s@p

Stichting **Archiefpublicaties**

Archives in Liquid Times

Jaarboek 17

edited by

Frans Smit, Arnoud Glaudemans, Rienk Jonker

Hogeschool van Amsterdam

GOED VOOR UW LOOPBAAN

BENEFICIAL FOR YOUR CAREER

De Hogeschool van Amsterdam I Archiefschool leidt archiefprofessionals op binnen het hoger beroepsonderwijs. Daarnaast verzorgen we na- en bijscholing voor de archiefsector.

HvA I Archiefschool:

- onafhankelijk, professioneel en praktijkgericht

Onze expertise:

- digitaal archief- en informatiebeheer
- duurzame toegankelijkheid
- persoonsgegevens en openbaarheid
- archiefrecht en auteursrecht

Maatwerk

Wat kan scholing voor uw organisatie betekenen? Op hva.nl/archiefschool vindt u het *complete cursusaanbod*. Neemt u gerust contact op voor een oriënterend gesprek.

Contact

06 - 211 58 210

archiefschool@hva.nl

hva.nl/archiefschool

HVA.NL/ARCHIEFSCHOOL

CREATING TOMORROW

Is Bill Gates part of your Swarm?

You are only six steps away from a connection to Bill Gates, co-founder of Microsoft. At least, that is what the “Six degrees of separation” theory tells us. In the digital world, those lines are even shorter. According to Facebook, its millions of users are connected by an average of 4,74 steps. Fact or fiction?

Fact is we are currently living in a ‘swarm’ and are all connected to each other. This requires a paradigm shift for the way we think about humankind, the work we do, and information storage.

In the book “De Zwerm. Een verhaal over de virtuele samenleving” (‘The Swarm. A story about the virtual society’) Doxis, in collaboration with three philosophers, explores the future of Dutch society. We point out three trends which will radically influence the work environment in the years to come: insecurity, atomisation and standardisation. What does this mean for the successful organising of both work and information? And what about the safeguarding of accessibility, quality control and sustainability?

These are important current issues, as proven by the many downloads, as well as a recent reprint, of our book! You can download the book ‘De Zwerm’ (in Dutch) at www.doxis.nl/dezwerm. Available as PDF and ePub.

The book ‘De Zwerm’ was created in collaboration with Filosofie Magazine.

DOXIS

No hassle information management: www.i-beez.nl
Structuring information, not people: www.somio.nl

When digital becomes the work of man: www.doxis.nl

Archives in Liquid Times

Archives in Liquid Times

Edited by: Frans Smit, Arnoud Glaudemans and Rienk Jonker

design - www.absoluutdesigners.com

printed by - GTV Drukwerk Project Management bv

ISBN EAN 978-90-71251-45-0
Stichting Archiefpublicaties, 's-Gravenhage 2017

This publication has been made possible by:
Archiefschool/Hogeschool van Amsterdam (cover 2, page 6)
DEVENTit B.V. (page 6, 328)
Doxis Informatiemanagers (page 1, 6)
Picturae (page 2, 6)
Karmac Informatie & Innovatie B.V. (cover 3, page 6)
De Ree archiefsystemen (page 6)

Archives in Liquid Times

edited by

Frans Smit
Arnoud Glaudemans
Rienk Jonker

Jaarboek 17
Stichting Archiefpublicaties
s@p

This publication has been made possible by:

Hogeschool van Amsterdam | Archiefschool
Faculteit Digitale Media en Creatieve Industrie
Postbus 125, 1000 BA Amsterdam,
The Netherlands
T +31 (0)6-21158210
archiefschool@hva.nl
www.hva.nl/archiefschool

Hogeschool van Amsterdam

DEVENTit B.V.
Postbus 60, 3750 GB Bunsschoten,
The Netherlands
T +31 (0)33-2992277
office@deventit.nl
www.deventit.nl

DEVENTit
Developers & Inventors in IT

Doxis Informatiemanagers
Mailing address and visiting address The Hague
Loire 126, 2491 AJ The Hague,
The Netherlands
Visiting address Zwolle
Dr. van Deenweg 84-92 ruimte B.5, 8025 BL Zwolle,
The Netherlands
T: +31 (0)70-3177172
info@doxis.nl
www.doxis.nl

DOXIS

Karmac Informatie & Innovatie B.V.
Pascallaan 68-74, 8218 NJ Lelystad,
The Netherlands
T +31 (0)320-286959
info@karmac.nl
www.karmac.nl

karmac
Specialist in informatielogistiek
Digitalisering Opslag Outsourcing

Picturae
Droogmakerij 12, 1851 LX Heiloo,
The Netherlands
T +31 (0)72-5320444
contact@picturae.com
www.picturae.com

PICTURAE

DE REE archiefsystemen
Lijnbaanstraat 2, 9711 RV Groningen,
The Netherlands
T +31 (0)50-3112600
info@de-ree.nl
www.de-ree.nl

DE REE
archiefsystemen
Erg goed in Erfgoed

Foreword

Almost two decades ago, in an article in *The American Archivist*, I argued that research in archivistics (or: archival science) would save the archival profession, because research is the instrument for experimenting, inventing, changing, and improving – and a profession that is not involved in *"The endless cycle of idea and action, endless invention, endless experiment"* (T.S. Eliot) is doomed (Ketelaar, 2000). Often, archive professionals do not realize that many if not all managerial or practical questions can be solved more fundamentally when one allows for some theoretical and methodological reflection. "*Research,*" Barbara Craig (1996) wrote, *"cultivates a habit of examining received notions for their continuing pertinence and relevance."* (p. 110) Such a habit is essential for the archival professional who has to be equipped to deal with the constant change in his or her environment, effecting changes in records creation, preservation, communication, and use. As Arnoud Glaudemans and Jacco Verburgt declare in the first sentence of their essay in this volume: *"Any account of present-day archives should not only address practical, operational or managerial issues but also explicate the relevant theoretical issues regarding the specific nature and societal impact of digital information – if only because practical, operational or managerial issues, important as they obviously are, always presuppose some underlying theoretical framework."*

Archivistics offers such a theoretical framework, drawing on concepts like context, authenticity, findability, and access. In researching the ontological and epistemological archive(s), archivistics applies the archival method that is specific for the discipline, but it also adopts methods from other disciplines. This is evidenced by the various chapters in the recent book *Research in the Archival Multiverse* (Gilliland, McKemmish, Lau, 2016). But not only in methods: archivistics is increasingly profiting from what other disciplines can offer in conceptual and theoretical understanding of archival phenomena. So, for example, in performance studies dance may be understood as *"the choreographic activation of the dancer's body as an endlessly creative, transformational archive"* (Lepecki, 2010, p. 46). This resounds archivistics' concern with the fluidity of the archive as keeping former instantiations of a record 'in reserve', to be released not as exact copies but as re-enactments. And just as *"the originating instantiation"* of a dance keeps possibilities for later re-enactment in reserve, so gets each activation of a record along the records continuum extra significance in the light of subsequent activations.

Other 'archival turns' are also relevant to the theory, methodology and practice of archivistics. This volume shows what is brought to the archivistics' table from fields like media archaeology, speech act theory, information science, data science, philosophy, semiotics, genre studies, and organization science. At the same time, several essays in this volume indicate how archival theory and methodology can enrich other disciplines. In this way *Archives in Liquid Times* tries to cross disciplinary boundaries which so often keep scholarly and professional communities locked in their own discourse.

Eric Ketelaar

Table of Contents

MARTIJN VAN OTTERLO

From Intended Archivists to Intentional Algivists. Ethical codes for humans and machines in the archives*

"If the digital future is to be our home, then it is we who must make it so"
Shoshana Zuboff

Overview

Starting from the prediction that someday algorithmic archivists – or as I like to call them: algivists – will work the archives, I describe how ethical thinking in traditional archives could be employed to teach algivists moral values. The essay starts by describing the digitalization of society and archives and how so-called codes of ethics have evolved to define the moral values of archivists, characterized as the intended archivist. I then turn to ethical thinking about algorithms, how different types of algorithms induce entirely new classes of ethical challenges, and argue that a good way to endow algivists with ethical behavior is to employ the same kind of technology, algorithms, to encode ethical values directly in their core beliefs as a bias. This results in the intentional archivist, or the algivist. In this essay I develop a vision on the future of the algorithmic archivist and an idea to obtain algorithms in archives that obey our human ethical values.

(1) The Coming Archivist Singularity[1]

[Some place, some time in the future] It took ages to get permission, but yesterday evening I finally got THE mail. I consider myself lucky, since I really needed access to the archives to finish my article. Other people would ask why an assistant professor in technology ethics would like to see those old-fashioned paper documents about the introduction of Mindbook, the company that grew out of the long-gone Facebook Corporation. Since, their summaries are already on Archipedia. Who is interested in paper documents anymore? Well I am. I never felt comfortable with all this digital… eh stuff… anyway. People are physical, and they like physical things. Well… at least that's my opinion. And besides… I don't trust Archipedia; they have appeared in so many algorithmic trials for information manipulation, but they always use their right-to-silence and nobody is able to crack their summarization code. I need to take a look myself. I enter the red building next to the rocket station and turn right after getting

* The author acknowledges support from the Amsterdam Academic Alliance (AAA) on data science.
1 All links appearing in footnotes have been last accessed October 2017.

through the bio-scanner. Paul, a robot from the ALGIVIST-5000 series is waiting at the desk. His emotional module can use an update, I catch myself thinking. I only get a nod and a metallic "Hello, how can I help you?", so much unlike the newer models that can really lighten your day with their big smiles and warm voices. I answer the way I am supposed to do, with a clear question and context: "Hello Paul, I'd like to see all documents containing discussions on the use of advanced mind models, especially whole brain simulations, of Facebook users prior to the formation of Mindbook. I also would like to look at pictures and footage of the meetings that include people from the legal department, and can you please provide me with additional CV information of these people? Thank you." Paul knew from prior contact that I would be coming to the archive myself; otherwise he would have downloaded the interpreted documents, or DOC-INTERPRETs as they call them here, to my communicator. Now he only sends the requested CVs and projects an interactive map of the archive a floor below which will guide me to the right boxes. Since Paul scans and stores all items (including photos and a shallow semantic analysis of texts), and organizes them in the physical space, he knows where I have to go. At least, that is what I have to believe since there is no way of knowing what is in the complete archive. While going downstairs, I sense excitement from my side on how optimized and effective my routing past all the right boxes, 16 in total, is. Five more boxes are off limits for me though. It turns out another researcher has a similar research question in parallel, and his (or her?) combined scientific h-index and social media coverage is so much higher than mine. Also, according to an analysis of the planned social activities in our agendas, and our biophysical energy levels in combination with the predicted moist weather in the next weeks, Paul estimates that I will not put enough hours in my analysis of the documents and my writing anyway. Sure… I need to stop eating snacks and boost my metabolism… but come on… who does Paul think he is? My doctor? According to Paul the overall estimated impact of the other researcher publishing the material alone is higher when I do not interfere. I have no other option than to accept, but I don't think it's fair. Archival robots such as Paul are built to optimize their impact since they too get ranked. Of course, everyone gets ranked, and so are archival robots. Paul needs to optimize the use and costs of the archive while at the same time striking a balance between preventing possible negative impact on the donor organization Mindbook, and stimulating positive impact from researchers and journalists publishing the right kind of information, again according to Mindbook. Oh well… the rest of the day I look at the documents, trying to find what I am looking for. The surveillance-sensors watch my every move while interacting with the documents, which helps them to further optimize the archive, so they say. Well… they sure also use them for the projected advertisements that are appearing on the electronic walls for me. Hey… yes indeed… I do need a snack… my hands are trembling…. How did they know? Oh… never mind.

This scenario may sound like science fiction today, but could be happening in the near future. The *algorithmic* archivist Paul, or **algivist** as I will call it, will be a natural outcome of the *digital age* we are only just starting. It is not a matter *if* all this will happen, but *when*. I define the coming **archivist singularity** as the moment when all core archivist's activities will be replaced by an algivist. Usually *singularity* amounts to general technology (Shanahan, 2015) but here I focus more specifically on the archivist profession. Just like in autonomous cars, we can talk about various *levels*[2] of autonomous algivists: some will only maintain digital archives, some will have a robot body (for physical collections), and some may only

function as an assistant of a human archivist. All will, however, be responsible for *selecting*, *ordering*, and *documenting* archival documents. Introducing algorithms into our lives, and letting them take over jobs that were exclusively done by humans will cause profound changes in society and requires considerable thought on how to do that in a "good" way. A central question in this essay will be about how we can ensure that algivists will uphold the same moral standards and behavior as their human counterparts who have been our human gatekeepers to societally important information for so long.

Worries about the general singularity, when computers will outsmart "us" in every way possible and may spin out of control relative to our human interests, trigger *existential fears*. It reminds of concerns when another technology was in its initial phases: *nuclear technology*. Albert Einstein warned President Roosevelt in 1939 in a letter[3] for the consequences if *some other nation* (Germany) would obtain the technology for powerful bombs and suggested to start a nuclear program in the United States. The current explosion in *digital technology* and *algorithms* may very well trigger a similar arms race. But before worrying about superintelligence, we should study the many ethical challenges of not-yet-fully-superintelligent algorithms, such as our algivist Paul.

Ethical issues with algorithms arise on a daily basis. For example, Google's search algorithm tagged[4] (photos of) black people as "gorillas", showing either a bias in data or learning procedures, or errors in the application of the tagging algorithm. Autonomously driving cars constantly make mistakes[5] or are not yet fully capable of driving in our complex, physical world. A related case is when algorithms are *deliberately* used for the wrong purposes, such as the Dieselgate[6] case which dealt with cheating software to fool emission tests. Another example with ethical dimensions is Facebook's idea to *predict*[7] potential suicides to proactively aid people, which is in the same direction as Google's recent efforts on *depression detection*.[8]

Whether some of such issues may be against current or coming laws, in most cases we can say they are at least *creepy* (Tene and Polonetsky, 2014) since people will be targeted by Google's and Facebook's algorithms as *depressed* or *suicidal*: what consequences will that have? Another creepy example is the Cayla[9] doll which can communicate with children, send their data (voice, things said, possibly video capture) to the manufacturers' servers, and in addition, it can say anything to a child through a microphone. Apart from possible hacks, such "connected" dolls are creepy because they invade (just like smart-TVs and cell phones) the privacy of intimate family life, without doing anything illegal.

Other recent ethical challenges have to do with the typical *gatekeeping role of algorithms* employed by search engines and the like*: fake news*, Pariser's (2011) *filter bubbles* (where algorithms reinforce people's biases), and *censorship*. As an example, Facebook's policy to allow or disallow particular content, essentially implementing a form of censorship[10], raises many ethical issues given their 2 billion user-base.

---

2 https://en.wikipedia.org/wiki/Autonomous_car#Levels_of_driving_automation
3 https://en.wikipedia.org/wiki/Einstein%E2%80%93Szil%C3%A1rd_letter
4 https://www.theverge.com/2015/7/1/8880363/google-apologizes-photos-app-tags-two-black-people-gorillas
5 https://phys.org/news/2016-09-dutch-police-probe-fatal-tesla.html
6 https://www.cleanenergywire.org/factsheets/dieselgate-timeline-germanys-car-emissions-fraud-scandal
7 https://www.wired.com/2017/03/artificial-intelligence-learning-predict-prevent-suicide/
8 https://www.theguardian.com/commentisfree/2017/aug/25/google-clinical-depression-privacy
9 https://www.nytimes.com/2017/02/17/technology/cayla-talking-doll-hackers.html?mcubz=1
10 http://fortune.com/2017/05/22/facebook-censorship-transparency/

Recently some of it has been disclosed[11] but generally it is unclear who decides upon them. Facebook is also active in detecting utterances related to terrorism[12], Google aims to tackle fake news by classifying[13] news sources and marking them, effectively implementing a "soft" version of censorship, and Twitter targets[14] "hate-speech", thereby implementing language (and possibly thought) monitoring on the fly. Big technology companies are starting to recognize the ethical[15] issues, even causing Google to revive Wiener's[16] idea of an emergency button[17] to turn off autonomous systems. Ethical concerns about algorithms, or more generally *artificial intelligence (AI)* (Nilsson, 2010), are still relatively new and come from many directions. Open expressions of concerns by Stephen Hawking, Elon Musk and Bill Gates warn[18] for the unforeseen consequences of widespread use of AI. A letter[19] of concern with "research priorities for robust and beneficial AI" was quickly signed by more than 8000 researchers and practitioners. Individual top AI researchers speak out, such as Tom Dietterich[20]. Big tech companies such as Google, Amazon, IBM and Microsoft announced that they are forming an alliance[21] which "aims to set societal and ethical best practice for AI research". Various academic initiatives[22] arise around the broad topic of "societal implications of algorithms" and the scientific literature on the topic is growing quickly (Mittelstadt et al., 2016). Various authors try to explain the complex interactions between algorithmic technology and society. Van Otterlo (2014a) links *behaviorist psychology* to the way technology now has the means to implement *behavioral conditioning* on a large scale. Zuboff (2015) introduces the "Big Other" as a metaphor to point to the combined logic of capitalism, surveillance and digital technologies such as AI. Morozov[23] sees similar patterns of information capitalism undermining our human democracy. All these analyses go beyond relatively simpler, more isolated, issues such as privacy and data protection, and see the potential influence of algorithms on society as a whole, with profound implications for democracy and free will.

In this essay I explore ethical implications of algorithms in archives, with consequences for *access*. One of my goals is to introduce recent developments in the ethical study of artificial intelligence algorithms to the reader and survey important issues. One argument I develop in this essay is that since "we", as humans are creating these future algivists, we should study their ethical implications before, during and after creation. However, I also argue that maybe it is better to try to *create them in such a way that we can ensure that they will behave according to our own moral values*. How to construct this *ethical algivist*, and how does this fit into more general, scientific developments?

(2) The Digitalization and Algorithmization of Society and Archives

One of the hype terms of this decennium[24] is *big data*. Everywhere around us everything is turned into *digital data* which is thought to be good for health, the economy, the advancement of knowledge, and so on (Mayer-Schönberger, 2013). The promise is that data will allow us to understand, predict and optimize any domain (van Otterlo and Feldberg, 2016). For example, patient data allows us to build *statistical models* to predict diseases, and to *experiment* with novel treatments based on the insights of data, to cure more diseases. Another promise of big data is that it allows one to throw[25] away typical "hypothesis-driven" science, which works *top-down*, and to adopt a more *bottom-up* strategy, which starts with the data and tries to find patterns. Big data is not entirely new: *big data "avant-la-lettre"* can for

example be found in the *Cybersyn project* in Chile in the seventies which was aimed at controlling the economy of a complete country (Medina, 2015), something which sounds like modern "smart city"[26] endeavours. Data has always[27] been gathered and analysed but the scale of today is new. Modern data-driven technology induces a new[28] machine age, or an industrial revolution (see also Floridi, 2014). After the rationalization of both human labour and cognitive labour, we now enter a new phase where much of our society gets turned into data, and processed by autonomous, artificial entities.

The **digitalization** which turns our world into data is depicted in the figure (p. 272): each square represents an *object*, each triangle a *document* and each circle a *person*. Traditionally, all relations and interactions between any of these groups were *physical*. In our modern age, all such interactions are becoming *digitalized* step-by-step and produce data entering the data area. If we consider shopping, long ago, one could go to a store, fit some jeans, pay them and only the sales person (and the customer) would have a faint memory of who just bought which jeans. Nowadays, traces of security cameras, online search behavior on the store's website, Wi-Fi-tracking in the store, and the final payment, all generate a *data trace* of all interactions with the store and its products. A major consequence of that digitalization process is that a *permanent memory* of all those specific interactions is

11 https://www.theguardian.com/news/2017/may/21/revealed-facebook-internal-rulebook-sex-terrorism-violence

12 http://www.telegraph.co.uk/news/2017/06/16/facebook-using-artificial-intelligence-combat-terrorist-propaganda/

13 https://www.theguardian.com/technology/2017/apr/07/google-to-display-fact-checking-labels-to-show-if-news-is-true-or-false

14 https://www.forbes.com/sites/kalevleetaru/2017/02/17/how-twitters-new-censorship-tools-are-the-pandoras-box-moving-us-towards-the-end-of-free-speech/

15 https://www.wired.com/2016/09/google-facebook-microsoft-tackle-ethics-ai/

16 Wiener was, however, skeptical: "Again and again I have heard the statement that learning machines cannot subject us to any new dangers, because we can turn them off when we feel like it. But can we? To turn a machine off effectively, we must be in possession of information as to whether the danger point has come. The mere fact that we have made the machine does not guarantee that we shall have the proper information to do this." (N. Wiener (1948, 1961): Cybernetics, or control and communication in the animal and the machine).

17 http://www.dailymail.co.uk/sciencetech/article-3624671/Google-s-AI-team-developing-big-red-button-switch-systems-pose-threat.html

18 http://observer.com/2015/08/stephen-hawking-elon-musk-and-bill-gates-warn-about-artificial-intelligence/

19 https://futureoflife.org/ai-open-letter/

20 https://academic.oup.com/nsr/article/doi/10.1093/nsr/nwx045/3789514/Machine-learning-challenges-and-impact-an

21 https://www.theguardian.com/technology/2016/sep/28/google-facebook-amazon-ibm-microsoft-partnership-on-ai-tech-firms

22 https://www.nytimes.com/2016/11/02/technology/new-research-center-to-explore-ethics-of-artificial-intelligence.html?mcubz=1

23 (In German) http://www.sueddeutsche.de/digital/alphabet-google-wird-allmaechtig-die-politik-schaut-hilflos-zu-1.3579711

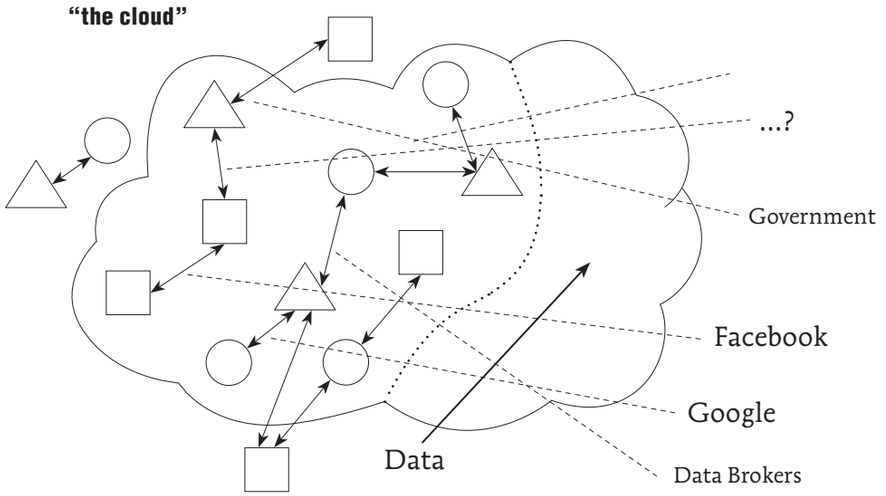
24 The start of this direction was only roughly ten years ago
The Petabyte Age https://www.wired.com/2008/06/pb-intro/ (Mitchell 2009)
Mining Our Reality http://www.cs.cmu.edu/~tom/pubs/Science2009_perspective.pdf (Anderson 2008)

25 This phenomenon is called "the end of theory" since it breaks with standard scientific methodology.

26 See for example Barcelona (http://www.smartcityexpo.com/barcelona) and other cities.

27 See for example East-Germany's Stasi and the great movie about it 30 http://www.imdb.com/title/tt0405094/

28 See the Rathenau Report on "Working in the Robot Society (2015) https://www.rathenau.nl/nl/node/766
The Rathenau Institute publishes many reports on the digital society and its implications, see https://www.rathenau.nl/nl/publicaties



stored in a *cloud* and can never be forgotten. In addition, often this data is generated and governed by *private entities*. For example, Facebook governs a lot of our social interactions on their platform and keeps data about us, Google gathers everything that people do with its search engine, and Twitter keeps score of all our interactions via Tweets and others trace our love life (OkCupid, Tinder), our communication (Gmail, Twitter, WhatsApp) and our entertainment (Netflix). This data is to some extent owned by these companies, and whereas a long time ago interactions were physical, and no trace was kept, these modern platforms are *aimed* at gathering as much data as possible of all our interactions, and aimed at *retrieval* of that data (of all users combined) for purposes such as *profit* and *surveillance*.

Despite the focus on *data*, it is only a consumable for the entities that really change our world: algorithms. Algorithms are *computer programs* that autonomously utilize data in order to do something. This can be *sorting* names in a database, computing navigation instructions, or also organizing Facebook's news feed. The term algorithm[29] stands for any *finite procedure/recipe*, with *well-defined instructions* and which is *effective* in solving a problem. **Algorithmization** is the phenomenon where increasing numbers of tasks in society are carried out by intelligent algorithms. The field studying and creating such algorithms is AI[30] (McCarthy, 2007; Nilsson, 2010) which is seeing a recent explosion of advances, including breakthrough technologies such as reinforcement learning (Wiering and van Otterlo, 2012) and *deep learning*. AI's core is coming up with intelligent systems that *in some way* exhibit observable behavior for which some form of intelligence is required. Lately the focus is on *adaptive* AI, or *machine learning* (Domingos, 2015), which ranges from baking cookies[31] to driving autonomous cars by learning from popular computer games.[32] AI is rapidly becoming *the* driver for innovation (Stone et al., 2016).

The transformation into a digital society can thus be characterized by the two interrelating developments: *digitalization*, which turns once-physical interactions into digital *data*, and *algorithmization*, which amounts to increasing analysis and

utilization of that data by algorithms. The transformation's impact on archives (and libraries) is potentially huge. When it comes to digitalization, archives (and libraries) are in transformation. Collections are constantly being digitalized to provide wider public access to information, for example through the American project *Digital Public Library of America* (DPLA[33]) and the European counterpart *Europeana*.[34] They unlock massive amounts of archival data such as books, photographs and various documents. Initiatives such as the Google Books project are similar in terms of technology, but have different goals. Google Books[35] has a long history of battles[36] [37] [38] between a tech giant wanting to unlock *all* books written by mankind, for everyone, and author organizations that think that Google does not have the *right* to do that in this way. The ethical issues of access here are severe, since Google may want to push the idea being a *universal library* but many think this role should not be pursued by a commercial entity.

In general, libraries and archives (to some extent) have always struggled with their exact role, especially in the transformation to our digital age, with the novel aspects of born-digital records and books, and with the loss of being an information providing monopolist (Licklider, 1965; Herring, 2014, see also Anderson, 2011, p. 212) in the age of Google. Both Kallberg (2012) and Clement (2013) have investigated how the archival profession changes in our digital age, and how archivists think about that transformation. Paulus (2011) shows that the *lifecycle of information* of archives and libraries changes, and that, for example, a transformation is happening in which libraries may return to an ancient and medieval model of the library or archive as a site of both production and preservation. Cox (2007): "At last, archives have a real opportunity to abandon the role of gatekeeper and invite user participation, interaction, and knowledge-sharing." He continues: "What would happen if we could engage our users in defining and describing archival content and in communicating it to others? Is it possible that the analog archives tradition can learn from the movement of social media and social design? Some of the opportunities include diminishing the role of the archivist as gatekeeper, promoting participation and collaboration among users, and enriching the archives itself by tapping into the specialized and diverse knowledge of researchers".

The future of archives and libraries has many parallels with the development of information technology such as the internet. Noh (2015) describes several stages leading up to "library 4.0", which is where "technology will become one with users' lives" and which also features *3D printing, big data, cloud computing and augmented reality.* One can also digitalize interactions that were purely physical until very recently, for example using photocopiers[39] and (personal) cameras (Cox, 2007).

[29] https://en.wikipedia.org/wiki/Algorithm
[30] *Science*, special issue on how A.I. is transforming science http://science.sciencemag.org/content/357/6346/
[31] http://www.wired.co.uk/article/google-vizier-black-box-optimisation-machine-learning-cookies
[32] https://www.technologyreview.com/s/602317/self-driving-cars-can-learn-a-lot-by-playing-grand-theft-auto/
[33] http://dp.la
[34] http://www.europeana.eu
[35] http://books.google.com
[36] https://www.wired.com/2017/04/how-google-book-search-got-lost/
[37] https://www.theatlantic.com/technology/archive/2017/04/the-tragedy-of-google-books/523320/
[38] See https://www.theatlantic.com/technology/archive/2015/10/fair-use-transformative-leval-google-books/411058/ and https://www.wired.com/2017/04/how-google-book-search-got-lost/
[39] This also connects back to Eco's "restrictions" described earlier on being able to photocopy in a hostile library, but also to the ethical challenges concerning fairness when photocopying costs money.

Both Fernandez (2016) and van Otterlo (2016b) describe how AI can be employed to do, for example, recommendations based on access to items and user data. AI can also be employed for personal assistants (*agents*) implementing virtual reference desks (Liu, 2011), and to *optimize* library and archival processes. Many core archival processes can be *automated* but currently digitalization and algorithmization have only just begun.

Access to lots of information has been the dream of many visionaries, especially in the last century. Joseph Licklider (1965) predicted more than fifty years ago that humans by the year 2000 would invest in a kind of *intermedium*[40] which would provide access to the so-called *procognitive net*, containing all knowledge. Paul Otlet envisioned various automated ways to do knowledge classification and retrieval, and laid the foundation for the modern internet with his Mundaneum and universal decimal classification. In 1945 Vannevar Bush introduced the "Memex", resembling Otlet's "Mondotheque" (introduced around the same time), a machine in the form of a regular desk that used microfilm as the storage medium for collections of text, and which could provide access to knowledge. Otlet's version was more related to H.G Wells "World Brain" in the sense that it focused on "networked" knowledge, and targeted film, photographs and radio in addition to text. Wells, building on ideas on information retrieval in his early "A Modern Utopia" from 1905, introduced his "World Brain" in 1939 in a series of lectures, as an idea to make the whole human memory accessible to every individual. More recently Wilfred Lancaster wrote (1982, quoting Schiller 1977): "Ultimately, the signs point to a technology offering search capability at home or office terminals without the aid of librarian intermediaries who perform the searches." (p. 33-34). All these, and many more pioneers (see Borner (2010) and Wright (2014) for extensive overviews), envisioned forms of technology that would connect each individual to "all" knowledge, in the form of some "world encyclopaedia" and would make this knowledge retrievable by technology. In essence, our current world, with Google, Wikipedia, Twitter and smartphones, exhibits all that they were looking for.

The enthusiasm of these pioneers in "universally accessible" knowledge is echoed in today's Silicon Valley's technology push. Every day comes with new services, new technologies, new apps and new AI. That each person on earth, in principle, has access to the world's knowledge through a smartphone was just a start. Soon, algorithms will become the prime actor doing selection, ordering and description for many information-rich tasks. What Silicon Valley and the pioneers also have in common, at least until very recently, is their focus on the *possibilities* of novel technologies, and not on possible *(unintended) consequences*. Archivists, librarians and other information professionals have powerful roles as gatekeepers, and with great power comes great responsibility. If we are increasingly handing such tasks as *access to information* over to algorithms, or algivists, we need to look at the ethics of doing so. And, since human information professionals have been doing that for such a long time, it is interesting to see how they have handled moral issues in the next section.

(3) The Intended Archivist: Ethical Aspects of Archives

Taking practical action based on moral values is the domain of *ethics* (Laudon, 1995; Baase, 2013; Kizza, 2013). According to Kizza (2013) *morality* is "a set of rules for right conduct, a system used to modify and regulate our behavior." (p. 3).

It naturally has close ties to *law* since when a society deems certain moral values to be important, it can formalize such values in a law and set behavior that will uphold those values as a *norm*. Ethics typically is concerned with analysis of such norm-setting processes. Classic ethical questions are: "should we clone humans?", "is it sometimes allowed to kill people?" and "should we provide a base income in case robots take over most jobs?". As Laudon defines it (1995): "Ethics is about the decision making and actions of free human beings. When faced with alternative courses of action or alternative goals to pursue, ethics helps us to make the correct decision... Ethics is, above all, about what is good and what is evil, and how we come to make such judgments" (p. 34). I would summarize it as: if there are options what to do, then ethics is concerned with practical reasoning about "good" and "bad" actions. Important subsequent questions are then, *for whom* is something good or bad, and *by who's standards?* Different answers to those questions induce a variety of ethical reasoning frameworks, with two main dimensions. One is about *rules vs. consequences*: to find the right decision one may follow a religious rule like "thou shalt not steal", or look at the consequences and decide, for example ignoring a red light at night when there is no traffic. The second dimension deals with "for whom" something is good: the *individual*, or the *collective*. A well-known *collective consequentialist* framework is John Stuart Mills' *utilitarian* ethics, which is aimed at finding the decision that gives the best *result on average, for all*, and can be *unfair* to single individuals.

Traditional archives are filled with ethical issues. The archivist performs many core[41] archival operations that all involve ethical decisions. Archives are (just like libraries and museums, see Kirchhoff et al., 2008) "memory institutions".[42] Morris (2009): "Archives are records, regardless of format, created or received by a person or organization during the conduct of affairs and preserved because they contain information of continuing value." (p. 4). Archivists deal with the *selection* (acquisition, appraisal, accessioning, retention), *maintenance* (provenance, order, physical arrangements) and *description* (cataloguing, referencing) of sources. Access to the material in traditional archives involves physical access to the physical material. Because archivists are, in contrast[43] to e.g. librarians, highly involved in creating the order and descriptions of the archive, users are more dependent on the archivist when they want to access materials. Zastrow (2013): "The idiosyncratic and contextualized world of archives necessitates communication with the archivist." (p. 18). Physical access to archives and libraries has always appealed to our imagination, in *fiction, poetry* and *film* (Crawford, 2015). Exciting stories like *Indiana Jones* revolve around the idea of finding a lost archive and retrieving a valuable item. The nicest example of such a *physical hunt* for a book appears in Umberto Eco's (1980) *The Name of the Rose*, which features an evil librarian, a difficult book maze, and poisonous pages as *physical* barriers to access.

[40] In his words: "a capital investment in their intellectual Cadillac".

[41] https://www2.archivists.org/node/14804

[42] Kirchhoff et al. (2008, p252) cites Lorcan Dempsey (2000) as follows: "Archives, libraries and museums are memory institutions: they organize the European cultural and intellectual record. Their collections contain the memory of peoples, communities, institutions and individuals, the scientific and cultural heritage, and the products throughout time of our imagination, craft and learning. They join us to our ancestors and are our legacy to future generations. They are used by the child, the scholar, and the citizen, by the business person, the tourist and the learner. These in turn are creating the heritage of our future. Memory institutions contribute directly and indirectly to prosperity through support for learning, commerce, tourism, and personal fulfillment."

[43] https://www.quora.com/How-would-you-explain-the-difference-between-a-librarian-and-an-archivist

Archives have many stakeholders: users, donor organisation, archivist, and people occurring in documents. Any relation between them can cause dilemmas, and the archivist plays a pivotal role. A typical object of ethical study in this domain is *privacy* (Garoogian, 1991; Svensson et al., 2016). Preisig et al. (2014): "Librarians, archivists and other information workers had to face ethical conflicts and ethical dilemmas long before digital media and the Internet started to reshape the whole information sphere. Francis Bacon's aphorism knowledge is power (scientia potentia est) refers to the fact that limited access to information and restricted education were prerequisites of ruling elites in pre- and non-democratic societies." (p. 11). Many ethical dilemmas are about *access* but plenty others arise between archive stakeholders. For example, Preisig (2014) mentions that unlimited freedom of expression collides with protection from defamation: archives may contain information that, when published freely, could cause harm to individuals (rendering a conflict with the owner or the subject of the archival matter). Ferguson et al. (2016) introduce a list of 86 real-world ethical cases and cluster them by *dilemma*. Similar to Preisig et al. (2014) dilemma is the "privacy versus potential harm to individuals" but also included are "privacy versus organisational ethos or requirements" – where obligations to core customers were in conflict with the organisational interests, for example when a professor requests reading records of a student suspected of plagiarism – and "ethics versus law" – where librarians or archivists have a conflict between their ethical convictions and what they see as "unjust laws". An example of the latter was where the government instructed librarians not to buy books from a specific country. Next to data privacy, increased digitalization of archives and their use also creates challenges for *intellectual privacy* (Richards, 2015; van Otterlo, 2016a), which is the right of an individual to access and read whatever he *wants without interference or monitoring* and which is a fundamental requirement for intellectual growth, freedom of thought, and especially *autonomy*.

Access is the most important issue with ethical repercussions in archival practice. Danielson (1989): "Providing fair access to archives may appear to be a fundamentally simple operation, until one examines specific cases." (p. 53). It often comes down to balancing many interests of stakeholders, ranging from overzealous researchers who want to gain access to legitimately privileged papers, to archivists who disagree with institutional policies, and to donors who have difficulty relinquishing control over their papers. Danielson distinguishes three distinct cases concerning access: restricted collections, open collections, and the topic of fair access. The first two deal with ethical issues of various forms of (legal) access restrictions by donors because of privacy, or sensitive materials (e.g. government documents and possible war crimes). According to Danielson (1989): "Just as individuals are responding to a candid society with a renewed sense of privacy, so too are institutions showing a heightened awareness of security." (p. 59). Danielson's third case concerns *equal intellectual access*. In large archives it costs lots of work[44]

[44] An interesting case here is the one on Cybersyn, the socialist big-data-avant-la-lettre project from the seventies in Chile, which was extensively described by Eden Medina in her fascinating book "Cybernetic Revolutionaries" from 2011. In 2014 Evgeny Morozov wrote a piece in the New Yorker on the exact same project (http://www.newyorker.com/magazine/2014/10/13/planning-machine). This created some controversy because some people accused Morozov of plagiarism, and quite interestingly, his rebuttal consisted of showing photographs of his own extensive search efforts in the archives of Stafford Beer (the main person in the Cybersyn project). The issue was never fully resolved (http://leevinsel.com/blog/2014/10/11/an-unresolved-issue-evgeny-morozov-the-new-yorker-and-the-perils-of-highbrow-journalism).

and money to find interesting things. One idea to help users is to inform them when researchers are after similar items. Practically it is questionable whether this works. Danielson (1989) describes several hypothetical examples related to ethics. For example, do professors get priority over access to sources just because they are better researchers? Do fees for copy services influence the access, and should profit and non-profit making patrons pay the same fees? Should the judgment about the quality of a researcher make a difference when prioritizing access to particular still unpublished sources? And should ethical decisions be made when a journalist (who has a much faster publication medium) asks for the same information the archivist knows a researcher is working on?

The related study by Ferguson et al. (2016) lists five dilemmas where *access* to information comes into conflict with another important *value*. The first is *censorship*. For example, archives can contain materials about groups of people which some people might see as offensive, so a balance is needed between publishing information and protecting groups. The second is *privacy*: access to information and records of that access could be in conflict if the latter need to be shared, for example with authorities. The third dilemma concerns access and *intellectual property*. The example that is mentioned here is translating something into braille without copyright compliance. The fourth conflicting value consists of *social obligations*. This one is personal for the archivist: should he or she work (partially) for free in the context of budget costs, just to maintain the level of service? The last one concerns *organisational ethos or requirements*. Here the specific case was about making university theses publicly available (with pressure for "open access") even though this might jeopardise publication of the results.

Given the many ethical dilemmas in accessing archives, the big question is how do archivist know how to make the right choices? Several scholars all point to the use of so-called "**code-of-ethics**". A *code of ethics* formalizes rules, guidelines, canons, advisories and more for the members of a particular profession. Well-known examples are the *ten commandments*[45] of the Christian bible and Asimov's *three laws of robotics*[46]. Another influential code is the *universal declaration of human rights* which deals[47] with fundamental ethics of human life. Usually codes of ethics are used by high-visibility institutions and big corporations[48], but in principle any profession could define one. The main *objectives* of a code of ethics are five-fold:

- **Disciplinary**: to enforce professionalism and the integrity of its members, possibly with *penalties*.
- **Advisory**: to offer members advice when difficult ethical decisions need to be made, professionally.
- **Educational**: to educate new members and show them the do's and don'ts of the profession.
- **Inspirational**: to (indirectly) inspire members to "do the right thing".
- **Publicity**: to show *externally* that a profession and its members have clear values and moral behavior.

[45] https://en.wikipedia.org/wiki/Ten_Commandments

[46] https://en.wikipedia.org/wiki/Three_Laws_of_Robotics

[47] In previous work (van Otterlo 2014b) I analyzed this code and found several necessary alterations needed for the digital age. Recently more interest in such issues has risen, due to advances in AI and robotics (Van Est, R. and Gerritsen, J. 2017).

[48] See for example one by IKEA (http://www.ikea.com/ms/en_JP/about_ikea/our_responsibility/iway/index.html), by Sony (https://www.sony.net/SonyInfo/csr_report/compliance/index3.html) and McDonalds (http://corporate.mcdonalds.com/mcd/investors/corporate-governance/codes-of-conduct.html)

Codes of ethics can be *prescriptive* (prescribe the do's and don'ts) or *aspirational* (only specify *ideal results*). Ferguson et al. (2016) note that they are an important tool for archivists, yet not always sufficient, especially not when there are *conflicts* between rules and values.

Archival codes[49] of ethics have a history. The first dates from 1955, from the Society of American Archivists (SAA). It (SAA 1955) is fairly compact and states things like:

> "The Archivist should endeavour to promote access to records to the fullest extent consistent with the public interest, but he should carefully observe any proper restrictions on the use of records".

Similar statements come from the Universal Declaration on Archives (ICA-DL 2011):

> "Archives are made accessible to everyone, while respecting the pertinent laws and the rights of individuals, creators, owners and users".
>
> "The Archivist should respond courteously and with a spirit of helpfulness to reference requests."
>
> "The Archivist should not profit from any commercial exploitation of the records in his custody."

Later (SAA 1992) it includes:

> "It is not sufficient for archivists to hold and preserve materials: they also facilitate the use of their collections and make them known."

This amounts to the preservation, use and publicity aspects of the archive. It also contains:

> "Archivists endeavour to inform users of parallel research by others using the same materials, and, if the individuals concerned agree, supply each name to the other party."

This refers to a dilemma I have discussed.

The final commentary of the code states something about potential conflicts:

> "When there are apparent conflicts between such goals and either the policies of some institutions or the practices of some archivists, all interested parties should refer to this code of ethics and the judgment of experienced archivists."

The most recent version (SAA 2012) features additional *core values*, which represent what the archivists *believe* while the code itself represents a framework for the archivists' *behavior*. This division is intuitive and could be a way to solve some ethical dilemmas, for example by a utilitarian analysis weighing in more factors. For access it expresses the value that it is essential in personal, academic, business and government settings, and use of records should be welcomed. Later in the code of ethics itself this value is translated into "minimize restrictions and maximize ease of access".

Ethical codes, especially when they have consequences when misbehaving, cause fewer discipline problems among members (Kizza, 2016, p. 50). However, some codes of conduct can be *non-committal*. Morris[50] calls for an *enforceable* code of ethics, just like legal and medical professions are governed by codes of ethics which carry the force of law. Violations would then be subject to sanctions including loss of license and civil and criminal liabilities. Formalizing ethical codes though, has one main purpose: to formalize *how humans should behave*, in this case in the archival profession. I call this the intended archivist; how he is supposed to think, feel and act professionally based on *human values* and *human behavior*. By formalizing it in a code it becomes *transparent* and can be communicated to peers, users, donor organisations and the general public.

(4) The Ethics of Algorithms

For algorithms, ethical analysis has only started recently resulting in the multidisciplinary field of *ethics of algorithms* (see for pointers: Lichocki et al., 2011; van Otterlo, 2013,2014a,2014b,2016a; Medina, 2015; Mittelstadt et al., 2016). People often associate with algorithms properties such as *infallible, exact*, and especially: *objective*. Because computer-based algorithms are based on logic and statistics people tend to think that because of that algorithms are objective and fair, since they can compute the *best answers* given the data. While some of this may be true, in general algorithms are far from objective: they are heavily *biased* (Bozdag, 2013; van Otterlo, 2013). Consider for example[51] (part of) a simple algorithm for a bank, specifying that "IF sex = female AND age > 60 THEN decision = no-life-insurance-policy". Now this algorithm is perfectly mathematical, and exact, and it thoroughly computes from personal data whether somebody is eligible for a life insurance policy. However, from a human point of view, it is far from "objective", or "fair" since it discriminates against women above 60 years old. Its decisions are *biased* and it discriminates, in plain sight. To make things worse, we can also imagine a second algorithm which is specified as "IF f(sex) * g(age) > 3.78 THEN decision = no-life-insurance-policy", and let us assume it makes exactly the same decisions as the first. A problem here is that this algorithm discriminates too, but it is hard to see from its description because we do not know what the functions f() and g() do, and also not why there is a threshold of exactly 3.78. Maybe these aspects have been *learned from data* which would require us to have a look at the data and learning process to form an opinion about the algorithm's objectiveness. In general, algorithms *are* biased in many ways (Bozdag, 2013), for example by the data, by learning procedures, by programmers who make choices, by technological constraints and many other reasons. This immediately requires us to form an opinion about algorithms and whether they do *the right thing*, which again brings us back to ethical reasoning.

Characterizing the ethics of algorithms is hard since algorithms and potential consequences are so diverse, and situations may change over time. Mittelstadt et al. (2016) define *concerns* about how algorithms transform data into decisions, which are then coupled with typical ethical issues. The core operations of an algorithm are: 1) it turns *data* into *evidence* which can be a probabilistic prediction, a yes-no decision, or some other *conclusion*, and 2) it uses the evidence to *trigger and motivate an action* based on the data. For example, an algorithm for bank loans could take personal data of someone and produce a credit-score of 12, which then could trigger an action to approve a particular mortgage. For the first step three general concerns

[49] Many other related codes exist, for example by the Dutch royal association for archivists (KVAN)(1) and the professional charter for librarians in public libraries (PL 1993)(2), and codes by the American library organization (ALA)(3), the International Federation of Library Associations and Institutions (IFLA)(4) and the International Council of Museums (ICOM)(5) code of ethics for museums. Although libraries do have different activities, core values are shared with archivists, which can be seen in the similarities with library values concerning access. Occasionally separate codes are made with respect to specific aspects such as privacy, for example as was done recently by IFLA in 2015 (6). See: (1) http://kvan.nl/images/PDF/Beroepscode_voor_Archivarissen.pdf; (2) http://www.ifla.org/files/assets/faife/codesofethics/netherlands.pdf; (3) http://www.ala.org/advocacy/proethics/codeofethics/codeethics; (4) http://www.ifla.org/news/ifla-code-of-ethics-for-librarians-and-other-information-workers-full-version; (5) http://icom.museum/fileadmin/user_upload/pdf/Codes/code_ethics2013_eng.pdf; (6) https://www.ifla.org/node/9803

[50] http://slanynews.blogspot.nl/2010/09/enforceable-code-of-ethics-why.html

[51] Birkbak and Carlsen (2016) elegantly show in a toy experiment how bias that is explicitly put in (the code of) a ranking algorithm causes different results, exemplifying how implementation choices change algorithm outcomes. As bias, they use intuitive operationalizations of the company mottos of Google, Facebook and Twitter.

can be defined. First, the evidence may be *inconclusive*. For example, when an algorithm predicts that I am a terrorist with 43.4 percent probability, what does it mean? Second, evidence may be *inscrutable* and not open for inspection which is often the case for a *no-fly list* decision. Third, evidence can be *misguided*, meaning that the underlying data is incomplete or unreliable. Actions, decided upon evidence, may have problems too, since they can be unfair, e.g. *discriminatory*. In addition, they can have *transformative* effects, for example that they change people's behavior which can happen when Facebook orders your personal news feed. These concerns then lead to typical patterns with ethical implications. For example, transformative effects can lead to *loss of autonomy* when a search engine manipulates you with advertisements, inconclusive evidence can lead to *unjustified actions*, and inscrutable evidence can lead to *opacity*. Overall, many concerns lead to a *loss of privacy*, and for any *algorithmic decision-making* situation attributing responsibility for the decisions can be quite complicated.
As a complement to this taxonomy, I developed[52] another way to look at the potential (ethical) impact of algorithms, now ordered by *what the algorithm can do*, or in general terms their *level of autonomy*. This results in five broad algorithm classes which have clearly defined *capabilities* and corresponding ethical issues.

Algorithms that interpret

The first type consists of *algorithms that reason, infer and search.* These algorithms can be quite complex in what they do, but they all compute answers based on data *as it is*. The more complex they are, the more information they can extract from that data. Examples include translation[53] and spatial language understanding[54] but also poetry generation.[55] Visual information processing now includes examples in recognizing[56] *what is on a picture*, evaluating picture's *aesthetics*[57], generating 3D face[58] models, *augmented reality* with IKEA[59] furniture and even recognizing kids in Halloween[60] costumes by Google's autonomous cars. The interpretation of sound includes better-than-human speech recognition[61], lip reading[62], and real-time Skype translations.[63] General *data science* can for example be used to *infer*[64] when people get into love relations. Ethical concerns about such algorithms are typically about *privacy* since more ways become available to interpret and link more kinds of data.
A second member of this group are *search* algorithms like Google. They not only rank and filter information, but they increasingly so use *knowledge* and *learning* to understand what the user wants (Metz, 2016a). Search engines also try to *answer* queries like "how high is the Eiffel tower" instead of delivering source documents.

[52] In the context of my course on the ethics of algorithms, see http://martijnvanotterlo.nl/teaching.html
[53] https://translate.google.com/?hl=nl
[54] https://www.wordseye.com/
[55] http://www.wired.co.uk/article/google-artificial-intelligence-poetry
[56] https://www.theverge.com/2017/6/15/15807096/google-mobile-ai-mobilenets-neural-networks
[57] https://petapixel.com/2016/10/08/keegan-online-photo-coach-critiques-photos/
[58] https://petapixel.com/2017/09/20/ai-tool-creates-3d-portrait-single-photo/
[59] IKEA augmented reality https://www.youtube.com/watch?v=UudV1VdFtuQ
[60] http://www.dailymail.co.uk/sciencetech/article-3301013/Google-teaches-self-driving-cars-drive-slowly-children-dressed-up.html
[61] https://www.technologyreview.com/s/544651/baidus-deep-learning-system-rivals-people-at-speech-recognition/
[62] https://www.technologyreview.com/s/602949/ai-has-beaten-humans-at-lip-reading/
[63] https://futurism.com/skype-can-now-translate-your-voice-calls-into-10-different-languages-in-real-time/
[64] https://www.facebook.com/notes/facebook-data-science/the-formation-of-love/10152064609253859/

The ethical issues with search engines are typically about the transformative effects they have on user *autonomy*, because of their enormous power (Granka, 2010; van Otterlo, 2016a). Search engines are key *gatekeepers* and influence the minds of billions of people every day. They have been shown to be capable of influencing[65] elections (Anthes, 2016), which is a serious ethical problem. Answering queries is an important issue too in so-called *conversational agents* and *social bots* (Ferrara et al., 2016). Social bots can influence discussion on forums, or act as genuine users on platforms such as Twitter. An ethical issue is that bots could be used for malicious[66] purposes, such as steering a debate towards a particular outcome, or providing false support for election candidates. This raises threats for autonomy again as a transformative effect. A second type of conversational agent are the *voice-controlled assistants*[67] such as *Cortana, Siri* and *Alexa*, which perform tasks like agenda keeping, creating shopping list, and *answering questions*. Assistants are increasingly used, especially in China[68], and have already appeared[69] in legal[70] situations (as a "witness").

Algorithms that learn

The second class of algorithms goes beyond the first and can *learn*, and *find generalized patterns* in the data. These *inductive* algorithms perform statistical inference to derive patterns, models, rules, profiles, clusters and other *aggregated knowledge fragments* that allow for statistical predictions of properties that may not be explicitly in the data. Overall, these are typically *adaptive* versions of the inference algorithms I have discussed, i.e. search engines typically adapt over time, and algorithms that interpret text, images and sound are often trained on such data. Applications range from predicting sounds for video[71], to training self-driving cars using video game data[72], even to predicting social security numbers.[73] Once algorithms start to learn (Domingos, 2015; Jordan and Mitchell, 2015) from data concerns about inconclusive evidence are justified because most methods use *statistical predictions*. In addition, outcomes may change over time with the data, making outcomes unstable. Most powerful contemporary learning algorithms, such as *deep learning*[74] [75], are purely statistical algorithms and very much like black boxes, which entails they are non-transparent and the evidence they produce inscrutable (with some exceptions[76]). When algorithms are used for *profiling* and *personalization* (van Otterlo, 2013; De Hert and Lammerant, 2016), something that happens everywhere on the internet, algorithms influence the user's choices and therefore affect his *autonomy of choice*. If profiles are learned from data, algorithms

[65] https://algorithmwatch.org/en/watching-the-watchers-epstein-and-robertsons-search-engine-manipulation-effect/
[66] A funny example of a malfunctioning bot: https://www.theverge.com/2016/3/24/11297050/tay-microsoft-chatbot-racist
[67] http://www.businessinsider.com/siri-vs-google-assistant-cortana-alexa-2016-11?international=true&r=US&IR=T
[68] https://www.technologyreview.com/s/608841/why-500-million-people-in-china-are-talking-to-this-ai/
[69] See also the hilarious Southpark episode on these assistants: http://www.ibtimes.com/south-park-season-premiere-sets-amazon-echo-google-home-speakers-2590169
[70] https://www.wired.com/2017/02/murder-case-tests-alexas-devotion-privacy/
[71] https://www.engadget.com/2016/06/13/machines-can-generate-sound-effects-that-fool-humans/
[72] https://www.youtube.com/watch?v=JGAIfWG2MQQ
[73] https://www.wired.com/2009/07/predictingssn/
[74] https://www.wired.com/2017/04/googles-dueling-neural-networks-spar-get-smarter-no-humans-required/
[75] https://machinelearningmastery.com/inspirational-applications-deep-learning/
[76] http://www.sciencemag.org/news/2017/07/how-ai-detectives-are-cracking-open-black-box-deep-learning

typically learn statistical models *from many* users and *apply them to a single user*. This may render inconclusive evidence which may be right on *average* but not for that single individual. A new *privacy* risk of learning algorithms is that they can also reveal *new* knowledge (van Otterlo, 2013; Schwartz et al., 2013; Youyou et al., 2015; Kosinski et al., 2013), predicting personal traits from language use, Facebook like's or just a photo.[77] Such algorithms obviously have effects on privacy, but certainly also transformative effects related to *autonomy*.

A more general consequence of adaptive algorithms is that we move in the direction of "the end of code" (Tanz, 2016). In the near future, increasingly many algorithmic decision-making tasks will be learned from data, instead of hardcoded by programmers. This has consequences for society, and for people, who will more often be assigned the role of *trainer*, instead of *programmer*.

Algorithms that optimize

The third class of algorithms consists of algorithms that *optimize, incorporate feedback*, and *experiment*. These typically employ *reward functions* that represent what are *good outcomes*, which can be, for example, a sale in a web shop, or obtaining a new member on a social network. *Reward definitions* tell an algorithm what is *important* to focus on. For example, advertising algorithms on webpages get +1 reward for each time a user clicks on an offer. Optimization algorithms will, based on all that is known about statistical aspects and based on all data about a problem, compute the *best* expected solution. The most prominent system currently comes from Google's DeepMind. It combines reasoning, learning and optimization, beat the world best Go player (Metz, 2016b) and is now tackling the complex computer game Starcraft-2.[78] Optimization algorithms feature two kinds of rewards. One is used by the algorithm to optimize and represents clicks, sales, or other things which are *valuable*. The other type are rewards *for users* (e.g. a sale), with the goal of *nudging*[79] them into doing something (e.g. buying something). Manipulating users' behavior obviously has transformative effects on autonomy. Worse, just like learning algorithms, optimization works well *on average* and could deliver nudges to the wrong users too, which would make the outcomes discriminating and unfair. Optimization algorithms typically *iterate* the optimizations by **experimenting** with particular decisions, through *interactions with the problem* (see Wiering and van Otterlo, 2012). A good example are algorithms that determine the advertisements on the web: they can "try out" (experiment) with various advertisements for individual users, and use the feedback (clicking behavior) of individuals to *optimize* advertisement placings. So, instead of a one-pass optimization, it becomes an *experimentation loop* in which data is collected, decisions are made, feedback and new data is collected, and so on. Platforms with large user bases are ideal laboratories for experimentation. For example, Netflix experiments with user suggestions to optimize their rewards which are related to how much is being watched (Gomez-Uribe and Hunt, 2015). Optimization algorithms are generally used to rank things or people. In the *ranked society* in which we now live everything gets ranked, with examples such as Yelp, Amazon, Facebook (likes), TripAdvisor, Tinder (swiping) and OkCupid, all to find "the best" restaurant, lover, holiday trip, or book. Also in our work life, ranking and scoring becomes the norm (called: *workplace monitoring*[80]). The ultimate example is China's 2020 plan (Chin and Wong, 2016) to rank everyone in society to find out "how good a citizen are you". Scores are computed from many things ranging from school results to behavior on

social media, to credit score, and combined into one overall score. The higher that score, the more privileges the citizen gets (from easier car rental and bank loans, to visa to other countries). The ethics of experimentation has many aspects (Puschmann and Bozdag, 2014). Most important here are the choice of reward function (who decides has great power) and the fact that (especially on the internet) we often do not know we are part of an experiment, and maybe we need new forms of *consent*.

Physical manifestations

A fourth class of algorithms concerns *physical manifestations* such as *robots* and *sensors* (internet-of-things). These algorithms go beyond the digital world and have *physical presence* and *agency* in our physical world, which may jeopardize human safety. A first manifestation is the *internet-of-things* (Ng and Wakenshaw, 2017) in which many appliances and gadgets get connected and where increasingly *sensors* are being placed everywhere[81], creating data traces of once physical activities. The *programmable world* (Wasik, 2013) will feature all digital (and intelligent) items around us as being *one giant computer* (or: algorithm) that can assist us and manipulate us. For example, if your car and refrigerator and microwave could work together, they could – with the right predictions on the weather, your driving mood and speed, and possible traffic jams – have your diner perfectly cooked and warm the moment you get home from work. The ubiquity of such systems will raise ethical issues since they will be influential, but often unnoticeable. Also, privacy concerns are raised. A similar big development will be physical *robots*[82] in our society. "A robot is a constructed system that displays both physical and mental agency, but is not alive in the biological sense" (Richards and Smart, 2016). Many types of robots exist, ranging from simple vacuum cleaners, to *humanoids* (with human-like appearance[83] [84]) to robots capable of manipulating their physical environments in hospital or manufacturing situations. Robots are not yet part of our daily lives, but the literature on the ethics of robots is rich (Lichocki et al. 2011; Smart and Richards, 2016). Steinert (2014) frames the ethics of robots into four main[85] categories: robots as *tools* (or instruments), robots as *recipients of moral behavior,* robots as *moral actors*, and robots as *part of society*. The difference between the first and the latter two is mainly one of *responsibility*. The introduction of increasing numbers of robotic agent in society (the fourth type) will also have socio-economic consequences we can only partially imagine, most obviously for *work* which will[86] increasingly being taken (or not[87]) over by robots (Ford, 2013). Robots are also expected to have (ethical) impact on things like law enforcement, the military, traffic (Kirkpatrick, 2015), healthcare and even prostitution (Richardson, 2016).

[77] https://www.theguardian.com/technology/2017/sep/12/artificial-intelligence-face-recognition-michal-kosinski
[78] https://deepmind.com/blog/deepmind-and-blizzard-release-starcraft-ii-ai-research-environment/
[79] https://en.wikipedia.org/wiki/Behavioural_Insights_Team
[80] https://harpers.org/archive/2015/03/the-spy-who-fired-me/
[81] https://www.iamexpat.nl/lifestyle/lifestyle-news/hidden-cameras-dutch-advertisement-billboards-ns-train-stations-can-see-you
[82] https://en.wikipedia.org/wiki/R.U.R.
[83] https://en.wikipedia.org/wiki/Uncanny_valley
[84] https://www.wired.com/2017/04/robots-arent-human-make/
[85] The article also includes a fifth type which refers to the influence of robots on ethics itself (meta-ethics).
[86] https://www.wired.com/brandlab/2015/04/rise-machines-future-lots-robots-jobs-humans/
[87] https://www.wired.com/2017/08/robots-will-not-take-your-job/

Superintelligence

The fifth class of algorithms goes beyond the algorithms as we know them now (digital or in physical form) all the way to *superintelligent* algorithms, which surpass our human-level intelligence. Once we have reached that point, questions of *conscience* and *moral decisions*, and with that *responsibility* of algorithms, will play a role. Most of this discussion falls beyond the scope of this text. A general remark is that the more intelligent, autonomous or conscience an algorithm will become, the more moral values will be attributed to it, and the more ethical reasoning and behavior will be expected of it. However, as Richards and Smart (2016) elegantly show using the *android fallacy* it will take still a long time before robots are even capable of deserving that. According to many scholars, a so-called (*technological*) *singularity* (Vinge, 1993; Shanahan, 2015) will come, which is[88] "the hypothesis that the invention of artificial superintelligence will abruptly trigger runaway technological growth, resulting in unfathomable changes to human civilization". For some already the point of getting algorithms to become "smarter" than humans (whatever that may mean) will trigger an explosion of unstoppable AI growth that could dominate the human race entirely even. Ethical concerns about such algorithms are discussed by Bostrom and Yudkowsky (2011) and many other people, like Kurzweil.[89] Many straightforward ethical concerns are about whether machines will overpower us, whether they still need "us", and what it *means* to be human in a society dominated by machines (see Shanahan, 2015 for some pointers).

These five groups of algorithms show the many sides of the ethics of algorithms. Depending on the type of algorithm, task, setting and data, many kinds of ethical issues arise that must be addressed.

(5) Towards the Intentional Archivist

Algorithmic versions of virtually all current professions will appear, eventually. The basic, *human*, question is how to ensure that all these algorithms respect our human values. In this section I will sketch the considerations in ensuring algorithms like Paul, the algivist from the scenario at the beginning of this essay, will have the right moral behavior if we actually build them.

Solving ethical issues using AI

The previous section has described many potential ethical issues and they would all apply to algivists, but so far not many effective *solutions* exist. Literature on *governance* of algorithms (Diakopolous, 2016) focuses on *transparency* and *human involvement*, and on *making algorithmic presence known*. A challenge is that so far algorithms are largely *unregulated* (van der Sloot et al., 2016). However, there are laws and rules for *data*, such as the *data protection act* (DPA; Dutch: WBP[90]) from 1998. In 2018 new European regulation will take effect as a replacement of the directive of[91] 1995 in the form of the *general data protection regulation* (GDPR[92]) which will cover several forms of algorithmic decision making (see also Mittelstadt et al., 2016). Outside the law, solutions include *privacy-by-design*, and *encryption*.

[88] https://en.wikipedia.org/wiki/Technological_singularity
[89] https://en.wikipedia.org/wiki/The_Singularity_Is_Near
[90] http://wetten.overheid.nl/BWBR0011468
[91] https://www.autoriteitpersoonsgegevens.nl/nl/onderwerpen/europese-privacywetgeving/algemene-verordening-gegevensbescherming
[92] General Data Protection Regulation (GDPR) http://www.eugdpr.org/more-resources-1.html

Individual users can often protect their privacy to some extent by using privacy-friendlier software or services. A solution shared by many is *data minimization* (see e.g. Medina, 2015): only gather data that is really necessary. Another set of solutions is *obfuscation* (Brunton and Nissenbaum, 2013) in which users deliberately sabotage algorithmic systems.
An alternative though, is to *employ AI itself*. That is, one can utilize the same power of algorithms to deal with ethical issues. For example, recent advances in machine learning remove discriminatory biases by adapting training methods, or implement *privacy-aware* techniques. Etzioni and Etzioni (2016) propose general *AI Guardians* to help us cope with the government algorithms. Since AI systems more and more become *opaque* (black box), *adaptive* (using ML) and *autonomous*, it becomes undoable *for humans* to check what they are doing and AI systems can do that for us. AI guardians are *oversight* systems using AI technology, and come in various sorts: *interrogators* can investigate e.g. a drone crash, and a *monitor* can keep an eye on other AI systems, or even *enforce* compliance with the law. A special type is the *ethics bot* which is concerned with ensuring that the operational AI systems *obey ethical norms*. These norms can be set by the individual, but can also come from a community. An ethics bot could guide another operational AI system, for example to ensure a financial AI system only invests in socially responsible corporations.

Learning the right values

Ethics bots will have to *learn* moral preferences, either by explicit instruction or from observed behavior. An intuitive idea would be to let algivists learn their moral behavior, for example, from watching a human archivist do their work. AI has developed many ways to do that, for example using *imitation*, or *learning from demonstrations*, however it is not that simple. A key challenge is *generalization*: which parts of the task need to be imitated exactly, and which not? "We're always learning from experience by seeing some examples and then applying them to situations that we've never seen before. A single frightening growl or bark may lead a baby to fear all dogs of similar size – or, even animals of every kind. How do we make generalizations from fragmentary bits of evidence? A dog of mine was once hit by a car, and it never went down the same street again – but it never stopped chasing cars on other streets." (Minsky, 1985, Society of Mind, Section 19.8). Based on the advances I described in the previous sections, AI would be capable of recognizing and interpreting the actions of a human archivist in action, and also replicating them in a robotic body, but it would still be a challenge to *do* learn how to sort out documents and to appraise the documents in the boxes, but to not learn how to scratch a nose, or fingertap while waiting for the printer to finish.
An effective alternative is to *learn the underlying reward function*. As we know from optimization algorithms, a reward function determines what is important and what not. Now assume the algivist could learn the reward function according to which the archivist does his job. In that case, the algivist would be able to replicate the archivist's behavior, including all the right ethical decisions. The technical term for this type of learning is *inverse reinforcement learning* (Wiering and van Otterlo, 2012) which is based on solid theories for behavior learning. For specialized tasks, especially in robotics, many successful applications exist. Equally so, it could form the basis for AI systems that *act* in alignment with human goals and values, which is an interesting option for ethical algivists. The core challenge then is how to learn these *human* values, sometimes framed as *the value learning problem* (Soares, 2015).

The challenge is that human values are typically difficult to learn, since they can be based on complex mental processes, can be working on multiple timescales, can be difficult to put on one value scale, can involve both intuition and reasoning and may involve other interactions such as *signalling* and *trust-building*. Furthermore, they require *ontological agreement* between human and machine: do they see the world in the same way? Many of these problems are shared with technical AI work (e.g. computer vision) but for use in ethical systems much more work is needed.

Against learning from scratch

The value learning problem is difficult for many reasons. In addition, any type of purely statistical learning procedure faces other difficulties related to opacity and the limited possibilities to employ *knowledge* one might have about a domain. However, there are machine learning techniques that allow for the *insertion* of knowledge as a *bias* for learning, and the *extraction* of learnt knowledge after learning. Consider the robot learning technique by Moldovan et al. (2012) where a robot needs to learn from demonstration how physical objects are to be manipulated and how they behave when manipulating. Without any prior knowledge, the robot would have quite a challenging learning problem, mapping the pixels of its cameras all the way to motor commands in its hands. Instead, by adding some common-sense knowledge about the world, like "if you move object A, and object B is far away, then you can safely assume B will not be affected", or "if you want to manipulate an object, you can either push, tap, or grab". This type of knowledge will make the learning problem easier and at the same time it *focuses* (or: *biases*) the learning efforts on the things that really matter. Other, general common-sense knowledge could also help in choosing the right behavior (based on a reward function) such as "green objects are typically heavy", and "one cannot place an object on a ball-shaped object". In machine learning we call this kind of bias *declarative*, since it is knowledge that can be *explicitly* used, stored, and "looked at". Declarative models have been used before in ethical reasoning in AI (Anderson and Anderson, 2007) and other ethical studies (van Otterlo, 2014a).
In order for inserting knowledge to work, we need to solve the ontological issue: knowledge should be at the right level and meanings should mean the "same" for AI and for humans. To bridge AI and human (cognitive) thinking, the *rational agent* view is a suitable view. In AI, a rational agent is "one that acts so as to achieve the best outcome or, when there is uncertainty, the best expected outcome" (Russell and Norvig, 2009). In cognitive science we can take the **intentional stance** view introduced by Daniel Dennett (2013). The intentional stance sees entities as *rational agents* having *mental notions* such as *beliefs, goals* and *desires*. Using this viewpoint, we assume the agent takes into account such beliefs and desires to *optimize* its behavior. For people this is the most intuitive form of description of other people's behavior. But, it is also common to use it to talk about algorithms: I can say that Google *believes* I like Lego and therefore it *desires* to feed me advertisements about it and sets a *goal* to prioritize websites referring to Lego. I can also say that Google *believes* that I *want* pizza when I enter "food" as a query since it *knows* from my profile it is my favourite food.

Code of ethics as a moral contract between humans and machines

Coming back to the *archivist singularity* mentioned in the introduction, I propose a simple strategy to construct **Paul, the Intentional Algivist** as a robotic,

algorithmic agent for the archives that has moral principles just like human archivists. What could be better *declarative, human* knowledge about ethical values in the archival domain than the previously discussed archival *codes of ethics*? Indeed, these hold general consensus ideas on how an archivist should behave ethically, dealing with issues such as privacy, access, and fair use of the archive. In addition, they are full of *intentional* descriptions, see for example: "The Archivist should endeavour to promote access to records to the fullest extent consistent with the public interest, but he should carefully observe any proper restrictions on the use of records". This is clearly a bias on how the algivist should behave and it contains intentional constructs such as a goal, a desire and several (implicit) beliefs. Codes of ethics are solid knowledge bases of the most important ethical *guidelines* for the profession, and typically they are defined to be *transparent, human-readable* and *public*. Using codes of ethics as a knowledge bias in adaptive algivists that learn ethical behavior is natural, since it merely *translates* (through the rational agent connection) an ethical code that was designed as a bias for human behavior, and uses that as a guide or constraint, or: *as a moral contract between man and machine*. I see a practical way to go in which an algivist is endowed with the ethical values contained in the code of ethics, after which it observes human archivists at work to *fine-tune* its behavior based on their example. Human archivists will slowly transform into *trainers and coaches of algivists*: the more advanced algivists become, the more humans will *guide* them and leave the archival work to them. But, before this happens, much still needs to be done, both by AI researchers as well as by archivists themselves.

What does the field of AI need to do?

AI needs to keep on progressing as always, but more research is needed on several aspects specifically. Language understanding and formalization of human (common-sense) knowledge needs to be improved to translate codes of ethics automatically in forms that the algivist can use for acting, and for reasoning. We know that even the impossible Roadrunner cartoon logic has at some point been formalized (McCartney and Anderson, 1996), so nothing is impossible. Furthermore, robotic skills need to improve a lot. Manipulation skills are somewhat sufficient for laboratory conditions (e.g. Moldovan et al., 2012) and there has been some progress in – for archivists, related – environments such as libraries[93], but obtaining general movement and object manipulation skills in *any* physical archive will take enormous efforts still. Once parts of the archive have been made digital, many of the archival selection, ordering and description tasks can be handled well, although also there much improvement is possible in the *semantic understanding* of documents, images, and other items.

What do archivists need to do?

Archivists will need to assist AI researchers as experts in archives, and they need to decide at least two things.

- The ethics of choosing THE code of ethics: The core idea is to inject ethical codes into machines. Out of the many possible versions, which one should be picked? And who decides upon that? Archivists, committees of experts, programmers, or more general democratic methods? For this to work, we may also need to investigate more which kinds of values hold in professions as held by archivists and librarians.

[93] https://phys.org/news/2016-06-automated-robot-scans-library-shelves.html

- Who approves algivists? Depending on the impact of algivists on the daily life of people, we may need regulations concerning their *use*, similar to regulations concerning autonomous cars. In analogy with medicine, we may need to think about formal *approval* procedures, as a kind of "FDA approval for algivists" (Tutt, 2017) where algivists first need to be tested in laboratories before they can work in archives.

(6) Conclusions

In this essay I have done several things. First, I have described a plausible, yet still fictive, future of algivists as algorithmic archivists. Second, I have given the reader an extensive view on the new field of ethics of algorithms which is concerned with the societal impact of intelligent algorithms. Third, I have introduced how ethical thinking has been formalized in archival practices using codes of ethics. Fourth, and most importantly, I have sketched how human codes of ethics could be employed to build algorithmic algivists that will obey our human ethical values, thereby moving from the *intended archivist* to the *intentional algivist*. Future research on AI, ethics and archives will bring us the advances algivists promise, but hopefully also gives us tools to maintain high moral standards when incorporating these agents into our lives. At least two sets of questions remain for archivists to answer and for others to study. The first is how the new role of *trainer* or *coach* will have an impact on the profession. Instead of appraising documents, they will now "appraise" the behavior of the algivist. How many trainers are needed at some point? How will they become a *certified* trainer? And will algivists stay a separate profession, or will they merge with other information service machines? The second set of questions is about the long-time future. When archival practices will be changed drastically with the introduction of algivists, ethical codes may need to be updated to reflect new social norms between humans and machines. Who decides when that time comes, and who decides what is to be changed? Maybe employing algivists also requires us to rethink ethical concepts over time (see Steinert, 2014 about meta-ethics). Time will tell.

Literature

ICA-DL (2011). *Universal Declaration on Archives*. Retrieved from http://www.ica.org/en/universal-declaration-archives

SAA (1955). *Society of American Archivists Code of Ethics* (1948-1965). Retrieved from https://historyhub.history.gov/docs/DOC-1031

SAA (1992). *Society of American Archivists Code of Ethics*. Retrieved from http://ethics.iit.edu/ecodes/node/4559

SAA (2012). *Society of American Archivists Code of Ethics*. Retrieved from http://www2.archivists.org/statements/saa-core-values-statement-and-code-of-ethics

Anderson, C. (2008). The End of Theory: The Data Deluge Makes the Scientific Method Obsolete. *Wired Magazine*. Retrieved from https://www.wired.com/2008/06/pb-theory/

Anderson, M., & Anderson, S.L. (2007). Machine Ethics: Creating an Ethical Intelligent Agent. *AI Magazine, 28*, 15-26.

Anderson, R. (2011). Collections 2021: The future of the library collection is not a collection. *Serials, 24*(3), 211-215.

Anthes, G. (2016). Search Engine Agendas. *Communications of the ACM, 59*(4), 19-21.

Baase, S. (2013). *A Gift of Fire: Social, Legal, and Ethical Issues for Computing Technology* (4th ed.). Upper Saddle River, NJ: Pearson Prentice Hall.

Birkbak, A., & Carlsen, H.B. (2016). The public and its algorithms: comparing and experimenting with calculated publics. In Amoore, L. and Piotukh, V. (eds.), *Algorithmic life* (pp. 21-34). London: Routledge.

Borner, K. (2010). *Atlas of Science: Visualizing what we know*. Cambridge, MA: MIT Press.

Bostrom, N., & Yudkowsky, E. (2011). The Ethics of Artificial Intelligence: In William Ramsey, Keith Frankish (eds.), *Cambridge Handbook of Artificial Intelligence*. Cambridge (UK): Cambridge University Press.

Bozdag, E. (2013). Bias in Algorithmic Filtering and Personalization. *Ethics of Information Technology, 15*, 209.

Brunton, F., & Nissenbaum, H. (2013). Political and Ethical Perspectives on Data Obfuscation. In Hildebrandt, de Vries (eds.), *Privacy, due process and the computational turn*. London: Routledge.

Chin J., & Wong G. (2016). China's New Tool for Social Control: A Credit Rating for Everything. *Wall Street Journal, Nov. 28, 2016*.

Clement, T., Hagenmaier, W., & Knies, J.L. (2013). Toward a Notion of the Archive of the Future: Impressions of Practice by Librarians, Archivists, and Digital Humanities Scholars. *The Library Quarterly, 83*(2), 112-130.

Cox, R.J (2007). Machines in the archives: Technology, and the coming transformation of archival reference. First Monday, 12, 11.

Crawford, A. (2015). *The Meaning of the Library: A Cultural History*. Princeton (UK): Princeton University Press.

de Hert, P., & Lammerant, H. (2016). Predictive Profiling and its Legal Limits: Effectiveness Gone Forever? In Bart van der Sloot; Dennis Broeders; Erik Schrijvers (eds.), *Exploring the Boundaries of Big Data (WRR-verkenning, Vol. 32)* (pp. 145-173). Den Haag: WRR.

Dennett, D.C. (2013). *Intuition Pumps and Other Tools for Thinking*. New York: W. W. Norton & Company.

Diakopoulos, N. (2016). Accountability in Algorithmic Decision Making. *Communications of the ACM, 59*(2), 56-62.

Danielson, E.S. (1989). The ethics of access. *American Archivist. 52*, 52-62.

Domingos, P. (2015). *The Master Algorithm: How the Quest for the Ultimate Learning Machine Will Remake Our World*. Ingram Publisher Services US.

Eco, U. (1980). *The Name of the Rose*. London: Vintage, Random House Publishing.

Etzioni, A., & Etzioni, O. (2016). Designing AI Systems that Obey Our Laws and Values. Communications of the ACM, 59(9), 29-31.

Ferguson, S., Thornley, C., & Gibb, F. (2016). Beyond codes of ethics: How library and information professionals navigate ethical dilemmas in a complex and dynamic information environment. *International Journal of Information Management, 36*(4), 543-556.

Fernandez, P. (2016). Through the looking glass: envisioning new library technologies. *Library Hi Tech News, 3,* 20-23.

Ferrara, E., Varol, O., Davis, C., Menczer, F., & Flammini, A. (2016). The Rise of Social Bots. *Communications of the ACM, 59*(7), 96-104.

Floridi, L. (2014). *The 4th revolution: How the infosphere is reshaping human reality* (paperback version). Oxford: Oxford University Press.

Ford, M. (2013). Could Artificial Intelligence Create an Unemployment Crisis? *Communications of the ACM, 56*(7), 37-39.

Garoogian, R. (1991). Librarian/patron confidentiality: an ethical challenge. *Library Trends 40*(2), 216-233.

Gomez-Uribe, C.A., & Hunt, N. (2015). The Netflix Recommender System: Algorithms, Business Value, and Innovation. *ACM Transactions Manage. Inf. Syst. 6*(4), Article 13.
Granka, L.A. (2010). The Politics of Search: A Decade Retrospective. *The Information Society 26*(5).
Herring, M.Y. (2014). *Are libraries obsolete? An argument for relevance in the digital age*. North Carolina: McFarland & Company Inc. Publishers.
Jordan, M.I., & Mitchell, T.M. (2015). Machine learning: Trends, perspectives, and prospects. *Science, 349*(6245), 255-260.
Kallberg, M. (2012). Archivists 2.0: Redefining the archivist's profession in the digital age. *Records Management Journal, 22*(2), 98-115.
Kirchhoff, T., Schweibenz, W., & Sieglerschmidt, J. (2009). Archives, libraries, museums and the spell of ubiquitous knowledge. *Archival Science, 8*(4), 251-266.
Kizza, J.M. (2013). *Ethical and Social Issues in the Information Age*. London: Springer.
Kirkpatrick, K. (2015). The moral challenges of driverless cars. *Communications of the ACM 58*(8), 19-20.
Kosinski, M., Stillwell, D., & Graepel, Y. (2013). Private Traits and Attributes are Predictable from Digital Records of Human Behavior. *Proceedings of the National Academy of Sciences, 110*(15), 5802-5805.
Lancaster, F.W. (1982). *Libraries and Librarians in an Age of Electronics*. Arlington, VA: Information Resources Press.
Laudon, K.C. (1995). Ethical concepts and information technology. *Communications of the ACM, 38*(12), 33-39.
Lichocki, P., Billard, A., & Kahn, P.H. (2011). The ethical landscape of robotics: Bringing ethics into the design and use of robots. *IEEE Robotics and Automation Magazine, 18*(1), 39-50.
Licklider, J.C.R. (1965). *Libraries of the Future*. Cambridge, MA: The MIT Press.
Liu, G. (2011). The Application of Intelligent Agents in Libraries: a Survey. *Program, 45*(1), 78-97.
Mayer-Schönberger, Viktor, & Kenneth Cukier (2013). *Big Data: a revolution that will transform how we live, work and think*. Boston / New York: Houghton Mifflin Harcourt.
McCarthy, J. (2007). *What is artificial intelligence?* (unpublished). Stanford University, retrieved from http://www-formal.stanford.edu/jmc/whatisai/
McCartney, R., & Anderson, M. (1996). *The believability of Road Runner cartoons: logical consistency conquers unreality (AAAI Technical Report WS-96-03*). Retrieved from https://www.aaai.org/Papers/Workshops/1996/WS-96-03/WS96-03-002.pdf
Medina, E. (2015). Rethinking algorithmic regulation. *Kybernetes, 44*(6/7), 1005-1019.
Metz, C. (2016a). AI Is Transforming Google Search. The Rest of the Web Is Next. *Wired 02.04.16*.
Metz, C. (2016b). The Rise of A.I. What the AI Behind AlphaGo Can Teach Us About Being Human. *Wired 05.19.16*.
Mitchell, T.M. (2009). Mining Our Reality. *Science, 326*(5960), 1644-1645.
Mittelstadt, B.D., Allo, P., Taddeo, M., Wachter, S., & Floridi, L. (2016). The ethics of algorithms: Mapping the debate. *Big Data & Society*, 3(2).
Moldovan, B., Moreno, P., van Otterlo, M., Santos-Victor, J., & De Raedt, L. (2012). Learning Relational Affordance Models for Robots in Multi-Object Manipulation Tasks. In *2012 IEEE International Conference on Robotics and Automation (ICRA)*, (pp. 4373-4378). https://doi.org/10.1109/ICRA.2012.6225042
Morris, S.L. (2009). An Introduction to Archives for Librarians. *Libraries Research Publications*, Paper 103. Retrieved from http://docs.lib.purdue.edu/lib_research/103
Nilsson, N.J. (2010). *The Quest for Artificial Intelligence*. Cambridge (UK): Cambridge University Press.

Ng, I.C.L., & Wakenshaw, S.Y.L. (2017). The Internet-of-Things: Review and research directions. *International Journal of Research in Marketing, 34*, 3-21.
Noh, Y. (2015). Imagining library 4.0: Creating a model for future libraries. *The journal of academic librarianship, 41*(6), 786-797.
Pariser, E. (2011). *The Filter Bubble: What The Internet Is Hiding From You*. New York: Penguin Press.
Paulus, M.J. Jr. (2011). Reconceptualizing Academic Libraries and Archives in the Digital Age. *Libraries and the Academy, 11*(4), 939-952.
Preisig, A.V., Rösch, H., & Stückelberger, C. (eds.) (2014). *Ethical Dilemmas in the Information Society: How Codes of Ethics Help to Find Ethical Solutions, Papers from the IFLA/FAIFE Satellite Meeting 2014*. Retrieved from https://www.ifla.org/files/assets/faife/publications/misc/ethical-dilemmas-in-the-information-society.pdf
Puschmann, C., & Bozdag, E. (2014). Staking out the unclear ethical terrain of online social experiments. *Internet Policy Review*, 3(4).
Richards, N.M. (2015). *Intellectual Privacy: Rethinking Civil Liberties in the Digital Age*. Oxford: Oxford University Press.
Richards, N.M., & Smart, W.D. (2016). How should the law think about robots? In Calo R., Froomkin A.M. and Kerr I. (eds.), *Robot Law* (pp. 3-22). Cheltenham: Edward Elgar Publishing.
Richardson, K. (2016). Sex Robot Matters: Slavery, the Prostituted, and the Rights of Machines. *IEEE Technology and Society Magazine, 35*(2).
Russell, S.J., & Norvig, P. (2009). *Artificial Intelligence: A Modern Approach* (3rd ed.). Harlow: Pearson Education Ltd.
Schwartz, H.A., Eichstaedt, J.C., Kern, M.L., Dziurzynski, L., Ramones, S.M., Agrawal, M., Shah, A., Kosinski, M., Stillwell, D., Seligman, M.E.P., & Ungar, L.H. (2013). Personality, Gender and Age in The Language of Social Media: The Open-Vocabulary Approach. *PLOS One, 8*(9), 1-15.
Shanahan, M. (2015). *The Technological Singularity*. Cambridge, MA: The MIT Press.
Soares, N. (2015). *The Value Learning Problem - Machine Intelligence Research Institute, Technical report 2015-4*. Retrieved from https://intelligence.org/files/ValueLearningProblem.pdf
Steinert, S. (2014). The Five Robots - A Taxonomy for Roboethics. *International Journal of Social Robots, 6*, 249-260.
Stone, P., Brooks R., Brynjolfson, E., Calo, R., Etzioni, O., Hager, G., Hirschberg, J., Kalyanakrishnan, S., Kamer, E., Kraus, S., Leyton-Brown, K., Parkes, D., Press, W., Saxenian, A., Shah, J., Tambe, M., & Teller, A. (2016). Artificial Intelligence and Life in 2030: One Hundred Year Study on Artificial Intelligence - *Report of the 2015-2016 Study Panel. Stanford, CA: Stanford University*. Retrieved from https://ai100.stanford.edu/sites/default/files/ai100report10032016fnl_singles.pdf
Svensson, M., and Rosengren, C., & Astrom, F. (2016). *Digitalization and Privacy: A systematic literature review*. Lund: Lund University (Media-Tryck).
Tanz, J. (2016). Soon We Won't Program Computers. We'll Train Them Like Dogs. *Wired 05-17-16*.
Tene, O., & Polonetsky, J. (2014). A Theory of Creepy: Technology, Privacy, and Shifting Social Norms. *Yale Journal of Law and Technology, 16*(1).
Thomas, M.A. (2000). Redefining Library Space: Managing the Co-Existence of Books, Computers, and Readers. *Journal of Academic Librarianship, 26*(6), 408-15.
Tutt, A. (2017). An FDA for Algorithms. *69 Admin. L. Rev, 83*.
van Est, R., & Gerritsen, J. (2017). *Human Rights in the Robot Age: Challenges arising from the use of robotics, artificial intelligence, and virtual and augmented reality*. Den Haag: Rathenau Instituut.

van der Sloot, B., Broeders, D., & Schrijvers E. (eds.). (2016). *Exploring the Boundaries of Big Data, Netherlands Scientific Council for Government Policy (WRR)*. Retrieved from https://www.ivir.nl/publicaties/download/1764

van Otterlo, M. (2013). A machine learning perspective on profiling. In Hildebrandt and de Vries (eds.), *Privacy, due process and the computational turn* (pp. 41-64). London: Routledge.

van Otterlo, M. (2014a). Automated Experimentation in Walden 3.0.: The Next step in Profiling, Predicting, Control and Surveillance. *Surveillance and Society, 12*(2).

van Otterlo, M. (2014b). *Broadening the Privacy Concept in the Digital Age: Adjusting rights?* (unpublished, position paper prepared for the Amnesty International Strategic Investigations Symposium on surveillance and Human Rights, november 2014.

van Otterlo, M. (2016a). The libraryness of calculative devices. In Amoore, L. and Piotukh, V. (eds.), *Algorithmic life* (pp. 35-54). London: Routledge.

van Otterlo, M. (2016b). Project BLIIPS: Making the Physical Public Library more Intelligent through Artificial Intelligence. *Qualitative and Quantitative Methods in Libraries (QQML), 5*, 287-300.

van Otterlo, M., & Feldberg, F. (2016). Van kaas naar big data: Data Science Alkmaar, het living lab van Noord-Holland noord. *Bestuurskunde, 1*, 29-34.

Vinge, V. (1993). The Coming Technological Singularity: How to Survive in the Post-Human Era. Retrieved from https://www-rohan.sdsu.edu/faculty/vinge/misc/singularity.html

Wasik, B. (2013). In the Programmable World, All Our Objects Will Act as One. In *Wired (05-14-13)*. Retrieved from https://www.wired.com/2013/05/internet-of-things-2/

Wiering, M.A., & van Otterlo, M. (2012). *Reinforcement Learning: State-of-the-Art*. Springer-Verlag.

Wright, A. (2014). *Cataloging the World: Paul Otlet and the Birth of the Information Age*. Oxford: Oxford University Press.

Youyou, W., Kosinski, M., & Stillwell, D. (2015). Computer-based personality judgments are more accurate than those made by humans. *PNAS 112*(4), 1036-1040.

Zastrow, J. (2013). Digital Changes Everything: The Intersection of Libraries and Archives. *THE OPINION PIECE, 33*(9).

Zuboff, S. (2015). Big Other: Surveillance Capitalism and the Prospects of an Information Civilization. *Journal of Information Technology, 30*, 75-89.

Biographies

Geert-Jan van Bussel has studied medieval history, business administration, business informatics and archival studies. He is a certified archivist. He is assistant professor at HvA University of Applied Sciences Amsterdam. From 2012-2016, he was professor Digital Archiving and Compliance at that university. He is, with *Van Bussel Document Services*, an independent consultant, auditor and researcher. He is visiting lecturer at several universities in the Netherlands and Europe. He was president of the Special Commission for Archives, a commission of the Council of Culture, the most important advisory body on culture for the Dutch government. He is a (keynote) speaker on many seminars and conferences, mostly on the effects and influence of information processing and information management on people's work. He published extensively on digital archiving, accountability, and Enterprise Information Management. In 2001, he has been awarded the prestigious NMA Award, an award of excellence from the Dutch Association for Information Management to acknowledge his merits for the Document-, Workflow- and Record Management market.

Wolfgang Ernst is Full Professor for Media Theories in the Institute for Musicology and Media Studies at Humboldt University in Berlin since 2003. Having been academically trained as a historian (PhD) and classicist (Latin philology and Classical Archaeology) with an ongoing interest in cultural tempor(e)alities, he grew into the emergent technology-oriented "German school" of media studies and His academic focus has been on archival theory and museology, before attending to media materialities. His current research covers media archaeology as method, theory of technical storage, technologies of cultural transmission, micro-temporal media aesthetics and their chronopoetic potentials, and sound analysis ("sonicity") from a media-epistemological point of view.

Books in English: Digital Memory and the Archive (2013); Stirring in the Archives. Order from Disorder Stirring in the Archives (2015); Chronopoetics. The temporal being and operativity of technological media (2016); Sonic Time Machines. Explicit Sound, Sirenic Voices and Implicit Sonicity in Terms of Media Knowledge, Amsterdam (2016)

Luciano Floridi is Professor of Philosophy and Ethics of Information at the University of Oxford, where he is also the Director of the Digital Ethics Lab of the Oxford Internet Institute. Still in Oxford, he is Distinguished Research Fellow of the Uehiro Centre for Practical Ethics of the Faculty of Philosophy, and Research Associate and Fellow in Information Policy of the Department of Computer Science. Outside Oxford, he is Faculty Fellow of the Alan Turing Institute (the national institute for data science) and Chair of its Data Ethics Group; and Adjunct Professor ("Distinguished Scholar in Residence") of the Department of Economics, American University, Washington D.C.

His research concerns primarily Information and Computer Ethics (aka Digital Ethics), the Philosophy of Information, and the Philosophy of Technology. Other research interests include Epistemology, Philosophy of Logic, and the History and Philosophy of Scepticism. He has published over a 150 papers in these areas, in many anthologies and peer-reviewed journals. His works have been translated into many languages, including Arabic, Chinese, Dutch, French, German, Greek, Hungarian, Italian, Japanese, Lithuanian, Persian, Polish, Portuguese, Russian, and Spanish. His lifetime project is a tetralogy (not his term) on the foundation of the philosophy of information, called Principia Philosophiae Informationis.

Fiorella Foscarini is an associate professor in the Faculty of Information at the University of Toronto, Canada. In 2014-16, she taught in the Department of Media Studies at the University of Amsterdam, The Netherlands. She holds a PhD in Archival Science from the School of Library, Archival and Information Studies at the University of British Columbia in Vancouver. Before joining academia, she worked as senior archivist for the European Central Bank in Frankfurt am Main, Germany. Prior to that, she was Head of the Records Office and Intermediate Archives at the Province of Bologna, Italy. In her teaching and research, she uses diplomatics, rhetorical genre studies, and information culture concepts to explore issues related to the creation, management, and use of records in organizational contexts. She is co-editor in chief of the Records Management Journal.

Anne J. Gilliland is Professor and Director of the Archival Studies specialization in the Department of Information Studies, Director of the Center for Information as Evidence, Graduate School of Education & Information Studies, and a faculty affiliate of the Center for Digital Humanities at the University of California Los Angeles (UCLA). She is also the director of the Archival Education and Research Initiative (AERI), a global collaborative effort amongst academic institutions that seeks to promote state-of-the-art in scholarship in archival studies, broadly conceived, as well as to encourage curricular and pedagogical innovation in archival and recordkeeping education locally and worldwide.

She is a Fellow of the Society of American Archivists and recipient of numerous awards in archival and information studies. She is an Honorary Research Fellow of the Centre for Global Research, RMIT University in Melbourne.

Her research and teaching relate broadly to the history, nature, human impact and technologies associated with archives, recordkeeping and memory, particularly in translocal and international contexts. Her recent work has been addressing recordkeeping and archival systems and practices in support of human rights, recovery and daily life in post-conflict and diasporic settings; the role of community memory in promoting reconciliation in the wake of ethnic conflict; bureaucratic violence and the politics and nature of metadata; digital recordkeeping and archival informatics; and research methods and design in archival studies.

Arnoud Glaudemans works at Streekarchief Gooi en Vechtstreek in Hilversum as supervisor of the information management at the six affiliated govermental organisations. He studied philosophy and archival studies in Amsterdam. As a member of the archival advisory committee of the Dutch association of municipalities (VNG) he is actively involved in the development of various practical tools in information management (e.g., appraisal, quality management).

Juan Ilerbaig holds a MISt from the University of Toronto (2011) and a Ph.D. in the History of Science and Technology from the University of Minnesota (2002). For the past few years he has taught courses as a sessional instructor at the University of Toronto, in both the iSchool (Archives and Records Management Concentration) and the Institute for the History and Philosophy of Science and Technology (History of Evolutionary Biology). His research interests focus mostly on three areas: the interactions between record keeping and the practice of science, particularly in the life sciences; the application of a genre perspective in both archival science and the history of science; and the history and philosophy of archival concepts and theories. Current work in progress focuses on the genre systems used by Charles Darwin in his natural history research and on the uses of geological and pictorial metaphors in archival thinking and theory.

Charles Jeurgens is professor of archival studies at the University of Amsterdam (since 2016) and advisor at the Dutch National Archives (since 2009). He published extensively on issues of appraisal and selection, colonial and postcolonial archival cultures. He studied history and archivistics and did a PhD in the history of 19th century infrastructural planning in the Netherlands. He worked as editor of archival sources of the Batavian-French period at the Institute of Netherlands History in The Hague and he was municipal archivist of Schiedam (1994-1999) and Dordrecht (1999-2009). He was professor of archivistics at Leiden University between 2004 and 2016.

Rienk Jonker has been working as archivist since 1981. After ten years at the Centrale Archief Selectie Dienst in Winschoten, an agency of the Ministry of the Interior, he returned to the municipal archive of the city of Groningen, what later became part of the RHC Groninger Archieven, as archival inspector and later municipal archivist with the instruction to advise about and accompany the transition to the digital world from an archivist perspective. Since 2006 he has been working for the municipality of Leeuwarden with almost the same assignment. In 2008 he became the municipal archivist of Leeuwarden.

His main areas of interest are the basics of archival science, information architecture, metadata, information processing, appraising and appraisal of records, terminology, the digitization of the work environment and the management and preservation of digital records. From 1999 until 2011, he has on almost monthly basis provided colleagues with information about developments that touch the horizon of the archivist. From 2004, he maintains his own website on records and information management and archives under the motto there is nothing news under the sun (www.labyrinth.rienkjonker.nl). In 2009, he received the Van Wijnpenning from the Royal Association of Archivists in the Netherlands (KVAN) as a token for his work.

Eric Ketelaar is Professor Emeritus at the University of Amsterdam, where from 1997 to 2009 he was Professor of Archivistics in the Department of Mediastudies. As an honorary fellow of his former department he continues his research which is concerned mainly with the social and cultural contexts of records creation and use. From 1989-1997 he was General State Archivist (National Archivist) of The Netherlands. From 1992-2002 he held the chair (part-time) of archivistics in the Department of History of the University of Leiden. Eric Ketelaar was visiting professor at the University of Michigan (Ann Arbor), Gakushuin University (Tokyo), the University of Toronto and Monash University (Melbourne), where he continues to be involved as a Senior Research Fellow. From the foundation, in 2001, of Archival Science, he was one of the editors-in-chief. Since 2014 he is a member of the Editorial Board.

Giovanni Michetti is Assistant Professor of Archival Science at Sapienza University of Rome. His research area is focused on contemporary and digital archives. His main research interests are records management, description models and digital preservation. He has been involved in national and international projects on digital preservation, including ERPANET (Electronic Resource Preservation and Access Network) and CASPAR (Cultural, Artistic and Scientific knowledge for Preservation, Access and Retrieval), both funded by the European Commission. He is currently leading researches within the InterPARES Trust project. He is heavily involved in standardization processes as the Chair of the Subcommittee “Archives and Records Management” and Vice-Chair of the Committee “Documentation and Information” in UNI, the Italian Standards Organization. He is also the Italian representative in a few ISO Working Groups on archives and records management.

Martijn van Otterlo obtained his PhD (artificial intelligence, A.I.) from the University of Twente (Netherlands, 2008) with a dissertation on expressive knowledge representation in machine learning from evaluative feedback. He published two books on such adaptive learning algorithms (2009 IOS Press; 2012 Springer, together with Dr. Wiering). Martijn has worked on robotics, vision and language and held positions in Freiburg (Germany), Leuven (Belgium) and Nijmegen (The Netherlands). His second research interest, which arose from his expertise in A.I., concerns the ethics and implications of adaptive algorithms on privacy, surveillance and society. He has served as committee member and reviewer for dozens of international journals and conferences on machine learning, data science and artificial intelligence. In his current position at the Vrije Universiteit Amsterdam (The Netherlands) he combines data science and ethics with his third interest: libraries. He currently studies the digitalization of physical, public libraries, and also the ethical consequences of datafication of library processes and services. More information can be found at http://martijnvanotterlo.nl

Frans Smit is Information Governance Officer at the Dutch Municipality of Almere, and Teacher of Archival Science at the University of Amsterdam. Educated as a historian, he has been working in fields like software engineering, archives, libraries and information policy departments as a developer, governance officer, manager and consultant. He publishes regularly in various journals, predominantly about cross-boundaries between information disciplines. He was co-editor of the S@P-Yearbook on archival inspection "Profiteer, profileer, prioriteer" (2013). He is a member of the archival advisory committee of the Dutch Association of Municipalities (VNG) as well as a member of the Records Management Expert Group (RMEG) of the International Council on Archives (ICA). He is a consultant and a trainer for among others the National Archives of Indonesia (ANRI, 2012-2013), the Dutch Archiefschool (2014-) and the Royal Association of Archivists in the Netherlands (KVAN, 2017-).

Jacco Verburgt studied philosophy and theology in Amsterdam, Leuven, Berlin, and Rome. He is a researcher at Tilburg University, the Netherlands. His current research focuses on Aristotle, Aquinas, Kant, and Hegel, but includes applied science topics too. He also is an editorial board member of Critique, which is an online publishing platform (see https://virtualcritique.wordpress.com). He teaches philosophy (especially courses on history of philosophy, philosophical anthropology, general and applied ethics, and philosophy of science) at various institutions of higher education in the Netherlands.

Geoffrey Yeo is an Honorary Senior Research Fellow in the Department of Information Studies at University College London (UCL), United Kingdom. Before joining UCL in 2000, he worked as an archivist for the Corporation of the City of London, for St Bartholomew's Hospital, London, and for the Royal College of Physicians of London. He has also worked as a freelance archivist and records manager, and as a consultant to the International Records Management Trust, participating in records management and educational projects in The Gambia, Ghana, Botswana and Uganda. In 2010 he was Visiting Professor at the School of Library, Archival and Information Studies at the University of British Columbia, Vancouver, Canada.

His research interests include conceptual understandings of records; perceptions of the origins and scope of record-making and record-keeping; records' contextualisation and description; and relations between records and the actions of individuals and organisations. He has published widely on description and on conceptual understandings of records and is a frequent speaker on these and related topics at international academic and professional conferences. His published work won the Society of American Archivists Fellows' Ernst Posner Award in 2009 and the Hugh A. Taylor Prize in 2013.

Atlantis

The ultimate platform for collection management and portal construction

Atlantis is a flexible and reliable system for collection management and portal construction.

If you wish to manage your heritage resources in a professional and responsible way and wish to offer your customers and users an optimal heritage experience, Atlantis is the perfect choice.

DEVENTit
Developers & Inventors in IT
www.deventit.nl

Experience the heritage

OUR EXPERTISE IS TO **DIGITALIZE YOUR COLLECTIONS!**

- Notarial archives
- Old-court archives
- Church archives

From collection to connection!
Karmac would like to help you to process the first step. We offer you the possibility to digitalize your old-court archive, notarial archive, slides, newspapers, population registers, microfiches etc. in a secure and trusted environment. This offers you a lot of benefits like: reducing the use of the originals; widening public accessibility or connection with other collections.

Curious to the benefits? Please contact us and we will make your collections digital. You can reach us by:

+31 (0)320 - 28 69 59
info@karmac.nl
karmac.nl

karmac

Archives in Liquid Times aims to broaden and deepen the thinking about archives in today's digital environment. It is a book that tries to fuel the debate about archives in different fields of research. It shows that in these liquid times, archives need and deserve to be considered from different angles.

Archives in Liquid Times is a publication in which archival science is linked to philosophy (of information) and data science. Not only do the contributors try to open windows to new concepts and perspectives, but also to new uses of existing concepts concerning archives. The articles in this book contain philosophical reflections, speculative essays and presentations of new models and concepts alongside well-known topics in archival theory.

Among the contributors are scholars from different fields of research, like Anne Gilliland, Wolfgang Ernst, Geoffrey Yeo, Martijn van Otterlo, Charles Jeurgens and Geert-Jan van Bussel. This book includes interviews with Luciano Floridi and Eric Ketelaar, in which they reflect on key issues arising from the contributions. The editors are Frans Smit, Arnoud Glaudemans and Rienk Jonker.

ISBN/EAN 978-90-71251-45-0
Jaarboek 17, Stichting Archiefpublicaties