

SEMANTIC RELATIONS IN ARTIFICIAL INTELLIGENCE TERMINOLOGY: A
COMPARATIVE STUDY OF UZBEK AND ENGLISH

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Abstract: *This article investigates the semantic relations that structure artificial intelligence (AI) terminology in the Uzbek and English languages, focusing on synonymy, polysemy, and hyponymy. Based on a corpus of 120 AI-related terms drawn from scientific literature and terminological sources in both languages, the study shows that the two systems share a largely parallel semantic hierarchy, since Uzbek AI terminology develops mainly through the translation and adaptation of the internationally established English conceptual system. At the same time, the article identifies language-specific patterns of synonymic competition and polysemy that arise from differing word-formation strategies. The findings are relevant for terminology standardization, technical translation, and AI-related lexicography in Uzbek.*

Keywords: *artificial intelligence, terminology, semantic relations, synonymy, polysemy, hyponymy, Uzbek language, English language, comparative linguistics.*

As artificial intelligence terminology continues to expand, the semantic organization of this specialized vocabulary becomes an important object of linguistic study. Beyond the formal structure of individual terms, understanding how they relate to one another — through synonymy, polysemy, and hierarchical (hyponymic) relations — is essential for building coherent, learnable, and translatable terminological systems. This is particularly relevant for the Uzbek language, which is actively absorbing AI concepts originally formulated in English and must integrate them into a semantically consistent native system.

This article aims to examine the semantic relations within AI terminology in Uzbek and English on a comparative basis, to determine the extent to which the semantic hierarchy of the field is preserved across the two languages, and to identify points of divergence that may cause ambiguity or inconsistency in scientific and educational use.

The study draws on a corpus of 120 AI-related terms collected from English-language scientific publications and their attested Uzbek equivalents in academic articles, course materials, and terminological glossaries. Terms were analyzed using componential semantic analysis to identify shared and distinctive semantic features, and were classified according to three relation types: synonymy (multiple forms for one concept), polysemy (one form with multiple related meanings), and hyponymy (hierarchical relations between general and specific concepts). A comparative method was then applied to assess correspondence between the English and Uzbek semantic networks.

Semantic relations in terminology have long been recognized as a key organizing principle of specialized vocabularies. Synonymy in terminology differs from synonymy in general language in that it is typically viewed as undesirable, since precision requires a one-



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to-one correspondence between a term and a concept; competing synonyms therefore tend to be resolved through standardization over time. Polysemy, similarly, is minimized in well-developed terminological systems, though it frequently persists at the boundary between general and specialized vocabulary, where everyday words are terminologized without losing their original meaning. Hyponymy, by contrast, is considered a constructive relation in terminology, since it reflects the taxonomic structure of a scientific field and supports systematic term formation, definition writing, and knowledge organization. These three relations therefore provide a natural framework for comparing how two languages organize the same conceptual domain.

Synonymic variation typically emerges during the early stage of concept adoption, before a single preferred term becomes standardized. In English, this is illustrated by the historical competition between machine intelligence and artificial intelligence, or between deep neural network and multilayer neural network, before usage converged on the now-dominant forms. In Uzbek, synonymic competition is more pronounced and often reflects the coexistence of borrowing and calquing strategies for the same concept: *sun'iy intellekt* and, less frequently, *sun'iy aql* are both attested for artificial intelligence, while *neyron tarmoq* and *neyral tarmoq* compete as equivalents of neural network. Such variation, while a natural stage of terminological development, complicates indexing, translation, and educational standardization if left unresolved.

True polysemy is relatively rare among core AI terms, since terminological systems generally favor monosemous, precisely defined units. However, a notable number of general-language words acquire additional, specialized meanings when they enter the AI domain, producing a form of terminological polysemy. The English word *model*, for instance, denotes a trained computational representation in machine learning, distinct from its general meaning of "a representation of a system or process." The Uzbek equivalent *model* shows the same semantic extension, indicating that this polysemy is transferred through calquing of the English concept rather than arising independently within Uzbek. A similar pattern is observed with the word *feature* (*belgi/xususiyat* in Uzbek), which denotes a measurable input variable in machine learning contexts, in addition to its general meaning of "characteristic" or "property."

Further examples reinforce this pattern of parallel terminologization. The English word *weight*, in its general sense denoting physical mass, acquires a distinct technical meaning in neural network architecture as a numerical parameter that scales the influence of an input signal; the Uzbek term *og'irlik* undergoes an identical semantic shift. Likewise, *layer* (*qatlam* in Uzbek) is extended from its general architectural meaning to denote a processing stage within a neural network, again mirroring the English source term rather than developing independently.

Hyponymic relations are the most systematically preserved semantic relations across the two languages, reflecting the hierarchical structure of AI as a scientific field. In English, artificial intelligence functions as a hyperonym for machine learning, which is in turn a hyperonym for deep learning, reinforcement learning, and supervised learning. The Uzbek

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system mirrors this hierarchy closely: sun'iy intellekt > mashinali o'rganish > chuqur o'rganish, nazoratli o'rganish. Table 1 summarizes this parallel hierarchy for three conceptual levels.

Level	English	Uzbek
General field (hyperonym)	artificial intelligence	sun'iy intellekt
Subfield (hyponym, level 1)	machine learning	mashinali o'rganish
Specific method (hyponym, level 2)	deep learning / reinforcement learning	chuqur o'rganish / mustahkamlangan o'rganish

This close correspondence confirms that Uzbek terminology largely inherits the conceptual architecture of English-language AI science through calquing, rather than developing an independent classificatory system. While this ensures cross-linguistic compatibility and ease of translation, it also means that inconsistencies in the English source terminology (for example, overlapping use of deep learning and neural network in popular discourse) tend to be reproduced in Uzbek.

The comparative analysis shows that Uzbek and English AI terminology share a broadly parallel semantic structure, particularly with respect to hyponymic hierarchy, which is preserved with high fidelity through calquing. Divergence is more evident in synonymy, where the coexistence of borrowing and calquing strategies in Uzbek produces a higher degree of terminological variation than in English, and in polysemy, where general-language words acquire specialized AI meanings in both languages through parallel semantic extension.

These findings suggest that terminology planning efforts in Uzbekistan should prioritize the resolution of synonymic variation — through the formal selection of preferred equivalents — over restructuring the semantic hierarchy itself, which already aligns well with international usage. Establishing a centrally maintained, regularly updated bilingual glossary of AI terms would help reduce inconsistency in scientific publishing, translation, and education, while preserving the conceptual compatibility that currently exists between the two terminological systems.

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