Infinity, kaleidoscopy and society

On reflections of AI

Ghebreab, S.

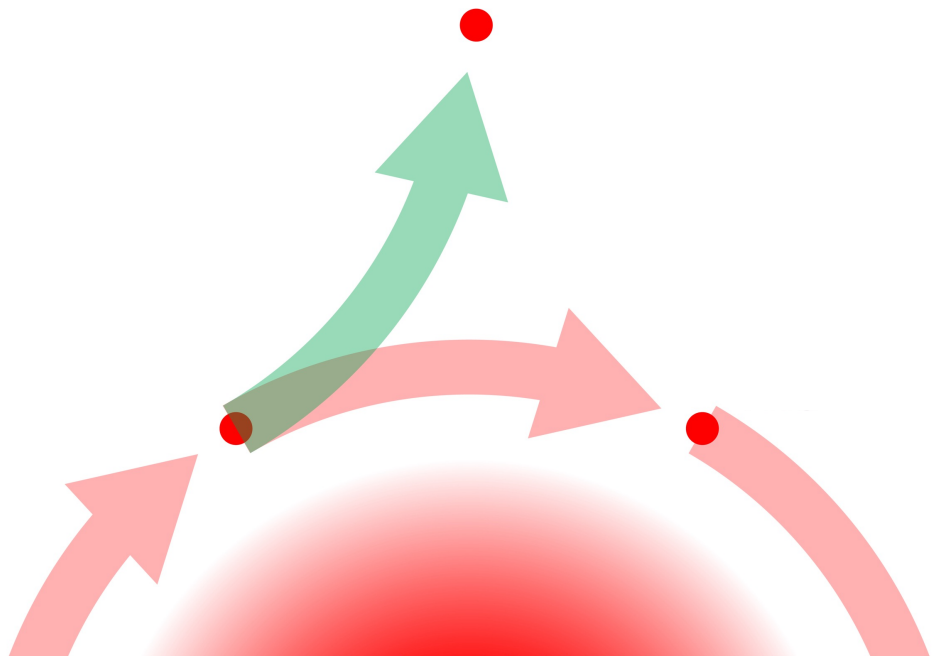
Publication date
2023

Document Version
Final published version

Infinity, Kaleidoscopy and Society: On reflections of AI

Inaugural lecture
December 15, 2023

Prof. dr. Sennay Ghebreab
Socially Intelligent Artificial Systems group
Informatics Institute, Faculty of Science
University of Amsterdam



Mister Rector Magnificus, Mister Dean, Dear audience

Reflections

As human beings, as societies, we have always been fascinated by reflections. Reflections reveal more than what meets the eye; they bring to light the unseen, the mysterious, such as our own faces or secrets concealed within our hearts. Long ago humans turned to elements like water ice and obsidian to catch a glimpse of themselves. In the natural reflections, they discovered *the first objectification of the human soul* as Melchior-Bonnet eloquently describes in her fascinating book The Mirror: A History.

She writes that myths like Narcissus, who was delighted by his own image, bear witness to the early curiosity toward reflections. A curiosity that might stem from the fact that "far beyond just presenting an enactment, the reflection invites the mind to free itself from the tangible and focus on cause rather then effect – in other words to contemplate the world with the clarity of understanding, returning to the essence". Nowadays, we of course have embraced man-made objects for reflection with the glass mirror being the most widely used and perfected tool for visual reflection. We see glass mirrors all around us without even taking notice of them. They have become an integral part of our daily lives.

Mirror

AI has been likened to many metaphors, but the glass mirror stands out as one of the most compelling and telling, given the profound technological, philosophical, social and legal associations that have evolved around it over time. Allow me to highlight a few quotes and insights from Melchior-Bonnet's book, spanning centuries.

During the golden age of Athens, "Socrates urged young people to look at themselves in mirrors so that, if they were beautiful, they would become worthy of their beauty, and if they were ugly, they would learn how to hide their disgrace through learning". In the medieval age, much like Sillicon Valley now, Venice became a global hub for mirror science, mirror technology and mirror craftsmanship, even though "the Church opposed all experiments with mirrors, as curiosity, unlike faith, sought to pierce the secrets of God and to seek out that which was supposed to stay hidden from man, most especially the future". Venice fiercely guarded its monopoly by setting up a ring of defenses around its workers, ranging from beneficial tax exemptions to oppressive factory contracts.

Melchior-Bonnet goes on to describe how, during the Renaissance, quality improvements and lower prices by competitors in France led to the collapse of the Italian mirror industry. The narrative of the mirror also changed into an empowering one because people came to believe in the idea of an "infinite universe - no longer closed, circular, and prone to being deciphered". Finally, in the age of Enlightenment, the mirror turned from "an instrument of social hierarchy to a symbol of equality among men, serving as a normative instrument for measuring conformity to the social code and facilitating the advent of a democratic world".

These and many other technological, philosophical, moral and social associations with the mirror, often marked by ambivalence - God versus devil, good versus evil, nature versus artifice, moral versus immoral, privacy versus social life, and Utopia versus Dystopia - are now reemerging in the context of AI.

TRANSFORMATION
IMAGINATION
INTROSPECTION
REFLECTION

Functions

One aspect of the history of mirrors invites deeper exploration and comparison with AI. Over centuries, different forms of mirrors have been crafted and utilized, including flat, convex, and concave mirrors. These mirrors reflect reality in different ways, allowing the emergence of new insight and the production of new knowledge. As Melchior-Bonet puts it: “The convex mirror concentrated space and offered a global and spherical view of the world, embracing multiple perspectives, but its roundness distorted the image. The plane mirror, on the other hand, offered an exact but only partial image a framed vision from a single point of view that controls what is seen like a stage director. A model of knowledge that is no longer symbolic and analogical, but rather critical and discursive, the mirror finds its place in a new philosophy of representation, responding to its own rules.”

In the past, mirrors not only have served social purposes but also contributed significantly to scientific progress. In animal science, for example, mirrors are used as test for self-recognition, self-awareness. In astronomy, telescopes use complex mirror arrangements to precisely capture distant objects in space. In microscopy, mirrors are used to direct and focus light, enabling detailed exploration of the microscopic world. These are merely a handful among the many instances where mirrors serve as scientific instruments.

The different forms of mirrors created throughout time served five distinct functions from personal to societal. The first function is reflection, primarily concerned with observing the physical and visual appearance. The second function, introspection, involves scrutinizing one's emotions, thoughts, motivations and actions in order to cultivate consciousness. As noted, mirrors still serve to test self-awareness. The third function is imagination, enabling to dream about both the self and society envisioning what might be. As early as 1650 the mirror’s imagination function was taken to heart by the German Jesuit Kircher, who developed the metamorphosis machine depicted here on screen. Much like today’s face filter apps, this machine allowed a person to look at himself in the mirror and see the sun or the head of an animal or another object appear on his reflected body instead of his own face. The fifth function involves transformation, enabling change in both the self and in society. For instance, during the Renaissance, mirrors played an important role in emancipation. They allowed the less privileged to view themselves in the mirror and transform their appearances to align with the wealthy.

These five mirror functions follow a sequential path transitioning from reflection to introspection to imagination and to transformation. A path that became evident only over decades and even centuries. And, much like the mirror, the entire spectrum of functions and impact of AI on society may only become evident across decades and centuries.

Promise

AI has rapidly emerged as a new chapter in the history of reflections, promising to become the most extensive mirror both in scale and depth. It extends its reflections far beyond the individual and the physical, capturing and reflecting our collective knowledge, our collective thoughts, emotions, actions, and behaviors through the sheer data we collectively and continuously generate and through insightful information we extract from this data. These reflections of AI can be conisdered *the first objectification of society's soul.*

This is a view that heartsurgeon-turned-comedian Bassem Youssef embraces sarcastically, yet very thoughtfully. In a recent viral Piers-Morgan-interview, Bassem Youssef shared how he used ChatGPT to gain an "objective" view of how the world thinks about Israelis and Palestinians. He asked ChatGPT if Israelis deserve to be free and he asked ChatGPT if Palestinians deserve to be free. The answer to the first question was "Yes", to the second "It is complex", reflecting the world's dominant but not necessarily righteous perspectives and practices. If Socrates were here today, he might urge the world to look at itself in the AI mirror and learn to see and overcome its flaws, instead of looking away. But, however unfair and ugly they may be, reflections of AI, such as the ones produced by ChatGPT, hold the promise of societal introspection, imagination and critical transformations at scale.

This promise extends beyond humans and human society to other animate and inanimate objects on our planet. As data gathered from nature not only allows us to better understand and learn from nature's diverse manifestations of intelligence, but it also allows to form new ways of coexistence centered on both human and planetary wellbeing.

Peril

Unfortunately, this promise of AI carries the risk of remaining unfulfilled. In the past curiosity, serendipity, and sincerity of exploration led to the creation of different types of mirrors, each providing unique reflections and perspectives on reality. This sincerity and diversity of reflections served as a rich foundation for deep introspection, imagination, and transformation of individuals, of communities and of societies. Today we are collectively constructing a specific type of mirror - *an infinity mirror*. Such a mirror consists of two parallel planes generating endless, progressively smaller reflections of the same object or object constellation. At first glance it may evoke a sense of awe, offering an infinite glimpse into the world. However, the endless, repetitive reflections result in sameness and hence in emptiness.

The AI infinity mirror we are building today is formed by two planes representing the public sector, particularly academia, and the private sector, particularly Big Tech. These two planes are as of yet very poorly polished - coarsely and selectively - resulting in foggy reflections. And together they create endless progressively smaller reflections of the same opinions, frames and behaviours. With such poor reflections, meaningful introspection, imagination, and transformation become unattainable. AI is evolving into an infinity mirror, keeping individuals and society within an echo.

Today

Ironically, the infinity mirror is being developed in a world experiencing rapid and complex changes across social, political, technological, and ecological dimensions. In such a dynamic world, rich reflections - coming from AI or through other means such as education - are a precondition for meaningful change. Nevertheless we tend to look away, suppress or superficially address reflections of ourselves as humans, as organisations and as societies. As individuals, we proclaim our openness to reflection and self-critique. Yet we find ourselves trapped in false frames, assumptions, and behaviors. Take, for example, the distorted narratives surrounding migrants and refugees in politics, media, and society as a whole. Despite repeated debunking, these misleading frames keep persisting and even become dominant in national elections as we have seen here in The Netherlands last month.

We like to consider ourselves as intelligent, enlightened, and social beings, but science and every day life consistently reveal our sensitivity to cognitive biases like attribution bias, self-serving bias and status quo bias. And organizations embed and strengthen these sensitivities within their structures. They may establish policies and processes to address issues like social discrimination, inequality and injustice, yet they often find themselves doubling down these very issues. In the Netherlands, for example, hiring discrimination based on race and ethnicity has grown over time, despite scores of interventions. In the complex times we currently face our limitations and pitfalls are undeniably apparent, and the infinity mirror that AI is becoming is playing into and reinforcing these limitations and traps.

Escaping these intrapersonal, interpersonal and organizational traps requires more than perpetual scrutiny of the self and isolated problem-solving of complex social issues. It necessitates abstracting away from these specific issues and considering the broader picture. It requires systemic reflection. Many scholars, thinkers, influential individuals, and ordinary people have proposed and advocated this.

Oppression

Among them, one stands out: the renowned Brazilian scholar and changemaker, Paolo Freire. He highlights a world marked by uneven distribution, power concentration, and inequality. Freire abstracts these social phenomena considering them as manifestations of a system a social system, a cycle designed to maintain the status quo. The cycle of oppression as Paolo Freire puts it more strongly in his seminal work "Pedagogy of the Oppressed" revolves around predefined assumptions, frames, roles and power structures.

Early in life, individuals are exposed to these preconceptions through their parents, family, and education, and later in life churches, cultural practices, the rule of law, media, and other societal elements perpetuate and reinforce them through their policies and practices. By inheriting and conforming to these preconceptions, individuals are normalized, both consciously and unconsciously. In this way, society is turned into a vortex - guided by an ethics of the market as Paolo Freire puts it – and revolving around power, profit, competition, greed and fear.

Infinity

This context is also the backdrop against which we develop, deploy, and optimize AI. Over the past two decades, AI has undergone most stages of the cycle of oppression, reinforcing the systems and structures that hold society in a grip of inequality, discrimination, and exclusion. Unfortunately individuals, governments, academia and companies continue to contribute to this cycle. Their lack of technical or social awareness about AI, coupled with their desire to maintain the status quo and power structures, often lead to these outcomes.

Consider the recent child benefit scandal where the AI system of the Dutch Tax office falsely flagged tens of thousands of parents and caregivers for fraud, mostly people from ethnic minority groups and low-income families. These people were chased for years by authorities. The AI system used by these authorities merely reflected and implemented the governments then dominant assumptions and perceptions around people from ethnic minority groups and low-income families. The scandal brought down the Dutch government, but it remains to be seen if sufficient lessons have been learned.


Actions
The Beginning
POWER
PROFIT
GREED
FEAR
HATE
Results
First Socialization
Enforcements
Institutional & Cultural socialization

This and other similar scandals could have been averted had people and organisations engaged in deeper reflection and introspection on institutional and societal assumptions, biases, and behavior. But rather than engaging in such processes, acknowledging responsibility and making fundamental changes, AI is often blamed. This practice creates a narrative that pits humans against AI, rather than addressing the root causes. It leads to business leaders, politician, scientists, artists and many others to call for an AI pause, instead of calling for social reflection. Consequently, we continue to build AI in the same manner and against the same background, collectively reinforcing the cycle of oppression. We are collectively contributing to an infinity mirror, and missing the promise of AI.

Kaleidoscoop

However an alternative path is possible. We can construct a different kind of AI, one that is not self-serving and self-perpetuating—an AI that is not an infinity mirror but *a kaleidoscope mirror*. A kaleidoscope mirror is constructed not from just two, but three mirrors carefully placed under specific angles. In a kaleidoscope mirror, sameness disappears and newness appears. It produces beautiful patterns from different reflections of objects and blendings thereof as most of us will have experienced during our childhood.

In this spirit, we can carefully craft a kaleidoscopic AI from finely polished planes not only representing the public and private sectors but also the civic sector, including civil society, communities and citizens. A kaleidoscopic AI reflects societies in diverse ways, uncovering and playing into the unique and dynamic characteristics of people, communities, societies, their cultures, and values. And enabling the creation of new cultures revolving around values such as dignity, morality, solidarity, equity. This requires a radical different relationship between AI and the civic sector. Instead of viewing civil society and citizens - in their everyday capacity as consumers, customers, patients, residents - as a challenging nuisance, there is a need for an inclusive approach that actively involves them in the design, development, deployment and improvement of AI.

A Kaleidscopic AI has the potential to lead to a more self-aware and conscious society, in line with Paolo Freire's philosophy in line with the Ubuntu philosophy in line with many other indigenous traditions. This might appear idealistic and unattainable due to our distorted, biased and limited worldview, but if we gather the courage and take the right leadership to gradually think and act outside of our boxes, embracing the unknown - whether human or non-human - we might be able to break free from the cycle of oppression.

Liberation

Paolo Freire presents a path out of the cycle of oppression and toward liberation. Decades ago, he introduced concepts like banking education and false generosity to help identify recurrent and self-reinforcing patterns of oppression. He also introduced concepts such as generative themes, and praxis to break self-serving and self-perpetuating patterns, and to foster meaningful change. He advocated a transition from the current "ethics of the market" which centers on economic value to a future "ethics of life" grounded in values like dignity, empathy, solidarity, compassion, and love.


Creating Change
Maintaining
Coalescing
Getting Ready
Building Community
Reaching Out
DIGNITY
COMPASSION
SOLIDARITY
JUSTICE
LOVE

Altogether, the concepts Paolo Freire puts forward give rise to a cycle of liberation, a comprehensive and cyclical process that unfolds, according to Bobby Harro, in various stages. Stages that include changing how we see ourselves; getting rid of wrong beliefs, unfair attitudes, and behaviors that hold us or others back; connecting with others outside of our group or tribe; changing how we value and interact with them regularly; promoting new cultures that reflect shared identities and lastly; strengthening changes and making them a part of our daily routines. In this cycle, personal group and social values are continuously learned, and new cultures emerge from these values. In many ways, Paolo Freire's cycle of liberation elevates the different mirror functions from a linear sequence to a circular one: from reflection, to introspection, imagination, transformation and back to reflection.

Future

One might assume that Paolo Freire's decades old ideas would have had ample time to prove their worth. Yet, it is possible that his ideas were ahead of their time, awaiting the right conditions to emerge. These conditions might be present today with worldwide calls for political, social, environmental and technological changes. Established ways of coexisting are being challenged. Hierarchy is being challenged. People from all walks of life are envisioning nostalgic or futuristic change, addressing their feelings of discomfort and a lack of belonging, and acting with their voices, hands and feet.

There are numerous indicators pointing to the willingness and readiness of people, including academics, to break free from the cycle of oppression. One such indicator is the rapid increase in the citations to the work of Paolo Freire. His book Pedagogy of the Oppressed published in 1970 is arguably the most cited work in the history of social sciences, with yearly citations increasing by the year. Paolo Freire’s work now seems more relevant than ever, not only as a theory but also as a theatrical methodology to empower vulnerable and marginalized people and communities.

Moreover, not only seems there to be a willingness and readiness among people to break free from the cycle of oppression, more powerful technologies are currently available to them to enable such change. Take, for instance inverse surveillance AI. This turns the whole idea of surveillance upside down, and uses AI to surveil and hold accountable governmental authorities and companies. Still, AI is predominantly viewed and used to uphold the status quo. Even AI research is contributing to the status quo, rather than help breaking free from it.

Research

Current AI research can be broadly categorized into three groups. One group focuses mainly on the technological progress that AI brings, often overlooking the associated societal drawbacks. This is particularly prominent in the hard sciences, such as the field of AI itself. Another group concentrates on regulating or even banning AI systems, primarily found in the social and legal sciences and humanities. A third and emerging group spans multiple disciplines, addressing both advancements and drawbacks of AI. This group forms a socio-technical space, which is currently dominated by AI safety research. AI safety tackles the AI value alignment problem—the challenge of aligning human values, expressed as goals and intentions, with machine values, represented through objectives and actions of AI systems.

It is in this spirit that earlier this week the EU reached a provisional agreement on AI regulation and that last October -during the AI Safety Summit in the UK - the EU along with 28 other nations embraced the Declaration on Artificial Intelligence Safety. While these agreements will no doubt contribute to safety, ethics and responsible use of AI, the fundamental problem with AI safety research and policy persists. Namely its grounding in existing societal frames, systems and structures inheriting conflicting and undesirable human values, intentions, and behaviors including discrimination, polarization, and hate. Consequently, AI will harm despite and even because of human-machine value alignment. Current perspectives on and practices of AI safety are likely to contribute to the cycle of oppression and lead to an infinity mirror. The EU AI Act, for example, prohibits face recognition systems and abusive mass surveillance technology, but most likely with the exception of their use in migration and border control, paving the way to inhumane treatment of migrants and asylum seekers.

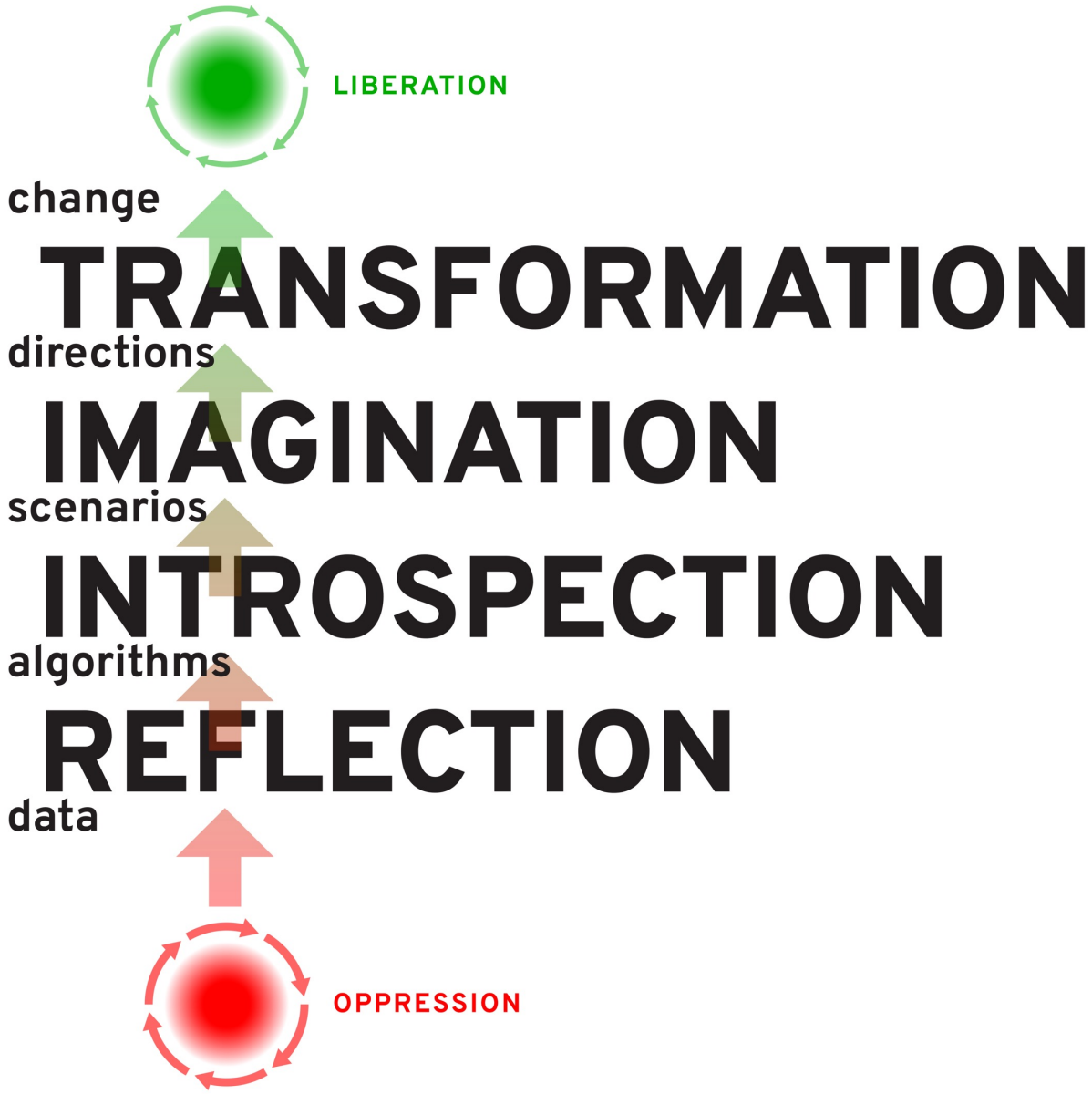
Socially intelligent AI

To transition from the cycle of oppression to the cycle of liberation to build kaleidoscopic mirror instead of infinity mirror we must rethink the role of science. Firstly, science should move beyond its ivory tower, diving deeper into society and fully embracing its transformative role. The notion that science can stand apart from society and produce objective and neutral knowledge is an illusion that masks the deep connection between science and all sectors of society: public, private and civic. Inspiringly recent recognition and reward initiatives in academia, including the University of Amsterdam's support for more engagement with society, offer a glimmer of hope.

Secondly, a fresh perspective on AI research, education and valorization is essential. Human-human value learning and alignment should become the primary goal with Human-machine alignment as a natural byproduct, rather than the ultimate goal. This is where the field of socially intelligent AI should distinguish itself from the current AI safety field. Social intelligence, at its core, involves understanding oneself and engaging with others in a human manner. On a group and population level, social intelligence fosters reliance on one another and promotes social functioning. It advances through engagement and cooperation with others, and through interpersonal successes and failures in social settings.

Socially intelligent AI systems and research should aim to enhance this social intelligence. One, by engaging with the cycle of oppression uncovering algorithmic and non-algorithmic practices of oppression such as discrimination and polarization. And two, by engaging with the cycle of liberation, helping to understand and shape liberative systems policies and practices.

Socially intelligent AI systems should pave the path from oppression to liberation by harnessing AI's mirror functions: reflection, introspection, imagination, and transformation. Elements of such systems are already in place or being developed. However often without consciously relating them to these mirror functions. For example the curation of valuable data and the elimination of harmful data – whether in public, private or civic sectors - is a form of polishing a mirror to get better reflections. The development of algorithms to extract meaningful patterns and insights from data contributes to better introspection. The computational simulation of future scenarios feeds imagination. And the gradual implementation of such scenario’s enables meaningful and sustainable societal transformations.


LIBERATION
change
TRANSFORMATION
directions
IMAGINATION
scenarios
INTROSPECTION
algorithms
REFLECTION
data
OPPRESSION

Socially intelligent AI systems group

Within my research group, the Socially Intelligent Artificial Systems (SIAS) Group we cover and interweave the mirror functions incrementally and iteratively, learning values and building trust at each step. Essential here is our relation our collaboration and implicit agreement with partners from the public and private sectors, as well as from civil sector to transform the infinity mirror that AI currently has become, to a kaleidoscope mirror. Together, we address the four AI mirror functions through diverse approaches. For example, in our Civic AI lab where we collaborate with the University of Amsterdam, the Free University of Amsterdam, the City of Amsterdam, and the Ministry of Interior we address social inequality in the city.

- We quantify the visual representation of city neighborhoods using computer vision models. That is, we curate visual data – expanding it or removing it - to get better reflections and insight in traditional social phenomena such as livability, inequality, privacy and gentrification.
- We use explainable and recoursable machine learning models to uncover unfair and biased practices in healthcare and well-being, offering institutions food for introspection.
- Our work extends to simulating and testing new public transport networks through multi-agent system modeling, allowing to better scrutinize the impact of future public transport network on accessibility fairness in mobility and education.
- And we recommend procedural and regulatory enhancements to the way public organizations develop and deploy AI driven solutions, helping them to meaningfully transform their AI-related process and AI-based policies.

In more recent initiatives, we push the currently dominant AI technology *for* people perspectives – also present in our group - to AI technology *with* people and even *by* people. Which I think should be the next frontier of AI.

- For the Heritage4Future initiative together with Afro-Caribbean communities in The Netherlands our focus is on populating archives with previously unknown experiences and untold stories, yielding more representative data for AI models and helping policy makers with their knowledge gaps.
- In the AI4Fintech hub in Amsterdam, we scrutinize the interpretability and explainability of automated decision systems in finance using neurosymbolic approaches, getting better foundation for financial insight and introspection.
- The Prosocial Learning Lab is dedicated to developing social media link-recommendation algorithms designed to have a long-term positive impact on observable social behavior. Here simulations and online experiments will be used to test future scenario's.
- In the EU Horizon project CommuniCity, we have started to bring technology providers and governmental services closer to the needs of marginalized groups through co-creation. The aim here is to critically, not superficially, transform people's lived experiences with technology.

All of these examples from our group are just a glimpse of the scope of our research, education, and social engagement. The breadth, depth, and interdisciplinarity of our activities come with its share of challenges, including the bridging of scientific disciplines covering the

full spectrum from fundamental to applied research getting our work published in academic journals. Nevertheless, we embrace these challenges boldly and continue in our quest for kaleidoscopic AI. Which leads me to the last part of my speech.

Acknowledgements
I am grateful to the people in my research group who have embraced the challenges alongside me. Hinda Haned has been supportive and instrumental from the very beginning. Her down-to-earth perspective and straight-forward practices have beautifully complemented my somewhat kaleidoscopic approach to thinking and doing. My appreciation extends to Fernando Santos, Giovanni Sileno, and Erman Acar who lead the group's public-public, public-civic, and public-private research lines respectively, and to Arjan Vreeken who coordinates the group's educational responsibilities. Their knowledge, skills and – above all – kindness to others make it a joy to have them in the group. Of course, my heartfelt thanks to all the PhD students and researchers who form the core of our group. And - last but not least - Virginie Mes. Her support has been and continues to be the natural adhesive that holds our group together.

I'd like to express my gratitude to the Institute of Informatics for welcoming me back after spending many years at other faculties. In particular Marcel Worring, Maarten de Rijke en Alfons Hoekstra. Marcel Worring is now my colleague, but thirty years ago, he was my master thesis supervisor. During the defense of my thesis, he aptly described both me and my work as kaleidoscopic. This concept has stayed with me as evident in the title of this inaugural speech. Maarten's support in establishing the Civic AI lab as one of the first public-public ICAI labs for social good has been of great value. I appreciate his approachable and effective manner in overcoming academic and social barriers benefiting me and many others. Under the leadership of Alfons Hoekstra, the institute recently introduced a fifth new research theme *People, Society, and Technology* which not only provided the ideal conditions for me to grow into a full professor, but also for the SIAS groups to flourish at the institute. To all my colleagues within the Informatics Institute and to all academic and non-academic partners such as Marieke van Putten, Elja Daae, Ger Baron, Aik van Eemeren, Bas Beekman, Touria Meliani en Caroline Nevejan, I extend my thanks.

I express my sincere gratitude to the Dean of the Faculty of Science, Peter van Tienderen, and the Executive Board of the University of Amsterdam for the trust placed in me, and for appointing me to full professor. Working at different faculties, in different disciplines and with different groups and people was challenging, yet an immensely enriching experience. Now, it comes full circle as I accept a professorship at the institute and faculty where I studied and pursued my PhD.

The breadth of my engagements with research, education and valorisation is a reflection of the breadth of the UvA and her institutes. I would like to highlight one such institute: the Amsterdam University College. I am most thankful to Marijk van der Wende and Ramon Puras who gave me the opportunity in 2009 to set-up and teach the course *Information, Communication and Cognition*, paving the way for a decade of undergraduate education on the neural, social and computational mechanisms of bias. A few years later, they entrusted me with the position of Head of Social Sciences at the college, and guided me in managing an interdisciplinary team of scholars. One of these scholars was Martha Montero Sieburth, who

reignited my interest in the works of Paolo Freire almost two decades after I first got to read the Pedagogy of the Oppressed. Another was Jan Pronk, with whom I had the honor to regularly discuss International Development and the devastating effects of state oppression in Eritrea. He kept reassuring me that change always comes, sooner or later, and thus I should not lose hope and focus on young people, the next generation. Finally Abram de Swaan, who then taught the course Mass Violence. His piercing analyses of social dynamics left a lasting impression on me. His kind and thoughtful gesture earlier this year to offer me his university gown because I am "a beta scientist with a social edge" I took to heart. As you can see, I am wearing his university gown with the colors and emblum of the Faculty of Social Sciences now enriched with the Faculty of Science's trim. A colorful and symbolic blend.

Before turning to my family I would like to give special recognition to my most significant mentor: Arnold Smeulders. I started my PhD in 1996 in computer vision and medical imaging under his supervision. Since then Arnold has served as my personal mirror, challenging me to see my shortcomings and helping me to recognize my talents. Through thick and thin encouraging me to reflect, introspect, imagine and transform myself. His guidance, mentorship, and invaluable life lessons have been instrumental in both my academic and personal life. I am immensely grateful for his support, without which I would not be here today.

Family

I conclude – naturally - with heartfelt thanks to my family. It's an immense privilege to share this moment with them. My sharp-witted 104-year-old grandmother, Haregu Neamin, who never stops following and carrying about what is going on in the world ago; my loving, wise, and humble parents Tesfay Ghebreab and Aster Isahac who first sacrificed their well-established life in Eritrea to resist Ethiopian oppression, and later sought refuge in the Netherlands, placing the well-being and future of their children above all else; my two sisters, Mical and Winta; my extended family. And, finally, my soulmate of almost 30 years and beautiful wife, Bet-El Teklemariam, along with our four adorable kids: Iyoas, Eliab, Iyoab, who are fifth generation students now and third generation soccer players, and Eliana, who – still -prefers to be called "schatje patatje". My families unwavering love and support has shaped the person I am today.

Last year, my grandmother sensibly summarized the legacy of my great-grandfather – Teweldemedhin Ghebremedhin – and my grandfather, Isahac Teweldemedhin. She said the first dedicated his life to transitioning society from "not knowing to knowing the known" through reading and writing of biblical texts, while the second devoted his to transitioning society from "knowing the known to knowing the unknown" through mathematics and art. Coming from a family that over generations, has dedicated their lives to dismantling oppressive structures and empowering marginalized people through education, delivering this inaugural speech on this topic, to me is what it means to stand on the shoulders of giants. This is why I dedicate this inaugural speech to my family, and particularly to my grandmother who insisted that I deliver this speech this year to ensure that she would witness it and pass it on to my ancestors.

Ik heb gezegd!