

## PRINCIPLES OF TERM FORMATION IN ARTIFICIAL INTELLIGENCE AND NEUROTECHNOLOGY

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**ABSTRACT:** This article examines the linguistic, structural, and semantic principles that guide the formation of terminology in the fields of artificial intelligence (AI) and neurotechnology. With the rapid advancement of machine learning, neural engineering, and cognitive computing, researchers must create precise and internationally standardized terms to ensure clarity and interdisciplinary communication. The study identifies key mechanisms of term formation—affixation, compounding, blending, and acronymization—and analyzes challenges associated with the adaptation of AI and neurotechnology terms in different languages. The findings highlight the importance of conceptual transparency, semantic precision, and cultural neutrality in the creation of new scientific terminology.

**Keywords:** Artificial intelligence; neurotechnology; terminology; term formation; neologisms; machine learning; neural engineering; compounding; affixation; acronymization; semantic transparency.

### INTRODUCTION

The rapid development of Artificial Intelligence (AI) and neurotechnology has introduced a wide range of new scientific concepts, requiring the creation of precise, systematic, and internationally standardized terminology. The speed of innovation in machine learning, neural engineering, and cognitive computing has led to the emergence of thousands of new terms within the last decade, many of which continue to evolve. Terminology in these domains plays a crucial role in ensuring clarity, interoperability, and consistency across disciplines such as computer science, neuroscience, biomedical engineering, linguistics, and cognitive psychology.

This article examines the principles of term formation in AI and neurotechnology, exploring linguistic, structural, and semantic mechanisms that guide the creation of new terms. The study also highlights the challenges of translating and adapting emerging terminologies into other languages, especially in non-Indo-European contexts such as Uzbek.

Terms in AI and neurotechnology must reflect the underlying scientific concept with maximum clarity. Researchers aim to ensure semantic transparency so that terms can be interpreted correctly across languages and fields.

Examples:

deep learning — refers to multi-layered neural network models

brain-computer interface (BCI) — explicitly describes the system connecting brain signals to devices

neuro-prosthetics — signifies prosthetic devices controlled through neural activity

Motivation is achieved through morphological clarity, logical semantic mapping, and avoidance of ambiguity.

AI and neurotechnology research is global; thus, English dominates as the lingua franca. Most terms emerge in English and are borrowed into other languages with minimal adaptation (e.g., AI, machine learning, neural network).

International bodies such as IEEE, ISO, and ICANN play a key role in harmonizing terminology and preventing conceptual inconsistencies.

Affixation is one of the most productive methods. Key affixes include:

**Neuro-**: neurogenetics, neuromodulation, neuroinformatics

**Bio-**: biofeedback, biocomputing

**Cyber-**: cybersecurity, cyberbioengineering

**Auto- / Self-**: autonomous systems, self-learning algorithms

These elements provide semantic predictability and help categorize terms into sub-fields.

Compound terms are dominant in AI terminology, often representing complex processes.

Examples:

machine learning

natural language processing

reinforcement learning

artificial neural network

predictive analytics

Such constructions allow researchers to encode multi-layered processes into compact linguistic units.

### **Abbreviations and Acronyms**

Due to the complexity of definitions, acronyms are frequently used.

Examples:

AI — Artificial Intelligence

ANN — Artificial Neural Network

CNN — Convolutional Neural Network

BCI — Brain–Computer Interface

EEG — Electroencephalography

These are widely standardized and internationally recognized.

Blended terms often appear in interdisciplinary fields.

Examples:

cobot (collaborative + robot)

infotech (information + technology)

neurotech (neuro + technology)

Blending increases linguistic economy and supports innovation in naming.

Terms must encode one specific concept without ambiguity. Semantic precision is essential to avoid misinterpretation in clinical, technological, and ethical contexts.

For instance, neural network refers specifically to computational models inspired by the brain, while biological neural network is its biological counterpart.

New terms must align with established conceptual frameworks. For example:

supervised learning

unsupervised learning

semi-supervised learning

These terms share a lexical and conceptual pattern based on training paradigms.

### **Cross-disciplinary Transparency**

Neurotechnology integrates terms from medicine, biology, engineering, and computer science. Therefore, a created term must be understandable across disciplines.

Examples:

cognitive computing

neuro-robotics

neuro-simulation

Many AI and neurotechnology terms enter other languages unchanged (AI, big data, deep learning). In Uzbek, borrowing occurs with transliteration: neyrotarmoq, sun'iy intellekt, mashinaviy o'qitish.

### **Challenges in Translation**

Key issues include:

lack of equivalents in target languages

differences in morphological structure

preserving semantic accuracy

avoiding calques that distort meaning

For instance, reinforcement learning is difficult to translate precisely because “reinforcement” in English carries both behavioral and computational connotations.

### **Cultural Neutrality**

Terms must avoid culturally-biased metaphors. Scientific terminology benefits from neutrality, universality, and transparency.

### **Ethical-Neurological Terms**

Emerging technologies require new terms to describe ethical dilemmas.

Examples:

algorithmic bias

neuro-privacy

neuro-rights

These reflect concerns related to autonomy, data protection, and human augmentation.

### **Rapid Technological Change**

Neurotechnology evolves quickly, leading to provisional terms that later become standardized. For example, general AI, neuro-enhancement, and cognitive augmentation were initially informal but now widely accepted.

## **CONCLUSION**

Term formation in artificial intelligence and neurotechnology follows a set of linguistic, structural, and semantic principles aimed at ensuring precision, clarity, and universality. Affixation, compounding, acronymization, and blending remain the most productive mechanisms. As technology evolves rapidly, terminology must adapt to describe new concepts while maintaining international consistency.

In addition, effective translation and localization of terms remain critical for harmonizing scientific communication across languages. A deeper understanding of these principles enables linguists, researchers, and educators to contribute to the systematic development of terminologies in emerging scientific fields.

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