



Education, Technology, and Humans: An Interview with Jeffrey Schnapp

Interview with Jeffrey Schnapp by Art Farley and Massimo Lollini

We are interested in learning about the creative, intellectual, and pedagogical aspects of your work in the Digital Humanities and artificial intelligence. We are especially intrigued by the breadth of your interests and the overall vision present in your teaching and research activities. You started your career as a scholar of Dante and then have done pioneering work in the domains of media, knowledge design, digital arts and humanities, robotics, and curatorial practice in museums. Is there a common thread running through all these activities and interests?

There are a series of common threads, but they were never woven together as part of a plan. Rather, they emerged over an extended period of time only to merge late in the course of my career. So, what may have been separate threads of enthusiasm, interest, engagement, and commitment came together late in the game. Among these were an interest in computing that goes back to high school years; a passion for languages (I grew up bilingually in Mexico but also studied several other foreign languages); and a commitment to creative practice (my minor as an undergrad was studio art; for three years between undergraduate and graduate studies I was a visual artist; I continued working as an illustrator during the first two years of my PhD).

Do you believe that your initial activity as a scholar of Dante and the Middle Ages played a significant role in modeling and carrying out your current work in digital humanities and artificial intelligence? How?

There's a direct connection to the degree that my first position was at Dartmouth College where, thanks to the legacy of John Kemeny's presidency (he was the creator of BASIC), the Kiewitt Computing Center was a state-of-the-art hub for the entire campus. It was for this reason that Robert Hollander sought to house the Dartmouth Dante Project not as his home institution (Princeton) but at mine; Bob was very generous in this regard and needed an on-site associate director with both Dantean and computational chops. I was in the right place at the right time, so I soon found myself as part of the leadership of the first digital humanities project ever funded by the National Endowment for the Humanities in 1983.

This said, it was my teacher John Freccero whose brilliance and erudition drew me into the field of Dante Studies and away from 20th century studies. For all its significance as a reference tool (that has endured to this day), the DDP was for me only a steppingstone. It confirmed in me the conviction that computational tools and techniques could play a decisive role in the future of all knowledge forms, including the humanistic, but building reference tools is laborious and, to be frank, unsexy. My main passions at the time were for interpretive cultural-historical work across the literary/visual divide within the fields of medieval studies and early 20th century studies.

In your current teaching of medieval literature do you use digital technologies?

I do. But more as supports than as a research methodology. I am currently running a graduate seminar on Dante and material culture to an audience that is scattered across five universities on two continents. Some of the units are built around research on medieval inventories and manuscript collections with which it would be impossible to interact in analog fashion. Manuscript studies and codicology have benefitted enormously from high quality digitization efforts undertaken by some of the world's leading libraries.

How do you think the current technology available to academia has influenced teaching and research in Medieval Studies? Can you give some examples?

It is important to underscore the fact that classicists and medievalists, not modernists, led the way in developing digital platforms and tools in the humanities fields. The first so-called “digital humanist”—I don’t much like the label “digital humanities” for reasons that I will explain—was Father Roberto Busa, the developer of the *Index Thomisticus* thanks to a friendship with Thomas J. Watson, the founder of IBM, dating back to 1949! Likewise, resources like the Perseus Project, led by Greg Crane, date back to the mid-1980s and reflect the special challenges that led premodern fields of research (such as archeology) to develop a strong appetite for innovation.

As far as literature and modern art are concerned, you have conducted significant research on Italian Futurism. Your book *FuturPiaggio* seems to act very well as a point of contact between research on Futurism and works on A.I. and Digital Humanities. What value do you attribute to this research for the development of your work in Digital Humanities and Artificial Intelligence?

It’s hard for me to sort out which came first, but I became fascinated with Futurist art and poetry when I was a high school student and carried this interest forward into my undergraduate work at Vassar College (studying with Linda Nochlin among others), my art practice (which relied upon the use of projections and site-specific constructions), and a love for engineering (motors and electronics).

In most ways, Futurism (and Marinetti in particular) were naïve regarding technics and the mechanical realm; but their insights, later enriched and expanded upon by Marshall McLuhan, on the cognitive shifts that are triggered by the ever-intensifying human/machine interactions that characterize the machine age captured my attention. I have never been interested in engineering or computation per se; rather my interests lie in what, in technical and design circles, are referred to as “human factors”: how can one design meaningful human/robot or human/data interactions? How do such interactions reshape the boundaries of that form of fast thinking that is known as “intuition”?

How do Futurism and Piaggio represent a particularly significant observatory for discerning the radical changes that are introduced in our daily life by artificial intelligence?

As hinted, Futurism had one important insight in this domain: a complex and even self-contradictory understanding of the machine as at once self and other with respect to the human: as human prosthesis and enemy double of the human, as both primitive and advanced. Whereas philosophers stretching back to Descartes and moving forward through Enlightenment materialists like La Mettrie to the late 19th century prophets of progress all celebrated the technical as the rational and functional, and all shared the dream of a simple coalescence between man-as-machine and human-fabricated machines, Futurism scripts a far more interesting (if ultimately destructive) scenario. It is, after all, a *racine* car—not a Model T—whose hood is

adorned with great pipes, like serpents of explosive breath” that is “more beautiful than the Victory of Samothrace” according to the Founding Manifesto of Futurism. And that very vehicle delivers its driver not to a destination, but rather delivers a promise/threat of ecstasy and/or death. The resulting struggle between human and machine gives rise to an understanding of the human/machine complex as generative in character: as an engine for new sensations, new limit experiences, new modes of vision. Aspects of this vision were already becoming outdated by the end of World War I, but when Marinetti celebrates “the death of time and space” (with telegraphy as an early form of telepresence in mind), he was intuiting the kind of telecommunications revolution that has had us telecommuting over the past year.

Piaggio is a quite a different story. Though I’m a dedicated cyclist and motorcyclist, my role is that of the co-founder of Piaggio Fast Forward, the robotics wing of the Piaggio Group, where we are building mobility platforms for the century *after* Futurism’s dreams of perpetual acceleration and hypermobility long ago collapsed into rubble. The catastrophic consequences of automobile-centric models of urbanism and development on the quality of life and on the planet challenge us to rethink the future of mobility and urban design. While the speeds of land, sea, and air transportation began stalling out in the 1980s, connectivity and communications speeds have continued to accelerate. So how do we leverage these networks to move about the world better, more meaningfully, and more sustainably? How do we reconnect to the local in a globally interconnected world? The answers to such questions, in my view, lie in developing new mobility ecosystems for a post-automobile society. Here brilliant mid-20th century precedents like the Vespa scooter still have something to teach us.

What are the lessons they can teach us for the future? It seems that a particularly important point for you is the notion of "movability". What do you mean by this?

In the case of Futurism, however provocative, the lessons are largely negative. In the case of Piaggio’s illustrious history of innovation, the lessons are positive, but it’s not a matter of repeating or improving upon existing light mobility vectors. Rather, it’s a matter of developing entirely new smart electric vehicle typologies that can work alongside bicycles and e-scooters, and are aligned with the core values that we believe in. Piaggio Fast Forward is built on a bold, green, and anything-but-Futurist premise: the future of mobility is *walking* (but walking with smart follow-me transporters like the gita robot that, along with an embrace of such urban concepts as superblocks and the “15 minute city”, make pedestrianism a viable mobility choice).

You have recently curated an expanded reprint of *Blueprint for Counter Education* a significant work of radical pedagogy originally published in 1970 and integrated into the design of the Critical Studies curriculum at CalArts. What attracts you to this work by Maurice Stein and Larry Miller?

I am impatient person and struggle with the risk aversiveness and slow pace of innovation within the world that I love and work in: the university world. This has led to a longstanding interest in the history of radical and experimental pedagogy. From the laboratory of Constructivism to the Bauhaus to Black Mountain College to 1960s activist pedagogies of the sort propagated by Maury Stein... this is a genealogy that is aligned with the hands-on, creative/critical, experimental ethos of the two labs that I have built and led: the Stanford Humanities Lab (1999-2009) and metaLAB (at) Harvard (2011-present). I’m an avid reader/admirer of Gianni Rodari and have been putting together a book on Bruno Munari for several years now.

What were the principles on which their vision of a “counter education” was based?

Stein and his student Miller were part of the free university movement. They sought to devise a practice-based counter-pedagogy to the conservative models that were then prevalent in American universities. In so doing, they drew upon a wide range of methods from the Bauhaus studio to the activist teach-in (and maintained close connections to 1960s protest movements). The overall framework of their “blueprint” is easy enough to explain: to bring Herbert Marcuse’s critique of advanced capitalism into alignment with McLuhan’s celebration of the emancipatory potential of electronic media. The alignment was conceived of in the form of a boxed set that could be unfolded into an exploratory environment: three posters that mapped emerging architectures of knowledge and social practice, plus a “shooting script” that contains an instruction set for performing the posters supported by a database of readings of significance (represented by one hundred tables of content). *Blueprint* was conceived of not as a “plan,” “map,” “guide,” or “answer” but rather as a perpetual work in progress, an immersive environment that seeks to activate the learner.

Do you recognize yourself in these principles? What does educational innovation mean for you?

Yes and no. Yes, to the degree that I share its emphasis on *process* rather than *product* when it comes to imagining effective pedagogy. Yes, also inasmuch as the project resulted in a beautiful and unique print artifact endowed with a number of forward-looking features. (I note in passing that *Blueprint* served as the basis for the design of the humanities programs at CalArts in 1970-1972, the years when Stein served as Dean of Critical Studies there.)

No, for a variety of reasons, among them the fact that *Blueprint* remains very much a product of its era. It has blind spots (omitting any reference to feminism, for instance); there’s a psychedelic era naiveté to some of its assumptions; it’s a vibrant messy counterculture hand grenade that points to questions regarding the intersection between knowledge, power, and authority without really addressing them in a sustained fashion.

You are the director of the [metaLab](#) and collaborator with the [Berkman Klein Center for Internet and Society at Harvard](#). Could you discuss a couple of projects at the metaLAB that you think have implemented an innovative pedagogy especially well?

I believe in bringing together brain and hand, thinking and making, in arts and humanities education, no, in education writ large. I also believe in the importance of collaborative teaching and establishing a classroom where the “professor” is, among many other things, the learner in chief.

Along these lines, a few years back, metaLAB rolled out a series of hands-on Humanities Studio courses in which the attributes of the seminar were intermingled with those of the design studio. One was dedicated to researching, curating, and interpreting the part of Bernard Berenson’s photographic archive dedicated to lost works of the Italian Renaissance; another to the question of future models of scholarly communication (what I refer to as “knowledge design”).

With two colleagues (an architect and a designer) I am currently running an experimental online program for the Museo Madre in Naples entitled *museoFuturo* which is dedicated to training young professionals from various backgrounds in the field of “experimental museology.” The course concludes with a student authored, collaboratively produced instant book.

To what extent do the changes taking place in the education system today also depend on the creation and use of digital laboratories and interactive electronic classrooms that offer the opportunity to

practice new pedagogical models based on active learning and interactions between students and teachers?

Technology provides no answers in and of itself; it only opens up new possibilities. Classroom technology might just as well not be there at all if we are pouring old practices into shiny new bottles. Active learning is a great idea and a great hook, but it needs to be deep and sustained. Tech doesn't provide that depth or sustenance. Imaginative and innovative course design and teaching methodologies can.

According to some critics of digital innovation, the marked use of technology in education can become the source of new problems. Leaving aside the misleading idea of “technological determinism” can technology in education play a positive role in this innovative process?

Of course, digital innovation can play both a positive role and can give rise to new problems. But there's too much technodeterminism implicit in the question itself.

Tools and technologies don't provide the answers; teachers and institutions do.

They have to start by focusing on what they wish to achieve, on their core values, on locating those value-added domains where technology does open up transformative possibilities.

If tech is being viewed as a mere support, it is being viewed, as it were, from the outside. Whatever transformative potential exists can only be tapped if you get in under the hood, experiment, take chances, dare to fail, stretch your limits. This implies retraining teachers and researchers.

How do your projects and teaching activities align or differ from those promoted by other academic institutions in the United States? Is there a distinctive feature in what you do? For example, many universities have created a digital project around Dante. You do not seem to have followed this path. Why? What do you think of these projects?

That's a very hard question. Compared with other so-called “digital humanities” ventures, metaLAB is to some degree anomalous. We are part of the Berkman Klein Center (where Creative Commons and the Digital Public Library of America were incubated) but physically located in Harvard's Graduate School of Design; but we interact with Harvard as a whole. Neither the word “digital” nor the word “humanities” is in our name. We define ourselves instead as “an idea foundry, a knowledge design laboratory, and a production studio.” We are especially engaged by questions regarding the future of libraries, museums, and archives; more drawn to the critical and creative media practice than to digital literary studies; and maintain a strong commitment to environmental and social justice projects as well as to playful remediations of print.

I have nothing against the creations of web-based resources like the projects that you allude to; needless to say, I welcome them and make use of them in my teaching. Most fall under the domain of supports; I wouldn't describe them as “digital humanities.”

Over the past few decades, we have seen the creation of electronic books, digital repositories, textual and visual databases, digital archives, and hypertext projects based on the great texts and authors of the Western literary tradition. The most evident consequence of these changes is the increased

circulation and availability of literary texts. Do you believe that this phenomenon is horizontal, in the sense that it affects all social strata and the different areas of the world?

Absolutely. Just look at the analytics. Online content on sites like the Gutenberg Project and Internet Archive, and on platforms like Khan Academy is being accessed from all over the world, particularly areas of the developing world where libraries resources are scarce.

Or do you think that after all the change is quite real only in the sense that it concerns the same categories of people and world areas that were interested in Western literary tradition already before the technological changes?

I disagree: the democratizing impact of these projects is real. Again, the analytics demonstrate an expansion, at once geographic and demographic, despite the asymmetries in access to bandwidth and connectivity. The digital divide is, of course, real; but let's not overestimate its impact given the role that everything from cell phone networks to public libraries are playing in democratizing at least limited access.

At the same time, the increased circulation of literary works is not in itself a positive factor. Indeed, as many critics maintain, the uncontrolled circulation of literary works on the Internet often corresponds to a "distortion" of those texts. In your opinion, what are the most suitable criteria for evaluating the value of literary works published online?

It depends what you mean by "value" and "published online." The criteria will necessarily vary according to your definition of value and your target audience. If we are talking here about analog books that have been scanned and run through OCR, there is, of course, a need to ensure accuracy and the formal integrity of such works. But this is a relatively trivial matter in most cases. There's notion inherently more noble about a print object or a digital file; it's just that their ontologies are different.

What contribution can the Internet and digital technology make, if any, in creating an educated literary audience in the global network environment?

My answer may not please some readers, but I don't think it is the responsibility of the Internet or digital technology to create "an educated literary audience"; that is the responsibility of social and political institutions. The internet is a tool, just like an analog library is a tool. It can be used for a legion of ends, constructive and destructive.

For a moment let us consider the world of journalism and newspapers. Some critics hold that more information in circulation does not necessarily result in a more informed citizenry. Do you think that digital technology has increased the number of readers and changed the way people read newspapers?

More information in circulation has never "necessarily resulted in a more informed citizenry"; this was just as true in the pre-digital world of scandal sheets and tabloids as it is true today. There are more readers or information grazers than ever, but that doesn't guarantee being "better informed."

Again, let me insist: in contemporary polemics we grant too much agency to the technology and pay too little attention to our public institutions. The technology doesn't do this to us; it's our society, with all its

pathologies and asymmetries that interprets and shapes the media ecosystem that it has, quite literally, at its fingertips. There was never a “classical” era of the newspaper, contrary to the nostalgic ruminations of some and the newspaper as print artifact is mostly on its death bed.

However distinctive their present form, news bubbles and filters are hardly the creation of social media or online news networks. They may operate on vaster scales, churn more quickly, and be characterized by an accelerated “virality,” but the news ecosphere that preceded them (extending back to the early twentieth century and beyond) wasn’t more democratic or pluralistic or enlightened. It was slower, to be sure, and far more centralized, in the hands of a small circle of far-from-illuminated elites. Who would you prefer as your news gatekeeper: William Randolph Hearst, Axel Springer, Rupert Murdoch, or an algorithm? Of the four, I’d probably choose the algorithm. It’s easier to disrupt, manipulate, and it can be far more easily rewritten.

Do you see any noteworthy projects in the world of digital journalism?

Many. I think very highly of and support [ProPublica](#), but also think very highly of the sort of experimental work being done at the *New York Times*, among other places, devising new database storytelling modes.

How do you see the future of print newspapers in the global network paradigm?

I repeat, they are on their death bed. Print has a glorious future under digital conditions. But not newspapers. If the information that you rely upon to sell your product is to be evaluated on the basis of its informational “freshness”, print is (relatively) slow and electronic media are near instantaneous. This same conundrum does not apply to books (or, at least, beautiful books) and magazines (or, at least, beautifully print produced magazines).

As I have written elsewhere, “it is synchrony that prevails in cultural history. Old media don’t go away: they mutate. As the first centuries of books roll off the presses, scriptoria move from churning out lecture notes to crafting luxury pocket editions of multicolor illuminated prayer books. Microforms flourish alongside industrial-era books. Moleskine notebooks proliferate alongside laptops. Since the advent of the World Wide Web, more books continue to be printed than ever during the pre-internet era (and many of these are self-published books, a direct product of the democratization of access to publishing platforms).”

Digital technology has helped transform contemporary libraries and the very idea of book. You developed a project on this subject, [The Library Beyond the Book](#), with your colleague Matthew Battles. What are the most significant changes that you see now?

The title hints at one major shift in emphasis: libraries need to be about *connections* at least as much as they are about *collections*. This means thinking about the library as civic platform and key link in the knowledge distribution system. Libraries are more important than ever in the digital age.

What other changes do you envision for the book of the future?

I recently wrote the concluding chapter to the *Oxford Illustrated History of the Book*, so it’s impossible for me to sum up a complex historical argument in a few sentences. But the book has never been a single or a static object; just as it has undergone constant changes in the course of its history, it will continue to undergo such changes. But the books that will matter (and sell) will be books that double down on the physicality (i.e. tactility,

beauty, design) of the book object. If a book is a mere information container, there's no compelling reason for it *not* to live online. Most university press books don't pass this test, by the way.

Much of your work takes place in a markedly interdisciplinary perspective also through the curation of museum exhibitions such as [BZ '18 -'45](#) (the documentation center built under Marcello Piacentini's Monument to Victory in Bolzano / Bozen) or collaboration with institutes such as [Critical Media Practice](#) at Harvard that promotes innovative research using media practices in which written language may only play a part. Can you tell us briefly about these initiatives?

So, *BZ '18-'45* is the exhibition space and documentation center located under Piacentini's fascist monument: the first true fascist monument and a focal point of cultural-political conflict in the Alto Adige region since the time of its construction (1926-1928). At the time of the restoration of the monument, I was selected as part of the team assigned the task of re-imagining the monument's place within the city. Working with archivists and historians, we devised a hybrid itinerary combining a) an interactive experience within the mausoleum that lies right beneath the monument with b) a gallery tour that unfolds two interwoven narratives: one describes the life of Bolzano between the end of WWI and WWII; the other, the life of the monument itself, from the time that Mussolini commissioned it to the present. We also developed a somewhat startling external intervention: a luminous LED ring that spins around one of the columns of the façade of the original monument, symbolically re-wedding it to the city of Bolzano. The documentation center now draws some 30-50 thousand visitors a year (or at least it did until the pandemic).

Critical Media Practice is a PhD minor in the Faculty of Arts and Sciences at Harvard, so I work with a number of the students in the program as advisor, usually on the multimedia components to their thesis projects. It's a terrific program that allows for experimental and expressive add-ons to even the most conventional doctoral theses.

How do they fit into your research?

The tend to align very closely with metaLAB's activities in various modes. Numerous CMP students collaborate with metaLAB, even if there's no formal connection between the two entities.

What role does digital technology play in this context?

A considerable role, though some CMP projects involve little more than filmmaking or videography. Are there any forms of knowledge or cultural production today that aren't in some significant part digital? I pose this question only because it's the very reason I'm not fond of the phrase "digital humanities." However useful that label has proven, it wrongly implies that the digital (i.e. technology) is driving the train. In fact, the digital is simply a constitutive feature of contemporary culture and knowledge production in all domains. It's the air that we breathe, the setting within which we pose and answer questions. For this very reason we wouldn't speak of digital biology or physics.

Our journal is particularly interested in studying the changes in the way of reading following the advent of digital technology and the use of artificial intelligence in the analysis of literary texts. We are thinking here not only to different forms of distant reading as conceived by Franco Moretti but

also to unsupervised machine reading of literary texts or to the scientific research which is nowadays directed to push back the brain's speed barrier and read with greater speed and efficiency. The team at the [Laboratory for Visual Learning](#) – a collaboration of scientists from University of Massachusetts Boston, MIT, and Harvard, that included Matthew H. Schneps among others – stands for a significant example of this direction. For sure, the acceleration of reading processes produces not only benefits in society and the academic field but also a certain methodological and pedagogical uncertainty. Are there noteworthy results made possible by these new practices?

Naturally, but it all depends what you mean by “reading.” In the literary-historical fields, “reading” is a word that, as you know well, has usually been associated with qualitative methodologies. AI has shown great prowess in quantitative modes of reading, but I have my doubts regarding its qualitative potential. I'm not sure it's the right hammer to drive that nail into a wood beam.

This said, the quantitative is immensely powerful and can become intertwined with qualitative methods in productive ways, as Moretti's work, at its best, demonstrates. Speed and efficiency can provide certain kinds of insights at scale, but your research questions have to operate on that very scale. They possess considerable limitations as well, especially when one is working with small corpora. In my view, the real challenge involves the merger of quantitative and qualitative methods.

What has really changed in practices of reading in our time beyond the apocalyptic fears disseminated by staunch defenders of traditional reading or the overly euphoric expectations of technology and artificial intelligence gurus?

Reading practices in history are a moving target. Our era is no exception in this regard. There's no doubt that screen reading is a more rhizomatic, non-linear mode of navigating texts than is conventional, codex-based reading. But, as eye tracking studies and cognitive science have repeatedly demonstrated, even conventional reading proves far less linear than we usually imagine.

Have you practiced, or do you know significant experiences and in this regard?

As noted earlier, I have always steered metaLAB toward work with visual corpora, rather than textual ones, because I continue to see greater promise in this domain particularly with regard to the application of AI-based and machine learning techniques to their analysis.

To conclude the interview, we would now like to take a closer look at the theme of artificial intelligence and its consequences. Information technology, robotics, and A.I. have taken over many activities once performed only by humans, from spreadsheet calculations to pattern recognition, from playing *Chess* and *Go*, to translations, investment decisions, driving, and so on. Are there specific metaLab initiatives that make use of A.I. that you are particularly fond of?

The project that comes to mind is entitled [Curatorial A\(i\)gents](#) and it involves the critical and creative use of AI-based techniques to explore new modes of knowledge production and experience creation in the museological domain. As the project title suggests, it merges two words and two worlds—the human and the computational—in the form of a suite of co-curated experiments pairing an artificial intelligence with a human curator/creator. First presented at the Ars Electronica Festival in Linz in September 2020, *Curatorial A(i)gents*

is scheduled to open at the Harvard Art Museum later in 2021 for a ten-week run. It's only a first step: I have a number of other AI-based tricks up my sleeve that build on this initial experiment. What is essential to these future projects is the notion of curatorial practice, analysis, argument, and storytelling on a macro scale that involves collaboration between computational methods and human expertise.

What do you consider the most likely and relevant new capabilities and scope of AI and robotics that await us in the next 10 years?

As just stated, I'd like to draw us away from *substitutive* logics, whether it's the notion that AI is a rival intelligence to human intelligence—the word “intelligence” means something fundamentally different in the two phrases—or the persistent but historically sticky dream of building humanoid robots (which, as I argued at the Modena festival *filosofia* this year, leads not just to a profound misunderstanding of the robotic but also to robots that routinely fail).

Rather than substitutive models, I believe in *collaborative* models that leverage human expertise and general intelligence in the service of the expanded universe of action that AI and robotics imply. AI will surely reshape many domains of labor (including, for instance, medical diagnostics) just as robotics will increasingly invade our domestic spaces. But robots will forever remain useful appliances, not human doppelgangers.

The emergence of A.I. and of robotics is the result of complex interactions among technological, social, cultural, political, legal, and economic forces. Theorists like Hans Moravec in his books on the future of robots and A.I., hold that before 2050, robots will evolve to become a new super-intelligent species. What do you see as the factors that eventually will limit the reach and abilities of AI?

I'm going to repeat myself here, but bear with me. *Artificial intelligence* is not an “intelligence” of the generalized, fluid, flexible sort we usually understand when humans speak of intelligence; AI can do extraordinary things on expanded scales, but relies upon data architectures, forms of abstraction, and structures of dependency that bear little resemblance to the textured, multisensory *percepta* that feed human intelligence, not to mention critical reasoning. The same goes for *machine learning* which isn't “learning” in the conventional sense. It works best on well-bounded problems tackled by slogging through enormous training data sets: a large deep-learning model typically consumes the equivalent of the lifetime emissions of five automobiles. Pattern recognition at scale is its strength. But pattern recognition isn't thinking; it's only a first steppingstone towards thought, many steps removed from *critical* thought. So, these are powerful tools but, like all tools, they do some things well (especially at more-than-human scales) and other things poorly.

What are the most important challenges for society posed by A.I.?

Transparency and bias, first and foremost. At the racetrack you can look under the hood of any race car to see if the owner broke the rules, installing, for instance, a nitromethane supercharger. Data systems are expert systems, opaque to the vast majority of people who operate them and whom they affect. They require rigorous and well-informed regulatory frameworks that expose the values and assumptions that underlie them. Unfortunately, most of our politicians remain digital ignoramuses.

How must humans adapt to these changes? To what extent is their intervention marginalized in artificial intelligence and robotics?

As already noted, I don't accept the premise that AI and robotics aren't just another set of tools, which is to say that they somehow compromise or compete with the human in new and unprecedented ways as compared with earlier technologies. I take the long (anthropological) view. Just like the hammer turns every human into a hammerer, so machines like typewriters, telephones, and automobiles reshaped human cognition, culture, and society during the 20th century. Likewise, the information age has bred new adaptive behaviors and metaphors (time as bandwidth, synch, download) that imagine the computational and the human as one. They aren't however intimate the dance.

Some see significant differences in how artificial intelligence is conceived in the United States and in Europe. For example, Julian Nida-Rümelin and Nathalie Weidenfeld in their book *Digitaler Humanismus: Eine Ethik Für Das Zeitalter Der Künstlichen Intelligenz* argue that there exists an ideology, a specific Silicon Valley mindset, which would be countered by an idea of digital humanism with deep European roots. From this point of view, the ideology of Silicon Valley takes humanistic values as starting point and then transforms them into anti-humanistic utopias notwithstanding the genuine aspirations for the improvement of the human being. What is your view on this? Do you agree with these ideas?

I don't really have a view on this debate which, I have to confess, I don't really follow. I'm skeptical to two extents (but, again, this could be out of ignorance):

first, the idea of a humanism with "deep European roots" coming to the rescue strikes me as problematic. That's because Renaissance humanism represents one of the key constitutive moments of the very anthropocentrism that is destroying the planet humanity depends on for its survival. So, to propose some sort of restoration of "humanism" under digital conditions strikes me as an odd gesture. I envisage the true challenge of the present as *overcoming* humanism precisely in the sense of going *beyond* anthropocentrism. As I argued in my Modena talk, "the time has come for that image [of the human] to no longer be Vitruvian man, humanity at the center of the circle of being, humanity as model and master, including of the world's mechanical and computational extensions. Rather that image needs to become one small vector within that vast circle of interdependent, interconnected forms that make up the Circle of Life... so that the robot may be about us to precisely the same degree as we ourselves are about the world."

Second, I view the notion of "a specific Silicon Valley mindset" as a contemporary myth that treats many entangled but complex realities, distributed all over the globe, as if they were one. Like any simplification, it provides a useful shorthand (but that's about it).

How does "Silicon Valley AI" relate to the study of humanities?

AI has been with us for half a century now. It doesn't belong to "Silicon Valley" any more than it belongs to Dartmouth College where my former Stanford colleague, John McCarthy, first coined the phrase, or to IBM, Google, or DeepMind. Again, allow me to repeat myself: AI has the capacity to do extraordinary things on expanded scales, including things that involve cultural data sets, but it relies upon data architectures, forms of abstraction, and structures of dependency that bear little resemblance to the textured, multisensory percepta

that feed human intelligence and culture. Which means that the objects of study in the human sciences that AI can serve are new objects of study; they aren't simply extensions of traditional modes of inquiry. Often, they don't even fall within the conventionally understood domain of the Humanities. This is one of the reasons for my hesitancy with respect to the label "digital humanities": once you begin working critically and creatively with data as a material and expressive medium, the boundary lines between natural/human/social science have a tendency to become pretty porous.

Finally, some brief remarks on "Transhumanism" conceived as an end point or final goal of using AI. In the Transhumanist Declaration (2012) –signed by Alexander Chislenko, Max More, Natasha Vita-More, and Nick Bostrom among others – we read: "We envision the possibility of broadening human potential by overcoming aging, cognitive shortcomings, involuntary suffering, and our confinement to planet Earth. (...). We advocate the well-being of all sentience, including humans, non-human animals, and any future artificial intellects, modified life forms, or other intelligences to which technological and scientific advance may give rise." What do you think of these claims?

I'm guessing that I have already signaled my views in some earlier replies and, once again, should add that I don't follow this line of thinking. It's hard to object to such ideals as "overcoming aging, cognitive shortcomings, involuntary suffering", so fine; but overcoming "our confinement to planet Earth"? ...*confinement*, hmm. That's a word that sounds alarm bells for me. I love the desert. But the images from the Perseverance Rover of the surface of Mars don't quite suggest to me that space colonies are either the most plausible nor the most enticing "transhuman" future scenario.

I think, on the contrary, that we need to shed the legacies of humanism in all its forms, particularly those which animate technocentricism, and grapple instead with our deeper entanglements with a natural world that we still barely understand.

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