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From Creating Virtual Cells with AI and Spatial AI to Smart Information Multi-Level Model of the Universe

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Abstract

Information spatial modeling of the life of the Universe has become one of the urgent problems of world research. International researchers create virtual cells with artificial intelligence (AIVC) to reproduce the behavior of real human cells. Research is combined into models of organs and organisms using spatial data on how cells interact. Spatial artificial intelligence based on knowledge of subject areas can find common patterns at macro and micro levels, processing huge volumes of accumulated interdisciplinary data. The identified patterns can lead to a basic smart information model of all levels of the Universe. Russian scientist D.I. Mendeleyev linked the matter of the Universe through the characteristics of chemical elements. Physicists link energy macroprocesses with microprocesses. Discussion, creation and adoption of a smart information multi-level model of the Universe at the international interdisciplinary level by various specialists will allow the world scientific research community to begin implementing the global Mega Project of Universal Artificial Intelligence Erudition.

Keywords: modeling of biological processes by virtual cells, spatial artificial intelligence, smart information multi-level model of the Universe

1. Introduction to Technology

Most of the technology trends that will become a priority in 2025 are somehow related to artificial intelligence technologies (Anna Malinovskaya, 2025; Technological horizons, 2025). Gartner identified two technological intelligent trends that will have an impact in the coming years: the use of AI agents and the development of artificial intelligence management platforms. An AI agent is software for independent decision-making and performing actions to achieve specific goals, for example, in virtual cell biology (Evgeny Bryndin, 2024; Theofanis Karaletsos, Aviv Regev, Emma Lundberg, Jure Leskovec, Stephen R & Quake, 2024). A virtual assistant combines various artificial intelligence methods with functions such as memory, planning, environmental perception, use of tools and compliance with safety rules to independently perform tasks to study cellular organisms and create virtual cells with AI of various types and purposes (Sam Altman, 2025). Special management platforms will help control AI agents. They will ensure safe and ethical use of AI agents, will become an almost mandatory

element and will reduce the number of ethical incidents.

In its 2025 report, Deloitte calls spatial computing the leading technology (Gokul Yenduri, Praveen Kumar Reddy, Reddy Maddikunta & Thippa Reddy Gadekallu, 2024; Lars Riedemann, 2025). Among modern trends in high technology, Mark Zuckerberg named the metaverse. In 2025, the capabilities of the metaverse began to develop in new directions, towards a broader scope of spatial computing. Spatial technologies are now being used as tools especially actively in industry, where factories and commercial companies create digital twins, spatial models, augmented reality instructions, as well as a digital space for productive research collaboration. The prospects are promising: in the coming years, a multi-level metaverse may be created.

The metaverse obeys the laws of physics of the real world and allows for the most accurate, immersive visualization of physical processes using spatial data and artificial intelligence. Many companies are trying to first model future objects. High-precision 3D technologies and hardware for extended reality (a collective term that includes technologies such as augmented, virtual and mixed reality) have been refined, have become more accessible and can form the basis of a functional spatial network in which a digital layer is superimposed on the physical one and accelerates research work in various subject areas. Sooner or later, as progress in this area progresses, the era of multi-layered operations will arrive. And then autonomous systems, 3D models and quantum computing with direct, but moderate human participation will be enough for remote interdisciplinary research.

Technological advances in recent years have laid the foundation for a multi-layered metaverse. Investments in digital twins, 5G networks, cloud computing, edge computing, and artificial intelligence have delivered tangible benefits. The most popular tools, according to the survey, are process modeling, agent-based AI, and digital twins. Modeling facilitates the successful creation of a new or optimization of an existing research process.

To interact with the multi-layered metaverse, augmented reality allows you to overlay a digital layer on top of the physical one, creating a 3D internet for sharing.

Technology is advancing, ushering in a new era of photorealistic models that are built according to the laws of physics, enhanced by artificial intelligence, and connected to company ecosystems, such as BMW's Omniverse platform. Scientific and technological advances will affect various aspects of research, from space planning to design and even interaction.

Slowly but surely, a spatial network known as Web 3.0 is developing, which has the potential to erase the boundary between digital and physical objects, connecting them into one. With next-generation interfaces, the spatial network allows people to interact with information in real time. Data comes from the physical environment through location or computer vision, and voice and gesture control provide interactivity. With such a set of spatial computing capabilities, it is possible to design a multi-layered metaverse. Of course, interdisciplinary research will be needed for the spatial network to fully manifest itself, but its infrastructure is already being laid by innovative companies. With spatial computing, researchers can visualize, simulate and test. Spatial computing is becoming a leap in technology development, when natural ways of interacting with the physical world can be transferred to the digital world, creating a perfect match between the organic and technological worlds (Evgeny Bryndin, 2024). For this, 7G support networks will be needed. High-speed and ubiquitous connections between future supercomputers with self-learning artificial intelligence will allow them to seamlessly coordinate their actions with each other (Evgeny Bryndin, 2025). Alphabet has unveiled its own 100-qubit quantum processor, called Willow, which can solve a problem in five minutes that would take the fastest computers today ten septillion years.

Auki Network is actively changing the landscape of blockchain and spatial computing. It is a decentralized machine perception network and collaborative spatial computing protocol that enables digital devices to understand the physical world. This external sense of space enables deep understanding of environments and forms the basis of the Auki network. Auki is becoming a leader in decentralized spatial computing by incorporating cutting-edge technologies and ethical approaches.

Spatial AI (SAI) is a field of technology that focuses on the analysis and processing of spatial data and information. This includes various

aspects such as geographic information, image processing, computer vision, and spatial modeling. Let's look at the key components of Spatial AI.

1) Spatial data: Using data related to geographic coordinates, maps, and other spatial attributes.

2) Image processing: Analyzing images and videos obtained by drones, satellites, or cameras to extract information about spatial objects or events.

3) Modeling and simulation: Creating models of spatial systems to predict and analyze various scenarios.

4) Navigation and localization: Using algorithms to determine the location of objects in space and plot optimal routes.

5) Autonomous systems: Developing unmanned vehicles and robots that can navigate in space and interact with the environment.

6) Application: Spatial artificial intelligence has a wide range of applications in areas such as ecology, urban planning, transportation, agriculture, and the metaverse.

A decentralized machine perception network and collaborative spatial computing protocol that enables digital devices to understand the physical world with AI agents will help move beyond creating virtual AI cells and spatial AI to a smart, information-rich, multi-layered model of the Universe.

2. Modeling Organs with Virtual Cells

Modeling organs using virtual cells is an interesting and multifaceted field that covers various aspects, including biological, physical and computer sciences. The main idea is to create simulations that imitate the behavior of cells and their interactions, which allows us to study complex biological processes of life. Let's consider the main aspects of modeling organic cellular life with virtual cells:

1) Cell models: Cell models use the rules of life to determine the state of each cell based on the state of neighboring cells. For example, cells can be alive or dead depending on their environment. Or agent-based simulations, where each agent cell has its own rules of behavior and can interact with other agents or the environment, allowing for the modeling of complex systems.

2) Study of biological processes: Simulations can help in understanding processes such as tissue development, cell migration, cell interactions in immune responses, etc. Using virtual cells can help in modeling ecosystems, studying species interactions, and population dynamics.

3) Accuracy of models: Ensuring the accuracy and realism of complex models is an important task that requires deep knowledge of biology and related disciplines, as well as keeping up with the development of cell biology and research results.

4) Technologies and tools: There are various tools and platforms such as NetLogo, Unity3D, AnyLogic and others that can be used to create and visualize cellular simulations. Machine learning is actively used to analyze data from simulations and to optimize models. Modeling biological complex systems requires significant computing resources.

Modeling organs with virtual cells is a powerful tool for understanding complex biological systems and processes. It finds application in various fields of science and medicine and continues to evolve with new technologies and methods (Evgeniy Bryndin, 2020).

3. Living Spatial Artificial Intelligence

Living spatial artificial intelligence (LSAI) combines elements of artificial intelligence with spatial data and models. These are intelligent systems that are able to analyze, interpret, and interact with the surrounding space using multimodal data from various sources (Evgeny Bryndin, 2024). Let's look at the key aspects related to the LSAI:

1) Interactivity: LSAI can interact with users and the environment in real time, adapting its actions and recommendations based on the data it receives.

2) Data Analysis: Using AI algorithms to process data to analyze spatial information, detect patterns, and identify patterns in events.

3) Real-World Applications: LSAI can be used in research and sustainability areas, including smart environmental monitoring, safety, and healthcare.

4) Virtual and Augmented Reality: Creating spatial models and simulations that can be used to enhance perception and interaction with the environment.

5) Ethics: It is important to consider the ethical aspects of using LSAI (Evgeny Bryndin, 2024).

4. Aspects of Creating a Smart Information

Multi-Level Model of the Universe

4.1 Smart Model of the Universe

The smart model of the Universe implements several directions.

1) Complex systems and self-organization: The smart model of the Universe, like complex systems, is capable of self-organization and adaptation. This includes studying the interactions between the elements of the system, which leads to the emergence of new properties and structures.

2) Intelligent technologies: The smart model of the Universe uses artificial intelligence and modern digital technologies to analyze big data about the Universe. This includes processing astronomical observations, modeling cosmological processes and the behavior of complex systems.

3) Cognitive technologies: The smart model of the Universe relies on cognitive technologies of consciousness and intelligence to interpret the structure and processes of the Universe.

4) Smart ecosystems: The smart model of the Universe considers ecosystems as complex systems that require efficient management and optimization of resources.

5) Cosmology and consciousness: Consciousness is associated with the processes of the Universe. The Intelligent Model of the Universe explores how consciousness and perception influence our interdisciplinary understanding of the surrounding reality.

4.2 Information Model of the Universe

The information model views the universe as consisting of information and interactions that can be described and analyzed using various scientific approaches. This model focuses not only on the material components, but also on the information that allows us to describe their properties, interactions, and evolution. Key aspects of the information model of the universe include:

1) Information as the basis of reality: Information is a more fundamental entity than matter (Evgeny Bryndin, 2022). This means that all physical phenomena can be described through information and its processing.

2) Quantum information: Quantum information plays an important role in the model of the Universe. Quantum states can be considered as information carriers, and measurement processes can be considered as information transformations.

3) Living information: Living information of the Universe allows us to analyze the complexities and patterns in the structure and dynamics of the Universe.

4) Astronomical data: Modern astronomical research generates huge amounts of data. The information smart model helps in their analysis, identifying patterns and regularities.

5) Models and simulations: Computer models and simulations based on information principles help in the study of cosmological processes. The information smart model studies questions about the nature of reality, consciousness and knowledge, exploring how information affects our perception and understanding of the world.

The Smart Information Model offers a new perspective on the study of the Universe, emphasizing the importance of information in understanding both physical reality and the theoretical foundations of science.

4.3 Multilevel Model of the Universe

The multilevel model of the Universe various aspects and levels of organization of cosmic reality. In this model, the Universe is considered as consisting of several interconnected levels, each of which has its own unique characteristics and patterns. Let's consider the key levels of the Smart Information Model of the Universe.

1) Physical level: This is the level at which the known laws of physics operate. It includes elementary particles, atoms, molecules, and more complex structures such as stars and galaxies. At this level, we can study the interactions of matter and energy, gravity, electromagnetism, and other fundamental forces.

2) Cosmological level: This level covers the macroscopic structure of the Universe, including the distribution of matter, the evolution of galaxies, the cosmic microwave background, and the expansion of the Universe. Large-scale processes and dark energy and matter are considered here.

3) Biological level: This level examines the processes associated with life and its evolution in the Universe. This may include questions about the origin of life, its diversity and adaptation to different conditions, and healthy cellular forms of life on Earth.

4) Social and cultural level: This level focuses on how human perception and understanding of the Universe is shaped by culture, science, and technology. It involves the study of how different research communities interpret the Universe and the meaning they attach to their place in it.

5) Information level: Information is considered the basic element from which reality is created. Information is transmitted and processed in various systems, from elementary particles to complex biological and social systems, and up to cosmic structures and processes.

6) Autonomous Material Level: The autonomous material level forms three sublevels: the microworld, the meso-world, and the macroworld. The three sublevels of the autonomous material world lead to an understanding of the structure and organization of matter.

6.1) The microworld includes elementary particles such as electrons, protons, neutrons, and other particles that make up atoms.

6.2) The meso-world is located between the microworld and the macroworld: - Atoms and molecules are the basic building blocks of all chemical substances. Interactions at this level determine the chemical properties of substances. - Cells are the basic units of life, consisting of molecules and organelles. Cells interact with each other to form organs and organisms.

6.3) The macroworld encompasses large objects and systems: - Geological and astronomical objects include planets, stars, galaxies, and other large structures in the Universe. - Ecosystems are large-scale interactions between different biological species and their environment, which may include climate change and ecological processes. - Social systems include human societies, economic systems, and cultural interactions that are formed based on interactions between individuals.

The three-level model of the autonomous material world helps to better understand how the different levels of matter and life are interconnected. Each level has its own unique properties and laws that determine its behavior. Interactions between these levels can lead to the emergence of new phenomena and systems, which makes these levels a particularly exciting and important aspect for science.

7) Research level: This level includes reflections on the nature of reality, the place of humans in the Universe, and questions about consciousness. Research approaches analyze how different theories and models affect our understanding of existence and our place in the Universe. The research level of an intelligent information multi-level model of the Universe with spatial intelligence will allow the international research community to create Universal Artificial Intelligence Erudition at an interdisciplinary level.

5. Universal Artificial Intelligence Erudition

Universal artificial intelligence erudition is the ability of a high-speed software hardware complex, working with huge volumes of knowledge and data, to simulate the natural collective intelligence of humanity. Universal artificial intelligence is focused on the intelligent execution of tasks that can be performed by more than a human. Let's consider the main aspects of universal artificial intelligence erudition:

1) Cognitive abilities: Universal artificial intelligence erudition should have universal cognitive abilities similar to humans, including understanding, learning, reasoning, and creativity.

2) Adaptability: It should be self-learning reflexive and be able to adapt to new tasks and conditions, learning from experience, as humans do (Evgeny Bryndin, 2025; Evgeny Bryndin, 2024; Evgeny Bryndin, 2022).

3) Multifunctionality: Universal artificial intelligence erudition should cope with a variety of scientific research tasks, communicate in natural language, and manage complex systems.

4) Modeling and simulation: To create universal artificial intelligence erudition, models are developed that imitate human thinking and behavior, based on serious research in the field of cognitive science.

5) Control: The development of universal artificial intelligence erudition raises questions of control and act in the interests of man and humanity as a whole.

Universal artificial intelligence erudition works with reflected information from the perception of the nature of the Universe by natural intelligence. True reflected information from objects, processes, phenomena and their interactions can significantly accelerate scientific discoveries by processing and analyzing huge

amounts of data by universal artificial intelligence erudition. Its implementation can lead to significant changes in the social structure and economy and can have profound positive consequences for the future of humanity (Evgeny Bryndin, 2025).

6. Conclusion

The use of smart technologies and models influences our interaction with the world around us and expands our understanding of reality. The nature of the Universe can only be explained from different perspectives, and that the interaction between different levels is the key to a deep understanding of its essence. A smart information multi-level model of the Universe with spatial intelligence is a promising area of research that can lead to new discoveries and understanding of the nature of reality.

Models combine different technologies and approaches, which allows for a deeper understanding of the complex relationships that exist in the Universe (Leonid Marochnik, 2024; Richard Dvorsky, 2025). It provides comprehensive and interdisciplinary research on a universal scale. Self-learning agents with artificial intelligence seek to explain each action of the model in order to control subsequent decisions. This is especially useful in research, where a clear justification for decisions is important.

In 2025, multifunctional robots equipped with Self-Learning Agents with Artificial Intelligence will become a key technology, capable of performing multiple tasks and learning new tasks without reprogramming. Multifunctional AI-agent robots, based on a smart information multi-level model of the Universe with spatial intelligence, will be able to explore the Moon, Mars and other space objects accessible to humanity.

Universal artificial intelligence erudition will become a global instrument of international interaction, satisfying the desire of states and the world community as a whole to use intelligent systems for operational and effective global cooperation in all spheres of life (Evgeny Bryndin, 2025; Bryndin E. G., 2025).

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