MIRZO ULUG‘BEK NOMIDAGI O‘ZBEKISTON MILLIY UNIVERSITETI HUZURIDAGI ILMIY DARAJALAR BERUVCHI DSc.03/25.2021.Fil.01.16 RAQAMLI ILMIY KENGASH ASOSIDAGI BIR MARTALIK ILMIY KENGASH

O‘ZBEKISTON MILLIY UNIVERSITETI

QODIROVA ZEBO GULBOYEVNA

TIBBIYOT TERMINLARI ONTOLOGIK MODELINI YARATISH VA ULARNING SEMANTIKASI

10.00.11 – Til nazariyasi. Amaliy va kompyuter lingvistikasi

Filologiya fanlari bo‘yicha falsafa doktori (PhD) dissertatsiyasi AVTOREFERATI

Toshkent – 2025

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Оглавление автореферата диссертации доктора философии (PhD) по филологическим наукам

Qodirova Zebo Gulboyevna
Tibbiyot terminlari ontologik modelini yaratish va ularning semantikasi 3

Kadirova Zebo Gulboyevna
Creating an ontological model of medical terms and their semantics 25

Кадирова Зебо Гулбоевна
Создание онтологической модели медицинских терминов и их семантики ... 47

E’lon qilingan ishlar ro‘yxati
List of published works
Список опубликованных работ 51

MIRZO ULUG‘BEK NOMIDAGI O‘ZBEKISTON MILLIY UNIVERSITETI HUZURIDAGI ILMIY DARAJALAR BERUVCHI DSc.03/25.2021.Fil.01.16 RAQAMLI ILMIY KENGASH ASOSIDAGI BIR MARTALIK ILMIY KENGASH

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Ilmiy rahbar:	**Abduraxmonova Nilufar Zaynobiddin qizi** filologiya fanlari doktori, professor
Rasmiy opponentlar:	**Raupova Laylo Raximovna** filologiya fanlari doktori, professor
	Muhamedova Saodat Xudoyberdiyevna filologiya fanlari doktori, professor
Yetakchi tashkilot:	**Farg‘ona davlat universiteti**

Dissertatsiya himoyasi Mirzo Ulug‘bek nomidagi O‘zbekiston Milliy universiteti huzuridagi ilmiy darajalar beruvchi DSc.03/25.08.2021.Fil.01.16 raqamli Ilmiy kengash asosidagi bir martalik Ilmiy kengashning 2025-yil “25” noyabr soat 10:00 dagi majlisida bo‘lib o‘tadi (Manzil: 10074, Toshkent shahri, Universitet ko‘chasi, 4-uy. Tel.: (99871) 246-08-62; (99871) 227-10-59; faks: (99871) 246-65-24; e-mail: nauka@nuu.uz. O‘zbekiston Milliy universiteti, Jurnalistika va o‘zbek filologiyasi fakulteti (1-qavat, 108-xona).

Dissertatsiya bilan Mirzo Ulug‘bek nomidagi O‘zbekiston Milliy universitetining Axborot-resurs markazida tanishish mumkin (180 raqami bilan ro‘yxatga olingan). Manzil: 100174, Toshkent 4-uy. Tel.: (99871) 246-08-62.

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N.A.Rahmonov
Ilmiy darajalar beruvchi bir martalik ilmiy kengash raisi, filologiya fanlari doktori, professor

M.B.Xujamqulova
Ilmiy darajalar beruvchi bir martalik ilmiy kengash ilmiy kotibi, filologiya fanlari bo‘yicha falsafa doktori (PhD)

A.E.Mamatov
Ilmiy darajalar beruvchi bir martalik ilmiy kengash qoshidagi ilmiy seminar raisi, filologiya fanlari doktori, professor

KIRISH (falsafa doktori (PhD) dissertatsiyasi annotatsiyasi)

Dissertatsiya mavzusining dolzarbligi va zarurati. Jahon tilshunosligida terminologik tizimni tadqiq etish bo‘yicha, asosan, terminlarning lug‘aviy strukturasi, semantik maydon va terminlararo semantik munosabatlar tahlili asosida keng qamrovli izlanishlar olib borilmoqda. Bu tadqiqotlar terminologiyaning nazariy asoslarini yanada rivojlantirish, terminlarning aniqligi va uzluksizligini ta’minlash hamda ularning amaliy qo‘llanilishini samarali tashkil etishga xizmat qiladi. Sinonimik, antonimik, iyerarxik, paradigmatik va sintagmatik munosabatlarning terminlar doirasida tadqiq etilishi tilshunoslik nazariyasi hamda amaliyotida muhim ahamiyat kasb etmoqda. Til texnologiyalarining rivojlanishi natijasida terminologik tizimni modellashtirish, avtomatlashtirish hamda boshqarish jarayonlari takomillashdi. Natijada terminologik lug‘atlar, tezauruslar va ontologik ma’lumotlar bazalari yaratilib, qidiruv tizimlari, avtomatik tarjima hamda axborot-kommunikatsiya tizimlarida samarali qo‘llanilmoqda.

Dunyo tilshunosligida lug‘aviy birliklar o‘rtasidagi semantik munosabatlarni tahlil qilish borasida amaliy tilshunoslikning ilg‘or yutuqlaridan keng foydalanilmoqda. Semantik tahlillar kompyuter texnologiyalari va metodlari yordamida tadqiq etilmoqda. Bugungi kunda til birliklarining semantik xususiyatlarini foydalanuvchiga qulay, funksional va strukturalashgan shaklda ifodalash masalasi dolzarb hisoblanadi. Bu esa tadqiqotchilarni terminologik tizimlarni modellashtirishda yangi yondashuvlar ishlab chiqishga undamoqda. Tilshunoslikda kompyuter resurslaridan foydalanish natijasida tezaurus, WordNet va ontologik modellarga asoslangan lug‘at tizimlari shakllandi. Ushbu resurslar lug‘aviy birliklarni tizimli tahlil qilish, ularning semantik o‘zaro bog‘liqligini aniqlash hamda terminlarning lisoniy ongdagi kognitiv mohiyatini yoritishda samarali vosita sifatida xizmat qilmoqda.

O‘zbekistonda keyingi yillarda amalga oshirilayotgan til siyosati davlat tilining ilmiy va amaliy imkoniyatlarini kengaytirishga, xususan, terminologik tizimni rivojlantirish va uni raqamlashtirishga xizmat qilmoqda. Tibbiyot terminlarining zamonaviy ilmiy mezonlar asosida tizimlashtirilishi va amaliyotda samarali qo‘llanilishini ta’minlash bugungi kun tilshunosligining dolzarb vazifalaridan hisoblanadi. Shu bilan birga, ilg‘or axborot-kommunikatsiya texnologiyalarining jadal rivojlanishi tibbiy terminlarni ontologik asosda modellashtirish va semantik tuzilishini tizimli o‘rganish zaruratini yuzaga chiqarmoqda. Ushbu tadqiqot mazkur ehtiyojdan kelib chiqib, tibbiyot terminlarini ontologik modellashtirish, ularning semantik aloqalarini aniqlash hamda terminlararo munosabatlarni strukturaviy jihatdan tavsiflashga qaratilgan. Shuningdek, semantik munosabatlar tahliliga asoslangan terminologik ma’lumotlar bazasini shakllantirish va til texnologiyalarida samarali foydalanish o‘zbek kompyuter lingvistikasi oldida turgan muhim vazifalardan biridir.

O‘zbekiston Respublikasi Prezidentining[1] 2019-yil 21-oktyabrdagi PF-5850-son “O‘zbek tilining davlat tili sifatidagi nufuzi va mavqeini tubdan oshirish chora-

[1] Mirziyoyev Sh.M. 2017-2021-yillarda O‘zbekiston Respublikasini rivojlantirishning beshta ustuvor yo‘nalishi bo‘yicha Harakatlar Strategiyasi. – Toshkent: Adolat, 2017. – 112 b.; Mirziyoyev Sh. “Adabiyot va san’at, madaniyatni

tadbirlari to‘g‘risida”gi farmoni, 2020-yil 20-oktyabrdagi PF-6084-son “Mamlakatimizda o‘zbek tilini yanada rivojlantirish va til siyosatini takomillashtirish chora-tadbirlari to‘g‘risida”gi farmoni bilan tasdiqlangan “2020-2030-yillarda o‘zbek tilini rivojlantirish va til siyosatini takomillashtirish konsepsiyasi”da belgilangan davlat tilining axborot texnologiyalari va kommunikatsiyalari bilan integratsiyalashuvini ta’minlashga doir vazifalar, 2021-yil 17-fevraldagi PQ-4996-son “Sun’iy intellekt texnologiyalarini jadal joriy etish uchun shart-sharoitlar yaratish chora-tadbirlari to‘g‘risida” hamda O‘zbekiston Respublikasi Vazirlar Mahkamasining 2019-yil 12-dekabrdagi 984-son “Davlat tilini rivojlantirish departamenti to‘g‘risidagi Nizomni tasdiqlash haqida”gi qarorlari, 2020-yil 29-oktyabrdagi PF-6097-son “Ilm-fanni 2030-yilgacha rivojlantirish konsepsiyasini tasdiqlash to‘g‘risida”gi farmonlari; 2019-yil 4-oktyabrdagi PQ-4479-son “O‘zbekiston Respublikasining “Davlat tili haqida”gi qonuni qabul qilinganligining o‘ttiz yilligini keng nishonlash to‘g‘risida”gi qarori hamda tilimizning amaldagi faoliyatiga tegishli boshqa normativ-huquqiy hujjatlarda belgilangan vazifalarni bajarishda mazkur tadqiqot ma’lum darajada o‘z hissasini qo‘shadi.

Tadqiqotning respublika fan va texnologiyalari rivojlanishining ustuvor yo‘nalishlariga mosligi. Ushbu tadqiqot respublika fan va texnologiyalari rivojlanishining “Axborotlashgan jamiyat va demokratik davlatni ijtimoiy huquqiy, iqtisodiy, madaniy, ma’naviy-ma’rifiy rivojlantirish, innovatsion iqtisodiyotni rivojlantirish” ustuvor yo‘nalishlari bilan bog‘liq.

Muammoning o‘rganilganlik darajasi. Ontologik ma’lumotlar bazasini yaratish, ontologik modellashtirish qonuniyatlari, metodologiyalarni ishlab chiqish va amaliy qo‘llanmalarni yaratishga doir tadqiqotlar T.R.Gruber[2], T.Berners-Lee, N.Noy[3], Gomes-Peres[4], M.Ushold, N.Guarinolarning ishlarida o‘z aksini topgan. Shuningdek, Rossiyada A.Y.Zinovieva[5] ontologik bilimlarga asoslangan ko‘p tilli intellektual kontent tahlil modelini ishlab chiqqan va uni boshqa tillarda qo‘llash imkoniyatini asoslagan. A.V.Dobrov[6] rus tilidagi xabar matnlari sintaktik birliklari

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rivojlantirish xalqimiz ma’naviy olamini yuksaltirishning mustahkam poydevoridir” mavzusida O‘zbekiston ijodkor ziyolilari vakillari bilan uchrashuvdagi ma’ruzasi // Xalq so‘zi, 2017. 4-avgust; Mirziyoyev Sh. Buyuk kelajagimizni mard va olijanob xalqimiz bilan birga quramiz. – Toshkent: O‘zbekiston, 2017. – 488 b.; O‘zbekiston Respublikasi Prezidentining 2017-yil 7-fevraldagi sonli Farmoni // Xalq so‘zi, 2017. 8-fevral. – № 28 (6722); Mirziyoyev Sh. Milliy taraqqiyot yo‘limizni qat’iyat bilan davom ettirib, yangi bosqichga ko‘taramiz. 1-jild. – Toshkent: O‘zbekiston, 2019. – 592 b.; Mirziyoyev Sh. “Mamlakatimizda o‘zbek tilini yanada rivojlantirish va til siyosatini takomillashtirish chora-tadbirlari to‘g‘risida” PF-5850-sonli Farmoni // Ma’rifat, 2020. 21.10; O‘zbekiston Respublikasi Prezidenti Sh.M.Mirziyoyevning “O‘zbekiston Respublikasining “Davlat tili haqida”gi Qonuni qabul qilinganining o‘ttiz yilligini keng nishonlash to‘g‘risida”gi PQ-4479-son Qarori. 04.10.2019.

[2] Gruber T.R. The role of common ontology in achieving sharable, reusable knowledge bases / Principles of Knowledge Representation and Reasoning. Proceedings of the Second International Conference. J.A.Allen, R.Fikes, E.Sandewell eds. – Morgan Kaufmann, 1991. – P. 601-602.

[3] Noy N., McGuinness D. Ontology Development 101: A Guide to Creating Your First Ontology. – Knowledge Systems Laboratory Technical Report KSL-01-05 and Stanford Medical Informatics Technical Report SMI-2001-0880, March 2001. – P. 1-25.

[4] Gomez-Perez A., Corcho O. Ontology Languages for the Semantic Web. URL: http://ou.upm.eS/2646/l/JCR01. 2013

[5] Зиновиева А.Ю. Модель многоязычного интеллектуального контент-анализа (на материале англо, франко- и русскоязычных новостных сообщений о террористической деятельности). Автореф. дисс. ... канд. филол. наук: 10.02.21 – Челябинск, 2022. – С. 10

[6] Добров А.В. Автоматическая рубрикация новостных сообщений средствами синтаксической семантики. Автореферат дисс. ... канд. филол. наук: 10.02.21 – Санкт-Петербург, 2014. – С. 5.

iyerarxiyasining yangi kompyuter modelini ishlab chiqdi. Ushbu model sintaktik bog‘liqliklarni, iyerarxik birliklar o‘rtasidagi munosabatlarni hamda sintaktik komponentlarning ma’nolar tizimiga oid ma’lumotlarni samarali va avtomatik tarzda ifodalash imkonini beruvchi universal algoritmni taqdim etadi. B.N.Nguyen[7] tomonidan ontologik modellar va semantik texnologiyalardan foydalanish asosida axborot resurslarini izlash modellari, usullari va algoritmlari ishlab chiqilgan. N.V.Lukashevich[8] ontologik turdagi bilimlarni ifodalashning bir qancha modellarini taklif etadi. L.G.Fedyuchenko[9] tadqiqoti lingvistik ontologiya va tezaurus tamoyillari integratsiyasiga asoslangan texnik bilimlarni uzatish modelini nazariy asoslashga qaratilgan. Bundan tashqari, K.I.Belousov[10], N.Y.Kazakova, M.G.Zasedateleva[11], A.G.Shabalin[12], A.Aleksandrovich[13], R.A.Gatiatullin[14] kabi olimlar kompyuter lingvistikasi, amaliy tilshunoslikda semantik munosabatlar yuzasidan tadqiqot olib borganlar. Jumladan, R.A.Gatiatullin konseptual model yaratish, turk tillarini kompyuterda qayta ishlash uchun morfemalarga asoslangan yagona lingvistik bilimlar grafigi modeli[15] hamda agglyutinativ tillarning xususiyatlari va intellektual texnologiyalarda qo‘llanilish imkoniyatlari[16]ga doir izlanishlar olib borgan.

O‘zbek tilshunosligida A.Po‘latov, S.Muhamedova, N.Abduraxmonova[17], M.Abjalova[18], B.Mengliyev, L.Raupova, O.Abdullayeva[19], A.Eshmo‘minov, Sh.Gulyamova, A.Axmedova, N.Ataboyev, G‘.Abduvahobovlar tomonidan olib

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[7] Нгуен Б.Н. Модели и методы поиска информационных ресурсов с использованием семантических технологий. Автореферат дисс. ... канд. тех. наук: 05.13.11 – Томск, 2012. – С. 16.

[8] Лукашевич Н.В. Модели и методы автоматической обработки неструктурированной информации на основе базы знаний онтологического типа. Автореферат дисс. ... канд. наук: 05.25.05. – Москва, 2014. – С. 34.

[9] Федюченко Л.Г. Терминологическая база данных как трансферная модель технического знания. Автореферат дисс. ... док. филол. наук: 10.02.21. – Тюмень, 2021. – С. 42.

[10] Белоусов К.И. Деятельностно-онтологическая концепция формообразования текста. Автореферат дисс. ... канд. филол. наук: 10.02.19 – Барнаул, 2006. – С. 20.

[11] Заседателева М.Г. Репрезентация концепта “компетенция” в методическом дискурсе: онтологический и тезаурусный аспекты: (на материале немецкого и русского языков). Автореф. дисс. ... канд. филол. наук. – М., 2011.

[12] Шабалин А.Г. Разработка и исследование грамматического подхода для решения задачи автоматического выравнивания и объединения онтологий предметных областей. Автореф. дисс. ... канд. филол. наук. – М., 2013.

[13] Александрович А. Математическое моделирование процесса анализа реляционных баз данных при интеграции информационных систем. Автореф. дисс. ... канд. филол. наук. – М., 2017.

[14] Gatiatullin R., Khakimov B., Suleymanov D., Gilmullin R. (2017). Context-Based Rules for Grammatical Disambiguation in the Tatar Language. In: Nguyen, N., Papadopoulos, G., Jędrzejowicz, P., Trawiński, B., Vossen, G. (eds) Computational Collective Intelligence. ICCCI 2017. Lecture Notes in Computer Science. Vol 10449. Springer, Cham. // https://doi.org/10.1007/978-3-319-67077-5-51.

[15] Гатиатуллин А.Р., Прокопьев Н.А., Сулейманов Д.Ш. Модель лингвистических графов знаний тюркских языков // Онтология проектирования, 2024. Т. 14. – № 3 (53). – С. 366-378. DOI: 10.18287/2223-9537-2024-14-3-366-378.

[16] Сулейманов Д.Ш., Гильмуллин Р.А., Гатиатуллин А.Р., Прокопьев Н.А. Когнитивный потенциал естественных языков агглютинативного типа в интеллектуальных технологиях // Онтология проектирования, 2023. Т. 13. – № 4 (50). – С. 496-506. DOI:10.18287/2223-9537-2023-13-4-496-506

[17] Abduraxmonova N.Z. Inglizcha matnlarni o‘zbek tiliga tarjima qilish dasturining lingvistik ta’minoti (sodda gaplar misolida). Filol. fan. b. fals. dok. ... diss. avtoref. – Toshkent, 2018. – 49 b.; Abduraxmonova N. O‘zbek tili elektron korpusining kompyuter modellari. Filol. fan. d-ri … diss. avtoref. – Toshkent, 2021. – 72 b.

[18] Abjalova M. O‘zbek tili ontologiyasini yaratish tamoyillari. Filol. fan. d-ri … diss. avtoref. – Toshkent, 2022. – 80 b.; Abjalova M. O‘zbek tili ontologiyasini yaratish tamoyillari. Filol. fan. d-ri … diss. – Toshkent, 2022. – 228 b.

[19]Abdullayeva O. O‘zbek tilining internet axborot matnlari korpusini shakllantirishning nazariy va amaliy asoslari. Filol. fan. b. fals. dok. … diss. avtoref. – Andijon, 2022. – 15 b.

borilgan izchil ilmiy tadqiqotlar sohaning rivojlanishiga sezilarli amaliy hissa qo‘shgan.

Markaziy Osiyoda A.Sharipbay, B.Ergesh, G.Elibayeva[20] qozoq va qirg‘iz tillaridagi otlarning ontologik modelini solishtirish masalalarini, N.Israilova, P.Bakasova, R.Niyazova, S.Kudubayeva, R.Turebayeva, A.Aktayeva, L.Davletkireyeva[21]lar kompyuter lingvistikasiga oid ta’lim dasturlarining ontologik modelini yaratish, A.S.Mukanova, L.Zhetkinbay[22]lar qozoq tilidagi sifat so‘z turkumini ontologik modellashtirish, N.Abduraxmonova, M.Aripov[23]lar o‘zbek tilida sifat so‘z turkumining ontologik modelini yaratishga doir izlanishlar olib borgan.

Tadqiqotning dissertatsiya bajarilgan oliy ta’lim muassasasi ilmiy tadqiqot ishlari rejalari bilan bog‘liqligi. Dissertatsiya Mirzo Ulug‘bek nomidagi O‘zbekiston Milliy universiteti Kompyuter lingvistikasi va amaliy tilshunoslik kafedrasi ilmiy tadqiqot rejasining “Kompyuter leksikografiyasi”, “Ontologiya va semantik texnologiyalar” yo‘nalishi doirasida bajarilgan.

Tadqiqotning maqsadi sohaviy terminologik ontologik model yaratishda o‘zbek tilidagi tibbiyot terminlarini iyerarxik tasniflash va semantik maydonlarini aniqlash, tibbiy terminlar paradigmatik, sintagmatik tahliliga ko‘ra ontologik tamoyillarini nazariy jihatdan asoslashdan iborat.

Tadqiqotning vazifalari:

kompyuter lingvistikasida ontologiya va semantik texnologiyalarning nazariy asoslari, ontologik ma’lumotlar bazasi yaratishda xalqaro tajribani o‘rganish va semantik resurslarda konsept ifodasini aniqlash maqsadida, ontologiya va tezaurus modellarida konsept tushunchasini qiyosiy tahlil etish;

tabiiy tillar jarayoni uchun ontologik instrumentlarni tavsiflash, Protege muharririda tibbiyot sohasi terminlarining ma’lumotlar bazasini yaratish;

terminologik ma’lumotlar bazasini loyihalashning iyerarxik tasnifi asosida asosiy sinflarni va ularning tarkibida kichik sinflarni aniqlash hamda ontologik modellashtirishda tibbiyot terminlarini paradigmatik, sintagmatik munosabatlar asosida tahlil qilish;

tibbiyot terminlari semantik munosabatlar tahliliga ko‘ra lingvistik bazasini shakllantirish va mazkur resursni samarali izlash imkonini beruvchi qidiruv interfeysi modelini https://uzbekontology.uz/ saytida loyihalashdan iborat.

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[20] Шарипбай А.А., Ергеш Б.Ж., Елибаева Г.К., Жеткенбай Л. Сравнение онтологических моделей существительных казахского и кыргызского языков / Шестая Международная конференция по компьютерной обработке тюркских языков “TurkLang 2018” (Труды конференции). – Ташкент: NAVOIY UNIVERSITETI, 2018. – 390 с.

[21] Sharipbay A., Niyazova R., Kudubayeva S., Turebayeva R., Aktayeva A., Davletkireyeva L. Ontological model of the educational program computational linguistics / Шестая Международная конференция по компьютерной обработке тюркских языков “TurkLang 2018” (Труды конференции). – Ташкент: NAVOIY UNIVERSITETI, 2018. – 390 с.

[22] Шарипбай А.А., Елибаева Г.К., Муканова А.С., Жеткенбай Л. Онтологическое моделирование имени прилагательного казахского языка / Шестая Международная конференция по компьютерной обработке тюркских языков “TurkLang 2018” (Труды конференции). – Ташкент: NAVOIY UNIVERSITETI, 2018. – 390 с.

[23] Abdurakhmonova N., Aripov M. Uzbek ontology of Uzbek language as example of adjective / Шестая Международная конференция по компьютерной обработке тюркских языков “TurkLang 2018” (Труды конференции). – Ташкент: NAVOIY UNIVERSITETI, 2018. – 390 с.

Tadqiqotning obyekti. Tadqiqotning obyekti sifatida tibbiyot ensiklopediyasi, tibbiy terminologiyaga oid lug‘atlar[24] va tibbiyot sohasiga doir matnlar korpusi tanlandi.

Tadqiqotning predmetini tibbiyot terminlarining semantik tuzilmasi, paradigmatik va sintagmatik munosabatlari, shuningdek, iyerarxik tasnifi asosida ontologik modelda ifodalash tashkil etadi.

Tadqiqot usullari. Mavzuni yoritishda tasniflash metodi, statistik tahlil metodi, ontologik modellashtirish usulidan foydalanildi.

Tadqiqotning ilmiy yangiligi quyidagilardan iborat:

tibbiyot terminlari ontologik modelini yaratishda leksik semantik resurslarni shakllantirishga oid yondashuvlar asos qilib olinib, modelning semantik tasnifi yoritildi hamda lingvistik jihatdan asoslab berildi. Shuningdek, ontologiya va tezaurus lug‘atida konsept tushunchasining lisoniy modellari tibbiy terminlar misolida dalillandi;

o‘zbek tilidagi tibbiy terminlar lug‘ati korpus asosida tabiiy tilni qayta ishlash jarayonlari uchun ontologik vositalar yordamida tavsiflandi. Shuningdek, Protege muharriri yordamida tibbiyot sohasiga oid terminlarning ontologik modeli ishlab chiqildi;

terminologik ma’lumotlar bazasini loyihalashda iyerarxik tasnif asosida asosiy sinflar va ular tarkibida ichki sinflar aniqlanib, tibbiyot terminlari sohalariga ko‘ra guruhlarga tasniflandi hamda tibbiyot terminlarini ontologik modellashtirishda paradigmatik, sintagmatik munosabatlariga asoslangan metodologiya ishlab chiqildi;

https://uzbekontology.uz/ saytida tibbiyot terminlarning lingvistik bazasi yaratildi hamda ularning semantik guruhlariga ko‘ra ma’lumotlar bazasi arxitekturasi shakllantirildi.

Tadqiqotning amaliy natijalari quyidagilardan iborat: Mazkur ilmiy tadqiqot ishi 2024-2025-yillarga mo‘ljallangan “Yangi so‘z va atamalarning o‘zbekcha muqobilini sun’iy intellekt asosida avtomatik taqdim etuvchi “Atamacom.uz” dasturiy ta’minoti platformasi va mobil ilovalarini yaratish” nomli amaliy loyihada bevosita ishtirok etilib, platformaning ontologik bilimlar bazasini shakllantirishda ushbu tadqiqotda ilgari surilgan nazariy asoslardan namuna o‘rnida foydalanilgan. Shuningdek, 2024-2025-yillarda amalga oshirilgan “PARATRANSLATOR: parallel korpusga asoslangan kontekstologik elektron tarjima lug‘at platformasini yaratish” deb nomlangan innovatsion loyihada nazarda tutilgan vazifalarni amalga oshirishga xizmat qilgan;

“Ko‘p sohaviy o‘zbek tili ontologiyasining dasturiy ta’minoti: Ontolingua” (DGU 20239705) uchun mualliflik guvohnomasi olingan.

Tadqiqot natijalarining ishonchliligini chiqarilgan xulosalarning izchilligi, ularni dalillovchi ma’lumotlarning rasmiy manbalardan olingani, to‘plangan material

[24] Solixo‘jayev Z. va boshq. Tibbiyot ensiklopediyasi – T.: Sharq, 2016. – 640 b., Usmanxodjayev A., Abilov O‘., Turaxanova M. Tibbiy atamalar lug‘ati. – T.: Donishmand ziyosi, 2022. – 400 b., Qosimov A. Tibbiyot terminlari izohli lug‘ati. I jild. – Toshkent: Tibbiyot, 2003. – 472 b., Qosimov A. Tibbiyot terminlari izohli lug‘ati. II jild. – Toshkent: Tibbiyot, 2003. – 568 b., Qosimov A. Tibbiyot terminlari izohli lug‘ati. III jild – Toshkent: Tibbiyot, 2008. – 576 b., Qosimov A. Tibbiyot terminlari izohli lug‘ati. IV jild. – Toshkent: Tibbiyot, 2008. – 480 b.

tahlilining ilmiy jihatdan yoritilgani, nazariy xulosa va tavsiyalarning amaliyotga joriy etilgani, olingan natijalarning sohaviy ontologik elektron lug‘atlar[25], ontologik modellashtirishga oid nazariyalarga asoslangani tashkil etadi.

Tadqiqot natijalarining ilmiy va amaliy ahamiyati. Ilmiy tadqiqot natijalari o‘zbek tili leksikasi, terminologiyasi, uning tarkibiy qismi bo‘lgan tibbiy terminlarni rivojlantirish, takomillashtirish va to‘g‘ri tartibga solishga xizmat qiladi. Shu bilan birgalikda, terminlar pragmatikasi, ya’ni ulardan to‘g‘ri foydalanish masalasiga ma’lum darajada hissa bo‘lib qo‘shiladi.

Tadqiqot ishida tibbiyot terminlari ontologik modelining yaratilishi muhim amaliy ahamiyatga ega bo‘lib, o‘zbek tiliga yangi axborot texnologiyalarini tatbiq etish (kompyuter ontologik lug‘atlarini yaratish) va uni axborot resurslari bilan boyitishga ko‘maklashadi.

Dissertatsiya materiallaridan oliy o‘quv yurtlarining bakalavriat va magistratura bosqichlari uchun “Amaliy tilshunoslik”, “Kompyuter lingvistikasi”, “Ontologiya va semantik texnologiyalar”, “Kompyuter leksikografiyasi” kabi fanlar, shuningdek, tibbiyot fanlarini o‘qitishda foydalanish mumkin. Mazkur fanlar bo‘yicha yangi darslik, o‘quv qo‘llanma, ma’ruza matni hamda lug‘atlar yaratishda dissertatsiya materiallari manba sifatida xizmat qilishi mumkin.

Tibbiyot terminlarini ontologik modellashtirish asosida tuzilgan ma’lumotlar bazasidan kompyuter lingvistikasi va amaliy tilshunoslik ixtisosligidagi tadqiqotchilar, amaliy leksikografiya fan yo‘nalishidagi izlanuvchilar, shuningdek, tibbiyot sohasi xodimlari ham manba sifatida foydalanishlari mumkin. Qolaversa, tezkor axborot qidiruv ishlaridagi samaradorlikni oshiradi.

Tadqiqot natijalarining joriy qilinishi. Tibbiyot terminlari ontologik modelini yaratish va ularning semantikasini tadqiq qilish asosida:

o‘zbek tili kompyuter lingvistikasi uchun terminologik ontologik ma’lumotlar bazasini yaratish, xususan, tibbiyot terminlari ontologik bazasini tuzishda semantik munosabatlar tahliliga asoslangan tadqiqotining nazariy asoslaridan 2021-2023-yillarda Toshkent axborot texnologiyalari universitetida bajarilgan “Yangi avlod o‘quv lug‘atlari va ularning mobil ilovalarini yaratish” mavzusidagi amaliy loyihasini bajarishda foydalanilgan (Muhammad al-Xorazmiy nomidagi Toshkent axborot texnologiyalari universiteti 2025-yil 17-martdagi 949/05-2-son ma’lumotnomasi). Natijada loyiha yangi fikr va xulosalar bilan boyigan;

o‘zbek tili korpusi uchun terminologik ontologik ma’lumotlar bazasini yaratish, shuningdek, o‘zbek tili korpusi uchun tibbiyot terminlarini semantik maydonlar bo‘yicha iyerarxik tasnifi asosida ontologik modellashtirish tamoyillaridan 2021-2023-yillarda bajarilgan “O‘zbek tilining milliy korpusini loyihalash va dasturiy majmua ishlab chiqish” mavzusidagi amaliy loyihasini amalga oshirishda foydalanildi (Muhammad al-Xorazmiy nomidagi Toshkent axborot texnologiyalari universiteti Samarqand filialining 2025-yil 14-martdagi 139/01-01-son ma’lumotnomasi). Tadqiqot natijalarini qo‘llash amaliy loyiha doirasida tayyorlangan lingvistik baza yaratish hamda korpusning dasturiy ta’minotini mukammallashtirishga xizmat qilgan;

[25] https://disease-ontology.org/

O‘zbekiston Milliy universitetida bajarilgan “REP-25112021/113 – UzUDT: O‘zbek tilida tabiiy tilni qayta ishlash uchun universal bog‘liqlik daraxti korpusi va uning semantik tahlili” mavzusidagi xalqaro ilmiy loyihada tadqiqotning ontologik model yaratishda semantik munosabatlar tahlili, ontologiya va tezaurus modellarida konsept tushunchasi talqini, terminologik tizimda semantik maydonlarni aniqlashda semantik munosabatlar hamda iyerarxik tasnifi yuzasidan amalga oshirgan tadqiqi nazariy asos vazifasini o‘tagan (Mirzo Ulug‘bek nomidagi O‘zbekiston Milliy universitetining 2025-yil 3-martdagi 04/11-3400-son ma’lumotnomasi). Natijada ontologik model yaratishda semantik munosabatlar tahlili, ontologiya va tezaurus modellarida konsept tushunchasi talqini masalasiga oydinlik kiritilgan.

Tadqiqot natijalarining aprobatsiyasi. Tadqiqot natijalari 5 ta xalqaro va 2 ta respublika ilmiy-amaliy anjumanlarida muhokamadan o‘tgan.

Tadqiqot natijalarining e’lon qilinganligi. Dissertatsiyaning asosiy mazmuni muallif tomonidan chop etilgan 7 ta ilmiy-amaliy anjuman va seminarlarda, 6 ta ilmiy maqola (ularning 5 tasi O‘zbekiston Respublikasi OAK e’tirof etgan ilmiy jurnallarda), 1 ta impakt faktor bazasida indekslangan ilmiy jurnalda o‘z ifodasini topgan.

Dissertatsiyaning tuzilishi va hajmi. Dissertatsiya kirish, uchta asosiy bob, umumiy xulosa va foydalanilgan adabiyotlar ro‘yxatidan iborat. Ishning umumiy hajmi 128 sahifani tashkil qiladi.

DISSERTATSIYANING ASOSIY MAZMUNI

Dissertatsiyaning **Kirish** qismida tadqiqotning dolzarbligi va zarurati asoslangan, tadqiqot ishining maqsad va vazifalari, obyekti va predmeti tavsiflangan, respublika fan va texnologiyalar rivojlanishining ustuvor yo‘nalishlariga mosligi ko‘rsatilgan, tadqiqotning ilmiy yangiligi va amaliy natijalari bayon qilingan, olingan natijalarning ilmiy va amaliy ahamiyati ochib berilgan, tadqiqot natijalarini amaliyotga joriy qilish, nashr etilgan ishlar va dissertatsiya tuzilishi bo‘yicha ma’lumotlar keltirilgan.

Dissertatsiyaning **“Ontologiya kompyuter lingvistikasining o‘rganish obyekti sifatida”** deb nomlangan birinchi bobida kompyuter lingvistikasida ontologiya va semantik texnologiyalarning vujudga kelishidagi nazariy asoslar, ontologiyani tasniflashning asosiy tamoyillari, yaratilish maqsadi bo‘yicha ontologiya turlari, ontologik modellar tavsifi, darajalar bo‘yicha ontologiya tasniflari, ontologiya va tezaurusda konsept tushunchasi talqini, tabiiy tillar jarayoni uchun ontologiyaga oid muharrirlar va ontologik tavsif tillari tahlil etilgan, sohada amalga oshirilgan ishlar xususida ma’lumot berilgan va uning nazariy asoslari tadqiq etilgan.

Dissertatsiyaning *“Kompyuter lingvistikasida ontologiya va semantik texnologiyalarning nazariy asoslari”* deb nomlangan birinchi bobning birinchi faslida ontologiyaning yaratilish zaruriyati, ontologiyaning olimlar tomonidan o‘rganilishi, ontologiya tushunchasining falsafa hamda kompyuter texnologiyalarida qo‘llanilishi va ta’riflari o‘rin olgan.

Lingvistik resurslarni lug‘atlar, tezaurus, ontologiya ko‘rinishida ifodalash mumkin. Dastlab falsafa fanida shakllangan “ontologiya” atamasi keyinchalik sun’iy intellekt tadqiqotchilari tomonidan o‘zlashtirilib, turli ilmiy yo‘nalishlarda qo‘llanish doirasini kengaytirdi.

Texnika va axborot texnologiyalarida “ontologiya” terminining tatbiq etilishi amerikalik olim T.Gruber nomi bilan bog‘lanadi. U aqlli tizimlar hamda inson va kompyuter o‘rtasidagi o‘zaro munosabatlarni tadqiq etish jarayonida ontologik yondashuvni taklif etgan. Olimning ta’rifiga ko‘ra[26], “Ontologiya konseptualizatsiyaning aniq va rasmiy tavsifi” sifatida ifodalanadi. Mazkur ta’rif ontologik modellashtirishga oid ilmiy izlanishlar uchun nazariy asos bo‘lib xizmat qilgan va turli bilim sohalarida bilimlarni standartlashtirish hamda almashinish imkonini beruvchi umumiy konseptual model va lug‘aviy birliklarni ishlab chiqish zaruratini yuzaga keltirgan. Mazkur konsepsiya turli tizimlar va ilovalarda qayta ishlatilishi mumkin bo‘lgan ontologiyani yaratishga qaratilgan hamda ularni sun’iy intellekt tizimlarini yaratishning muhim tarkibiy qismiga aylantirdi.

V.N.Borst, J.M.Akkermans[27] T.Gruber tomonidan ilgari surilgan ta’rifni rivojlantirib, ontologiyani “Umumiy tushunchalarning rasmiy ifodalanishi” tarzida talqin qiladilar va bunda rasmiylik hamda umumiylik tamoyillariga urg‘u beriladi.

Keyinchalik ontologiyaning bir qator ta’riflari yuzaga keldi. Eng mashhurlaridan biri italiyalik tadqiqotchi N.Guarino tomonidan quyidagicha: “Ontologiya – bu dunyoning mumkin bo‘lgan konseptualizatsiyalarini cheklaydigan rasmiy nazariya”[28] – deya qayd etiladi. Shuningdek, N.Guarino ontologiyaning nazariy asoslarini tahlil qilib, ontologiyani tasniflash va ularning o‘zaro farqlarini aniqlashda o‘z hissasini qo‘shgan.

Birinchi bobning ikkinchi fasli *“Ontologiya va tezaurusda konsept tushunchasi talqini”* deb nomlanib, unda ontologiya ham, tezauruslar ham bilimlarni tashkil etish vositalari bo‘lib xizmat qilsa-da, konseptual tuzilishi va qo‘llanilishi bilan sezilarli darajada farqlanishi, ontologiya va tezaurus modellari tavsifi, ontologiya va tezaurusdagi konseptlar o‘rtasidagi munosabatlar tahlilga tortilgan.

Taksonomik munosabat ontologik munosabatlar ichida eng muhimi sifatida qayd etiladi. Taksonomiya – bu tasniflash yoki toifalash bilan bog‘liq jarayon. Odatda, u ikki qismdan iborat: sinflarning asosiy sxemasini ishlab chiqish (taksonomiya) va tushunchalarni sinflarga taqsimlash (klassifikatsiya). Taksonomiya tushunchasi ilk marotaba 1813-yilda shvetsariyalik olim Ap de Kandolle tomonidan fanga kiritilgan. 2009-yildan boshlab WordNet[29] kabi

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[26] Gruber, T. R. A translation approach to portable ontology specifications // Knowledge Acquisition, 1993. Vol. 5. – № 2. – P. 199-220.

[27] Borst, P., Akkermans, J. M. Engineering Ontologies // International Journal of Human-Computer Studies, 1997. Vol. 46. – № 2-3. – P. 365-406. DOI: 10.1006/ijhc.1996.0096.

[28] Guarino N. Formal ontology and information systems // Proceedings of the FOIS’98. – Trento, Italy, 1998. – P. 3-15.

[29] George A. Miller (1995). WordNet: A Lexical Database for English // Communications of the ACM, 1995. Vol. 38. – № 11. – P. 39-41 // https://wordnet.princeton.edu/

lingvistik bazalar uchun qo‘lda tuzilgan taksonomiyadan vikipediya tizimida foydalanish imkoniyati asoslangan[30]. Taksonomik munosabatlarning asosiysi sifatida *is-a, has-a* munosabatlari ajratib ko‘rsatiladi.

Is-a munosabati turlar (sinflar) o‘rtasidagi **has-a** munosabatidan ma’nosiga ko‘ra farqlanadi. Shuningdek, has-a va is-a munosabatlarini farqlamaslik munosabatlar modelini yaratishda xatolikni keltirib chiqaradi.

Konsept termini tilshunoslikda o‘tgan asrning 80-yillariga qadar tushuncha so‘ziga sinonim sifatida ishlatilgan bo‘lsa, bugungi kunga kelib uning izohi tushuncha terminiga nisbatan kengayganini ko‘rish mumkin[31]. O‘zbek tilshunosligida Sh.Safarov, A.Mamatov, D.Xudoyberganovalar kognitiv tilshunoslikda markaziy tushunchalardan biri sifatida konsept tushunchasini talqin etishgan va eng ko‘p definitsiyaga ega bo‘lgan birlik sifatida ta’kidlashgan. Anglashiladiki, konsept yondashuvga ko‘ra, tilshunoslikda turli ma’nolarni ifodalashga xizmat qiladi, shuningdek, turli semantik texnologiyalarda qanday birliklar bilan ifodalanishida ham farqlar yuzaga keladi. Ontologiya kontekstida konsept obyektlar, obyektlar sinfi yoki toifasini ifodalovchi asosiy ma’no birligi bo‘lib, u ontologiyaning strukturaviy va semantik asosini tashkil qiladi.

Tezaurus kontekstida konsept ma’lum bir ma’noni ifodalovchi atama yoki atamalar to‘plamini anglatadi. Axborotni tushunish va axborot olishni osonlashtirish uchun atamalar o‘rtasida semantik munosabatlar o‘rnatiladi.

“Tabiiy tillar jarayoni uchun ontologiyaga oid instrumentariylar tavsifi” deb nomlangan birinchi bobning uchinchi faslida ontologik ma’lumotlar bazasini yaratishda foydalaniladigan ontologik muharrirlar va ularning imkoniyatlari, amaliy jihatlari, ontologik tavsif tillari va ularning afzalliklari yoritilgan.

Hozirgi kunda ontologiyani yaratish uchun ko‘pgina dasturiy vositalar mavjud bo‘lib, ularning muhim afzalliklaridan biri sifatida bilim va konsept tuzilmasini vizual tarzda ifodalay olish imkoniyati bilan baholanadi. Ushbu vositalar foydalanuvchilarga ontologik model elementlarini aniqlash, ular o‘rtasidagi semantik munosabatlarni belgilash, shuningdek, ma’lumotlar bazasi bilan integratsiyani ta’minlash imkonini taqdim etadi. Tadqiqotimiz doirasida ontologik muharrirlardan bir nechtasi, jumladan, OntoLingua, Protégé, OntoGen, HOZO, WebODE, NeON kabi vositalar va ularning funksional imkoniyatlari, foydalanuvchi interfeysi, avtomatlashtirish darajasi va qo‘llanish sohalari bo‘yicha tahlil qilindi.

Ontologiyani yaratishda keng foydalanilgan dastlabki instrument sifatida OntoLinguani qayd etish mumkin. OntoLingua[32] – 1990-yillarning boshlarida Stenford Universitetida ishlab chiqilgan ontologiyani yaratish va ulardan samarali foydalanish uchun mo‘ljallangan dasturiy vosita hisoblanadi.

Protégé[33] – bu bepul, ochiq manbali ontologiya muharriri va bilimlarni boshqarish tizimi. Dastlabki davrda protégédan soha mutaxassislari tibbiyot

[30] Ponzetto S., Navigli. R. “Large-Scale Taxonomy Mapping for Restructuring and Integrating Wikipedia” / International Joint Conference on Artificial Intelligence (IJCAI 2009). – Pasadena, California, 2009. – P. 2083-2088.
[31] Демьянков В.З. Понятие и концепт в художественном литаратуре и в научном языке // Вопросы филологии. – Москва, 2001. – № 1. – С. 35-47.
[32] http://ksl.stanford.edu/software/ontolingua/
[33] http://protege.stanford.edu/

sohasi bilimlarini konseptual modellashtirish uchun foydalanishgan, so‘nggi paytlarda esa protégédan fanning turli sohalarida ontologik model yaratishda, xususan, semantik veb uchun ontologiyani yaratishda foydalanilmoqda. Mazkur sohadagi ilg‘or texnologiyalardan biri sifatida NeOn[34]ilovasi alohida ahamiyat kasb etadi. NeON – ontologiya tarmoqlarini yaratish, boshqarish va evolyutsiyani soddalashtirish vazifalarini bajaradi. Shu bois, NeOn katta hajmdagi bilimlarni modellashtirish va uzluksiz yangilash talab etiladigan sohalar uchun ilg‘or hamda samarali yechim sifatida e’tirof etiladi. NeOn platformasi ontologiyani yaratish va boshqarish jarayonlarini sezilarli darajada soddalashtiradi hamda asosiy ustunlik sifatida keng ko‘lamli bilimlarni samarali modellashtirish va doimiy yangilashga moslashuvchanligi deya qayd etish mumkin. O‘rganishlarimiz natijasida ontologik instrumentlar o‘rtasida Protégé muharriri eng keng tarqalgan, foydalanish qulayligi va samaradorligi bilan ajralib turadigan vosita ekanligi haqida xulosaga kelindi. Tadqiqotimizning uchinchi bobida Protégé muharriri hamda ushbu muhitda ontologik model yaratish jarayoni batafsil tahlil qilingan.

Dissertatsiyaning **“Terminologik ma’lumotlar bazasini loyihalashda semantik munosabatlar tadqiqi”** deb nomlanuvchi ikkinchi bobida terminologiyada iyerarxik tasnif, semantik maydonlar tahlili, tibbiy terminologik tizimni tadqiq etgan xorijlik va o‘zbekistonlik tadqiqotchilarning izlanishlari tadqiq etilgan. Mazkur bobda terminologik tizimda paradigmatik, sintagmatik munosabatlarning nazariy asoslari ifodasini topgan hamda misollar asnosida ifodalangan tahlillar aks etgan.

Ikkinchi bobning birinchi fasli *“Terminologiyada iyerarxik tasnif va semantik maydonlar tahlili”* deb nomlanib, mazkur faslda dunyo tilshunosligida tibbiy terminlarni tizimlashtirish va lingvistik aspektda tadqiq qilishga bag‘ishlangan qator tadqiqotlar amalga oshirilganligi, tibbiyot terminologiyasini tadqiq qilishda E.V.Bekisheva[35], E.D.Makarenko[36], L.Besekirskaya, O.G.Borisova[37], S.I.Madjayeva[38], V.F.Novodranova, M.N.Chernyavskiy, S.M.Velichkova tadqiqotlari muhim ahamiyatga ega ekanligi qayd etilgan.

O‘zbek tilshunosligida ham tibbiy terminlarni lingvistik nuqtayi nazardan tadqiq etishga qaratilgan bir qator ishlar mavjud. Jumladan, Z.Mirzahmedova[39],

[34] http://www.neon-project.org

[35] Бекишева Е.В. Формы языковой репрезентации гносеологических категорий в клинической терминологии. Автореферат дисс. ... д-ра филол. наук: 10.02.19. – Москва, 2007. – С. 50.

[36] Макаренко Е.Д. Когнитивно-деривационный потенциал хирургической терминологии. Автореферат дис. ... канд. филол. наук: 10.02.19. – Краснодар, 2008. – С. 22.

[37] Борисова О.Г. Омонимия терминов медицинских наук. Автореферат дисс. ... канд. филол. наук: 10.02.01. – Краснодар, 2000. – С. 30.

[38] Маджаева С.И. Медицинские терминосистемы: становление, развитие, функционирование. Автореферат дисс. ... д-ра филол. наук: 10.02.19. – Волгоград, 2012. – С. 38.

[39] Mirahmedova Z. Hozirgi o‘zbek tilining anatomik terminologiyasi. Filol. fan. nomz. ... diss. avtoref. – Toshkent, 1994. – 159 b.

M.Navruzova[40], F.Abdulxairova[41], Z.Urunova[42], B.Suyunov[43] tadqiqotlarini qayd etish joizdir.

Terminologik tizimda iyerarxik munosabatning yuzaga kelishi o‘ziga xos tarzda namoyon bo‘ladi. Iyerarxik munosabat asosida leksemalarning mazmun guruhlari ajraladi[44]. H.Ne’matov, R.Rasulovlarning fikrlariga ko‘ra bu holat ilmiy atamalar sirasida juda ko‘p uchraydi. Tibbiyot sohasi birliklari ham muayyan iyerarxiyani, yuqoridan quyiga tomon iyerarxiyani hosil qiladi. Yuqoridan quyiga tomon iyerarxiya eng katta, asosiy sinfni topishdan boshlanadi va uning ichki tarmoqlari aniqlanadi. Tibbiyot soha sifatida katta iyerarxik guruhning asosi, ya’ni subsinf hisoblanadi. Iyerarxiya birliklari sifatida esa uning barcha ichki sohalari olinadi.

Semantik maydon – ma’nosi o‘zaro bog‘liq bo‘lgan leksemalar to‘plamidir. So‘z atrofidagi semantik jarayonlarning hosil bo‘lishida til birliklari o‘rtasidagi iyerarxik munosabatlar muhim o‘rin tutadi. Semantik maydon nazariyasini o‘zbek tilshunosligiga kirib kelishi o‘tgan asrning 90-yillaridan boshlandi. Bu borada R.Rasulov[45], Sh.M.Iskandarova[46], N.R.Nishonova[47], S.X.Muhamedova[48], H.Tojimatovlarning tadqiqotlarini qayd etish mumkin. Tilshunoslikda *maydon nazariyasi* haqida, avvalo, til birliklarining semantik tuzilishi va semantik munosabatlariga e’tibor qaratish lozim. So‘zlar ma’lum semasiga ko‘ra muayyan semantik guruhlarga birlashadi[49].

B.Suyunov o‘zlashma tibbiy terminlarni ma’no jihatdan shartli ravishda 5 ta semantik maydonga ajratgan. Tibbiyot sohasi qadimiy tarixga ega bo‘lishi va faoliyat doirasining nihoyatda kengligi sababli, terminologiyasi ham nihoyatda boy va murakkabdir. Shu bois, tibbiy terminlarning barchasini B.Suyunov tomonidan taklif etilgan semantik maydonlar doirasida to‘liq qamrab olish imkoni mavjud emas. B.Suyunov ajratgan semantik maydonlarga bir nechta qo‘shimcha semantik maydonlarni qo‘shgan holda tadqiqotimizda quyidagi semantik maydonlardan foydalandik:

1. Tibbiy faoliyat bilan shug‘ullanuvchi shaxslar oti semantik maydoni: *shifokor, hamshira, stomatolog, jarroh, travmatolog, pediatr, kardiolog, nevropatolog…*

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[40] Navruzova M.G. o‘zbek folklori tilida tibbiy birliklarning etnolingvistik va lingvopoetik ifoda xususiyatlari. Filol. fan. b. fals. dok. ... diss. avtoref. – Buxoro, 2023. – 60 b.

[41] Abdulxairova F.I. O‘zbek tilida tibbiyot atamalarining metaforik manzarasi. Filol. fan. b. fals. dok. ... diss. avtoref. – Toshkent, 2021. – 58 b.

[42] Urunova Z.N. O‘zbek tilida defektologiya terminlari. Filol. fan. b. fals. dok. ... diss. avtoref. – Toshkent, 2021. – 52 b.

[43] Suyunov B. T. Tibbiy terminlar semantikasi va tezaurusi. Filol. fan. d-ri … diss. – Toshkent, 2022. – 241 b.

[44] Ermatov I. Terminologik tizimda gipero-giponimik va ekvonimik munosabatlar. – Toshkent: Tamaddun, 2022. – B. 45.

[45] Расулов Р. Глаголы состояния в узбекском языке и их валентности. Автореф. дисс. ... д-ра филол. наук. – Ташкент, 1989.

[46] Iskandarova I.M. O‘zbek tili leksikasini mazmuniy maydon sifatida o‘rganish (shaxs mikromaydoni). Filol. fan. d-ri ... diss. avtoref. – Toshkent, 1999.

[47] Nishonova N.R. O‘zbek tilida “hayvon” arxisemali sememalar maydonining mazmuniy tahlili. Filol. fan. nomz. … diss. avtoref. – Toshkent, 2000.

[48] Muhamedova S.X. O‘zbek tilida harakat fe‘llarining semantik va valentlik xususiyatlari. Filol. fan. d-ri … diss. avtoref. – Toshkent, 2007.

[49] Mirtojiev M.M. O‘zbek tili semasiologiyasi. Monografiya. – Toshkent: Mumtoz so‘z, 2010. – B. 40-42.

2. Anatomik terminlar semantik maydoni: *yurak, miya, jigar, oshqozon, ichaklar, bosh, bo‘yin, qo‘l, oyoq, og‘iz bo‘shlig‘i, tomoq …*

3. Kasallik nomlari semantik maydoni: *astma, infarkt, insult, sil, mioma, qizamiq, pnevmoniya, qabziyat, qandli diabet, shizofreniya, alsgeymer kasalligi …*

4. Davolash jarayoni bilan aloqador terminlar semantik maydoni: *operatsiya, terapiya, emlash, fizioterapiya, tekshiruv, biopsiya, rentgen, UTT tekshiruvi …*

5. Tibbiyotga oid o‘rin-joy nomlari semantik maydoni: *shifoxona, klinika, laboratoriya, reanimatsiya bo‘limi, ambulatoriya, dispenser, sanatoriya …*

6. Farmakologik vositalar va dori nomlari semantik maydoni: *antibiotik, tabletka, kapsula, eritma, inyeksiya, tomchi, malham, sirop, vaksina, analgin, paratsetamol, spirt, yod…*

7. Tibbiy asbob-uskunalar semantik maydoni: *termometr, tonometrtomograf, endoskop, mikroskop, skalpel, shtativ, qaychi, kislorod baloni, kislorod niqobi, shpris, kateter, nogironlar aravachasi, qo‘ltiqtayoq, tibbiy karovat …*

8. Diagnostika va kasallik belgilari semantik maydoni: *isitma, yo‘tal, og‘riq, harorat ko‘tarilishi, bosh aylanishi, ko‘ngil aynishi, terlash, qaltirash, ko‘z qizarishi, sariqlik, shish, holsizlik, qon tahlili, ultratovush tekshiruvi, klinik tekshiruv, qon tahlili, peshob tahlili …*

9. Fiziologik va biokimyoviy terminlar semantik maydoni: *yurak urishi, qon aylanishi, nafas olish, nafas chiqarish, qon bosimi, immunitet, insulin, gormonlar, insulin, adrenalin* va boshqalar.

Ikkinchi bobning *“Ontologik modellashtirishda leksik birliklarning paradigmatik munosabatlar tahlili”* deb nomlangan ikkinchi faslida terminologik tizimda paradigmatik munosabat ifodasi haqida fikr yuritilib, misollar asnosida izohlab berilgan.

Til birliklari nutq oqimida birin-ketin saf tortadi, til birliklarining bunday kombinatsiyasi sintagma deyiladi. Sintagmatika ichidagi birliklarning tarqalish nisbatini, ya’ni yuqori darajadan quyiga tomon yoki quyi darajadan yuqori tomon tarqalish munosabatini esa iyerarxiya munosabatlari, qolaversa, til birliklarining vertikal munosabatlarini paradigmatika deb atash mumkin[50].

Tadqiqotimizda M.Mirtojiyevning paradigmatik munosabatning semantik jihatdan tasnifiga asoslandik, tibbiy terminologik tizimda mavjud sinonimlik, antonimlik (kam uchraydi), omonimlik hodisalariga ko‘proq diqqat qaratildi.

1. Sinonimiya – bu bir xil (yoki deyarli bir xil) ma’noga ega bo‘lgan, ammo grafik ifodalanishi turlicha bo‘lgan so‘zlar o‘rtasidagi semantik munosabatdir. Boshqacha qilib aytganda, sinonimiya leksik birliklar o‘rtasidagi semantik ekvivalentlik deb aytishimiz mumkin. Ushbu turdagi semantik munosabatga ega bo‘lgan juftliklar sinonimlar deyiladi. Sinonimlar ma’no tushunchasiga nisbatan ikki xil bo‘ladi: 1) so‘zlarning ma’no munosabati aynan bir xillikka asoslangan

[50] Влавацкая М.В. Введение в языкознание. Учебное пособие. – Новосибирск: Новосибирский государственный технический университет, 2019. – 140 с.

sinonimlar, ya’ni absolyut sinonimlar; 2) so‘zlarning ma’no munosabati aynan bir xil emas, balki qo‘llanilish konteksti, uslubida farqlanadigan sinonimlar semantik sinonimlardir.

Tibbiyot sohasi uzoq tarixiy davrda shakllangan bo‘lib, absolyut sinonimlar yani dubletlarga boydir. Ushbu holatni A.Madvaliyev “muayyan fanlarning to‘xtovsiz rivojlanishi, yangi-yangi tushunchalarning, terminlarning paydo bo‘lishi mahsulidir”, – deya baholaydi. Olim fikrini davom ettirar ekan, aksar ilmiy adabiyotlarda dubletlik (absolyut sinonimiya) terminologik sistemalarning dastlabki bosqichiga xos belgi sifatida ko‘rsatilishini ta’kidlaydi. Biroq dublitlik faqat terminologik sistemalarning dastlabki rivojlanish bosqichiga xos bo‘lib qolmasdan, balki terminologik sistemalar yangi-yangi terminlar bilan boyib borishi yoki yangi terminologik sistemalar vujudga kelar ekan, dubletlik (absolyut sinonimlik) an’ana sifatida hamon saqlanib kelayotganligini qayd etadi.

2. Antonimiya – qarama-qarshi ma’noga ega bo‘lgan ikki yoki undan ortiq so‘z o‘rtasida mavjud bo‘lgan semantik munosabatdir. Antonimlarni qarama-qarshi ma’noga ega bo‘lgan juft so‘zlar deyish mumkin. Antonimik juft so‘zlar, odatda, bir xil grammatik toifaga kiradi, ya’ni ikkala element ham ot, ikkala elemant ham, sifat yoki ikkalasi ham fe’l tarzida bo‘ladi. Tibbiyot terminlarida antonimlikning ikki ko‘rinishi uchraydi: 1) leksik antonimlik; 2) morfologik antonimlik.

Leksik antonimlik hodisasi shaklan alohida mustaqil so‘zlarning bir-biriga qarama-qarshi ma’noga ega bo‘lishi natijasida yuzaga keladi. Masalan, *kasal-sog‘lom, sog‘lik-kasallik, kuchli-zaif, tirik-o‘lgan* kabi.

Morfologik antonimlik hodisasi asoslarga qo‘shimcha qo‘shish orqali yuzaga kelgan antonimlikda kuzatiladi. Masalan, (giper – ortiqcha, oshish; gipo – kam, pasayish) *gipertermiya-gipotermiya, gipertoniya-gipotoniya, giperplaziya-gipoplaziya*; (taxi – tez; bradi – sekin) *taxikardiya-bradikardiya* va boshqalar.

Ikkinchi bobning uchinchi fasli *“Ontologik modellashtirishda leksik birliklarning sintagmatik munosabatlar tahlili”* deb nomlanib, unda terminologik tizimda sintagmatik munosabat ifodasi yoritib berilgan.

Sintagmatik munosabatga kirishuvchi lisoniy birliklar tanlanish xususiyatiga ega bo‘ladi, ya’ni har qanday qiymat jihatidan bir xil bo‘lgan lisoniy birliklar emas, balki mazmuniy muvofiqlashgan, ma’no taqozo etgan ikki paradigma a’zosi variantlarigina sintagmatik munosabatga kirishadi.

Sintagmatik munosabat til birliklarining o‘zaro mantiqiy birika olishi va yonma-yon qo‘llana olishi bilan belgilanadi. Har qanday til birligi boshqa har qanday til birligi bilan sintagmatik munosabatga kirisha olmaydi. Qachonki aloqaga kirishayotgan birliklar o‘rtasida ma’noviy aloqaning mavjud bo‘lishi talab etiladi. Aks holda grammatik bog‘lanish yuz bersa-da, sintagmatik munosabat yuzaga kelmaydi.

Quyidagi jadvalda (*1-jadval)* yurak so‘zi sintagmatik munosabatdagi ifodasi berilgan va bu birliklarning barchasi termin sifatida izohiga ega[51].

[51] Qosimov A. Tibbiyot terminlari izohli lug‘ati. I jild. – Toshkent: Tibbiyot, 2003. – 472 b.

1-jadval

Yurak so‘zining sintagmatik munosabatdagi ifodasi	
Yog‘ bosgan **yurak**	**Yurak** urish hajmi
Ichki **yurak** yorilishi	**Yurak** chap bo‘lmasi
Orttirma **yurak** nuqsoni	**Yurak** zaifligi
Sun’iy **yurak** qopqog‘i	**Yurak** xastaligi
Tug‘ma **yurak** nuqsoni	**Yurak** yetishmovchiligi
Yurak bo‘lmachalari	**Yurak**-tomir sistemasi
Yurak bo‘lmachalari titrashi	**Yurak** tonlari
Yurak do‘ngligi	**Yurak** shovqini
Yurak yorilishi	**Yurak** o‘ynashi
Yurak ishi yetishmasligi	**Yurak** o‘ng bo‘lmachasi
Yurakka qon quyilishi	**Yurak** o‘ng qorinchasi
Yurak naychasi	**Yurak**-o‘pka ishi yetishmasligi
Yurak nuqsoni	**Yurak** qopqog‘i
Yurak og‘riq	**Yurak** qopqog‘i ishi yetishmasligi
Yurak tepkisi	**Yurak** qorinchalari
Yurak tovushi	**Yurak** qorinchalari titrashi

1-jadvalda terminologik birliklar orqali “yurak” so‘zi anatomik tuzilma, kasallik turlari hamda jarrohlik amaliyotlari kontekstida turli so‘z birikmalari bilan bog‘lanib, murakkab sintagmatik birliklar hosil qilganligi ifodalangan. Har bir birikmaning o‘ziga xos tibbiy ma’nosi mavjud. Masalan, *yog‘ bosgan yurak* – yurak to‘qimasida yog‘ to‘planishi, *yurak qopqog‘i ishi yetishmasligi* – yurak qopqog‘ining funksional buzilishi. Bu birikma yurakning muayyan qismi bo‘lgan qopqoqning normal faoliyat ko‘rsatmasligi, natijada yurak ishida buzilish yuzaga kelishini anglatadi. *Yurak urishi* birikmasida: *yurak* – asosiy organ, *urish* esa yurakning qonni butun tanaga haydash uchun qisqarishi. Bu birikma yurakning asosiy fiziologik faoliyatini, ya’ni qonni pompalash jarayonini bildiradi. *Yurak-tomir jarrohi* birikmasida: *yurak-tomir* – yurak va qon tomirlari tizimini ifodalaydi, *jarroh* esa shu sohada ixtisoslashgan shifokor. Bu misollar shuni anglatadiki (1-jadval), sintagmatik munosabat yordamida bir so‘z (bu yerda “yurak”) boshqa so‘zlar bilan birlashib, aniq, keng va funksional ma’noga ega tushunchalar hosil qiladi. Har bir birikma tibbiyot sohasidagi turli jarayonlar, anatomik qismlar yoki kasalliklarni kengroq ifodalaydi.

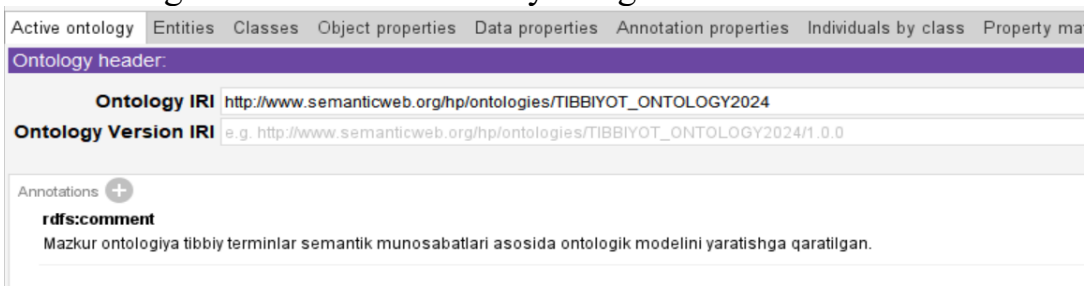
Dissertatsiyaning uchinchi bobi **“Tibbiy terminlar ontologiyasida modellashtirish bosqichlari”** deb nomlanib, mazkur bobda Protégé instrumenti yordamida terminologik bilimlar bazasini yaratishda tibbiy atamalarni tasniflash masalalari, tibbiy atamalarni tur va sinflarga ajratishda ontologik tamoyillar haqida fikr yuritiladi.

Uchinchi bobning *“Protégé instrumenti yordamida terminologik bilimlar bazasini yaratishda tibbiy atamalarni tasniflash masalalari”* nomli birinchi faslida instrument yordamida tibbiy terminlar ontologiyasini yartish bosqichlari, terminlar o‘rtasidagi semantik munosabatlarning ontologik muharrirda ifodasi aks etgan.

Bugungi kunda mavjud bo‘lgan eng mashhur OWL va RDF muharriri Protégé texnologiyasi bo‘lib, muharrirni dastur veb-saytidan bepul yuklab olish mumkin[52].

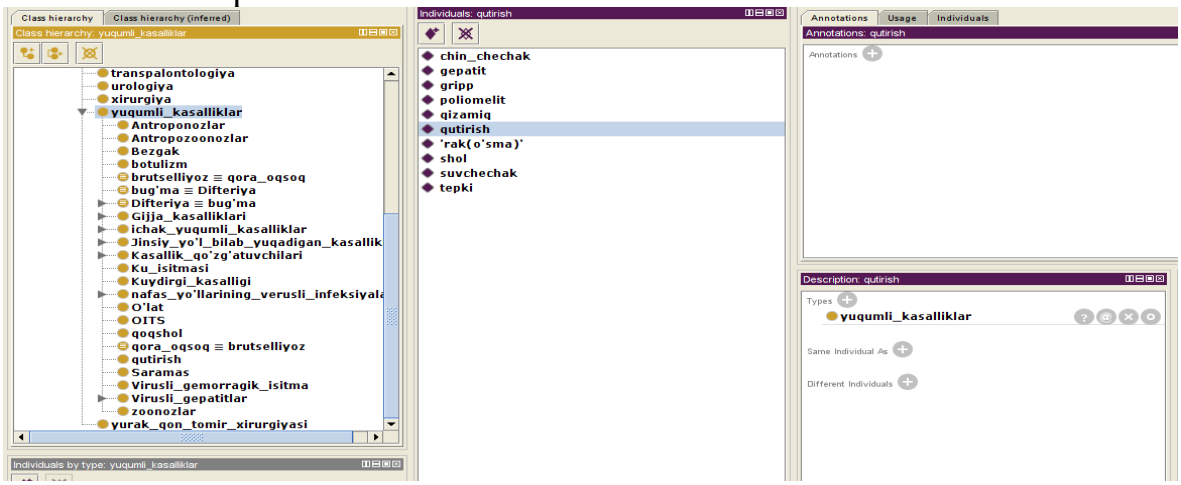
[52] https://protege.stanford.edu

Dastlabki bosqichda maqbul bo‘lgan ontologiya tili tanlanadi. Ma’lum ontologiya tavsif tili tanlangandan so‘ng, subdomainning asosiy sinflari aniqlanadi va har bir tanlangan sinf uchun annotatsiya belgilanadi.



1-rasm. **Ontologiya annotatsiyasi.**

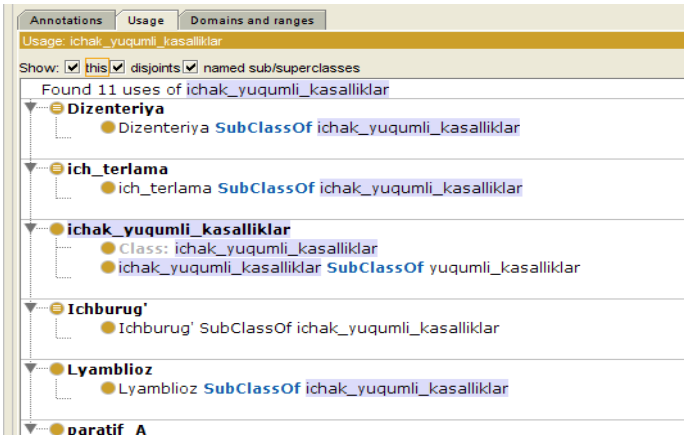
Bo‘sh ontologiya *Thing* deb nomlangan sinfni o‘z ichiga oladi. Sinflar alohida turlar (yoki obyektlar guruhlari) to‘plami sifatida talqin qilinadi. *Thing* sinfi barcha sinflarni o‘z ichiga olgan universal to‘plamni ifodalaydi. Shu sababli, sinflar *Thing*ning tag sinflaridir. Keyingi bosqichda asosiy subdomainlar va ular tarkibidagi subkategoriyalar aniqlanib sinf iyerarxiyasi shakllantiriladi. Sinf iyerarxiyasini shakllantirilayotganda, alohida sinflarga tegishli terminlar, ular o‘rtasidagi munosabatlar aniqlanadi.



2-rasm. **Sinf elementlarining individuals oynasida ifodasi.**

Har bir sinfga tegishli bo‘lgan elementlar i*ndividuals* oynasida ifodalanadi (*2-rasm*) va tegishli sinflarga bog‘lab chiqiladi. Bu yerda *poliomelit, qizamiq, shol, suvchechak, gepatit, chinchechak, gripp, qutirish* kabi kasalliklar *yuqumli kasalliklar* sinfiga mansubligi keltirilgan. *Individuals oynasi* sinf misollarini aniqlash imkonini beradi.

Sinf iyerarxiyasida tanlangan sinf (*virusli gepatitlar*)ning *description* oynasida qaysi *SubClassOf* ga tegishli ekanligi (*yuqumli kasalliklar sinfi*) ko‘rinib turadi. *Usage* qismida esa *Subclass* (*virusli gepatit*) sinfiga mansub bo‘lgan *Superclasses (gepatit C, gepatit D, gepatit E, gepatit V, gepatit A)*lar ifoda etilgan va barcha *Class: virusli gepatitlar SubClassOf*ga mansub deya ifoda etiladi.



3-rasm. **Sinf hamda elementlarning Usage qismida ifodasi.**

Uchinchi bobning ikkinchi fasli *"Tibbiy atamalarni tur va sinflarga ajratishda ontologik tamoyillar"* deb nomlanadi. Dunyoda turli sohaviy terminologik tizimlarni zamonaviy yondashuvlar nuqtayi nazaridan tadqiq etishga qaratilgan, xususan, tibbiy terminologiyani ontologik tamoyillar asosida tasnif etgan SNOMED CT, ICD va UMLS kabi qator yirik loyihalar yaratilgan.

Ontologik tamoyillar tibbiy atamalarning mantiqiy va izchil tasniflanishiga yordam beradi. Bu tamoyillar quyidagicha:

Taksonomik va iyerarxik tasnif – terminlarni umumiydan xususiyga, yuqoridan quyiga (masalan, "Tibbiyot" > "Kasallik" > "Yurak-qon tomir kasalliklari" > "Gipertoniya") qarab tizimlashtirishni nazarda tutadi. Tadqiqotimizning ikkinchi bobida iyerarxik tasnifning yuqoridan quyiga tomon yondashuvi tibbiyot terminlari ontologik modelini yaratishda tanlanganini ta'kidlagan edik. Iyerarxik munosabat o'z ichida ikki munosabat: partonimiya va xolonimiyani birlashtiradi. Bir qator tilshunos olimlar tadqiqotida partonimiya munosabati xolo-meronimik, ya'ni butun-bo'lak munosabatini reallashtiruvchi hodisa sanalib, u tilning leksik-semantik sathi, ayniqsa, terminologik sistemasida yaqqol namoyon bo'lishi ta'kidlanadi. Tadqiqotimizda esa partonimiya va xolonimiyani alohida hodisalar sifatida ajratishni lozim topdik. Iyerarxik tasnifda yondashuvni tanlash munosabatning qaysi turi yuzaga chiqishini belgilaydi

Part_of munosabati: Tilda xolonim-meronim (butun-qism) munosabatini reallashtiruvchi hodisa. Butun-qism munosabati ontologiyalarda sinf tuzilmalarini ifodalash uchun asos hisoblanadi. Turlarni (masalan, komponent, a'zo) farqlash orqali ular tibbiyot, biologiya va informatika kabi turli sohalarda murakkab tizimlarni aniq modellashtirish imkonini beradi.

Ontologik munosabatlar ichida taksonomik munosabat iyerarxik munosabatga yaqin va juda o'xshash tomonlari mavjud, shunga qaramasdan, taksonomik va iyerarxik munosabat bir-biridan farqlanadi. Taksonomiyada birliklarning tizim tarkibida mavjudligi ahamiyatga ega, iyerarxiyada esa tibbiy birliklarning qaysi pog'onada joylashishi muhim hisoblanadi. Taksonomik munosabat turlari: Is_a, part_of, has_a, ya'ni xolonimiya va giperonimiya munosabatlarini reallashtiradi.

H.Dadaboyev giper-giponimik munosabatlar deyarli barcha terminologik sistemalarda mavjud bo'lishi, tabiat va jamiyatdagi o'ta murakkab munosabatlarni ifodalovchi o'ziga xos xususiyatga egaligi bilan xarakterlanishini ta'kidlaydi.

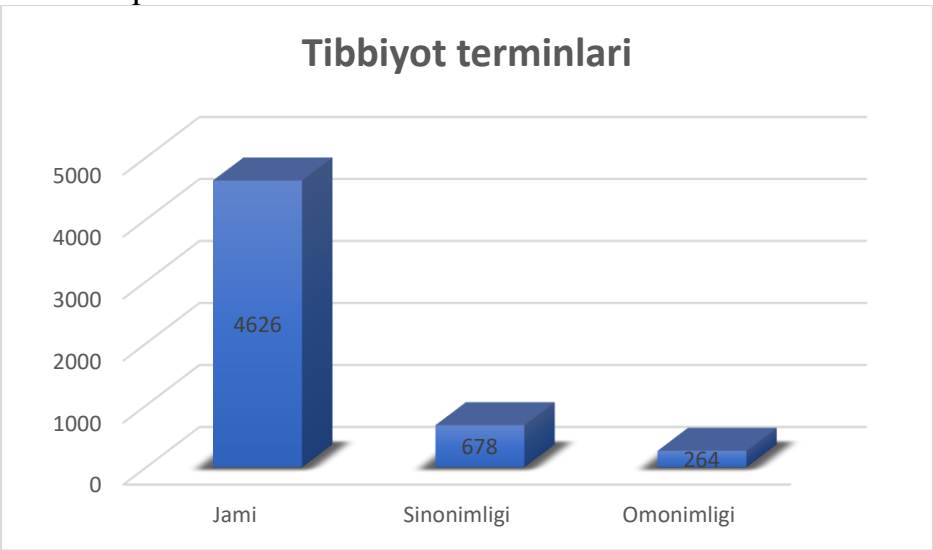
H.Dadaboyevning terminologiyada gipero-giponimik tasnifiga asosan tadqiqotimizda quyidagicha misollarni aniqladik.

“Organizmda organik yoki funksional o‘zgarishlar keltirib chiqaruvchi o‘ta kuchli yoxud buzuvchi omillarning ta’sir qilishi oqibatida yuzaga keladigan, odamzodda o‘ziga xos ruhiy-fiziologik holat” (A.Qosimov, TTIL 1-jild. 169-bet) sememali *og‘riq* giperonimining ikki turdagi giponimlar guruhi aniqlandi (2-jadval) va quyidagicha berildi.

2-jadval

Inson organizmida kuzatilish holati va vaziyatiga ko‘ra *og‘riq* giperonimining giponimlari:	Inson organizmining qaysi qismida kuzatilishiga ko‘ra *og‘riq* giperonimining giponimlari:
burama og‘riq, *ikki to‘lqinli og‘riq,* *zirqiroq og‘riq,* *kechki og‘riq,* *lo‘q-lo‘q og‘riq,* *mavsumiy og‘riq,* *simillovchi og‘riq,* *o‘tkir og‘riq,* *ertaki og‘riq,* *uzatiluvchi og‘riq,* *o‘qtin-o‘qtin og‘riq.*	*belog‘riq,* *boshog‘riq,* *bo‘g‘im og‘riq,* *ichog‘riq,* *ko‘zog‘riq,* *ko‘krakog‘riq,* *oyoqog‘riq,* *tomoqog‘riq,* *yurakog‘riq,* *qorinog‘riq*

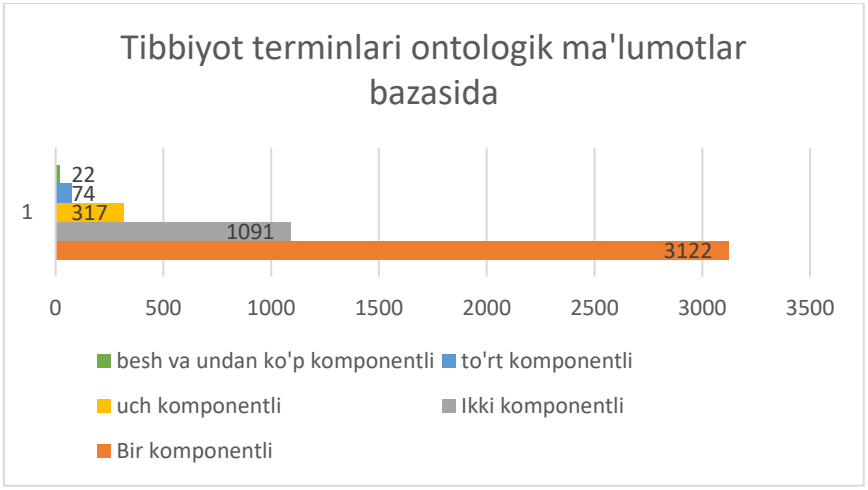
Tadqiqot davomida tibbiy terminlar bazasi shakllantirildi. Tibbiy terminlar bazasida (4-rasm) mavjud 4626 ta termindan 678 ta sinonim dubletlar va 264 ta omonim terminlar aniqlandi.



4-rasm. **Tibbiyot terminlarining paradigmatik munosabatdagi statistikasi.**

Tadqiqot ishining amaliy natijalaridan biri https://uzbekontology.uz/ platformasida tibbiy terminlar ontologik bazasi yaratildi. Platformada tibbiyotning qator sohalari asosiy yo‘nalish sifatida va asosiy yo‘nalishlar tarkibidagi subsohalari o‘rin oldi.

5-rasm. **Uzbekontology.uz platformasining foydalanuvchi interfeysi.**



6-rasm. **Tibbiyot terminlari ontologik ma’lumotlar bazasida komponentlar soniga ko‘ra terminlar statistikasi.**

Tibbiy terminlar bazasida (6-rasm) mavjud 4626 ta termindan besh va undan ortiq komponetli 22 ta, to‘rt komponentli 74 ta, uch komponentli 317 ta, ikki komponentli 1091 ta, bir komponetli 3122 ta termin aniqlandi.

Shuni ta’kidlash kerakki, tibbiyot terminlarini ontologik tamoyillar asosida tahlil qilish sohani tizimli ravishda o‘rganish, terminologiyani tasniflashda muhim ahamiyat kasb etadi. Ontologik tamoyillar tarkida har bir munosabat turining yondashuvda funksional ahamiyati yuzaga keladi. Paradigmatik munosabatlar terminologiyani semantik jihatdan analiz qilsa, sintagmatik munosabatlar terminlarning kontestda qanday qo‘llanilishini tahlil etadi. Taksonomiyada terminlarning klassifikatsiyalarga ajratilishi muhim. Taksonomiyada gipero-giponimik munosabatlar orqali umumiy tushunchalar kichikroq, aniqroq turlarga bo‘linadi, bu esa murakkab tibbiy terminologiyani tizimlashtirishga imkon beradi. Iyerarxik tasnifda soha terminlarining qaysi pog‘onada joylashishini aniqlash orqali ular ma’lum sinflarga tasniflanadi. Yuqorida ta’kidlangan barcha munosabat turlari sohaviy ontologik modellashtirishda muhim amaliy ahamiyatga ega.

XULOSA

1. So‘nggi yillarda ma’lumotlar hajmining keskin ortishi turli sohalarda ma’lumotlarni samarali saqlash, tizimlashtirish, rasmiylashtirish muammolarini yanada murakkablashtirdi. An’anaviy usullar va vositalar katta hajmli, xilma-xil manbalardagi ma’lumotlarni qayta ishlashda yetarli emasligi aniqlandi. Shu bois, yangi, tizimli yondashuvlar va metodologiyalarini joriy etish ehtiyoji paydo bo‘ldi. Shu sababli, ontologiya tushunchalar o‘rtasidagi munosabatlarni aniq va rasmiy ravishda ifodalovchi, ularni semantik jihatdan bog‘lovchi struktura sifatida yuzaga keldi.

2. Barcha sohalarda ontologik modellar yaratish mumkin. Ma’lum fan sohasidagi umumiy terminologik tasniflar, guruhlarga ajratish, sinflararo munosabatlar sohaviy terminologik tizim haqida tasavvurni kengaytiradi, bilim sohalarini aniqlaydi, boshqa sohalar bilan bog‘laydi hamda asosiy atamalar bilan belgilaydi. Ontologiyaning rivojlanishi esa kelajakda bir qancha sohalarning o‘zaro bog‘liqligini ifodalay oladigan tizimlarni yaratadi. Qolaversa, sohaviy ontologiyaning yaratilishi kompyuter dasturiy ta’minot tizimlarida istiqbolli yo‘nalish hisoblanadi. Tabiiy tilda taqdim etiladigan ma’lumotlarni zamonaviy usullar orqali qayta ishlash, boyitib borish imkonini beradi.

3. Ontologiya va tezauruslar ma’lum semantik munosabatlar tahlili asosida yaratiladi, har ikki semantik tizimda konsept tushunchasi turlicha nomoyon bo‘ladi. Ontologiya kontekstida konsept obyektlar, obyektlar sinfi yoki toifasini ifodalovchi asosiy ma’no birligi hisoblansa, tezaurus kontekstida konsept ma’lum bir ma’noni ifodalovchi termin yoki atamalar to‘plamini anglatadi. Ya’ni ontologiyada konsept ma’lum soha tarkibida mavjud sinfni (kichik sinf, katta sinf) anglatsa, tezaurusda esa konsept termin yoki atamaga mos keladi. Tezaurus, birinchi navbatda, terminologiyani tartiblash va qidiruvni yaxshilashga yordam beradi, ontologiya esa aniq munosabatlar va fikrlash qobiliyatiga ega bo‘lgan bilimlarning tuzilgan tavsifini ifodalaydi. Ushbu farq ma’lumotlar integratsiyasi, semantik qidiruv va sun’iy intellekt kabi sohalarda bilimlar modelini tanlashda juda muhimdir. Tezaurus atamalarni tartibga solish uchun so‘zlarga asoslangan tuzilma bo‘lsa, ontologiya mantiqiy fikrlash asosida tuzilgan munosabatlarni belgilaydigan konsepsiyaga asoslanadi.

4. Ontologiya yaratishda ko‘plab vositalar qo‘llaniladi, ularning asosiy afzalligi ma’lumotlar bazasini vizual shaklda ifodalash imkoniyatidir. Vizual tasvir foydalanuvchilarga ontologiyaning strukturaviy elementlarini aniq va tushunarli shaklda taqdim etish, tahlil qilish hamda modellashtirish jarayonini soddalashtirish imkonini beradi. Shuningdek, vizual vositalar ontologiya yaratish jarayonida xatoliklarni aniqlash va bartaraf etishda muhim ahamiyat kasb etadi.

5. Terminologik tizimda iyerarxik munosabatning yuzaga kelishi o‘ziga xos tarzda namoyon bo‘ladi. Iyerarxik munosabat asosida leksemalarning mazmun guruhlari ajraladi va bu holat ilmiy atamalar sirasida juda ko‘p uchraydi. Sohaviy terminlar iyerarxik tasnifi dastlab sohaviy terminologik tizimda katta sinflarni aniqlashdan boshlanadi. Tilga sistem yondashuvning bir ko‘rinishi sifatida yuzaga kelgan maydon nazariyasi muammolari olamning bir butunligi hamda uning tilda

namoyon bo‘lishi masalasini yoritishni ko‘zda tutadi. So‘z atrofidagi semantik maydonlarning hosil bo‘lishida til birliklari o‘rtasidagi iyerarxik munosabatlar muhim o‘rin tutadi. Tilni sistema sifatida o‘rganish esa til birliklari o‘rtasidagi paradigmatik, sintagmatik, iyerarxik munosabatlarga ajratish bilan bog‘liq.

6. Tilshunoslikda paradigmatik va assotsiatsiyaviy munosabatlar farqlanadi. Paradigmatik munosabatlar bir xil leksik yoki grammatik toifaga kiruvchi so‘zlarning o‘zaro bog‘liqligini ifodalovchi munosabat bo‘lsa, assotsiatsiyaviy munosabatlar esa so‘zlarning semantik, kontekstual asosda o‘zaro bog‘lanishini ifodalaydi. Ushbu so‘zlar turli kategoriyalarga mansub bo‘lishi mumkin, lekin ular inson ongida bir-biriga aloqador tushunchalar sifatida shakllanadi. Paradigmatik munosabatda so‘zlar bir-birini almashtirish imkoniyatiga ega bo‘ladi. Assotsatsiyaviy munosabatda so‘zlar bog‘liq bo‘lishiga qaramay bir-birini almashtira olmaydi. Terminologik tizimda sinonimlik munosabati, asosan, ikki tushuncha o‘rtasida yuzaga keladi va sinonim birliklar uslubiy bo‘yog‘i, ma’no darajasiga ko‘ra mushtarak lisoniy qiymat hosil qiladi.

7. Sintagmatik munosabatlar yordamida birliklar o‘zaro bog‘lanadi. Sintagmatik munosabat gapda leksemalarning o‘zaro birikuviga asoslanadi. Nutq jarayonida so‘zlar, eng avvalo, ular ifodalagan ma’no orqali birikadi. Terminologik tizim yangi terminlarning paydo bo‘lishi ham aynan so‘zlar sintagmatik qurshovi bilan bog‘liq.

8. Ontologiyani qurishda semantik maydonlar tushunchalarni aniqlash, tushunchalar o‘rtasida bog‘lanishlarni belgilash, ma’lumotlarni integratsiya qilish, semantik qidiruvni yaxshilash, bilimlarni ifodalash va tizimli yondashuvni ta’minlashda muhim ahamiyatga ega bo‘lib, ma’lumotlardan samarali foydalanish va tushunchalar ma’nosini konkretlashtirishda yordam beradi.

9. Iyerarxik, taksonomik va semantik munosabatlar ontologik modellashtirish jarayonida, ayniqsa, tibbiyot kabi murakkab bilim sohalarida bilimlar tizimini strukturaviy va mantiqiy jihatdan tartibga solish, o‘zaro bog‘liqligini aniqlash hamda aniq konseptual model hosil qilish imkonini yaratadi. Iyerarxik munosabat tibbiyot terminologiyasidagi tushunchalarni yuqori va quyi darajadagi sinflarga ajratadi bu esa ularning sistematik tasnifini ta’minlaydi. Taksonomik munosabatlar esa tushunchalarni klassifikatsiya va kategoriyalash orqali bilimlar bazasini qurishda muhim vosita bo‘lib xizmat qiladi.

SCIENTIFIC DEGREE AWARDING ONE-TIME SCIENTIFIC COUNCIL BASED ON SCIENTIFIC COUNCIL DSc.03/25.2021.Fil.01.16 AT NATIONAL UNIVERSITY OF UZBEKISTAN NAMED AFTER MIRZO ULUG‘BEK

NATIONAL UNIVERSITY OF UZBEKISTAN

QODIROVA ZEBO GULBOYEVNA

CREATING AN ONTOLOGICAL MODEL OF MEDICAL TERMS AND THEIR SEMANTICS

10.00.11 – Linguistics theory. Applied and computational linguistics

DISSERTATION ABSTRACT OF DOCTOR OF PHILOSOPHY (PhD) IN PHILOLOGICAL SCIENCES

Tashkent – 2025

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Scientific consultant:	**Abdurakhmonova Nilufar** Doctor of philological sciences, Professor
Official opponents:	**Raupova Laylo Rakhimovna** Doctor of philological sciences, Professor
	Muhamedova Saodat Khudoyberdiyevna Doctor of philological sciences, Professor
Leading organization:	**Fergana State University**

The defense of the dissertation will be held at the meeting of the one-time Scientific Council DSc.03/25.08.2021.Fil.01.16 of the Mirzo Ulugbek National University of Uzbekistan on (2025 11.25 at 10.00 hours). Address: 10074, Tashkent city, Olmazor district, Universitet street, 4. Phone: (99871) 246-08-62; (99871) 227-10-59; Fax: (99871) 246-65-24; E-mail: nauka@nuu.uz). Faculty of Journalism and Uzbek Philology, National University of Uzbekitan (1st floor, room 108).

This dissertation can be accessed at the Information Resource Center of the Mirzo Ulugbek National University of Uzbekistan. Registration number: 180. Address: 100174, Tashkent city, house 4. Phone: (99871) 246-08-62.

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(Mailing report № 55 dated 6 november 2025)

N.A. Rahmanov
Chairman of the One-time scientific council on award of scientific degree of doctor of philological sciences, professor

M.B. Khujamkulova
Scientific Secretary of the One-time scientific council on award of scientific degree of doctor of philosophy in Philological Sciences

A.E. Mamatov
Chairman of the seminar of the One-time scientific council on award of scientific degree of doctor of sciences, doctor of philological sciences, professor

INTRODUCTION
(Doctor of Philosophy (PhD) Dissertation Annotation)

Actuality and necessity of the research theme. Extensive research is being conducted in world linguistics on the study of terminological systems, primarily focusing on the analysis of lexical structures of terms, semantic fields, and inter-term semantic relations. These studies serve to further develop the theoretical foundations of terminology, ensure the accuracy and consistency of terms, and effectively organize their practical application. The investigation of synonymous, antonymous, hierarchical, paradigmatic, and syntagmatic relations within the framework of terms is of great importance in linguistic theory and practice. As a result of advancements in language technologies, the processes of modeling, automating, and managing terminological systems have improved. Consequently, terminological dictionaries, thesauri, and ontological databases have been created and are being effectively used in search engines, machine translation, and information and communication systems.

In world linguistics, advanced achievements of applied linguistics are widely utilized in analyzing semantic relations between lexical units. Semantic analyses are being conducted using computer technologies and methods. Currently, the issue of expressing the semantic properties of language units in a user-friendly, functional, and structured form is particularly relevant. This is prompting researchers to develop new approaches to modeling terminological systems. The use of computer resources in linguistics has led to the formation of dictionary systems based on thesaurus, WordNet, and ontological models. These resources serve as effective tools for the systematic analysis of lexical units, determining their semantic interdependence, and elucidating the cognitive essence of terms in linguistic consciousness.

The language policy implemented in Uzbekistan in recent years aims to expand the scientific and practical capabilities of the state language, particularly in developing and digitalizing the terminological system. Systematizing medical terms based on modern scientific criteria and ensuring their effective use in practice is one of the urgent tasks of contemporary linguistics. Simultaneously, the rapid development of advanced information and communication technologies necessitates the ontological modeling of medical terms and the systematic study of their semantic structure. Based on this need, this research focuses on the ontological modeling of medical terms, determining their semantic connections, and structurally describing inter-term relations. Additionally, the formation of a terminological database based on the analysis of semantic relations and its effective use in language technologies is one of the important tasks facing Uzbek computational linguistics.

This research contributes, to a certain extent, to the fulfillment of tasks defined in various decrees and resolutions of the Republic of Uzbekistan. These include the Presidential Decree[53] No. UP-5850 (October 21, 2019) “On measures to radically

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enhance the prestige and status of the Uzbek language as the state language," Presidential Decree No. UP-6084 (October 20, 2020) "On measures for the further development of the Uzbek language and improvement of language policy in our country", which approved the "Concept for the development of the Uzbek language and improvement of language policy for 2020-2030" that outlines tasks related to ensuring the integration of the state language with information technologies and communications, Presidential Decree No. PP-4996 (February 17, 2021) "On measures to create conditions for the accelerated introduction of artificial intelligence technologies", Resolution of the Cabinet of Ministers No. 984 (December 12, 2019) "On approval of the Regulation on the Department for the Development of the State Language", Presidential Decree No. UP-6097 (October 29, 2020) "On approval of the Concept for the development of science until 2030," and Presidential Resolution No. PP-4479 (October 4, 2019) "On the Wide Celebration of the Thirtieth Anniversary of the Adoption of the Law of the Republic of Uzbekistan "On the State Language", as well as other regulatory legal acts related to the current functioning of our language.

Relevance of the research to the priority areas of science and technology development in Republic. This research is aligned with the priority directions of the republic's scientific and technological development, specifically "Socio-legal, economic, cultural, spiritual and educational advancement of the information society and democratic state, and development of an innovative economy".

Degree of study of the problem. Research on creating ontological databases, developing principles and methodologies of ontological modeling, and creating practical applications is reflected in the works of T.R. Gruber[54], T. Berners-Lee, N. Noy[55], Gomes-Perez[56], M. Uschold, and N. Guarino. Additionally, in Russia, A.Y. Zinovieva[57] developed a multilingual intellectual content analysis model based on ontological knowledge and substantiated the possibility of its application in other languages. A.V. Dobrov[58] developed a new computer model for the hierarchy of syntactic units in Russian message texts. This model presents a universal algorithm that enables effective and automatic representation of syntactic dependencies,

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relationships between hierarchical units, and information about the system of meanings of syntactic components. B.N. Nguyen[59] developed models, methods, and algorithms for searching information resources based on the use of ontological models and semantic technologies. N.V. Lukashevich[60] proposes several models for expressing ontological knowledge. L.G. Fedyuchenko's research[61] aims to theoretically substantiate a model of technical knowledge transfer based on the integration of linguistic ontology and thesaurus principles. Furthermore, scholars such as K.I. Belousov[62], N.Y. Kazakova, M.G. Zasedateleva[63], A.G. Shabalin[64], A. Aleksandrovich[65], and A.R. Gatiatullin[66] conducted research on semantic relations in computational linguistics and applied linguistics. Notably, A.R. Gatiatullin conducted research on creating a conceptual model, a unified linguistic knowledge graph model based on morphemes for computer processing of Turkic languages[67], as well as the characteristics of agglutinative languages and their potential applications in intelligent technologies[68].

Consistent scientific research conducted in Uzbek linguistics by A. Pulatov, S. Mukhamedova, N. Abdurakhmonova[69], M. Abjalova[70], B. Mengliev, L. Raupova, O. Abdullaeva[71], A. Eshmuminov, Sh. Gulyamova, A. Akhmedova, N. Ataboev, and A. Abduvakhobov has made a significant practical contribution to the field's development.

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[70] Abjalova M. O'zbek tili ontologiyasini yaratish tamoyillari. Filol. fan. d-ri … diss. avtoref. – Toshkent, 2022. – 80 b.; Abjalova M. O'zbek tili ontologiyasini yaratish tamoyillari. Filol. fan. d-ri … diss. – Toshkent, 2022. – 228 b.

[71] Abdullayeva O. O'zbek tilining internet axborot matnlari korpusini shakllantirishning nazariy va amaliy asoslari. Filol. fan. b. fals. dok. … diss. avtoref. – Andijon, 2022. – 15 b.

In Central Asia, A. Sharipbay, B. Ergesh, and G. Elibayeva[72] explored issues of comparing the ontological model of nouns in Kazakh and Kyrgyz languages. N.Israilova, P.Bakasova, R.Niyazova, S.Kudubayeva, R.Turebayeva, A.Aktayeva, and L.Davletkireeva[73] worked on creating an ontological model of educational programs in computational linguistics. A.S. Mukanova and L.Zhetkinbay[74] focused on the ontological modeling of adjectives in the Kazakh language, while N.Abdurakhmonova and M.Aripov[75] conducted research on creating an ontological model of adjectives in the Uzbek language.

Relevance of the dissertation research with the research plans of higher educational institution where the dissertation was completed. The dissertation was carried out within the framework of the research plan of the Department of Computational Linguistics and Applied Linguistics at the National University of Uzbekistan named after Mirzo Ulugbek, focusing on the areas of "Computer Lexicography" and "Ontology and Semantic Technologies".

The aim of the research is the creation of a domain-specific terminological ontological model involves hierarchically classifying medical terms in the Uzbek language and identifying their semantic fields, as well as theoretically substantiating the ontological principles based on paradigmatic and syntagmatic analysis of these medical terms.

Tasks of the research:

analyze the theoretical foundations of ontology and semantic technologies in computational linguistics, study international experience in creating ontological databases, and conduct a comparative analysis of the concept in ontology and thesaurus models to determine its expression in semantic resources;

describe ontological tools for natural language processing and create a database of medical terms using the Protege editor;

identify main classes and their subclasses based on the hierarchical classification of terminological database design, and analyze medical terms in ontological modeling based on paradigmatic and syntagmatic relationships;

develop a linguistic database of medical terms based on the analysis of semantic relationships and design a search interface model on the website https://uzbekontology.uz/ that enables efficient searching of this resource.

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[72] Шарипбай А.А., Ергеш Б.Ж., Елибаева Г.К., Жеткенбай Л. Сравнение онтологических моделей существительных казахского и кыргызского языков / Шестая Международная конференция по компьютерной обработке тюркских языков "TurkLang 2018" (Труды конференции). – Ташкент: NAVOIY UNIVERSITETI, 2018. – 390 с.

[73] Sharipbay A., Niyazova R., Kudubayeva S., Turebayeva R., Aktayeva A., Davletkireyeva L. Ontological model of the educational program computational linguistics / Шестая Международная конференция по компьютерной обработке тюркских языков "TurkLang 2018" (Труды конференции). – Ташкент: NAVOIY UNIVERSITETI, 2018. – 390 с.

[74] Шарипбай А.А., Елибаева Г.К., Муканова А.С., Жеткенбай Л. Онтологическое моделирование имени прилагательного казахского языка / Шестая Международная конференция по компьютерной обработке тюркских языков "TurkLang 2018" (Труды конференции). – Ташкент: NAVOIY UNIVERSITETI, 2018. – 390 с.

[75] Abdurakhmonova N., Aripov M. Uzbek ontology of Uzbek language as example of adjective / Шестая Международная конференция по компьютерной обработке тюркских языков "TurkLang 2018" (Труды конференции). – Ташкент: NAVOIY UNIVERSITETI, 2018. – 390 с.

The object of the research. As objects of the research, a medical encyclopedia, dictionaries of medical terminology[76], and a corpus of texts related to the field of medicine were selected.

The subject of the research consists of representing medical terms in an ontological model based on their semantic structure, paradigmatic and syntagmatic relationships, as well as hierarchical classification.

Methods of the research. The methods of classification, statistical analysis, and ontological modeling were employed in elucidating the topic.

Scientific novelty of the research work is as follows:

approaches to forming lexical semantic resources were used as a foundation for creating an ontological model of medical terms. The semantic classification of the model was elucidated and linguistically substantiated. Additionally, linguistic models of the concept in ontology and thesaurus dictionaries were validated using medical terms as examples.

a dictionary of medical terms in the Uzbek language was described using ontological tools for natural language processing, based on a corpus. Furthermore, an ontological model of medical terms was developed using the Protege editor.

when designing a terminological database, main classes and their internal subclasses were identified based on a hierarchical classification. Medical terms were categorized into groups according to their fields, and a methodology based on paradigmatic and syntagmatic relations was developed for the ontological modeling of medical terms.

a linguistic database of medical terms was created on the website https://uzbekontology.uz/, and a database architecture was structured according to their semantic groups.

Practical outcomes of the research include the followings: This scientific research work was directly involved in the practical project titled “Creation of the “Atamacom.uz” software platform and mobile applications for automatically providing Uzbek alternatives to new words and terms based on artificial intelligence” planned for 2024-2025. The theoretical foundations proposed in this study were used as examples in forming the platform’s ontological knowledge base. Additionally, it served to implement the tasks envisaged in the innovative project “PARATRANSLATOR: creation of a contextological electronic translation dictionary platform based on a parallel corpus” carried out in 2024-2025.

An author’s certificate has been obtained for “Software of multidisciplinary Uzbek language ontology: Ontolingua” (DGU 20239705).

The reliability of the research results is ensured by the consistency of the conclusions drawn, the fact that the supporting data is obtained from official sources, the scientific analysis of the collected material, the practical implementation of theoretical conclusions and recommendations, and the grounding of the obtained

[76] Solixo‘jayev Z. va boshq. Tibbiyot ensiklopediyasi – T.: Sharq, 2016. – 640 b., Usmanxodjayev A., Abilov O‘., Turaxanova M. Tibbiy atamalar lug‘ati. – T.: Donishmand ziyosi, 2022. – 400 b., Qosimov A. Tibbiyot terminlari izohli lug‘ati. I jild. – Toshkent: Tibbiyot, 2003. – 472 b., Qosimov A. Tibbiyot terminlari izohli lug‘ati. II jild. – Toshkent: Tibbiyot, 2003. – 568 b., Qosimov A. Tibbiyot terminlari izohli lug‘ati. III jild – Toshkent: Tibbiyot, 2008. – 576 b., Qosimov A. Tibbiyot terminlari izohli lug‘ati. IV jild. – Toshkent: Tibbiyot, 2008. – 480 b.

results in theories related to sectoral ontological electronic dictionaries[77] and ontological modeling.

Scientific and practical significance of research results. The results of scientific research contribute to the development, improvement, and proper regulation of the Uzbek language lexicon, terminology, and medical terms as its integral components. Additionally, it makes a significant contribution to the pragmatics of terms, specifically addressing the issue of their correct usage.

The creation of an ontological model of medical terms in this research work has significant practical importance, facilitating the application of new information technologies to the Uzbek language (such as creating computer-based ontological dictionaries) and enriching it with new information resources.

The dissertation materials can be utilized in teaching subjects such as “Applied Linguistics”, “Computational Linguistics”, “Ontology and Semantic Technologies”, and “Computer Lexicography” for bachelor’s and master’s degree programs at higher educational institutions, as well as in teaching medical disciplines. The dissertation materials can serve as a source for creating new textbooks, teaching aids, lecture notes, and dictionaries on these subjects.

The database compiled based on the ontological modeling of medical terms can be used as a resource by researchers in computational linguistics and applied linguistics, scholars in applied lexicography, as well as medical professionals. Moreover, it enhances the efficiency of rapid information retrieval.

Dissemination of research results. Based on the creation of an ontological model of medical terms and the study of their semantics:

the creation of a terminological ontological database for computer linguistics of the Uzbek language, in particular, the theoretical foundations of the research based on the analysis of semantic relations in the creation of an ontological database of medical terms were used in the implementation of the practical project “Creation of new generation educational dictionaries and their mobile applications” carried out at the Tashkent University of Information Technologies in 2021-2023. (Reference No. 949/05-2 of the Tashkent University of Information Technologies named after Muhammad al-Khwarizmi dated March 17, 2025)

the creation of a terminological ontological database for the Uzbek language corpus, as well as the principles of ontological modeling based on the hierarchical classification of medical terms by semantic fields for the Uzbek language corpus, were used in the implementation of the practical project “Design of the National Corpus of the Uzbek Language and Development of a Software Package”, completed in 2021-2023. The application of the research results served to create a linguistic base prepared within the framework of the applied project and to improve the software of the corpus. (Reference No. 139/01-01 of the Samarkand branch of the Tashkent University of Information Technologies named after Muhammad al-Khwarizmi dated March 14, 2025)

in the international scientific project “REP-25112021/113 - UzUDT: the corpus of the universal tree of dependence for processing natural language in the Uzbek

[77] https://disease-ontology.org/

language and its semantic analysis", carried out at the National University of Uzbekistan, the analysis of semantic relations in the creation of an ontological model, the interpretation of the concept in ontological and thesaurus models, semantic relations in the definition of semantic fields in the terminological system, and its hierarchical classification served as the theoretical basis. (Reference No. 04/11-3400 of the National University of Uzbekistan named after Mirzo Ulugbek dated March 3, 2025)

Approbation of the research results. The research results were discussed at 5 international and 2 republican scientific and practical conferences.

Publication of the research results. The main content of the dissertation has been presented in 7 scientific-practical conferences and seminars, 6 scientific articles (5 of which were published in scientific journals recognized by the Higher Attestation Commission of the Republic of Uzbekistan), and 1 article in a scientific journal indexed in an impact factor database.

The structure and scope of the dissertation. The dissertation consists of an introduction, three main chapters, a conclusion, and a list of references. The total volume of the work is 128 pages.

THE MAIN CONTENT OF THE DISSERTATION

The **Introduction** substantiates the relevance and demand for the topic of the dissertation, formulates the goal and objectives, object and subject of research, shows the compliance of the research with the priority areas of science and technology development of the republic, sets out the scientific novelty and practical results of the research, reveals the scientific and practical significance of the obtained results, provides information on the implementation of the research results into practice, published works, and the structure of the dissertation.

In the first chapter of the dissertation, entitled *"Ontology as an object of study of computational linguistics"*, the theoretical foundations of the emergence of ontology and semantic technologies in computational linguistics, the basic principles of ontology classification, types of ontology according to the purpose of creation, description of ontological models, classifications of ontology by levels, interpretation of the concept in ontology and thesaurus, ontological editors for the natural language process and ontological description languages are analyzed, information about the work done in the field is given and its theoretical foundations are researched.

The first paragraph of the first chapter of the dissertation, entitled *"Theoretical Foundations of Ontology and Semantic Technologies in Computational Linguistics",* examines the necessity of creating ontology, the study of ontology by scientists, the application and definitions of the concept of ontology in philosophy and computer technology.

Linguistic resources can be expressed in the form of dictionaries, thesauruses, ontologies. The term "ontology", originally formed in philosophy,

was later adopted by researchers of artificial intelligence and expanded its scope of application in various scientific fields.

The introduction of the term "ontology" in technology and information technologies is associated with the name of the American scientist T. Gruber. He proposed an ontological approach in the process of studying intelligent systems and the relationship between humans and computers. According to the scientist's definition[78], "ontology is expressed as a clear and formal description of conceptualization". This definition served as a theoretical basis for scientific research on ontological modeling and created the need to develop a general conceptual model and lexical units that allow standardizing and exchanging knowledge in various fields of knowledge. This concept is aimed at creating an ontology that can be reused in various systems and applications and has made them an important component of the creation of artificial intelligence systems.

V.N.Borst, J.M.Akkermans[79], developing the definition put forward by T.Gruber, interpret ontology as "The formal expression of general concepts", emphasizing the principles of formality and generality.

Later, a number of definitions of ontology emerged. One of the most famous is noted by the Italian researcher N. Guarino: "Ontology – is an official theory that limits the possible conceptualizations of the world"[80]. N. Guarino also analyzed the theoretical foundations of ontology and contributed to the classification of ontology and the identification of their differences.

The second paragraph of the first chapter is called *"Interpretation of the Concept in Ontology and Thesaurus",* in which, although both ontology and thesauruses serve as tools for organizing knowledge, they differ significantly in conceptual structure and application, the description of ontology and thesaurus models, and the relationship between concepts in ontology and thesaurus are analyzed.

The *taxonomic relationship* is noted as the most important among ontological relations. Taxonomy is a process related to classification or categorization. Usually, it consists of two parts: the development of a basic scheme of classes (taxonomy) and the division of concepts into classes (classification). The concept of taxonomy was first introduced to science in 1813 by the Swiss scientist Ap de Candolle. Since 2009, the possibility of using manually compiled taxonomy for linguistic databases such as WordNet[81] in the Wikipedia system has been substantiated[82]. As the main taxonomic relations, the *is-a, has-a* relations are distinguished.

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[78] Gruber, T. R. A translation approach to portable ontology specifications // Knowledge Acquisition, 1993. Vol. 5. – № 2. – P. 199-220.

[79] Borst, P., Akkermans, J. M. Engineering Ontologies // International Journal of Human-Computer Studies, 1997. Vol. 46. – № 2-3. – P. 365-406. DOI: 10.1006/ijhc.1996.0096.

[80] Guarino N. Formal ontology and information systems // Proceedings of the FOIS'98. – Trento, Italy, 1998. – P. 3-15.

[81] George A. Miller (1995). WordNet: A Lexical Database for English // Communications of the ACM, 1995. Vol. 38. – № 11. – P. 39-41 // https://wordnet.princeton.edu/

[82] Ponzetto S., Navigli. R. "Large-Scale Taxonomy Mapping for Restructuring and Integrating Wikipedia" / International Joint Conference on Artificial Intelligence (IJCAI 2009). – Pasadena, California, 2009. – P. 2083-2088.

Is-a relation differs in meaning from the **has-a** relation between species (classes). Also, failure to distinguish between has-a and is-a relations leads to an error in creating a relationship model.

If the term concept was used in linguistics as a synonym for the word concept until the 80s of the last century, today it can be seen that its interpretation has expanded compared to the term concept[83].

In Uzbek linguistics, Sh.Safarov, A.Mamatov, D.Khudoyberganova interpreted the concept as one of the central concepts in cognitive linguistics and emphasized it as a unit with the most definitions. It is understood that the concept serves to express different meanings in linguistics according to the approach, and there are also differences in what units are expressed in different semantic technologies. In the context of ontology, the concept is the basic semantic unit representing objects, a class or category of objects, which forms the structural and semantic basis of ontology.

In the context of a thesaurus, a concept refers to a term or a set of terms that express a certain meaning. Semantic relationships are established between terms to facilitate understanding and obtaining information.

In the third paragraph of the first chapter, entitled *"Description of ontological tools for the natural language process",* ontological editors used in creating an ontological database and their capabilities, practical aspects, ontological description languages and their advantages are highlighted.

Currently, there are many software tools for creating ontology, one of the important advantages of which is the ability to visually represent the structure of knowledge and concepts. These tools allow users to identify elements of the ontological model, establish semantic relationships between them, as well as ensure integration with the database. Within the framework of our research, several ontological editors were analyzed, including such tools as OntoLingua, Protégé, OntoGen, HOZO, WebODE, NeON, and their functionalities, user interface, level of automation, and areas of application.

OntoLingua[84] can be noted as the first tool widely used in the creation of ontology. OntoLingua is a software tool designed for creating ontologies and their effective use, developed at Stanford University in the early 1990 s.

Protégé[85] is a free, open-source ontology editor and knowledge management system. Initially, specialists in the field used protégé for conceptual modeling of knowledge in the field of medicine, and recently protégé is used to create an ontological model in various fields of science, in particular, to create an ontology for the semantic web. As one of the advanced technologies in this field, the NeOn[86] application is of particular importance. NeON performs the functions of creating, managing, and simplifying the evolution of ontological networks. Therefore, NeOn is recognized as an advanced and effective solution

[83] Демьянков В.З. Понятие и концепт в художественном литаратуре и в научном языке // Вопросы филологии. – Москва, 2001. – № 1. – С. 35-47.
[84] http://ksl.stanford.edu/software/ontolingua/
[85] http://protege.stanford.edu/
[86] http://www.neon-project.org

for areas requiring modeling and continuous updating of large volumes of knowledge. The NeOn platform significantly simplifies the processes of creating and managing ontology, and the main advantage can be noted as the flexibility of effective modeling and constant updating of a wide range of knowledge. As a result of our research, we came to the conclusion that among ontological tools, the Protégé editor is the most widespread tool, distinguished by ease of use and efficiency. The third chapter of our research analyzes in detail the Protégé editor and the process of creating an ontological model in this environment.

The second chapter of the dissertation, entitled *"Study of Semantic Relations in the Design of a Terminological Database",* examines the hierarchical classification of terminology, the analysis of semantic fields, and the research of foreign and Uzbek researchers who have studied the medical terminological system. This chapter reflects the theoretical foundations of paradigmatic and syntagmatic relations in the terminological system, as well as analyses expressed on the basis of examples.

The first paragraph of the second chapter is called *"Analysis of Hierarchical Classification and Semantic Fields in Terminology",* in this chapter, a number of studies have been conducted in world linguistics dedicated to the systematization and linguistic study of medical terms, and the research of E.V.Bekisheva[87], E.D.Makarenko[88], L.Besekirskaya, O.G.Borisova[89], S.I.Madjaeva[90], V.F.Novodranova, M.N.Chernyavsky, S.M.Velichkova is of great importance in the study of medical terminology.

In Uzbek linguistics, there are also a number of works aimed at the linguistic study of medical terms. In particular, it is worth noting the research of Z.Mirzakhmedova[91], M.Navruzova[92], F.Abdulkhairova[93], Z.Urunova[94], B.Suyunov[95].

The emergence of hierarchical relations in the terminological system manifests itself in a peculiar way[96]. Semantic groups of lexemes are distinguished on the basis of hierarchical relations. According to H. Nematov, R. Rasulov, this situation is very common among scientific terms. Units of the

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[87] Бекишева Е.В. Формы языковой репрезентации гносеологических категорий в клинической терминологии. Автореферат дисс. ... д-ра филол. наук: 10.02.19. – Москва, 2007. – С. 50.

[88] Макаренко Е.Д. Когнитивно-деривационный потенциал хирургической терминологии. Автореферат дис. ... канд. филол. наук: 10.02.19. – Краснодар, 2008. – С. 22.

[89] Борисова О.Г. Омонимия терминов медицинских наук. Автореферат дисс. ... канд. филол. наук: 10.02.01. – Краснодар, 2000. – С. 30.

[90] Маджаева С.И. Медицинские терминосистемы: становление, развитие, функционирование. Автореферат дисс. ... д-ра филол. наук: 10.02.19. – Волгоград, 2012. – С. 38.

[91] Mirahmedova Z. Hozirgi o‘zbek tilining anatomik terminologiyasi. Filol. fan. nomz. ... diss. avtoref. – Toshkent, 1994. – 159 b.

[92] Navruzova M.G. o‘zbek folklori tilida tibbiy birliklarning etnolingvistik va lingvopoetik ifoda xususiyatlari. Filol. fan. b. fals. dok. ... diss. avtoref. – Buxoro, 2023. – 60 b.

[93] Abdulxairova F.I. O‘zbek tilida tibbiyot atamalarining metaforik manzarasi. Filol. fan. b. fals. dok. ... diss. avtoref. – Toshkent, 2021. – 58 b.

[94] Urunova Z.N. O‘zbek tilida defektologiya terminlari. Filol. fan. b. fals. dok. ... diss. avtoref. – Toshkent, 2021. – 52 b.

[95] Suyunov B. T. Tibbiy terminlar semantikasi va tezaurusi. Filol. fan. d-ri … diss. – Toshkent, 2022. – 241 b.

[96] Ermatov I. Terminologik tizimda gipero-giponimik va ekvonimik munosabatlar. – Toshkent: Tamaddun, 2022. – B. 45.

medical field also form a certain hierarchy, a hierarchy from top to bottom. From top to bottom, the hierarchy begins with finding the largest, main class and determining its internal branches. Medicine, as a field, is the basis of a large hierarchical group, i.e., a subclass. All its internal spheres are taken as units of the hierarchy.

A semantic field is a collection of lexemes whose meanings are interconnected. Hierarchical relations between language units play an important role in the formation of semantic processes around a word. The introduction of semantic field theory into Uzbek linguistics began in the 90s of the last century. In this regard, one can note the research of R.Rasulov[97], Sh.M.Iskandarova[98], N.R.Nishonova[99], S.Kh.Mukhamedova[100], H.Tojimatov. In linguistics, about *field theory (maydon nazariyasi)*, first of all, attention should be paid to the semantic structure and semantic relations of language units. Words are grouped into certain semantic groups according to a certain seme[101].

B. Suyunov conditionally divided borrowed medical terms into 5 semantic fields in terms of meaning. Due to the fact that the field of medicine has an ancient history and an extremely wide range of activities, its terminology is also extremely rich and complex. Therefore, it is impossible to fully cover all medical terms within the semantic fields proposed by B. Suyunov. Adding several additional semantic fields to the semantic fields identified by B. Suyunov, we used the following semantic fields in our research:

1. Semantic field of names of persons engaged in medical activities: *doctor (shifokor), nurse (hamshira), dentist (stomatology), surgeon (jarroh), traumatologist (travmatolog), pediatrician (pediatr), cardiologist (kardiolog), neurologist (nevropatolog)…*

2. Semantic field of anatomical terms: *heart (yurak), brain (miya), liver (jigar), stomach (oshqozon), intestines (ichaklar), head (bosh), hand (qo‘l), foot (oyoq), oral cavity (og‘iz bo‘shlig‘i), throat (tomoq)…*

3. Semantic field of disease names: *asthma (astma), infarction (infarct), stroke (insult), tuberculosis (sil), myoma (mioma), measles (qizamiq), pneumonia (pnevmoniya), constipation (qabziyat), diabetes mellitus (qandli diabet), schizophrenia (shizofreniya), Alzheimer’s disease (alsgeymer kasalligi)…*

4. Semantic field of terms related to the treatment process: *surgery (operatsiya), therapy (terapiya), vaccination (emlash), physiotherapy (fizioterapiya), examination (tekshiruv), biopsy (biopsiya), X-ray (roentgen), ultrasound examination (UTT tekshiruvi)…*

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[97] Расулов Р. Глаголы состояния в узбекском языке и их валентности. Автореф. дисс. ... д-ра филол. наук. – Ташкент, 1989.

[98] Iskandarova I.M. O‘zbek tili leksikasini mazmuniy maydon sifatida o‘rganish (shaxs mikromaydoni). Filol. fan. d-ri ... diss. avtoref. – Toshkent, 1999.

[99] Nishonova N.R. O‘zbek tilida “hayvon” arxisemali sememalar maydonining mazmuniy tahlili. Filol. fan. nomz. … diss. avtoref. – Toshkent, 2000.

[100] Muhamedova S.X. O‘zbek tilida harakat fe‘llarining semantik va valentlik xususiyatlari. Filol. fan. d-ri … diss. avtoref. – Toshkent, 2007.

[101] Mirtojiev M.M. O‘zbek tili semasiologiyasi. Monografiya. – Toshkent: Mumtoz so‘z, 2010. – B. 40-42.

5. The semantic field of medical place names: *hospital (shifoxona), clinic (klinika), laboratory (laboratoriya), intensive care unit (reanimatsiya bo'limi), outpatient clinic (ambulatoriya), dispensary (dispenser), sanatorium (sanatoriya)…*

6. Semantic field of pharmacological means and drug names: *antibiotic (antibiotic), tablet (tabletka), capsule (kapsula), solution (eritma), injection (inyeksiya), drop (tomchi), ointment (malham), syrup (sirop), vaccine (vaksina), analgin (analgin), paracetamol (paratsetamol), alcohol (spirt), iodine (yod)…*

7. Semantic field of medical equipment: *thermometer (termometr), tonometer-tomograph (tonometrtomograf), endoscope (endoskop), microscope (mikroskop), scalpel (scalpel), stand (shtativ), scissor (qaychi), oxygen balloon (kislorod baloni, oxygen mask (kislorod niqobi), syringe (shpris), catheter (kateter), wheelchair (nogironlar aravachasi), crutch (qo'ltiqtayoq), medical bed (tibbiy karovat)…*

8. Semantic field of diagnostic and disease symptoms: *fever (isitma), cough (yo'tal), pain (og'riq), fever (harorat ko'tarilishi), dizziness (bosh aylanishi), nausea (ko'ngil aynishi), sweating (terlash), tremors (qaltirash), redness of the eyes (ko'z qizarishi), jaundice (sariqlik), swelling (shish), weakness (holsizlik), blood test (qon tahlili), ultrasound examination (ultratovush tekshiruvi), clinical examination (klinik tekshiruv), urine test (peshob tahlili)…*

9. Semantic field of physiological and biochemical terms: *heartbeat (yurak urishi), blood circulation (qon aylanishi), breathing (nafas olish), exhalation (nafas chiqarish), blood pressure (qon bosimi), immunity (immunitet), insulin (insulin), hormones (garmonlar), adrenaline (adrenalin)*, etc.

In the second paragraph of the second chapter, entitled *"Analysis of Paradigmatic Relations of Lexical Units in Ontological Modeling",* the expression of paradigmatic relations in the terminological system is considered and explained on the basis of examples.

Language units line up one after another in the flow of speech; such a combination of language units is called a syntagma. The ratio of distribution of units within syntagmatics, that is, the ratio of distribution from the upper level to the lower or from the lower level to the upper level, can be called hierarchical relations, as well as vertical relations of language units[102].

In our research, we relied on M. Mirtojiyev's semantic classification of paradigmatic relations, paying more attention to the phenomena of synonymy, antonymy (rare), and homonymy existing in the medical terminological system.

1. *Synonymy* is a semantic relationship between words that have the same (or almost the same) meaning, but different graphic expressions. In other words, we can say that synonymy is semantic equivalence between lexical units. Pairs with this type of semantic relationship are called synonyms. Synonyms are of two types in relation to the concept of meaning. 1) synonyms, i.e., absolute synonyms, in which the semantic relationship of words is based on identity; 2)

[102] Влавацкая М.В. Введение в языкознание. Учебное пособие. – Новосибирск: Новосибирский государственный технический университет, 2019. – 140 с.

synonyms that do not have the same semantic relationship of words, but differ in the context and style of use, are semantic synonyms.

The field of medicine was formed over a long historical period and is rich in absolute synonyms, i.e., doublets. This situation is assessed by A.Madvaliev as "the product of the continuous development of certain sciences, the emergence of new concepts and terms". Continuing his thought, the scientist emphasizes that in most scientific literature, doublet (absolute synonymy) is shown as a characteristic feature of the initial stage of terminological systems. However, it is noted that duplicity is characteristic not only of the initial stage of development of terminological systems, but also that as terminological systems are enriched with new terms or new terminological systems are formed, duplicity (absolute synonymy) is still preserved as a tradition.

2. *Antonymy* is a semantic relationship that exists between two or more words with opposite meanings. Antonyms can be considered as paired words with opposite meanings. Antonymic pairs of words usually belong to the same grammatical category, that is, both elements are nouns, both elements are adjectives, or both are verbs. There are two types of antonymy in medical terms: 1) lexical antonymy; 2) morphological antonymy.

The phenomenon of lexical antonymy arises as a result of separate independent words having opposite meanings. For example, *kasal-sog'lom* (sick-healthy), *sog'lik-kasallik* (health-sickness), *kuchli-zaif* (strong-weak), *tirik-o'lgan* (alive-dead).

The phenomenon of morphological antonymy is observed in antonyms formed by adding an affix to the bases. For example, (hyper - excess, increase (giper – ortiqcha, oshish); hypo - less, decrease (gipo – kam, pasayish)) hyperthermia-hypothermia, hypertonia-hypotonia, hyperplasia-hypoplasia; (taxi – fast; bradi – slow (taxi – tez; bradi – sekin)) tachycardia-bradycardia and others.

The third paragraph of the second chapter is called *"Analysis of syntagmatic relations of lexical units in ontological modeling",* in which the expression of syntagmatic relations in the terminological system is highlighted.

Linguistic units entering into a syntagmatic relationship have the property of selection, that is, not linguistic units that are identical in any value, but only variants of members of two paradigms that are semantically coordinated and required by meaning enter into a syntagmatic relationship.

Syntagmatic relations are determined by the fact that language units can be logically combined and used side by side. Any language unit cannot enter into a syntagmatic relationship with any other language unit. When it is required that there be a spiritual connection between the units entering into contact. Otherwise, although grammatical connection occurs, a syntagmatic relationship does not arise.

The following table (Table 1) shows the expression of the word yurak in a syntagmatic relationship, and all these units have an interpretation as a term[103].

[103] Qosimov A. Tibbiyot terminlari izohli lug'ati. I jild. – Toshkent: Tibbiyot, 2003. – 472 b.

Table 1

The expression of the word heart in syntagmatic relation (Yurak so‘zining sintagmatik munosabatdagi ifodasi)	
Yog‘ bosgan **yurak**	**Yurak** urish hajmi
Ichki **yurak** yorilishi	**Yurak** chap bo‘lmasi
Orttirma **yurak** nuqsoni	**Yurak** zaifligi
Sun’iy **yurak** qopqog‘i	**Yurak** xastaligi
Tug‘ma **yurak** nuqsoni	**Yurak** yetishmovchiligi
Yurak bo‘lmachalari	**Yurak**-tomir sistemasi
Yurak bo‘lmachalari titrashi	**Yurak** tonlari
Yurak do‘ngligi	**Yurak** shovqini
Yurak yorilishi	**Yurak** o‘ynashi
Yurak ishi yetishmasligi	**Yurak** o‘ng bo‘lmachasi
Yurakka qon quyilishi	**Yurak** o‘ng qorinchasi
Yurak naychasi	**Yurak**-o‘pka ishi yetishmasligi
Yurak nuqsoni	**Yurak** qopqog‘i
Yurakog‘riq	**Yurak** qopqog‘i ishi yetishmasligi
Yurak tepkisi	**Yurak** qorinchalari
Yurak tovushi	**Yurak** qorinchalari titrashi

In Table 1, through terminological units, the word *“heart”* (yurak) is connected with various phrases in the context of anatomical structure, types of diseases, and surgical operations, forming complex syntagmatic units. Each compound has its own medical meaning: For example, *a fatty heart* (*yog‘ bosgan yurak*) is the accumulation of fat in heart tissue, valve insufficiency is a functional *disorder of the heart valve* (*yurak qopqog‘i ishi yetishmasligi)*. This combination means that the valve, which is a specific part of the heart, does not function normally, resulting in cardiac dysfunction. In the combination of *heartbeat (yurak urishi)*: the *heart* (yurak) is the main organ, and *beat* (beat) is the contraction of the heart to pump blood throughout the body. This compound represents the main physiological activity of the heart, that is, the process of blood pumping. In the phrase *cardiovascular surgeon (yurak-tomir jarrohi)*: *heart-vessel (yurak-tomir)* represents the system of the heart and blood vessels, and the *surgeon (jarroh)* is a doctor specializing in this field. These examples (Table 1) show that with the help of a syntagmatic relation, one word (here *“heart” (yurak)*) combines with other words to form concepts with a clear, broad, and functional meaning. Each compound more broadly represents various processes, anatomical parts, or diseases in the field of medicine.

The third chapter of the dissertation is called *“Stages of modeling in the ontology of medical terms”* and this chapter discusses the issues of classification of medical terms when creating a terminological knowledge base using the Protégé tool, ontological principles in dividing medical terms into types and classes.

The first paragraph of the third chapter, entitled *“Issues of Classifying Medical Terms in Creating a Terminological Knowledge Base Using the Protégé Tool”* reflects the stages of creating the ontology of medical terms using the protégé tool, the expression of semantic relations between terms in the ontological editor[104].

[104] https://protege.stanford.edu

The most popular OWL and RDF editor available today is the Protégé technology, which allows the editor to be accessed free of charge from the program's website can be downloaded.

At the initial stage, the optimal ontology language is selected. After selecting a specific ontology description language, the main classes of the subdomain are identified, and an annotation is assigned for each selected class.

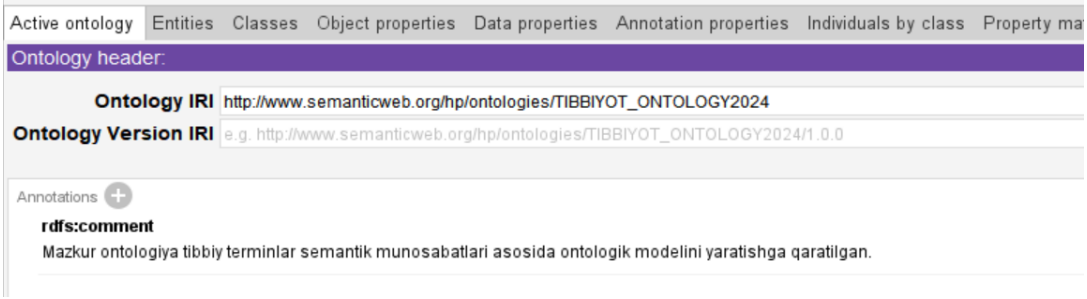

Figure 1. **Ontology annotation.**

Empty ontology includes a class called *Thing*. Classes are interpreted as a set of individual types (or groups of objects). The *Thing* class represents a universal set containing all classes. Therefore, classes are the subclasses of *Thing*. At the next stage, the main subdomains and their subcategories are identified, and a class hierarchy is formed. When forming a class hierarchy, the terms belonging to individual classes and the relationships between them are determined.

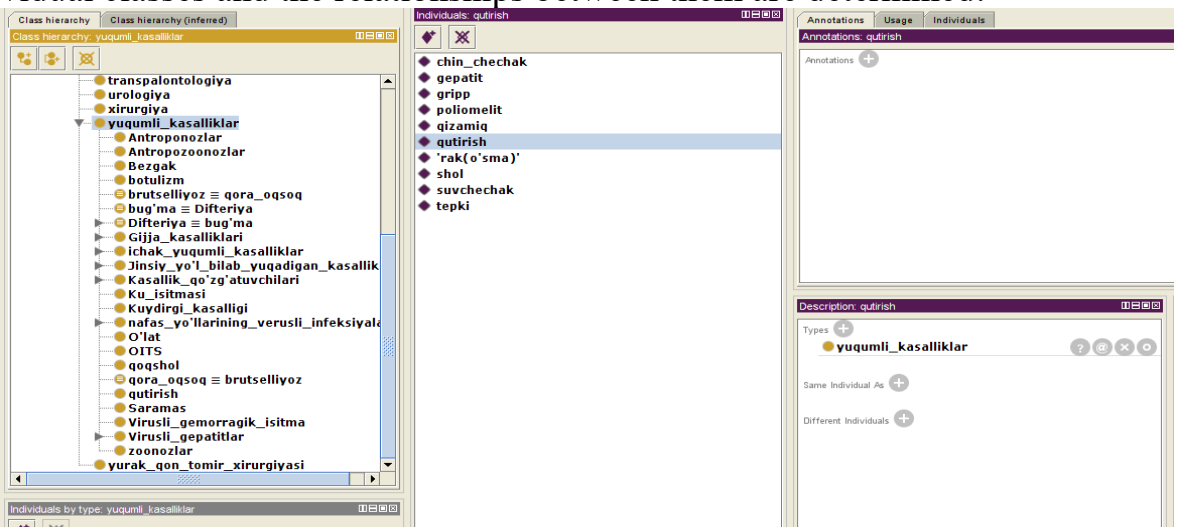

Figure 2. **Representation of class elements in the individuals window.**

Elements belonging to each class are displayed in the *individuals* window (*Figure 2*) and linked to the corresponding classes. Here, diseases such as *poliomyelitis (poliomelit), measles (qizamiq), paralysis (shol), chickenpox (suvchechak), hepatitis (gepatit), smallpox (chinchechak), influenza (gripp),* and *rabies (qutirish)* are classified as *infectious diseases (yuqumli kasalliklar*. The Individuals window allows you to identify class examples.

In the class hierarchy, in the description window of the selected class (*viral hepatitis (virusli gepatitlar)*), it is visible which *SubClassOf* it belongs to (*class of infectious diseases* (*yuqumli kasalliklar sinfi*)). In the Usage section, *Superclasses* (*hepatitis C, hepatitis D, hepatitis E, hepatitis B, hepatitis A*) belonging to the *Subclass (viral hepatitis virusli gepatit))* class are represented, and all *Class*: *viral hepatitis* is represented as belonging to the *SubclassOf*.

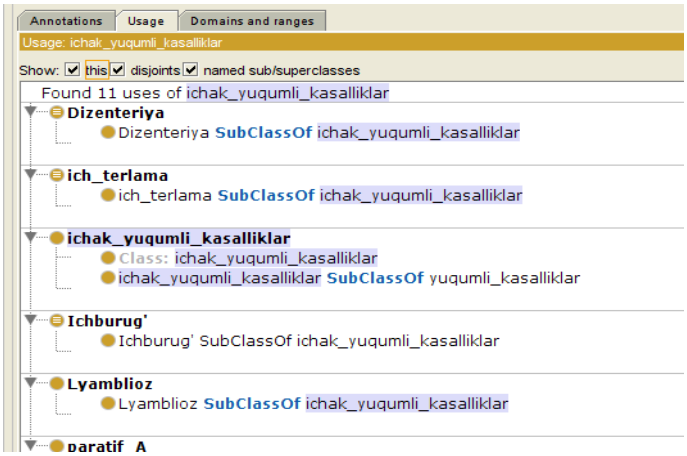

Figure 3. **Expression of classes and elements in the Usage section.**

The second paragraph of the third chapter is called *"Ontological Principles in the Classification of Medical Terms into Types and Classes"*. A number of major projects have been created in the world aimed at studying various sectoral terminological systems from the point of view of modern approaches, in particular, SNOMED CT, ICD and UMLS, which classify medical terminology based on ontological principles.

Ontological principles contribute to the logical and consistent classification of medical terms. These principles are as follows:

Taxonomic and hierarchical classification involves systematizing terms from general to specific, from top to bottom (for example, *"Medicine," "Disease," "Cardiovascular Diseases," "Hypertension"* ("Tibbiyot"> "Kasallik"> "Yurak-qon tomir kasalliklari"> "Gipertoniya")). In the second chapter of our research, we noted that the top-down approach to hierarchical classification was chosen in the creation of an ontological model of medical terms. Hierarchical relations combine two relations: partonymy and holonymy. In the research of a number of linguists, the relationship of partonymy is considered a holo-meronymic, that is, a phenomenon that realizes the whole-part relationship, and it is clearly manifested in the lexico-semantic level of the language, especially in the terminological system. In our study, we found it necessary to distinguish partonymy and holonymy as separate phenomena. In a hierarchical classification, the choice of approach determines which type of relationship emerges.

Part_of relationship: A phenomenon that realizes the holonym-meronym (whole-part) relationship in language. The whole-part relationship is the basis for expressing class structures in ontologies. By distinguishing species (e.g., components, organs), they allow for precise modeling of complex systems in various fields, such as medicine, biology, and computer science.

Among ontological relations, the taxonomic relation is close to the hierarchical relation and has very similar aspects, however, the taxonomic and hierarchical relations differ from each other. In taxonomy, the presence of units within the system is important, while in the hierarchy, the hierarchy of medical units is important. Types of taxonomic relations: Is_a, part_of, has_a, that is, realizes the relations of holonymy and hyperonymy.

H.Dadaboev emphasizes that hyper-hyponymic relations exist in almost all terminological systems and are characterized by a unique feature expressing extremely complex relations in nature and society. Based on H. Dadaboev's hypero-hyponymic classification in terminology, we identified the following examples in our research.

“A peculiar psycho-physiological state in man, arising as a result of the influence of extremely strong or destructive factors that cause organic or functional changes in the body” (A. Kasymov, TTIL, Vol. p. 169) two types of hyponyms of the hyperonym *“pain”* (og‘riq) with the sememe were identified (Table 2) and presented as follows.

Table 2

Inson organizmida kuzatilish holati va vaziyatiga ko‘ra *og‘riq* giperonimining giponimlari:	Inson organizmining qaysi qismida kuzatilishiga ko‘ra *og‘riq* giperonimining giponimlari:
burama og‘riq, *ikki to‘lqinli og‘riq,* *zirqiroq og‘riq,* *kechki og‘riq,* *lo‘q-lo‘q og‘riq,* *mavsumiy og‘riq,* *simillovchi og‘riq,* *o‘tkir og‘riq,* *ertaki og‘riq,* *uzatiluvchi og‘riq,* *o‘qtin-o‘qtin og‘riq.*	*belog‘riq,* *boshog‘riq,* *bo‘g‘im og‘riq,* *ichog‘riq,* *ko‘zog‘riq,* *ko‘krakog‘riq,* *oyoqog‘riq,* *tomoqog‘riq,* *yurakog‘riq,* *qorinog‘riq*

During the research, a database of medical terms was formed. In the database of medical terms (Fig. 4), out of 4626 terms, 678 synonymous doublets and 264 homonymous terms were identified.

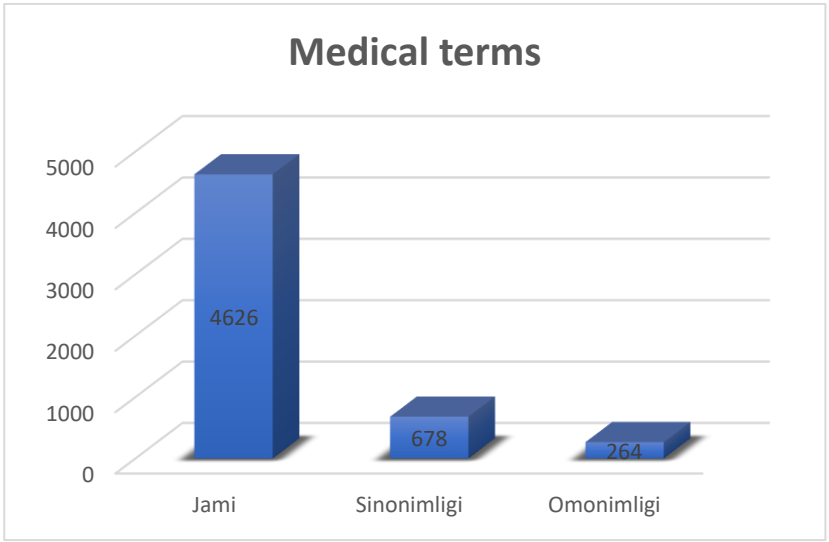

Figure 4. **Statistics of medical terms in paradigmatic relationships.**

One of the practical results of the research work is the creation of an ontological database of medical terms on the platform https://uzbekontology.uz/. The platform includes a number of areas of medicine as the main area and sub-areas within the main areas.

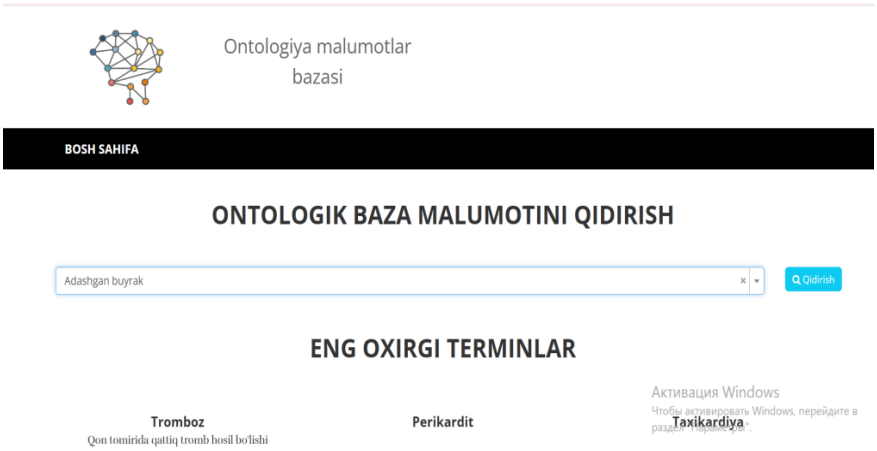

Figure 5. **User interface of the Uzbekontology.uz platform.**

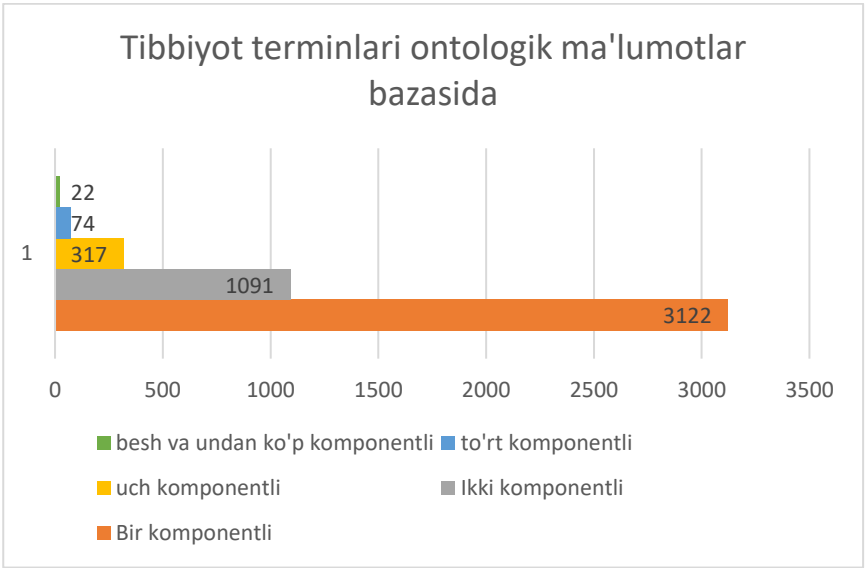

Figure 6. **Statistics of terms by the number of components in the ontological database of medical terms.**

In the database of medical terms (Fig. 6), out of 4626 terms, 22 terms with five or more components, 74 terms with four components, 317 terms with three components, 1091 terms with two components, and 3122 terms with one component were identified.

It should be noted that the analysis of medical terms based on ontological principles plays an important role in the systematic study of the field and the classification of terminology. Within the framework of ontological principles, the functional significance of each type of relationship in the approach arises. While paradigmatic relations analyze terminology semantically, syntagmatic relations analyze how terms are used in context. In taxonomy, the division of terms into classifications is important. In taxonomy, through hyper-hyponymic relations, general concepts are divided into smaller, more precise types, which allows for the systematization of complex medical terminology. In a hierarchical classification, by determining at what level the terms of the field are located, they are classified into certain classes. All the above-mentioned types of relations have important practical significance in sectoral ontological modeling.

CONCLUSION

1. The sharp increase in the volume of data in recent years has further complicated the problems of effective storage, systematization, and formalization of data in various fields. It has been established that traditional methods and tools are insufficient for processing data from large, diverse sources. Therefore, there is a need to introduce new, systematic approaches and methodologies. Therefore, ontology emerged as a structure that clearly and formally expresses the relationships between concepts, semantically connecting them.

2. It is possible to create ontological models in all areas. General terminological classifications in a particular field of science, grouping, inter-class relations expand the understanding of the sectoral terminological system, define fields of knowledge, connect with other fields, and define with key terms. The development of ontology will create systems that can express the interdependence of several fields in the future. Moreover, the creation of a sectoral ontology is a promising direction in computer software systems. It allows for the processing and enrichment of information presented in natural language using modern methods.

3. Ontology and thesauruses are created on the basis of the analysis of certain semantic relations, the concept of the concept is manifested differently in both semantic systems. In the context of ontology, the concept is the basic unit of meaning that represents objects, a class or category of objects, while in the context of a thesaurus, the concept refers to a term or a set of terms that express a certain meaning. That is, in ontology, the concept refers to a class (subclass, large class) existing within a certain field, while in a thesaurus, the concept corresponds to a term or term. A thesaurus, first of all, helps to organize terminology and improve search, while ontology represents a structured description of knowledge with clear relationships and the ability to think. This difference is very important when choosing a knowledge model in areas such as data integration, semantic search, and artificial intelligence. While a thesaurus is a word-based structure for ordering terms, ontology is based on a concept that defines relationships based on logical reasoning.

4. Many tools are used in the creation of ontology, the main advantage of which is the ability to represent the database in a visual form. Visual representation allows users to present the structural elements of ontology in a clear and understandable form, simplify the process of analysis and modeling. Also, visual aids play an important role in identifying and eliminating errors in the process of creating an ontology.

5. The emergence of hierarchical relations in the terminological system manifests itself in a peculiar way. Based on hierarchical relations, semantic groups of lexemes are distinguished, and this situation is very common among scientific terms. Hierarchical classification of industry terms begins with the identification of large classes in the industry terminological system. The problems of field theory, which arose as a form of a systematic approach to language, provide for the illumination of the problem of the unity of the universe and its manifestation in language. Hierarchical relations between language units play an important role in the formation of semantic fields around a word. The study of language as a system

is associated with the division of paradigmatic, syntagmatic, and hierarchical relations between language units.

6. In linguistics, paradigmatic and associative relations are distinguished. Paradigmatic relations are relations expressing the interdependence of words belonging to the same lexical or grammatical category, and associative relations express the interconnection of words on a semantic, contextual basis. These words can belong to different categories, but they are formed in the human mind as interconnected concepts. In a paradigmatic relationship, words have the ability to replace each other. In an associative relationship, words, despite being related, cannot replace each other. In the terminological system, the relationship of synonymy mainly arises between two concepts, and synonymous units form a common linguistic value according to their stylistic coloring and level of meaning.

7. Units are interconnected using syntagmatic relations. Syntagmatic relations are based on the combination of lexemes in a sentence. In the process of speech, words are connected primarily by the meaning they express. The emergence of new terms in the terminological system is also connected with the syntagmatic environment of words.

8. In constructing ontology, semantic fields play an important role in defining concepts, establishing connections between concepts, integrating information, improving semantic search, expressing knowledge, and ensuring a systematic approach, contributing to the effective use of information and concretizing the meaning of concepts.

9. Hierarchical, taxonomic, and semantic relations in the process of ontological modeling, especially in such complex fields of knowledge as medicine, make it possible to structurally and logically organize the system of knowledge, determine its interrelationships, and create a clear conceptual model. Hierarchical relations divide the concepts of medical terminology into higher and lower classes, which ensures their systematic classification. Taxonomic relations serve as an important tool for building a knowledge base through the classification and categorization of concepts.

РАЗОВЫЙ НАУЧНЫЙ СОВЕТ НА БАЗЕ НАУЧНОГО СОВЕТА DSc.03/25.2021.Fil.01.16 ПО ПРИСУЖДЕНИЮ УЧЕНЫХ СТЕПЕНЕЙ ПРИ НАЦИОНАЛЬНОМ УНИВЕРСИТЕТЕ УЗБЕКИСТАНА

НАЦИОНАЛЬНЫЙ УНИВЕРСИТЕТ УЗБЕКИСТАНА

КАДИРОВА ЗЕБО ГУЛБОЕВНА

СОЗДАНИЕ ОНТОЛОГИЧЕСКОЙ МОДЕЛИ МЕДИЦИНСКИХ ТЕРМИНОВ И ИХ СЕМАНТИКИ

10.00.11 – Теория языка. Прикладная и компьютерная лингвистика

АВТОРЕФЕРАТ
диссертации доктора философии (PhD) по филологическим наукам

Ташкент – 2025

Тема диссертации доктора философии (PhD) зарегистрирована в Высшей аттестационной комиссии за B2024.2.PhD/Fil4746.

Диссертация выполнена на кафедре Прикладной и компьютерной лингвистики Национального университета Узбекистана.

Автореферат диссертации на трех языках (узбекский, английский, русский (резюме)) размещен на веб-странице Национального университета Узбекистана по адресу www.nuu.uz и в Информационо-образательном портале «Ziyonet » www.ziyonet.uz.

Научный руководитель:	**Абдурахмонова Нилуфар** доктор филологических наук, профессор
Официальные оппоненты:	**Раупова Лайло Рахимовна** доктор филологических наук, профессор
	Мухамедова Саодат Худойбердыевна доктор филологических наук, профессор
Ведущая организация:	**Ферганский государственый университет**

Защита диссертации состоится на разового заседании Ученого совета за номером DSc.03/25.08.2021. Fil.01.16 при Национальном университете Узбекистана имени Мирза Улугбека «25» НОЯБРЯ 2025 года. (Адрес: г. Ташкент, ул.Университет,1-этаж, аудитория 108. Национальный университет Узбекистана (99871) 2271224; факс: (99871) 246-53-21; e-mail: nauka@nuu.uz

С диссертацией можно ознакомиться в информационно-ресурсном центре Национального университета Узбекистана имени Мирза Улугбека. (зарегистрационный под номером 180). Адрес: г. Ташкент, Алмазариский район, улица Университетская, дом 4. Административное здание УзМУ 2-этаж каб.4. Тел: (99871) 2364655; факс: (99871) 2460224 .

Автореферат диссертации разослан «6» НОЯБРЯ 2025 г.

(Протокол реестра № 55 от «6» НОЯБРЯ 2025 г.)

Н.А.Рахмонов
Председатель Научного совета по присуждению научных степеней, д. ф. н, профессор

М.Б.Хужамкулова
Ученый секретарь Научного совета по присуждению научных степеней, д. филос.по.филол.н. (PhD)

А.Е.Маматов
Председатель научного семинара при Научном совете по присуждению научных степеней, д. ф. н. профессор

ВВЕДЕНИЕ (аннотация диссертации доктора философии (PhD))

Целью исследования является определение иерархической классификации и семантических полей медицинских терминов узбекского языка при создании отраслевой терминологической онтологической модели, теоретическое обоснование онтологических принципов медицинских терминов на основе парадигматического и синтагматического анализа.

Объектом исследования выбраны медицинская энциклопедия, словари медицинской терминологии, а также корпус текстов, относящихся к области медицины.

Научная новизна исследования:

при создании онтологической модели медицинских терминов за основу взяты подходы к формированию лексико-семантических ресурсов, уточнена и лингвистически обоснована семантическая классификация модели. Также обоснованы лингвистические модели концепта в онтологии и словаре-тезаурусе на примере медицинских терминов;

словарь медицинских терминов узбекского языка описан с использованием онтологических инструментов обработки естественного языка на основе корпуса. Также разработана онтологическая модель терминов, относящихся к области медицины, с использованием редактора Protégé;

при проектировании терминологической базы данных выделены основные классы и внутренние классы внутри них на основе иерархической классификации, медицинские термины сгруппированы по сферам, также разработана методология, основанная на парадигматических, синтагматических связях в онтологическом моделировании медицинских терминов;

создана лингвистическая база данных медицинских терминов на сайте https://uzbekontology.uz/ и сформирована архитектура базы данных в соответствии с их семантическими группами.

Внедрение результатов исследования. На основе создания онтологической модели медицинских терминов и исследования их семантики:

теоретические основы создания терминологической онтологической базы данных для компьютерной лингвистики узбекского языка, в частности, анализ семантических отношений на основе изучения медицинских терминов, использованы при реализации практического проекта «Создание образовательных словарей нового поколения и их мобильных приложений», выполненного в Ташкентском университете информационных технологий в 2021–2023 гг. (Справка № 949/05-2 Ташкентского университета информационных технологий имени Мухаммада ал-Хоразмий от 17 марта 2025 г.);

принципы создания терминологической онтологической базы данных для корпуса узбекского языка, а также онтологическое моделирование медицинских терминов для корпуса узбекского языка на основе иерархической классификации по семантическим полям использованы при выполнении практического проекта по теме «Проектирование национального корпуса

узбекского языка и разработка программного комплекса», выполненного в 2021–2023 гг. Применение результатов исследования послужило созданию лингвистической базы данных, подготовленной в рамках практического проекта, и совершенствованию программного обеспечения корпуса. (Справка № 139/01-01 Самаркандского филиала Ташкентского университета информационных технологий имени Мухаммада ал-Хоразмий от 14 марта 2025 г.);

теоретической основой исследования в рамках международного научного проекта «REP-25112021/113 – UzUDT: Универсальный корпус дерева связей для обработки естественного языка узбекского языка и его семантический анализ» послужил анализ семантических отношений при построении онтологической модели, интерпретация понятия «концепт» в онтологических и тезаурусных моделях, а также семантических отношений и иерархической классификации при выделении семантических полей в терминологической системе. (Справка № 04/11-3400 Национального университета Узбекистана имени Мирзо Улугбека от 3 марта 2025 г.)

Структура и объем диссертации. Диссертация состоит из введения, трёх основных глав, общего заключения и списка литературы. Общий объём работы составляет 128 страницы.

E’LON QILINGAN ISHLAR RO‘YXATI
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