation 4: 降低成本、节省时间、提高质量以及增强工业流程的**鲁棒性**是应用人工智能的主要目标。

“Robustheit” is commonly used to describe the robustness and anti-interference capabilities of systems, algorithms, or methods. This term forms a metaphor by linking the robustness of systems or methods to the physical robustness of organisms. Employing a translation strategy that balances phonetic and semantic considerations, it is rendered as “鲁棒性”, ensuring the term’s monosemy and expanding its connotation while restricting its denotation to a specific characteristic of systems within the field of computer science and artificial intelligence. This approach facilitates the accurate conveyance of the term’s meaning. Additionally, “鲁棒性” forms a small terminological system within the conceptual framework of model design in AI, alongside terms, such as “鲁棒控制器”, reflecting the systematic reproducibility of terminological information.

### **Amplification: Supplementary Annotations**

Given that generative artificial intelligence has gained widespread attention and application primarily in recent years, particularly following breakthroughs in deep learning and neural network technologies, supplementary annotations in the translation can assist readers with varying levels of knowledge in the target

language. This approach helps those with lower knowledge gradients understand highly specialized metaphorical terminology, thereby enhancing the readability and educational value of the translated text.

Example 5: Die Anwendung von **GAN** in der Medizin ermöglicht es, hochpräzise medizinische Bilder zu generieren, die Ärzten bei der Diagnose und Behandlung von Krankheiten unterstützen.

Translation 5: 生成式对抗网络 (**GAN**) 在医学领域的应用使得可以生成高精度的医学图像, 帮助医生进行疾病的诊断和治疗。

Note 1: **Generative Adversarial Network (GAN)** is a deep learning model composed of two opposing neural networks, known as the generator and the discriminator. These two networks learn from each other through adversarial training, ultimately enabling the generator to produce realistic new data samples that resemble real data.

Example 6: Die Anwendung von **DNN** in der medizinischen Bildgebung ermöglicht eine präzise Diagnose von Krankheiten und eine personalisierte Behandlung.

Translation 6: 深度神经网络 (**DNN**) 在医学影像领域的应用使得疾病可以得到精确的诊断和个性化的治疗。

Note 2: **Deep Neural Network (DNN)** is a type of artificial neural network typically composed of multiple layers, with each layer connected to adjacent layers. DNNs have achieved widespread success in fields, such as computer vision, natural language processing, and speech recognition, making them a core component of deep learning.

## Conclusion

Metaphorical terminology, as a special category in technical German, plays a significant role in fostering mutual exchange and learning between Chinese and German scientific communities. Therefore, exploring how to appropriately translate these terms into Chinese is of great importance for promoting academic exchange and practical applications in the field of artificial intelligence. This paper analyzes the lexical characteristics of metaphorical terminology from a vocabulary perspective and, based on this, discusses Chinese translation strategies. For metaphorical terms with high cultural commonality between Chinese and German, a literal translation strategy can effectively convey the metaphorical meaning of the original term while preserving its figurative effect. For semi-technical terms derived from ordinary vocabulary entering specialized fields, free translation that emphasizes the term's specialization and monosemy aligns with the lexical features and stylistic norms of technical texts, ensuring accurate information transmission and comprehension. For relatively novel terms in generative artificial intelligence, the amplification strategy of supplementary annotations, considering the knowledge gradient of target readers, enhances the readability and educational value of the translated text.

In conclusion, the translation of metaphorical terminology in technical German requires a nuanced approach that considers both linguistic and cultural factors. By employing a combination of literal translation, free translation, and supplementary annotations, translators can effectively bridge the gap between Chinese and German scientific communities, thereby enhancing mutual understanding and collaboration in the rapidly evolving field of artificial intelligence. This comprehensive strategy not only preserves the original meaning and intent of the source terms, but also adapts them to the linguistic and cultural context of the target audience, ensuring that the translated texts are both accurate and accessible.

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