Let's Talk AI with Ina Schieferdecker

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"The wealth of artificial intelligence methods enables digital solutions, without which the transition to sustainability, including the transition to renewable energy and the circular economy, would be impossible. It would be unethical not to harness these enormous opportunities, not to liberalise access to data, computing, and AI resources worldwide, and not to educate and train people around the world to make the most of AI."

The Interviewee - Ina Schieferdecker

My Personal AI Mission:
On a large scale, my dream is the liberalization of AI. Basic AI should not be a masterpiece of political, economic, or military power. A key area for the beneficial application of this AI vision is to use this powerful tool to address the most critical threat to humanity, which is sustainability in all its forms. On a smaller scale, I would like to contribute to the improvement of software engineering by applying AI methods and tools.

My Takes on AI

Artificial Intelligence: There is no single definition for Artificial Intelligence, as views of its characteristics, properties, potentials, or risks differ depending on the research discipline, such as computer science, jurisprudence, or social

science. As a software engineer, I like to make use of a systemic view of an AI system according to which "an AI system is an engineered system that generates outputs such as content, forecasts, recommendations or decisions for a given set of human-defined objectives." An AI system can use "various techniques and approaches related to artificial intelligence to develop a model to represent data, knowledge, processes, etc. which can be used to conduct tasks." [6]

Trust: Trust, which is largely based on experience, has multiple dimensions, and includes elements of reliance, vulnerability, expectation of honesty, or dependability. As a software engineer, I am interested in how users of services and products perceive the trustworthiness of the providers, operators and/or technologies involved [11]. The trustworthiness of services, products and technologies is of particular interest here, as trustworthiness, which includes quality, security, performance, reliability, robustness, etc., provides the technical basis for building trust.

Explainability: Explainability is a requirement for today's AI systems to make their results understandable to users. It is achieved with methods such as textual, visual, or exemplary justifications, rule extraction, or determining the importance of model features. Explainable AI is necessary for the development and widespread adoption of traceable and trustworthy AI-based systems. It will become less important as AI-based systems proliferate in everyday life but will remain important in AI-assisted applications where the final decisions remain with the human user.

Essential Elements of Human Capabilities: Mental human capabilities are of particular interest when comparing human intelligence with technical artificial intelligence. These include learning, contextual understanding, creativity, adaptability, error tolerance, consciousness, and ethical motivation. At present, any one mental or other human capability can be performed better by one machine or another, but not in combination, which is certainly true of the sum of human mental capabilities compared to artificial intelligence.

The Interview

Barbara *Today, I have the pleasure to interview Ina Schieferdecker. Could you briefly introduce yourself and your relationship to artificial intelligence?*

Ina Thank you, Barbara. I appreciate the opportunity to participate in this interview. I am Ina Schieferdecker, a mathematical computer scientist. My research so far has mainly focused on software and quality engineering, open data and data platforms, smart cities as well as on digitalization and sustainability.

I studied at Humboldt University, Berlin, and joined GMD FOKUS, now known as Fraunhofer FOKUS, during my PhD studies. My connection to AI began during my studies, where we were taught logic-based AI and programming with Prolog. To be honest, it was not my favourite subject. I found it too narrow and too limited. It was indeed the early days of AI.

When I joined GMD FOKUS, which I eventually co-led, we used AI extensively. We were on the application side, not the development side for AI methods. We used AI in various fields, such as autonomous driving, medical data analysis, software test optimization, or the optimization of telecommunication network topologies. Throughout my career, I have been tracking advancements in AI and observing its developments from an application perspective, in particular for software engineering and for quality engineering.

My perspective shifted when I co-founded the Weizenbaum Institute for the Network Society. There, we examine the implications of digitalization on society. I led two research groups, one of which focused on the criticality of AI-based systems. We explored questions of biases in AI, trustworthiness, sustainability properties such as resource efficiency, and inter-labor aspects of AI, such as workforce, regulations, and working conditions [7, 14].

More recently, I was a member of the Advisory Council on Global Change, or WBGU, from 2015 to 2019. We developed a flagship report on our common digital future, which is essentially about the digital age, its characterization, and the utopian and dystopian visions that can emerge from digitalization. We identified AI as one of the key technologies of the digital age and discussed three scenarios [10]: First, we posited that AI is currently the most powerful tool we have at hand for humankind. It can help us excel in our core concerns, which are not just computation or automation, but rather to have machinery that takes care of the mundane tasks, freeing us to focus on care, education, science, art, and so on [10, p. 6]. Second, we considered a scenario where AI developments are so advanced that AI becomes a good companion to every human being, providing significant help [10, p. 6]. Lastly, we discussed a dystopian view where AI becomes the master of humankind, a view I personally do not subscribe to [10, p. 7]. In the past four years, I worked with the Federal Ministry of Research and Education in Germany. I led the Directorate for Technological Sovereignty and Innovation, including AI, where we supported the AI Act and

the federal AI research programs, for example including the establishment of the AI Competence Centers in Germany.

Now, I returned to research as an independent researcher. I am excited about the possibilities of current AI tools and how they can revolutionize research. For example, in conducting literature reviews, analyzing how scientific results relate to other scientific results, improving data empirics, data visualization, and even enhancing my English writing and speaking skills. I find it fascinating to look at my field of expertise, software engineering and testing, primarily not of AI, but with AI. I believe AI can revolutionize many sectors, including core technologies in digitalization such as software engineering.

However, I am aware that the term "AI" can be misleading, as it may trigger incorrect impressions about the technology behind it. But it is a term that was established decades ago, and we have to work with it. I hope we can educate people to better understand the potential and not just the risks of AI. Along the way, AI can become a very powerful companion for us. The case of AI becoming our master is, I think, if not theoretically impossible, at least very unlikely. However, we need to be careful about how much automation is handed over to AI-based systems, and that the human-in-the-loop remains in charge of key decisions.

Barbara *Have you been surprised by the advances in AI over the past few years?*

Ina I have to say that I am naturally inclined towards the mathematical, logical, and data-driven side of software engineering, statistics was not my favourite subject. But now, the two have come together, and yes, I have learned so much about the impressive results of AI. For instance, weather forecasting and climate analysis are better with AI [2]. Protein structure detection is significantly improved with AI [12]. The application of AI in my field of expertise has had a significant impact. The qualitative enhancement of a multitude of new technologies and applications has been remarkable [1, 15, 5].

"We need an international discussion on the red lines for the use of AI in autonomous weapons."

Barbara *Do you think users are currently educated enough to use these AI-based tools and systems appropriately? Or do you think we often deal with over- or undertrust in these contexts?*

Ina Let us differentiate education on the one hand side, and trust or mistrust on the other: Although they are interrelated, one can trust without knowledge or education. Nevertheless, it is my contention that the education of the public regarding AI is not being conducted in an optimal manner. It is imperative that we all gain a deeper comprehension of the ramifications of AI-based systems and tools in a multitude of domains, including education, training, research, industry, society, law, justice, and so forth. This is a challenge that must be

addressed collectively. The absence of definitive answers necessitates the training of problem-solving capabilities and the critical reflection of solutions.

The degree of trust and mistrust exhibited globally varies considerably. There are those who view AI as an advantageous and promising technology. I consider myself to be among those who are optimistic about the potential benefits of AI, although I am not naive about the challenges that the technology will undoubtedly present. There is a considerable degree of mistrust, which can be attributed to the novelty of AI technology and the fact that it is currently monopolised by a small number of companies. If we were to liberalise AI, which would entail liberalising foundational AI models, basic methods, tools, and the data needed to train and verify AI systems, it could be expected to function considerably more effectively. It is imperative that we ensure fair access to this pivotal technology, a task that requires our immediate attention.

Barbara *Do you support Meta's move to open-source its large language models, or do you see this as a potential risk given the power of such technology?*

Ina I think it is important to open them up to promote greater diversity in the LLMs. I do not think this is risky; on the contrary, I think it is a step forward. However, I do not think this should be solely in the hands of companies alone. There are many small and medium-sized enterprises that might contribute, or even the public sector and research.

Barbara *So, you're proposing a public goods approach, similar to the Internet?*

Ina Yes, exactly. Like the Internet, we need to develop a viable path towards digital commons. These digital commons should include open educational resources, open data, and a part of the Internet as an open public space like a Digital Agora, where opinions and facts can be openly exchanged. The Digital Agora should not be controlled by corporations. The same applies to the core components of AI.

Barbara *Do you disapprove of the current competition among big tech companies, where they use their resources to gain access to underlying technology, data, and top talent to strengthen their position?* **Ina** I understand why they behave this way, because it suits their purposes. However, I think we are in a situation similar to the telecommunications era before, where power was concentrated in a few companies. Eventually, some of the companies were broken up. I think we will see a similar discussion soon. Either we need to develop good enough LLMs from public fund, or there needs to be a market correction to distribute power more evenly.

Barbara *How do you view the role of trust in AI adoption?*

Ina Trust is a key element in the adoption of any new system, process, or technology. The same is true for AI. Without the trust of early adopters, followed by the trust of the majority of society, there will be little widespread adoption of AI in general.

Coming from the computer science/engineering side, I believe that high-quality, fit-for-purpose AI-based systems can provide a technical basis for trust [13]. We call such systems trustworthy. Characteristics of trustworthiness include features such as privacy, security, integrity, robustness, reliability etc. [9].

However, technical means alone will not be sufficient to secure AI-based systems, especially if they are security- or safety-critical. Rules, processes, and workforce will also be needed to manage, for example, misuse or malfunction.

I think the European AI Act correctly addresses the criticality levels of AI-based systems [3]. However, I am not convinced that the subtle technical details for an optimal balance between innovation and risks are well reflected. It will be very important that modern, innovative AI-based systems are not stifled by national regulation. It would be great if we could agree and succeed in making the use of AI a kind of mandatory requirement. You could even say, with a capital hyphen, that it is forbidden not to use AI wherever its use is appropriate.

Barbara *What measures are essential to ensure ethical use of AI?*

Ina Ethical AI use varies around the world, but there are common denominators such as human rights, the UN Agenda 2030 with the SDGs, and democratic values [4]. Ethical AI applications would mean no invasion of privacy, no unintentional bias or discrimination, no undetected deepfakes or manipulation, and no waste of resources. In terms of action, I think it is about education and training to understand the potential impacts, risks, and opportunities. It is about providing public data, computing resources, storage, AI tools, and LLMs. It is about strong research on AI, cross-disciplinary research between STEM and social sciences, standardization of AI-based systems, and processes to address any misuse of AI.

"Liberalising AI, making it open source, and being transparent about the training data used can help prevent unintentional biases and biases that contradict our values."

Barbara *Do you think that the EU AI Act is a step in the right direction?*

Ina The direction is right, but it is still rather open at critical points [8]. I appreciate the risk-based approach, but I think it is very important and more effective to take a customer-driven, application-oriented approach. Important technical details have not yet been clarified, which could lead to different solutions in Europe, potentially hindering the scalability of Europe-wide AI-based solutions.

Barbara *When you talk about an application-oriented approach, are you referring to the underlying AI technology or to the various AI applications? And should they be approached in a specialized and thus customized way?*

Ina I believe that we should focus on the services that a solution offers, rather than the technology itself. The impact comes from the use of the applications

and the results they produce, not from the potential of a technology. Therefore, it is crucial to start with consumer needs and the intended applications. I am not sure that the AI Act takes this into account, as only the application can lead to a real impact assessment, which needs to be verified, validated, and possibly certified.

Barbara *Indeed, one challenge is that AI systems like ChatGPT are quite generic in their approach. While the interaction may be limited, the range of topics it can address and the support it can provide is difficult to clearly define.*

Ina ChatGPT is a text processor and question-answer machine with selected advanced features for image or chart processing that can handle queries from any sector. Its responses are frequently impressive, although they are occasionally erroneous, contingent upon the training data it has been provided with. The risk associated with text processing is relatively low, as it is akin to conducting library research on a larger scale. However, when discussing AI in education, it is of the utmost importance to understand its application. If the system is merely used to support an individual student's learning journey, this is a different scenario to AI being used to assess the quality of a student group or even an entire university. It is crucial to evaluate the capabilities and limitations of a system, as well as its intended use, the individuals who can utilize it, and the potential consequences of its use.

Barbara *In the context of education or research, would you support the use of AI like ChatGPT for writing papers and improving texts, or do you think that these are areas where people should still think and work independently?*

Ina It is imperative that independent thinking gets encouraged. Nevertheless, the question of whether or not to utilise AI tools such as ChatGPT is not the issue at hand. Indeed, I believe they should be employed. It would be unwise not to do so. Initially, it might be necessary to disclose the use of AI tools for text improvement. However, this will become commonplace in the long term. As is the case with the use of text editors or grammar checkers, the use of AI tools will become a commonplace occurrence. It is of paramount importance to ensure that research and other texts remain original works. This is an area that should be included in the ethical training provided to students. It is inevitable that there will be instances of misuse and attempts to circumvent hard work. However, these will ultimately prove unsuccessful in the long term. It is not possible for AI to generate original ideas, as it is only capable of combining existing ideas.

Barbara *Looking to the future and specifically the future capabilities of AI, on a scale of 1 to 10, where 1 represents current AI systems like ChatGPT and 10 represents artificial general intelligence, what do you think will be possible?*

Ina In preparing for the interview, I found myself intrigued by this preparatory question and its implications for autonomy. In considering the five levels of autonomous systems in automotive technology, from assisted driving to autonomous driving, it can be observed that all levels utilise AI. Commercially deployed systems are at level three, and it is possible that we might reach level

four by 2030 or later. There is a strong conviction that full autonomy will be achieved, although the precise timing of this remains uncertain. Nevertheless, in terms of human capabilities, AI has already demonstrated the capacity to surpass us in a number of areas. Machinery is constructed with the intention of performing tasks more efficiently than humans can, or tasks that humans are unable to perform. For example, AI has already demonstrated superior performance in logical games, knowledge games, and big data analysis and large-scale pattern detection, including medical image analysis.

Barbara *In what areas do you think AI has already surpassed us?*

Ina As previously stated, AI has demonstrated superior capabilities in logical games, knowledge games, or medical image analysis. In these domains, the performance of AI can be considered to be top, with a rating of 10. Nevertheless, the term "artificial intelligence" may not be entirely accurate. As an artificial entity, it displays certain characteristics that can be attributed to intelligence. Nevertheless, it is not capable of solving tasks or situations that are unexpected, unforeseen, or unknown in the same way that humans can. Artificial intelligence is most effective in domains where there are clearly defined rules or a vast quantity of data. In contrast to humans, AI can work tirelessly and performing tasks with greater consistency. Nevertheless, it is unlikely that AI will ever fully replicate human intelligence. Instead, we will witness the emergence of a distinct form of intelligence, which I propose to designate as "technical intelligence." Technical intelligence should be applied where it's most beneficial, such as in critical, tedious, or repetitive tasks. While AI's victories in chess and Go may not appear to be of great consequence, they were nevertheless significant milestones in the field of AI research. The advantages of this approach are already apparent, and it is to be hoped that further benefits will accrue in the future.

"It is necessary to be sufficiently reflective to be able to modify our approach when new insights emerge regarding undesirable emergent behaviours."

Barbara *I often encounter two opposing perspectives on AI. Some people are unsure about what AI is capable of and whether we should trust it, while others hope to gradually outsource manual and time-consuming tasks that they no longer want to do to AI. Do you think the way the media is currently portraying AI is accurate? Or do you think there's a tendency to either create fear, with statements like we might lose control over it, or to over-market it as the solution to all our problems?*

Ina Firstly, I think AI is not well represented in the media. Journalists tend to focus more on the risks rather than the opportunities. I would like to see more balanced coverage of AI developments. For example, I appreciate the new devices that assist with housework, such as cleaning machines. If we could communicate better about these small solutions, I think it would open people's minds to the potential of AI. The real benefits, of course, lie elsewhere. It is my hope that we

will place greater emphasis on developing AI solutions to the grand challenges of humanity, while simultaneously ensuring that AI is both resource-efficient and energy-conserving. This could be achieved by utilising AI for example to monitor climate change, environmental developments, and provide early warnings of potential environmental disasters or even criminal attacks against the environment. Furthermore, there is the potential for AI in combating climate change identifying novel or improving deployed approaches to smart farming, mobility, or energy provisioning, for example. Nevertheless, I believe the primary risk is not AI surpassing humankind, given my mathematical education. It can be persuasively argued that this will not occur. The real risk could be in rather simple situations. To illustrate, if AI is employed to enhance the stability of energy networks in conjunction with renewable energies, a seemingly logical solution for AI to reduce CO2 emissions might be to simply switch off energy production. Energy blackouts can have catastrophic consequences. It is imperative that experts are included in the decision-making process when utilising any form of automation, including AI-based automation.

Barbara *Do you think we can ensure that we maintain control over AI?*

Ina It is my concern that the machinery of strong AI is only with companies. It is my contention that the machinery of strong AI should be subject to public control. In order to achieve this, it is necessary to democratize AI, thereby enabling access to the machinery and the capacity to analyse the systems that are implemented. As we have learned to manage and safeguard electricity and transportation, it is similarly important to integrate the digital technologies including AI into societal processes and procedures. It is not sufficient to rely solely on technology. To ensure that AI respects privacy, security, reliability, robustness, performance, and resource efficiency, it is necessary to implement societal processes. It is necessary to have technical associations monitoring the impacts of digital technologies on society and ensuring they align with our values.

Barbara *Looking into the future and AI's impact on it, where would you position yourself between utopian and dystopian visions?*

Ina Taking up our discussion of possible futures for humanity and AI at the WBGU, it seems reasonable to posit that, according to the computational theories currently available, there are good reasons why AI will not become general AI, but that generative AI has already surpassed a quality level with very impressive and important results. On the utopian side, it is my contention that AI will continue to be one of our most powerful tools for addressing the grand challenges of humanity and for tackling climate change.

The dystopian scenario posits that we fail to utilize AI correctly and are not cautious enough when deploying AI-based autonomous solutions. Such an outcome could result in the emergence of behaviours that were not foreseen, and which could have a disruptive effect on our society.

It can be reasonably assumed that the explainability of AI will be a significant factor in determining the extent to which AI is accepted and used on a

widespread basis. However, as the quality and trustworthiness of AI-based systems improve, this will become less of a concern.

Furthermore, it would be important to discuss how we can avoid the unintended emergence of behaviors of AI-based systems to which we assign and automate tasks, e.g. in critical infrastructures, or in cases where these behaviours are critical for individuals, for privacy or self-determination. It is necessary to determine how experts can be integrated into the process of quality checking and correcting, where necessary, the suggestions and solutions of AI-based systems.

It is my hope that we will be sufficiently courageous and intelligent to forestall wrong outcomes, but it needs to be a collaborative effort. It is my hope that organizations like the UN will play a role in democratizing not only AI but also the broader digital landscape. Otherwise, it is my considered opinion that the use of monopolized, unvalidated or unreliable AI represents a genuine and imminent threat to all of us.

Barbara *So, your main concern is that we are accelerating progress too quickly without considering the potential consequences?*

Ina The answer is both yes and no. It is imperative that AI-based innovations be implemented on a large scale. Concurrently, it is of the utmost importance to ensure a balanced distribution of power on a global scale and to implement state-of-the-art designs and validations of AI-based solutions. Reflections need to be made in a timely manner. It is evident that there is already a considerable amount of reflection taking place within the scientific community and across various disciplines. However, there is a need for this reflection to be disseminated more widely. Socio-technical impacts, environmental and ethical considerations should become part of professional education and university curricula. Such a process will require a certain amount of time. It is necessary to be sufficiently reflective to be able to modify our approach when new insights emerge regarding undesirable emergent behaviours. Furthermore, there is a need for a more open discussion about the use of AI in the military, the extent of autonomous weapons, and whether there are any boundaries. It is evident that such a discussion is currently lacking.

"Nevertheless, it is not capable of solving tasks or situations that are unexpected, unforeseen, or unknown in the same way that humans can. Artificial intelligence is most effective in domains where there are clearly defined rules or a vast quantity of data."

Barbara *From your perspective, what are the key disciplines that need to be involved in the development and discussion of AI and its future progress?*

Ina To reiterate, I would emphasize making AI-based innovations resource-efficient and using them also for the transformation towards sustainability. My perspective on sustainability encompasses not only environmental considerations but also includes rights of individuals and the role of society in the process of

transformation. This is consistent with the United Nations' perspective on sustainability. To achieve this, it is necessary to adopt a multidisciplinary approach encompassing both technical and social sciences, and to foster collaboration between industry and academia. Otherwise, it will not be effective.

Barbara *Are there specific research questions or areas where we should encourage more interdisciplinary collaboration?*

Ina Any AI application requires interdisciplinary or cross-disciplinary work. We have learned in software engineering that users should be in the loop. The technical perspective alone is not sufficient to address all the issues necessary to develop fit-for-purpose systems. Fit-for-purpose development requires knowledge and understanding of the application domain, requirements, and needs. This knowledge and understanding do not come from STEM alone, but rather from social science and other disciplines.

Barbara *Earlier in the interview, you mentioned the importance of addressing potential bias and discrimination. How do you distinguish between bias and customization? Is there a clear distinction?*

Ina To the best of my knowledge, there is a well-developed understanding of bias, and a strong research track record in service customization, personalization, and recommendations combined with the prevention of unintentional biases. Bias in general is necessary in society helping us to distinguish between friends and strangers, for example, or between our social groups and others. When we talk about bias in technical or AI-based systems, we are talking about unintentional bias or bias that goes against our ethical values.

We need customization for a good AI-based system. For example, AI in education needs to be customized. It uses biases because it can only derive ideas or certain distributions from the datasets it has. Society works with biases. The discussion about fairness is always relative to the ethical values we hold. I believe that liberalising AI, making it open source, and being transparent about the training data used can help prevent unintentional biases and biases that contradict our values.

Barbara *From your personal perspective, what should be the AI vision?*

Ina My dream is the liberalization of AI. The breakthroughs in AI could be the chance for breakthroughs in digitalization: The winner-takes-it-all-mechanism could become historic, enabling a paradigm shift towards more diverse and innovative digitalization with less monopoly and accumulation of market power.

For this to happen, AI should become part of the global digital commons: Similar to open-source software, open data, or open education, we need AI ecosystems worldwide that can be used by anyone for the benefit of the planet or humanity. These AI ecosystems must be accessible and accountable. Basic AI should not be a masterpiece of political, economic, or military power. Yet, private proprietary forks of the AI commons must be possible and exploitable.

A key area for the beneficial application of this AI vision is to use this powerful tool to address the most critical threat to humanity, which is sustainability in all its forms. Commercial adoption for any meaningful application will happen anyway. But if we are talking about the public interest, then resources should be directed towards sustainability. This includes basic and applied research. The vision is to find a good companion for humanity in AI.

Barbara *Given your professional background, do you think that Germany or Europe has a unique role to play in the field of AI? If so, are they taking adequate responsibility and action?*

Ina I think Germany has a big responsibility because of its economic power, perhaps more so than other countries. It also has a significant responsibility because it has been the source of many fundamental AI developments. However, I do not believe that it is fully embracing this role. I think we lack a clear vision in Germany. Coming from my political background, I feel that Germany's goals and strategies in this area are not well defined. The research coming out of Germany is excellent, and I hope we continue to attract top talent. But I see Germany as a major player in Europe, nothing more. I firmly believe that Europe needs to find its own way. Only then will it have the power to establish standards that are in line with our values or reject AI-based solutions that violate privacy. There is still a lot of work to be done.

"A key area for the beneficial application of this AI vision is to use this powerful tool to address the most critical threat to humanity, which is sustainability in all its forms."

Barbara *Is there anything else you would like to add?*

Ina I think I have covered most of it, including the issue of AI in weapons. We need an international discussion on the red lines for the use of AI in autonomous weapons. I am not an advocate of an AI moratorium, as developments will continue regardless. But I am an advocate of critical and responsible AI research and deployment that needs to be accompanied and reflected in society and policy. The point is to use AI intelligently. When I talk about liberalizing AI, I am also talking about the need for a robust AI infrastructure. Otherwise, our ambitions will remain dreams. Research in Germany and Europe is strong, but to achieve impactful results, we need to turn research into innovation, which is impossible without a strong and modern infrastructure.

And of course, there is a lot of work to be done in terms of digitalization in Germany and Europe, but that is a topic for another interview.

Barbara *What do we need more of? Is it funding, resources, data, computing power, something else?*

Ina I believe we need a change of mindset. We need people from different backgrounds in decision-making positions who understand the importance of modern infrastructure, public access to data, and good computing resources for the digi-

tal transformation. A change in mindset will ultimately lead to the improvements that are so desperately needed.

Barbara *Thank you very much, Ina, for your time and insightful perspective on AI.*

Ina Thank you for the engaging questions.

Barbara *It was a pleasure.*

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