RESULT: Actor cards for creating conversations between different perspectives towards technologies

What is it and why should I use this methodology?

These actor cards are aimed to generate empathy for and understanding of the world views for the perspective holder when designing applications of an emerging technology. They are best used in a role-playing game, where each player takes the perspective of the key stakeholder and examines the set of questions with a particular technology in focus. The card deck includes six perspectives and a technology card. The technology card provides a set of emerging technologies and their priority application areas that are to be discussed individually on each round of the game. The six perspectives provide detailed prompts around the interests of the actors, providing ground for the exploration of considerations about the societal impacts of technology.

The six perspectives are:
- Developer (the entity that creates, designs and releases an application)
- Citizen (including perspectives of agency, education and activism)
- User (individual, company)
- Regulator (different levels of governance, including non-traditional regulation actors)
- Investor/ venture capitalist (funder of companies and start-ups)
- Malicious agent (interest group, organized crime, state, individual)

This is a game with no individual winner or losers, but a good game will typically generate new ideas, contribute to identifying potential problems, and the solutions for those problems. You can take multiple rounds and change the perspectives, and you can star the game over with a new technology.

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FORGING

Actor cards by topics

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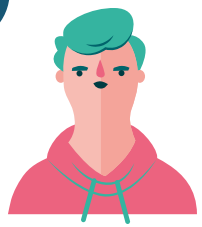
FORGING

TECHNOLOGIES FOR ENERGY EFFICIENCY AND TRUSTWORTHY AUTONOMY

DEVELOPER



QUESTIONS TO CONSIDER:

- Can I develop solutions that make use of energy waste, for instance excess heat?
- How can I balance between the aim for developing energy efficient systems and the need for clean energy solutions that may be less efficient?
- How do I balance between the need for novel efficient clean energy solutions and the environmental costs of their production?
- How can I contribute to introducing more sustainable energy solutions to very energy intensive industries?
- Can I develop solutions that do not require any energy use?
- How can I involve users and citizens in the development to better understand the impacts of my energy solutions?
- New questions?

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FORGING

TECHNOLOGIES FOR ENERGY EFFICIENCY AND TRUSTWORTHY AUTONOMY

REGULATOR

QUESTIONS TO CONSIDER:

- How can I incentivise the research and development of novel energy solutions that are sustainable throughout their life-cycle, from material sourcing through to production processes, and potential environmental impacts?
- How can I develop regulations that promote user control and decision-making within energy systems, ensuring equitable access and affordability?
- How can I enforce comprehensive life-cycle assessments and transparent risk management protocols for novel large-scale energy solutions?
- How can I contribute to the development of regulations for an ethical development and deployment of autonomous systems, whilst addressing concerns about data privacy, transparency and human oversight?
- How can I ensure that the design of regulations for the energy sector fully incorporates mechanisms for periodic participatory review and updates based on emerging technologies and societal needs?
- Considering the interconnectedness of energy systems, how might the development of common standards contribute to international collaboration to address global energy challenges?
- New questions?

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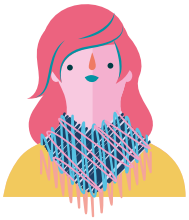
FORGING

TECHNOLOGIES FOR ENERGY EFFICIENCY AND TRUSTWORTHY AUTONOMY

CITIZEN



QUESTIONS TO CONSIDER:

- Do I have access to electricity and energy regardless of my socio-economic status?
- Is my voice heard when energy systems are being planned in my living environment?
- Can I have influence on ensuring equal access to electricity in my community?
- Am I being treated fairly in the development of novel energy systems?
- Can I take a more active role in my energy usage, e.g. by setting up or joining a community focused on the production and distribution of energy?
- Where can I find information and help when looking to minimize my energy consumption?
- New questions?

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FORGING

TECHNOLOGIES FOR ENERGY EFFICIENCY AND TRUSTWORTHY AUTONOMY

USER

QUESTIONS TO CONSIDER:

- Can I trust that I am being offered the most sustainable energy solutions?
- Am I supported to find ways to minimize my energy consumption?
- Do I have incentives to make investments to more sustainable energy solutions affecting my daily use of energy?
- Do I have enough information on the sustainability of different solutions to compare and choose between alternative options?
- Is the burden of minimizing the rebound effect (meaning that energy efficiency in one place often leads to more energy usage somewhere else) on my shoulders alone?
- Can I trust that the energy systems I depend upon are robust and resistant to external threats?
- New questions?

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FORGING

TECHNOLOGIES FOR ENERGY EFFICIENCY AND TRUSTWORTHY AUTONOMY

MALICIOUS AGENT

QUESTIONS TO CONSIDER:

- How can I exploit vulnerabilities in autonomous energy management systems to disrupt critical infrastructure, for instance through manipulating energy consumption or creating blackouts?
- Can I leverage the use of decentralised energy solutions such as microgrids for the manipulation of energy prices?
- Can I manipulate the algorithms used in energy distribution systems to impact specific communities or sensitive ecosystems?
- Can I exploit security vulnerabilities or potential environmental accidents to create distrust in novel energy solutions?
- How can I influence investors to prioritise short-term benefit over long-term sustainability goals?
- How can I exploit open-source technologies and collaborative research and development initiatives to obtain undue control over critical energy infrastructure?
- New questions?

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FORGING

TECHNOLOGIES FOR ENERGY EFFICIENCY AND TRUSTWORTHY AUTONOMY

INVESTOR

QUESTIONS TO CONSIDER:

- How can I best identify high-impact, early-stage energy solutions considering both technological breakthroughs and behavioural changes?
- How can I assess the level of risk associated with investing in autonomous decision-making systems applied to critical infrastructure?
- How can I make sure that my investment decisions contribute to equitable access to clean energy and to the empowerment of marginalised communities?
- How can I best determine the potential for unintended consequences of novel energy technologies such as rebound effects, resource scarcity or environmental degradation?
- Have I considered the option to prioritise investing in adaptable solutions with modular designs and open-source elements, even if this means incurring in higher initial development costs?
- Do I participate sufficiently in collaborative initiatives that address specific societal challenges, even if the financial returns are less immediate or indirect?
- New questions?

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FORGING

CYBER SAFE DATA TRANSMISSION, STORAGE, AND ANALYSIS TECHNOLOGIES

DEVELOPER

QUESTIONS TO CONSIDER

- How can I minimize the environmental footprint of the solutions both in the usage of equipment and in the conservation of energy?
- How can I design and implement secure systems that protect critical infrastructure, such as power grids, transportation networks, and communication systems, from cyberattacks?
- How can I place the user at the center of my design process in ways that adequately consider the ethical capture, storage and processing of data?
- How do I make sure that my design process addresses the unmet needs of traditionally unrepresented groups?
- Am I confident that the products or services I develop fully take account of social and environmental impacts?
- Can there be an alternative to a patching approach when confronting security gaps?
- New questions?

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FORGING

CYBER SAFE DATA TRANSMISSION, STORAGE, AND ANALYSIS TECHNOLOGIES

REGULATOR

QUESTIONS TO CONSIDER:

- Can I establish sufficient incentives / deterrents to ensure the best possible data security approaches are being applied in the market?
- How can I make sure markets have enough players to avoid concentration of power for too few actors?
- How can I best create an environment of collaboration with cybersecurity experts, law enforcement agencies, citizens, and government regulators to combat cybercrime?
- How can I ensure there is a balance between the need for cybersecurity and other important factors, such as economic growth, privacy, and civil liberties?
- How can I further international cooperation to establish and enforce cybersecurity standards for critical infrastructure, financial institutions, and other sectors?
- How can I collaborate more proactively with technology developers to implement effective cybersecurity standards and practices?
- New questions?

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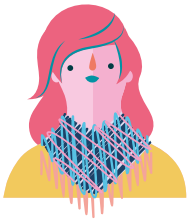
FORGING

CYBER SAFE DATA TRANSMISSION, STORAGE, AND ANALYSIS TECHNOLOGIES

CITIZEN



QUESTIONS TO CONSIDER:

- What kinds of safeguards can be implemented to protect my individual privacy rights?
- How much do I know about the roles and obligations of those that collect or process the data?
- What is my personal responsibility over the protection of my privacy?
- Do I understand enough about the potential implications of the data usage to my life?
- Do I know enough to make others accountable for the breaches to the integrity of my data?
- To what extent can I take an active role in the design of the technologies that enable safe data collection, transmission and processing?
- New questions?

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FORGING

CYBER SAFE DATA TRANSMISSION, STORAGE, AND ANALYSIS TECHNOLOGIES

USER

QUESTIONS TO CONSIDER:

- Do I understand the risks and implications involved in using data collection, storage and processing systems that might not be secure enough?
- Do I have the financial resources to implement cyber security measures?
- Do I understand where, how, by whom and for what purposes my data is being used?
- Am I confident in the degree of knowledge that I have about novel threats and vulnerabilities in the systems that I use?
- Do I have the capabilities to implement cyber security measures?
- Do I have a choice between more secure options?
- New questions?

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FORGING

CYBER SAFE DATA TRANSMISSION, STORAGE, AND ANALYSIS TECHNOLOGIES

MALICIOUS AGENT

QUESTIONS TO CONSIDER:

- How can I identify vulnerabilities in data collection, storage and transmission systems?
- How can I best exploit vulnerabilities in data collection systems, such as online forms, mobile apps, and social media platforms?
- How might I use emerging techniques to automate attacks, evade detection, and manipulate data?
- How might I use cyberattacks as weapons of war to disrupt critical infrastructure and compromise national security?
- How might I exploit the unique security challenges posed by the increasing integration of digital devices into critical infrastructure systems and the everyday life of citizens?
- How might I use targeted cyberattacks to manipulate financial markets, steal funds from financial institutions, or disrupt financial transactions?
- New questions?

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FORGING

CYBER SAFE DATA TRANSMISSION, STORAGE, AND ANALYSIS TECHNOLOGIES

INVESTOR

QUESTIONS TO CONSIDER:

- Do my investment decisions consider the development of usercentric security solutions that offer users greater control over their data?
- How can I move beyond static defense principles and embrace proactive threat detection and response mechanisms?
- Do my investment decisions prioritise companies developing security solutions that are adaptable, compatible and interoperable with existing infrastructure?
- How can I prioritise sustainable security investments and identify companies developing cyber security solutions that offer robust encryption while minimising energy consumption and computational resources required?
- How can I support the development of open-source security frameworks that are based on community collaboration for faster innovation while maintaining robust access controls and the right mechanisms to prevent malicious exploitation?
- How can I ensure that companies developing AI-powered security solutions demonstrate a commitment to fairness, accountability, and transparency?
- New questions?

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FORGING

ARTIFICIAL INTELLIGENCE

DEVELOPER

QUESTIONS TO CONSIDER:

- How can I design unbiased AI?
- What kinds of applications should I design to serve humanity's interests? What should I not?
- Can I design AI applications to help us become more ecological?
- Do I have the right data for building accurate models?
- How can I influence the most ecological hardware solutions?
- How can I develop solutions that require relatively less computing power?
- New questions?

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FORGING

ARTIFICIAL INTELLIGENCE

REGULATOR

QUESTIONS TO CONSIDER:

- How can I proactively collaborate with all stakeholders to implement effective regulation to target emerging societal issues?
- How can I protect vulnerable groups, such as children, from harmful use of AI?
- Should individuals have a chance of refusing the use of AI? How can I ensure it?
- How can I regulate for emerging technologies that could be harmful to society?
- How can I make sure there are enough intensives and deterrents for minimizing the energy usage of AI?
- How can I make sure markets have enough players to avoid concentration of power for too few actors?
- New questions?

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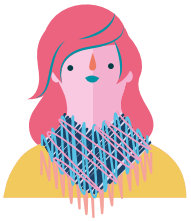
FORGING

ARTIFICIAL INTELLIGENCE

CITIZEN



QUESTIONS TO CONSIDER:

- How does AI contribute to a desirable future for all?
- Can I have influence on what kinds of AI applications are available?
- Do I understand enough about the training or build the models for AI?
- Will I be able to maintain enough connections to other humans, in physical settings?
- Can I resist the lure of technologies even if I felt they were not to my benefit?
- Am I more afraid of the negative outcomes that I can see the potential benefits?
- New questions?

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FORGING

ARTIFICIAL INTELLIGENCE

USER

QUESTIONS TO CONSIDER:

- Do I understand the risks and implications involved in using AI?
- Does the AI application exclude me as a user?
- Do I know when I am interacting with a human, and when with an AI?
- What are the needs where AI best serves me?
- Do I feel I am a part of the process and practice of developing AI?
- Do I think of AI as a technology or as a being I have a relation to?
- New questions?

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FORGING

ARTIFICIAL INTELLIGENCE

MALICIOUS AGENT

QUESTIONS TO CONSIDER:

- How can I exploit emerging vulnerabilities for my own benefit?
- How can I manipulate individuals, publics and decision-makers through fake news, propaganda, and deepfakes?
- How can I use AI to develop autonomous weapons to promote my objectives?
- How can I use AI to gather data on individuals and use it to reach my goals?
- How can I use AI to launch sophisticated cyber-attacks?
- How can AI be used to manipulate markets, for instance though manipulating stock prices or engaging in high-frequency trading?
- New questions?

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FORGING

ARTIFICIAL INTELLIGENCE

INVESTOR

QUESTIONS TO CONSIDER:

- How do I identify and prioritize investment proposals that have a significant impact on the betterment of human lives, such as making better decisions or making mundane tasks easier?
- How do I purposefully balance between open science and protecting intellectual property rights, considering both potential misuse of data or technologies and the use purposes that might require licensing?
- How do I ensure that my investments contribute to societally acceptable, environmentally sustainable, and ethical development of AI?
- When do I need to decide to not develop AI applications for certain functions?
- How my investments support making a clear distinction between AI powered applications and human interaction?
- How can my investment decisions support the creation of a world where the users can opt out from the use of AI applications that could potentially be harmful for them?
- New questions?

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FORGING

BIO-INSPIRED TECHNOLOGIES AND SMART MATERIALS

DEVELOPER

QUESTIONS TO CONSIDER:

- How can I make sure the materials I develop do not promote the use of virgin natural resources?
- Can I turn waste or pollution into materials?
- How do I make sure that the materials I develop can be recycled and / or composted?
- How do I change the perspective of my development work from the aim to satisfy human needs to the aim to balance the natural ecosystems?
- Am I trying to understand the consequences of the innovations I develop from the perspective that they will be scaled up, and part of every-day practices?
- How can I take into account the whole production and life cycle of the innovations I am developing so that their sustainability can be ensured?
- New questions?

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FORGING

BIO-INSPIRED TECHNOLOGIES AND SMART MATERIALS

REGULATOR

QUESTIONS TO CONSIDER:

- How can I balance the need for innovative R&D with the mitigation of potential risks related to untested functionalities and unknown long-term impacts?
- How can I make sure, from a standards perspective, that bioinspired technologies and smart materials effectively promote sustainability throughout their lifecycle at the levels of material sourcing, production processes, and end-of-life options?
- How can I ensure, from the perspective of regulations, the safety and privacy of users interacting with smart materials that have sensing and responding functionalities?
- How can I ensure that the benefits of bio-inspired technologies and smart materials are distributed fairly and equitably across user groups from the point of view of accessibility, affordability and bias limitation?
- How can I manage the burden on resource exploitation associated with the large-scale adoption of bio-inspired technologies and smart materials?
- How can I develop regulations and evaluation mechanisms that anticipate and evaluate the unforeseen long-term social and environmental impacts of bio-inspired technologies and smart materials?
- New questions?

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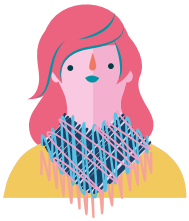
FORGING

BIO-INSPIRED TECHNOLOGIES AND SMART MATERIALS

CITIZEN



QUESTIONS TO CONSIDER:

- Can I trust that the sustainability of the novel materials has been assessed from multiple perspectives, and with consideration of different environmental values, such as climate change, biodiversity and toxicity?
- Am I able to experiment with new materials or is their use restricted by licences?
- Can I trust that there are processes in place that evaluate the costs of new materials primarily from their whole costs to ecosystems and the society?
- Is there an equal access to new materials with active (sensing, responding) and passive (antibacterial) functionalities that can enhance the quality of life?
- Are systems for recycling novel materials available and accessible to me?
- Can my community afford novel, more sustainable solutions and materials?
- New questions?

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FORGING

BIO-INSPIRED TECHNOLOGIES AND SMART MATERIALS

USER

QUESTIONS TO CONSIDER:

- Do I have available products or services that have minimized the use of materials in their production?
- Can I select products that have been produced locally?
- When using smart materials that have functionalities affecting me or my direct environment, do I understand my rights and the implications to my privacy?
- Can the products that I have be repaired and are they reusable?
- Are health-care solutions based on new materials and biosensing based solutions available to me?
- Are the novel products/ services enhancing or extending my abilities in ways that I understand to be useful and beneficial?
- New questions?

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FORGING

BIO-INSPIRED TECHNOLOGIES AND SMART MATERIALS

MALICIOUS AGENT

QUESTIONS TO CONSIDER:

- How can I disrupt the early-stage research of bio-inspired technologies and smart materials through introducing undetected vulnerabilities and harmful functionalities?
- How I exploit the properties of new materials with active or passive functionalities to create new weapons or tools for espionage or social manipulation?
- How can I exploit security gaps in smart materials that may be used to attack critical infrastructure?
- How can I exploit bias in AI-enabled material design to target specific groups and exacerbate social inequalities?
- How can I exploit the complexity of long-term material interactions and leverage the potential of delayed toxicity and ecological imbalances?
- How can I disrupt the public perception of new materials to create distrust and harm confident adoption?
- New questions?

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FORGING

BIO-INSPIRED TECHNOLOGIES AND SMART MATERIALS

INVESTOR

QUESTIONS TO CONSIDER:

- How can I identify high impact of bio-inspired technologies and smart materials whilst mitigating potential risks related to untested functionalities and environmental impacts?
- How can I assess the long-term commercial viability of new materials from the perspective of user trust and adoption, production costs, regulatory compliance and competition from established industries?
- How can I ensure that my investment decisions in bio-inspired technologies and smart materials contribute to social inclusion and equity and address access disparities and potential job displacement challenges?
- How can I comprehensively evaluate the sustainability of new materials throughout their lifecycle from the perspectives of circularity, waste reduction and resource conservation?
- How can I anticipate the evolving ethical concerns and unforeseen potential disruptions to existing industries?
- How can I collaborate more pro-actively with other entrepreneurs, researchers and regulators to create an ecosystem for the responsible development and deployment of bio-inspired technologies and smart materials?
- New questions?

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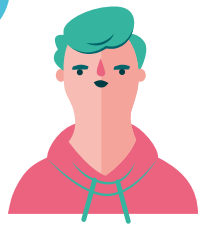
FORGING

HUMAN-CENTRIC SOLUTIONS AND HUMAN-MACHINE-INTERACTION

DEVELOPER



QUESTIONS TO CONSIDER:

- How can I develop human-centric solutions that are intuitive, user-friendly, and ethical?
- How can I leverage the latest advancements in NLP, human augmentation, AR/VR, explainable AI, collaborative robotics, and ethical AI to create innovative solutions?
- How can I support individuals in the utilization of technologies, including AI, to enhance their capabilities and fully reach their creative potential?
- How can I develop human-centric solutions that improve healthcare outcomes, facilitate personalised medicine, and tailor treatments to individual patients' needs?
- How can I involve users in the design process to ensure that my solutions meet their needs and preferences?
- How can I make sure that critical solutions (e.g. when inserting technology to human bodies) cannot be attacked to harm the user?
- New questions?

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FORGING

HUMAN-CENTRIC SOLUTIONS AND HUMAN-MACHINE-INTERACTION

REGULATOR

QUESTIONS TO CONSIDER:

- How can I establish clear guidelines and regulations to ensure the responsible development and use of human-centric solutions?
- How can I promote ethical practices and prevent the misuse of human-machine interaction for malicious purposes?
- How can I, in practical terms, balance the benefits of human-centric solutions with the need to protect individuals' rights and privacy?
- How do I ensure that citizens have an equal access to technology so that deepening inequalities and divides in access to knowledge can be avoided?
- How can I balance the economic benefits of technological advancements in human-centric solutions and human-machine interaction with the potential risks of job displacement and social disruption caused by the pursuit of an optimization rationality?
- How can I ensure that bodily enhancements that might become necessary for certain jobs or positions do not create cognitive or physical harm to users?
- New questions?

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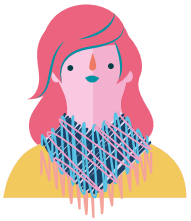
FORGING

HUMAN-CENTRIC SOLUTIONS AND HUMAN-MACHINE-INTERACTION

CITIZEN



QUESTIONS TO CONSIDER:

- How can human-centric solutions improve my quality of life and make my interactions with technology more seamless, intuitive and personalised?
- How can I ensure that human-machine interaction is safe, fair, and respectful of my privacy and autonomy?
- How can I be an active participant in shaping the development and use of human-centric solutions?
- How do I develop my own worldview when decision-making is strongly guided by technology?
- How can I identify and support companies that are developing and implementing sustainable human-centric technologies?
- How can I contribute towards a balance between open collaboration enabled by human-centric technologies and the safeguarding of individual creativity?
- New questions?

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FORGING

HUMAN-CENTRIC SOLUTIONS AND HUMAN-MACHINE-INTERACTION

USER

QUESTIONS TO CONSIDER:

- How can I benefit from the enhanced capabilities and personalised experiences that human-centric solutions offer?
- How can I understand and navigate the ethical implications of human-machine interaction in a digital immersive world?
- How can I protect my privacy and make informed decisions about the data I share with AI systems and other digital tools?
- Will I be able to opt out from technologies that I do not consider desirable?
- How can I be aware of the influences of the nudging techniques that are being used by the developers to shape my behaviour?
- How can I make informed decisions to avoid the use of products or services that may have a negative impact on the environment?
- New questions?

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FORGING

HUMAN-CENTRIC SOLUTIONS AND HUMAN-MACHINE-INTERACTION

MALICIOUS AGENT

QUESTIONS TO CONSIDER:

- Could I use human-centred design principles to create deceptive interfaces that trick users into giving up personal data or engaging in harmful behaviour?
- How can I exploit ethical concerns and biases in AI development to promote my own agenda or gain an advantage?
- Could I hack into human augmentation devices, such as braincomputer interfaces and wearables, to control or manipulate users?
- How do I identify the vulnerabilities in human-machine interfaces to deceive and manipulate the user?
- How can I use existing systems for spreading misinformation and manipulating public perception?
- How can I exploit social and psychological factors to promote intolerance, discrimination and undermine trust in institutions?
- New questions?

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FORGING

HUMAN-CENTRIC SOLUTIONS AND HUMAN-MACHINE-INTERACTION

INVESTOR

QUESTIONS TO CONSIDER:

- Taking forward my commitment to long-term value creation, how can I identify and support companies that are developing human-centric solutions that address pressing social and environmental challenges?
- How can I ensure that my investments in human-centric solutions are aligned with ethical considerations and promote responsible development and use of these technologies?
- How can I contribute to the democratization of access to human-centric solutions and ensure that these technologies benefit all people?
- How can I influence the companies I fund to shape their solutions to be more human-centric and ethically robust?
- How can I ensure that my investment decisions are focused on human-centric technologies that enhance and complement rather than replace human intelligence?
- How can I support start-ups that cater to the needs of diverse user groups, including minorities?
- New questions?

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FORGING

REAL TIME-BASED DIGITAL TWINS AND SIMULATION

DEVELOPER

QUESTIONS TO CONSIDER:

- How can my solutions support better quality decision-making based on high-quality data?
- Can I create solutions that reduce the need for physical travel?
- How are my solutions supporting environmental sustainability and social fairness?
- Am I making sure that I am developing solutions that are inclusive and create opportunities for everyone, e.g. for those who have restrictions in moving in the physical world?
- Are my solutions discouraging people from being active in the physical world?
- How do I ensure that my use of data preserves individuals' privacy?
- New questions?

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FORGING

REAL TIME-BASED DIGITAL TWINS AND SIMULATION

REGULATOR

QUESTIONS TO CONSIDER:

- How can I promote energy-efficient algorithms and infrastructure to mitigate the environmental impact of digital twins and simulation, while ensuring sufficient computational power for complex models?
- How can I ensure responsible data collection, storage, and utilisation in digital twin and simulation applications, especially through clear frameworks for data ownership, privacy, and transparency?
- How can I address potential negative societal impacts of digital twins and simulation, including social isolation, job displacement, and the influence of biased algorithms in decision-making processes?
- How can I champion the development of inclusive digital twin and simulation technology, ensuring affordability and usability for all social groups, regardless of income, disability, or technological literacy?
- How can I make use of foresight within regulatory bodies to anticipate the potential long-term social, economic, and environmental consequences of large-scale digital twin and simulation implementations?
- How can I develop regulations that establish ethical guidelines for the evolving relationship between the physical and virtual worlds facilitated by digital twins and simulations?

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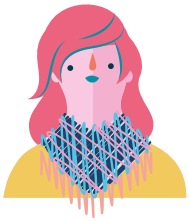
FORGING

REAL TIME-BASED DIGITAL TWINS AND SIMULATION

CITIZEN



QUESTIONS TO CONSIDER:

- Will I be able to maintain human contacts if I am hospitalized or placed in elderly care?
- Will some of the services I depend on be offered only in virtual spaces or will I have the possibility to select an option in the physical world?
- Will the use of digital twins and simulations offer me more opportunities to get involved in the development of my neighbourhood or city?
- Will the use of digital twins and simulations enhance my capabilities to participate in the working life?
- Can I trust that my privacy is always ensured even with the increased use of data?
- Are the services I am being offered optimized for economic rationality or human needs?
- New questions?

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FORGING

REAL TIME-BASED DIGITAL TWINS AND SIMULATION

USER

QUESTIONS TO CONSIDER:

- Is my job being threatened by my activities being modelled for simulations?
- Will someone notice and help if I get too involved in virtual spaces and start to suffer mentally because of it?
- What are the risks that I should be concerned about regarding the possible monopolization of digital twin and simulation technologies?
- Is the usability, functionality and affordability of the solutions I use ensured to all groups as well as possible?
- Is moving between the virtual and the real world seamless from all perspectives (economic, social, political, psychological etc.)?
- Do I understand enough about the solutions that I am using to make informed decisions about their use, for instance regarding their energy use or privacy related issues?
- New questions?

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REAL TIME-BASED DIGITAL TWINS AND SIMULATION

MALICIOUS AGENT

QUESTIONS TO CONSIDER:

- How can I exploit the complexity of real-time simulations to mask my activities and make it difficult to detect or attribute malicious actions?
- How can I manipulate real-time data streams within digital twin simulations to disrupt decision-making in critical infrastructure or financial markets?
- Am I able to weaponise personalised avatars and deepfakes within simulations to create discord, manipulate behaviour, or spread misinformation?
- Can I manipulate user perception or introduce delays to lead to critical errors in human-machine interface of real-time simulations?
- Can I use real-time social simulations to exacerbate societal tensions, polarise public opinion, or incite violence?
- Can I exploit potential blind spots in regulations or bypass ethical and security measures designed to prevent malicious manipulation of real-time simulations?
- New questions?

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REAL TIME-BASED DIGITAL TWINS AND SIMULATION

INVESTOR

QUESTIONS TO CONSIDER:

- How can I identify early-stage digital twin and simulation applications with disruptive potential, considering not only technological breakthroughs but also integration with existing infrastructure and workforce capabilities?
- How can I prepare for the potential disruption of quantum computing in the digital twin and simulation space?
- How can I balance the benefits of open-source data and simulation platforms with the need for intellectual property protection for proprietary algorithms and functionalities?
- How can I ensure that I prioritise companies with strong data privacy practices, accessibility considerations, and focus on solutions that address societal challenges beyond economic gains?
- How can I make sure that my investment decisions prioritise companies with robust methodologies for bias detection and mitigation, ensuring fair and equitable outcomes?
- How can I ensure my portfolio is adaptable and focused on modular and interoperable solutions that can be easily adapted to changing user needs and advancements in related fields such as AI and augmented reality?
- New questions?

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