Political studies of automated governing: A bird’s eye (re)view

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Abstract
In this paper, we develop an approach for analyzing the increasingly important strand of research that deals with automated systems of governing. Such systems, which figure prominently in public policy and regulation, are designed to utilize the rapid advancement in computer technology, like artificial intelligence, with the purpose of governing something or someone. Drawing on a large sample of articles we present a comprehensive analysis of scholarly works where these systems are studied as political, rather than neutral, instruments of governing. We find that the current state of the art articulates the politics of automated systems of governing in three ways. Namely, as part of ontological, epistemological and ideological questions. We conclude that future research should investigate the complex forms of marketization nested in these systems, that it should move from theoretical examples to detailed empirical studies and that political science should get more involved with the issue.

Keywords: algorithms, artificial intelligence, big data, governing, political science.

1. Introduction
Over the past decade or two, the European Union (EU) and European countries have been working hard to reap the benefits of what is sometimes called the new digital economy. Indeed, the European Commission (EC) operates a strategy called “Shaping Europe’s digital future” under which it gathers policies for “the digital society,” “advanced digital technologies,” “international cooperation” and the aforementioned “digital economy” (EC, 2020). As shown by recent research (Ulnicane & Erkkilä, 2023), similar initiatives have also been introduced around the world by governments that strive to tap into the avalanche of data generated by the contemporary interactions between humans and various information technologies. This so-called “big data” has been identified as the new oil of our time (Mayer-Schönberger & Cukier, 2014) and as a powerful imaginary that enables new forms of control and governing (Sætnan et al., 2020). In combination with algorithms that can be deployed in such ways that they enable new forms of profiling, insights, and conclusions about populations, as well as categories of people and particular behavior, data emerged as the foundation for what is now often referred to as the “tech-giants.” Corporations such as Apple, Amazon, Alphabet (Google), Microsoft, Cisco, Alibaba, and Tencent are now the backbone, not only of commercial products and services, but also of a digital infrastructure through which humans live their lives (Amoore & Piotukh, 2015; Zuboff, 2019).

In research, this new era has been discussed in terms of a new platform economy (Srnicek, 2016), a fourth industrial revolution (Avis, 2018), a surveillance capitalism (Zuboff, 2019) and it has been actualized in relation to issues such as security (Aradau & Blanke, 2017), justice (Jasanoff, 2017), and urban development (Kitchin, 2014) to name but a few broad categories.

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Thus, it should come as no surprise that a range of actors and powers are trying to find ways where they can utilize big data, algorithms, and more recently, AI and Machine Learning (ML) with the purpose of governing something or someone. Drawing on the Foucauldian notion of governmentality (Walters, 2012) such governing can be defined as attempts to control, direct, steer or guide a particular object or domain. Importantly, this “conduct of conduct” (Dean, 2010), is therefore not an exclusive matter for what we traditionally identify as political or administrative bodies. Rather, governing, understood in this way, as a matrix of rationalities, procedures, techniques, and operations with respect to an object or domain, is certainly also enacted by private interests, and indeed, it finds one of its most important vessels in “the self” (Foucault, 2008).

In other words, throughout the EU and beyond, a vast array of governmental technologies based on algorithms, AI and ML have been put in motion and made to operate on the massive data traces left behind by humans and machines. In this paper, we refer to these governmental technologies collectively as Automated Systems of Governing (ASG), and we argue that they are political instruments in the sense that they cannot be made to act from neutral positions (Gillespie, 2014).

Our notion of ASG can be understood as part of an ongoing scholarly discussion on how to properly conceptualize this technological development in the context of politics and governance. For example, one strand of research has started to theorize what is referred to as automated decision-making (ADM) or robotic process automation (RPA) when algorithms are implemented in public administration and formal politics with the purpose to aid or carry out decisions (Araujo et al., 2020; Wirtz et al., 2019). For us, while the terms are sometimes used more broadly, ADM and RPA signal an unnecessary narrow focus. Rather, with ASG we mean to denote more than decision-making in that we wish to capture precisely that these systems govern objects and subjects in a wider sense. Our conception of ASG, therefore, is more in line with Yeung’s (2018) notion of “algorithmic regulation” or perhaps designations such as “algorithmic governance” where governing is understood as “norms, structures, institutions and practices of social ordering, both formal and informal” (Ulbrich & Yeung, 2022, p. 7).

That said, our Foucauldian understanding of governing also deviates from Yeung (2018) and scholars working with the notion of governance in important ways. For instance, Yeung (2018, p. 507) defines algorithmic regulation as “regulatory systems that utilize algorithmic decisionmaking” where regulation is understood as “intentional attempts to manage risk or alter behavior in order to achieve some pre-specified goal.” For us, the governing enacted by ASG does not need to be intentional in this sense. Rather, like Bellanova and de Goede (2022), we understand such systems to be generative in terms of their governing effects. That is, they are capable of producing emergent forms of governing through their actions upon data, and the kind of ordering they facilitate is articulated already at the level of computational logic in ways that are contingent with respect to “intentions” (Eyert et al., 2022). Moreover, the governmentality perspective that underpins our notion of ASG also holds that while governing may certainly be thought of as purposeful, the subjects that articulate certain goals and ambitions can never hold intentions that sits outside of the discourses that shape them.

In short, we recognize that contemporary research on algorithms, AI and ML in the context of politics and governing draws on different conceptions of what these new information technologies “are” in such circumstances. However, from our point of view, automated decision making, RPA, algorithmic regulation, algorithmic governance and our own automated systems of governing share a family resemblance with enough overlap to spur fruitful discussion as the multi-disciplinary field of research is taking form.

With this in mind, the purpose of this article is to investigate the increasingly important strand of research that deals with the political dimensions of ASG. More precisely, we seek to (a) describe and categorize the field of research in terms of themes, topics, journals, keywords and approach as well as (b) show how the politics of ASG is articulated and analyzed in different ways across the field. We do so by suggesting a form of analysis that draws on bibliographical techniques (Andres, 2009) in combination with more common elements of “systematic” (Petticrew & Roberts, 2006) and “narrative” (Hart, 2018) reviews of research. We label this approach a bird’s eye (re)view and apply it to an original sample of 1667 articles dealing with the politics of ASG. In short, we argue that the rapid advancement in the deployment of automated systems of governing, as well as public policies designed to control and utilize them, warrant careful and critical attention from social scientists. However, at present, we are not aware of any broad takes on how this research stands today in terms of how it approaches ASG as political, or how its trajectories for the coming years can be understood.
After this introduction, the article is structured in the following way. First, we broadly introduce the analytical approach we construct here, before we specify how it translates into a concrete study in terms of methods and procedures. Second, we present the first part of our findings in an overview that illustrates some general patterns and trends in the research on the politics of ASG, this includes our reconstruction of seven major themes in the corpus. Third, we show how the political is articulated in three different ways with respect to ASG, namely in relation to questions of ontology, epistemology, and ideology. The article ends with a concluding discussion where we briefly discuss avenues for future research.

2. Approach: A bird’s eye (re)view

There are multiple ways of structuring a literature review with significant differences in terms of how researchers design such a task (Hart, 2018; Jesson et al., 2011). Thus, reviews range from the so called “systematic” reviews to “traditional” or “narrative” ones. The former one usually involves the application of specific search strings in databases before applying a defined logic to assess the state of the art in a particular field or around a certain question (Petticrew & Roberts, 2006). Narrative or traditional reviews on the other hand involve processes of reading and synthesizing previous studies in a field based on more qualitative criteria. As such they can be expert reviews, conducted by a leading scholar in the field with hands on experience of its state of the art, but they can also be more scoping and explorative in their approach (Hart, 2018). Related to all review approaches is also the growing field of bibliometrics (Pritchard, 1969), or the application of various techniques and strategies for measuring and getting a sense of large volumes of published material (Andres, 2009).

In this article, we draw on all of these general approaches to formulate what we call a bird’s eye (re)view. Departing from specific and limited searches in the Scopus database, we analyze a large number of published papers on automated systems of governing. To make sense of this volume, and to be able to present it in the compact format of an article, we employ some bibliometric measures and categories. At the same time, we also read and interpret sources in order to gain more qualitative insights regarding important themes, topics, and perspectives in this field of research. Thus, we argue that the benefits of this approach can be found in its ability to combine an analysis of broader patterns in a large number of published sources with the detailed insights it still retains from qualitative interpretations.

2.1. Selection of articles

As explained above, for the purpose of our bird’s eye (re)view, we set out to chart and understand the kind of scholarly work that studies automated systems of governing as political phenomena. For us, this meant that they had to articulate the concept of politics in order to study how ASG was made part of social practices. By this we mean that the research we are interested in here aims to study ASG with an emphasis on their political aspects. Specifically, it has to enlist politics as a category of analysis or as part of theoretical discussion in ways that do analytical work with respect to the functions of ASG. Thus, we are not concerned with, for example, the extensive body of work that draws on AI, Big Data and algorithms as tools for investigating political phenomena. Additionally, recall that governing, from our point of view, is not restricted to the formal apparatus of the state or similar institutions. Conversely, we do not consider a study to automatically articulate the concept of politics just because it deals with a formal political body in parts of its analysis. In sum, we operationalized this by performing searches in Scopus using the following search string:

\[
\text{TITLE-ABS-KEY (politic* AND (algorithm* OR “big data” OR “artificial intelligence” OR ai)) AND (LIMIT-TO (DOCTYPE, “ar”) OR LIMIT-TO (DOCTYPE, “ch”) OR LIMIT-TO (DOCTYPE, “bk”)) AND (LIMIT-TO (SUBJAREA, “SOCI”))}
\]

Essentially this means that our initial search captured scholarly journal articles, book chapters and books where politics or the political was mentioned in keywords, abstracts and titles together with at least one of the terms algorithm, big data or AI. It also restricted the search to social sciences and we only retained English language texts. In the end, this search arrived at 1667 hits with the first text published already in 1941, however,
publications from before 2011 are very few and scattered. We performed the search in early January of 2021 which in itself restricted the results to include publications from 2020, but not 2021.

While this search was indeed designed to capture all studies that have been indexed in Scopus where researchers analyze the politics of ASG, we recognize the need to invoke a few caveats with respect to this ambition. First, presenting preliminary results at conferences and seminars made us realize that in some disciplines and areas existing terms, such as ADM, RPA, “data justice” and “data-driven governance” were already established to the extent that researchers may use them instead of the ones we used to capture ASG (“algorithm,” “big data,” and “artificial intelligence/ai”). Therefore, later on, we also performed a number of complimentary searches in order to check if our corpus was systematically missing important works. However, none of these additional search terms changed the corpus to any meaningful degree. Adding “ADM” or “automated decision-making” resulted in seven additional hits compared to the original search. RPA or “robotic process automation” yielded 10 more hits, “data justice” nine more and “data-driven governance” added three articles.

Nevertheless, we acknowledge that our corpus does not capture all texts written on the politics of ASG, and in particular, three specific aspects are worth mentioning. First, we decided to exclude books and most book chapters. While we hoped to gain access to electronic versions of books and book chapters that were part of our search results it proved to be a hard and time-consuming process. In other words, the corpus we work with here is mostly comprised of peer-reviewed journal articles. For our purpose this works well, however, there are probably aspects of this field that may be more prominently developed in books than in the articles we use as basis for our analysis. Second, we are aware of the fact that scholarly work in the field of law is often best captured in specific databases. Our reliance on Scopus and the category “social science” may miss important work in this field. Third, for reasons of focus and scope, computer science is not accounted for here.

Notwithstanding the foregoing, our corpus of 1667 texts served as a starting point for a second selection procedure. A quick glance of our sample was enough to notice that the vast majority of the texts did not articulate the concept of politics at all. Rather, they were predominantly methodological applications where scholars tried to utilize algorithms, AI or big data to analyze various social phenomena. In particular, this seemed to be a focus of political scientists who, for instance, tried to understand new forms of political communication in social media. Therefore, we decided to read all 1667 abstracts and select only the ones that seemed to perform the kind of political analysis we were interested in. In the end, this led us to exclude 84 percent of all texts, leaving us with a sample of 267 articles that articulated the concept of politics in relation to ASG, treating them as political phenomena. In Table 1 below, we illustrate a segment of our selection process using the highest cited works among the 1667 originally included articles as an example. While we expected the methodological and technical approach to ASG to be common, the fact that only about 16 percent in our selection of social scientific research on ASG and politics actually studies algorithms, AI or big data as political phenomena can be considered an important insight into the field in its own right.

2.2. Methods and analytical procedures

After having arrived at the 267 texts we extracted all articles as pdfs from the Scopus database and imported them into a reference software (Zotero). Next, while retaining this reference database in Zotero, we exported it as a .ris file in order to import all of the texts into a qualitative data analysis software (Nvivo). We then made Nvivo our central hub for analysis, where we kept notes, research journals and performed our qualitative analysis of the 267 articles in our sample.

Using the abstracts of the articles as our starting point, the three of us began with a selection of 30 texts that we all read with the intention to interpret and code their analytical focus. We first decided on a few categories that we wanted to use for all texts such as “approach” which was a way for us to classify texts as empirical, theoretical or discussion pieces. Similarly, we also prepared categories for “methods” used in empirical analysis, the “disciplines” of the authors as well as a few other ones. Finally, since we built our database in Zotero first before importing it into Nvivo, we were able to utilize metadata related to the articles and journals in which they were published, such as year of publication and the name of the journal.

As our main task, however, we coded each text with what we decided to call “topics.” These were labels that we felt communicated what the article was focusing on and they could be anything from empirical settings such
TABLE 1 Selection of articles that articulate politics in relation to ASG

<table>
<thead>
<tr>
<th>Title</th>
<th>Author</th>
<th>Source</th>
<th>Year</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unsupervised named-entity extraction from the Web: An experimental study</td>
<td>Etzioni, O., et al.</td>
<td>Artificial Intelligence, 165(1), pp. 91–134</td>
<td>2005</td>
<td>Not included</td>
</tr>
<tr>
<td>#Gamergate and The Fappening: How Reddit’s algorithm, governance, and culture support toxic technocultures</td>
<td>Massanari, A.</td>
<td>New Media and Society, 19(3), pp. 329–346</td>
<td>2017</td>
<td>Included</td>
</tr>
</tbody>
</table>

Note: The example is based on the top 10 highest cited articles out of the 1667 that constituted the initial results from our search.

as “Facebook” or “farming,” to theoretical conceptualizations like “power” or “citizenship,” as well as analytical perspectives such as “Feminism” or “Post-colonialism.” In general, each text was coded with a number of different topics, along with classifications for the codes that we had decided to use beforehand (like “approach” as described above).

After coding the first 30 texts we compared topics, discussed analytical challenges and strategies and decided on a protocol for the rest of the analytical phase. This means that we divided the texts among us and held regular meetings where we continued our discussions concerning interpretations, topics, and classifications. This allowed us to adjust and triangulate interpretations and codes while making sure that we approach our texts and topics in a similar manner. During this process it became clear that 13 of the texts that were initially included in our sample had to be excluded. The most common reason for exclusion was simply that they turned out to be the front matter and index of an electronic book that we were unable to locate as a complete text. Thus, after this qualitative coding process we arrived at our final sample of 254 articles.

In the next step, we used the topics as a basis for reconstructing more general themes. We worked through an iterative process where all three of us presented suggestions that we discussed, changed, and combined over several meetings until we arrived at seven overarching themes that we felt reflected the content and focus of the texts in our sample. In three of our seven themes we also retained sub-themes reflective of the analytical process.

The final step in the analysis and presentation of our bird’s eye (re)view consisted of selecting a number of articles from each of the themes for more detailed readings. Using information from our Scopus searches we selected between seven and 10 articles from each theme that were highly cited as examples of influential scholarly work reflecting the particular theme. To be sure, number of citations is not an unproblematic measure of...
influence, however, it is often used. In this case, we argue that highly cited works probably represent the most salient discussions and debates within the themes we reconstructed. That being said, we also complemented this selection since the field is new and most of the publications are from the past 3 years. Therefore, we decided to include examples of more recent works, even though they were not as highly cited yet. The more detailed readings of these articles, in combination with the thematic analysis of all texts, then formed the basis for our qualitative analysis of how this body of research articulate and analyze the politics of ASG. As we elaborate further below, we argue that there are three distinct modes of articulating politics in relation to ASG across the themes we have analyzed. In order to better present these results, we made a final selection of one paradigmatic article for each mode of articulating politics. Thus, as paradigmatic cases, we selected three texts that “highlight more general characteristics” (Flyvbjerg, 2006, p. 232) of what we mean by that particular mode of articulating the politics of ASG. This selection was a qualitative assessment based on our readings with the purpose of finding articles that could serve as “exemplars” (Flyvbjerg, 2006) for each mode.

3. Research on automated systems of governing: An overview

When presenting our analysis, we focus on some major patterns such as publications over time and other features that are possible to show by applying basic bibliographic analysis to our sample of 254 articles. However, we are also able to combine our qualitative interpretations that resulted in topics and themes with such bibliographic approaches. Therefore, in this overview we draw on both to offer overarching insights into the scholarly work regarding the politics of ASG.

3.1. Publications over time

Starting with publications over time, we have already mentioned that this field is relatively new among social scientists. Indeed, publications before 2011 are so scattered that it makes sense to focus primarily on the past decade (2011–2020). If social scientists were off to a bit of a slow start with respect to the politics of ASG, right now, they are increasingly recognizing it. Indeed, as illustrated in Figure 1 below, the field of automated systems of governing among social scientists is exponentially increasing. In fact, the number of published papers in the past 3 years (2018, 2019, and 2020) are more than all of the other years combined.

![Figure 1](image-url)

**FIGURE 1** Number of publications per year for the “total sample” and the “articulate politics sample.”

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If we compare the initial sample of 1667 articles that includes all hits for our search string with the final sample of 254 articles where scholars articulate the concept politics in relation to ASG, we find that they follow a similar trajectory. In other words, while the number of articles that investigate ASG as political phenomena is exponentially increasing, so are the total number of social scientific papers on the topic.

Taken together, the point to be made here is rather simple. Social scientific studies of ASG are rapidly increasing which, given the points made in the introduction of this paper, seem both reasonable and welcome. On the other hand, only a fraction of these treat ASG as political phenomena and objects of study rather than as a methodological tool.

3.2. Journals
Given that the number of articles that articulate the concept of politics in relation to ASG is only about a sixth of the total number of articles in the search, it makes sense to investigate their marginal position further. For instance, we wanted to gauge where articles from the “articulate politics sample” have been published and by whom. Are such works marginal also in the sense that they do not get published in the high-ranking journals of various social scientific disciplinary fields? Is this similar across disciplines?

Drawing on the metadata associated with each article in our sample from the Zotero software and our coding in Nvivo we could easily count the most common journals for the 254 texts. After producing a ranking list, we cross-checked each of the top 15 journals in our sample with the Clarivate Journal Citations Report (JCR) from 2020. The JCR is widely discussed and sometimes criticized for being a much too simplistic way to assess journal quality. That being said, it is also the most widely used ranking and classification of journals and its impact factor scores as a measure of journal influence are routinely used among scholars. For our purpose it is also important that the JCR classifies all journals that qualify for inclusion in different disciplinary categories. The ranking for journals is then made within these categories as base since publication patterns vary widely between disciplines. A caveat here is that the ranking of journals in the JCR is updated every year with a new report. Thus, we chose 2020 as the most recent one, while realizing that the precise ranking position for when each article was published varies from year to year. However, we argue that the 2020 rankings work well for the point we are trying to make.

As can be seen in Table 2 below, the most common journal for the articles in our sample is Big Data & Society. It is classified as “interdisciplinary social science” in the JCR and in terms of ranking it sits very high at number 2 out of 108 journals ranked in this category. Far from being a marginal journal then, it represents the very top tier among interdisciplinary social scientific journals in terms of impact factor.

Furthermore, the rest of the data in Table 2 tells a similar story. In general, the most common journals where publications that articulate politics in relation to ASG can be found are very highly ranked. This may be interpreted as an indication of how this kind of research is received and accepted by the scholarly communities of the social sciences. If so, Table 2 shows that many of the highest ranked journals welcome and recognize high quality research on the politics of automated systems of governing as important contributions to their respective field.

However, there is also a clear dominance of communication studies and sociology among the most common journals in the sample. What is more, there are no journals classified as political science or public administration among the top 15 for our sample of articles that articulate the concept of politics with respect to ASG. Put crudely, Table 2 indicates that studying the political dimensions of automated systems of governing is important to communications scholars and sociologists, but not political scientists. Furthermore, when analyzing the articles qualitatively, we categorized disciplinary background of the authors. While this was a hard task since we were restricted to use department names, quite a few of them seemed to belong in some form of “politics department.” In other words, to the extent that scholars of politics and public administration publish on the politics of ASG they seem to choose communication and sociology journals.

3.3. Keyword analysis
As part of our analysis of articles we coded keywords and then proceeded to use that coding as the basis for a simple count. Since keywords are the “tags” or “labels” that authors use to signal the main content and relevance in a given text we argue that they can be used as a complement to our own qualitative interpretation of topics and themes. In essence, for us, an analysis of keywords in this particular circumstance offers insights into the
context for different studies of ASG as political phenomena. Thus, at an aggregated level, we may use them to illustrate the most common ones as well as show changes over time.

As shown in Table 3 below, we have divided our material into two main time periods. The first one contains all texts published before 2016 and the second one gathers all texts between 2016 and 2020. Finally, in Table 3, we also added these periods together to show the total ranking for the entire sample at once. As can be seen, only 227 texts are used here for the simple reason that not all of the 254 articles in our sample contained keywords.

Given our search string for the selection of articles from Scopus, it is no surprise to find keywords such as “big data,” “algorithm” and “politics” at the top of the table. That being said, note how “big data” was a keyword for 35 percent of all articles before 2016 and how after that it is down to 24 percent in the next time period. At the same time “algorithm” increases slightly in terms of percentage in the second period, while AI rises from not even being among the top 20 most frequent keywords in the first time period, to be the fourth most common in the second. Broadly speaking, it seems as if social scientists have shifted their attention over time more toward the operations and systems that are made to act upon the data rather than the data in itself.

Beyond these expected keywords, the list resonates well with our own thematic analysis and we note how terms such as “social media,” “public,” “technology,” and “governance” are all representative of the themes we reconstructed from the topics. Before we turn to a presentation of these themes, we may note a few more things. First, “ethics” and “automation” seem to be on the rise while keywords such as “analytics,” “security,” and “social” have gone from being part of almost one in four articles in the early period to not being part of the top list at all in the later period. We also find it interesting that “democracy” is not part of the list at all given that the focus is on the politics of ASG. Elsewhere, we have made the point that in research and policy of ASG, political and democratic issues are often rendered as “ethics” (Carlsson & Rönnblom, 2022).

### 3.4. Themes, sub-themes, and topics

Table 4 summarizes the result of our qualitative coding process. Recall that we first coded each text with a number of topics that we felt reflected their focus and emphasis. These were essentially labels or markers that signified...
what the texts were all about. From these topics we then reconstructed seven overarching themes that for us describes the contexts in which the politics of ASG is being studied by scholars.

With this thematization in place it is possible to convey the general distribution of articles in our sample over the seven themes. Hence, we simply tallied the number of times any article was coded under any given theme. Since each article, in principle, could have been coded to all seven themes, the total number for each category adds up to more than the 254 texts in our sample. While the quantitative difference is quite marked between the most common theme, “The digital and technological development,” and the least common one, “Health, education and culture,” we still argue that all themes are qualitatively salient ones. By this we mean that they all structure and give meaning to the corpus of texts and contextualize the different studies on ASG as political phenomena.

Along with topics, we also coded each article under a set of predefined codes. These were features that we argued could be potentially important for understanding the general corpus of documents, such as “approach.” As can be read from Table 5, empirical contributions constitute slightly more than a third of the total tally for all categories, however, within two of the numerically smaller themes they make up about half. Given the rapid advancement and the increasing realization of ASG in society we would expect this share to rise over the years to come. In short, it seems reasonable for scholars to move from theoretical and conceptual discussions to more tangible, hands-on empirical analysis.

### 4. Politics, the political, and ideology in automated systems of governing

In general, we argue that research on the politics of ASG can be understood to articulate the notion of politics in three distinct ways, or modes. First, a major and even dominant mode, can be described as ontological politics or questions of the political (Mouffe, 2005). Second, we argue that there is a way of articulating politics that draws
out questions of epistemology and that calls for ways of knowing the effects of ASG on political practices. Third, we identify a mode of articulating politics in relation to ASG that explicitly connects such systems to capitalism and questions of ideology. Naturally, this is an ideal type representation, and in practice, texts can often articulate more than one mode of the political dimensions of ASG.

In the following presentation we focus on a general description of these three modes of articulating politics in relation to ASG across the research field. We do so by first grounding the descriptions in the articles we read in more detail. We then provide, for each of the three modes, an account of a paradigmatic article which we argue highlights general characteristics for that particular mode in terms of how politics is articulated.

<table>
<thead>
<tr>
<th>Theme</th>
<th>Sub-theme</th>
<th>Topic examples</th>
<th>Articles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analytical categories, concepts, and theories</td>
<td>1a. Methods</td>
<td>Epistemology, ontology, methodology, ethics, aesthetics, affect, self, citizenship, feminism, the political, race, and racism</td>
<td>95</td>
</tr>
<tr>
<td></td>
<td>1b. Philosophical concepts</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1c. Social concepts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capitalism, labor, and industry</td>
<td>2a. Economy and finance</td>
<td>Bitcoin, High Frequency Trading (HFT), Financial markets, Political economy, gig-economy, capitalism</td>
<td>42</td>
</tr>
<tr>
<td></td>
<td>2b. System of production</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Governance, political organization, and democracy</td>
<td>Not applicable</td>
<td>Democracy, policy, governance, public administration, smart cities, urban and regional development, marketization, legal frameworks, IR, decision-making</td>
<td>87</td>
</tr>
<tr>
<td>Health, education, and culture</td>
<td>Not applicable</td>
<td>Children, education, food, health, farming, science fiction, medicine, psychology</td>
<td>26</td>
</tr>
<tr>
<td>Internet and online activities</td>
<td>Not applicable</td>
<td>Platforms, google, Fake news, digital media, social media, News selection, filter bubble, deepfake</td>
<td>55</td>
</tr>
<tr>
<td>Security and surveillance</td>
<td>Not applicable</td>
<td>Crime and police, hacking, security, terrorism, autonomous weapons, war, social control, surveillance, harassment</td>
<td>44</td>
</tr>
<tr>
<td>The digital and technological development</td>
<td>6a. Technology as a social phenomenon</td>
<td>Big data, calculation, data mining, prediction, algorithms, AI, robots, automation, bots, digital archives, dataveillance</td>
<td>179</td>
</tr>
<tr>
<td></td>
<td>6b. Technological tools</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**TOTAL** 528

*Note: Each article can be coded to more than one theme, thus the total number of tallies is larger than the total number of articles (n = 254).*

<table>
<thead>
<tr>
<th>Theme</th>
<th>Approach</th>
<th>Discussion</th>
<th>Empirical</th>
<th>Theoretical</th>
<th>Total</th>
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<tbody>
<tr>
<td>Analytical categories, concepts, and theories</td>
<td></td>
<td>29 (0.31)</td>
<td>27 (0.28)</td>
<td>39 (0.41)</td>
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</tr>
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<td>9 (0.21)</td>
<td>18 (0.43)</td>
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<tr>
<td>Governance, political organization, and democracy</td>
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<td>34 (0.40)</td>
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<td>86 (1.00)</td>
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<td>10 (0.38)</td>
<td>5 (0.19)</td>
<td>26 (0.99)</td>
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<td>Internet and online activities</td>
<td></td>
<td>17 (0.31)</td>
<td>23 (0.42)</td>
<td>15 (0.27)</td>
<td>55 (1.00)</td>
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<td>The digital and technological development</td>
<td></td>
<td>57 (0.32)</td>
<td>59 (0.33)</td>
<td>63 (0.35)</td>
<td>179 (1.00)</td>
</tr>
</tbody>
</table>

**Total** 166 (0.31) 192 (0.36) 169 (0.32) 527 (0.99)

*Note: Figures represent the total number of articles coded to combinations of theme and approach. Each article can be coded to more than one theme, thus the total number of tallies is larger than the total number of articles (n = 254).*
4.1. The political and the ontology of ASG

One of the most common ways that questions of politics are articulated in research on ASG is with respect to the nature of their existence. This means that researchers often ask fundamental questions and strive to position ASG within a conceptual grammar that enable further investigations. Thus, scholars can be said to ask what ASG “really are” and why they are important to study in the first place (Amoore, 2009). To this end, they mobilize and develop analytical categories and theories that can help us “deal with the ambiguity of algorithms as analytical objects” (Ziewitz, 2016, p. 11).

Often, the political is articulated in this regard as scholars start to zoom in on the technology, identifying and framing it by discussing the interrelationship between technology and society from a socio-technical perspective. This is illustrated by Kitchin (2017, p. 14) who argues that algorithms “are best understood as being contingent, ontogenetic and performative in nature, and embedded in wider socio-technical assemblages.” In terms of politics then, scholars often operate with post-structural notions of “the political” as a constitutive category for all social phenomena, including ASG. As an example, Crawford’s (2015) exploration of 10 different “scenes” that showcases the political nature of algorithms is typical in this regard. Indeed, she enlists the post-structural notion of the political in order to draw attention to the “complex readings of the political spaces in which algorithms function, are produced, and modified” (Crawford, 2015, p. 79) rather than to simply focus on the outcomes of their operations.

Coupled with this particular way of articulating politics in relation to ASG is usually also a position where ASG cannot be considered neutral. In this sense, a number of authors aim to demystify the often very oblique rendering of AI, big data and algorithms that have come to be common place in every day discourse as well as academic work. Briefly put, here “[d]ata do not exist independently” (Kitchin, 2014, p. 8) of its political context or as Couldry and Mejias (2019, p. 346) argue, this standpoint “rejects the idea that the continuous collection of data from human beings is natural, let alone rational” rather it is “a commercially motivated form of extraction that advances particular economic and/or governance interests.”

With respect to our seven themes this form of activating the political is particularly pronounced within the theme of analytical categories, concepts, and theories as well as the theme of digital and technological development. In terms of approach, this way of understanding politics is generally connected to theoretical work or discussions that exemplify political features of ASG with the help of empirical illustrations. Introna (2016), for instance, draws on feminist concepts, governmentality and STS-reasoning as he investigates the algorithmic system Turnitin that is designed to uncover plagiarism among student essays and academic research papers. Here, the empirical examples are primarily used to show the importance of ASG as a phenomena worthy of social scientific inquiry rather than empirical generalization or thick descriptions of a case.

4.1.1. Paradigmatic example 1—Life beyond big data: governing with little analytics

Drawing on Henri Bergson’s notions of perception, time and duration, the analysis put forward by Amoore and Piotukh (2015) illustrates how big data does not make sense without what they call little analytics. Their notion of little analytics refers to the particularities of various algorithms and numeric operations needed for “cutting out pieces from across a vast array of data sources and types, before stitching them together in a composite with other data elements” (Amoore & Piotukh, 2015, p. 342). However, such cutting and stitching is not just a matter of presenting that which before was hard to see, rather the little analytics represents new ways of perceiving the world. In short, following Bergson, the new algorithms set to work on big data can be understood as instruments of perception that “carve out images; reduce heterogeneous objects to homogenous space; and stitch together qualitatively different things such that attributes can be rendered quantifiable” (Amoore & Piotukh, 2015, p. 344).

The paradigmatic aspects of this text, we argue, lies in how the political dimensions of big data, or more precisely, little analytics become visible through careful analysis of what ASG “are” and how they relate to being in the world. For Amoore and Piotukh (2015, p. 360) this means that as new technologies are pushing the boundaries for what data is, how it is stored, partitioned, parsed and made visible it gives rise to new forms of analytics that “work not only merely with statistical notion of what is interesting, but also with an inductive process of knowledge discovery, in which the process generates the rules.” In short, the new instruments of perception changes what kind of stories we tell, changes how “the population” is conceptualized and how “the subject” emerges as distinct from this population. This means that ASG also have profound impacts on the political. For
one thing, the political horizon of little analytics, Amoore and Piotukh (2015, p. 361) argues, is based in an “infallible world where even the most turbulent of situations can be rendered tractable.” Therefore, “the invention of analytics engines has transformed the nature of analysis and, with it, the nature of what and how life can be rendered governable” (Amoore & Piotukh, 2015, p. 360).

4.2. Epistemology, politics, and ASG
The second major way of articulating politics in relation to ASG in the articles we have studied commonly revolves around the impact of these new technologies upon social practices. Therefore, these studies often aim to articulate forms of knowing with respect to how ASG are mobilized in everything from welfare and judicial systems, to surveillance and their everyday influence on the way people go about their lives (e.g., Gorwa et al., 2020). In other words, we argue that they are engaged with questions of epistemology, ways of knowing ASG and how to generate knowledge of their political effects, often conceptualized in terms of discrimination and power relations.

In particular, issues of control of data and the uneven distribution of knowledge and technological influence are addressed. This is illustrated by Kemper and Kolkman (2019, p. 2090) as they investigate accountability and transparency with respect to algorithms and argue that “[t]here is a significant lack of people who know how to effectively formulate algorithms” and by Williamson (2018, p. 22) in his studies of new data infrastructures in higher education when he argues that [c]ontrol over data infrastructure, then, is a mode of data politics since it confers great powers for infrastructure owners’. Likewise, from a public policy perspective, scholars urge us to critically discuss the effects of digital technology “on real systems of service delivery or infrastructure management” (Rabari & Storper, 2015, p. 21).

With respect to the seven themes, this way of working with ASG as political phenomena is particularly pronounced within the themes of health, education and culture and governance, political organization and democracy. In fact, even though COVID-19 was still a very new disease as we started sampling articles, we could notice a surge of publications already during 2020 where the effects of surveillance and ASG with respect to public health and pandemics were the primary questions (c.f. Couch et al., 2020). Moreover, on the topic of health care, another example is that of Stevens et al. (2018) and their study of how big data is represented and understood to make epistemological claims in the medical community.

For Williamson (2018, 2019) and a number of other scholars, the main context is education, particularly higher education. Thus, research highlights how ASG are becoming more common and influential around the globe both for practicing higher learning and for envisioning its future. In this regard, ASG can be understood as extensions of already existing infrastructures constituted by “complex relations between technical systems, social actors, policies, politics and values” (Williamson, 2019, p. 4). Indeed, in the works analyzed for this review, scholars seem to be in agreement that ASG within the educational sector are particularly entangled with private interests and that as such, they are important vehicles for the realization of neoliberal modes of governing, even in China (Knox, 2020).

4.2.1. Paradigmatic example 2—Governing software: networks, databases, and algorithmic power in the digital governance of public education
Ben Williamson’s article from 2015 represents a salient kind of study in our corpus, namely one where the role and function of ASG is examined, mapped out and described by focusing on a wider institutional setting of these systems. For Williamson (2015, p. 84), the empirical context is public education in England and what he calls digital governance “whereby public services are becoming the target for a host of governmental interventions and reforms augmented by software.” For this reason, Williamson focuses on how these new technologies that run on data and algorithms are increasingly mediating and governing educational practices.

By tracing a number of so-called intermediary policy actors, “such as think tanks, social enterprises, policy labs and third sector institutions” (Williamson, 2015, p. 86) the article shows how those actors promote educational settings where students are increasingly subjected to governing software. This, in turn, produces new notions of learners as networked individuals “whose ‘social brains’ are to be activated and optimized” (Williamson, 2015, p. 101). This, it is argued, is not a result of a natural development of learning subjects, but rather an achievement and a sociotechnical accomplishment by the promoting organizations and discourses.
This accomplishment, and in particular its effects, represent the political dimension of ASG in this case. While the article is devoted primarily to a mapping of the institutional setting that enables governing software to work as governmental technologies, it underscores how we need more detailed studies and knowledge to properly assess the effects. As such, Williamson hints at a number of consequences related to the introduction of ASG in terms of how they shape the subjectivities and capacities of the learners, yet we need to know more. In fact, the articulation of the political in this text is not straightforward but rather implicitly stated and understood as part of the possible effects the new systems may or may not have. Thus, questions of politics and ASG are also questions of epistemology and ASG. In sum then, as a paradigmatic case of politics and ASG, Williamson’s study represents how researchers often subtly make the political an aspect of knowing ASG and its contingent effects on practices and people.

4.3. Ideology and ASG

The third major mode of articulating politics in relation to ASG is related to ideology. While this is a salient motif throughout the corpus it is particularly present in the theme we have labeled capitalism, labor and industry. In fact, compared to the other two ways of activating the political, this is probably the one most centered on one of the themes. It is also more empirically oriented than the other ones, which is not to say that it is not also theoretical.

Here, the political is often articulated as part of exploitation and inequalities that are linked to the recent development of capitalism. There are different facets of this throughout the corpus, but one common line of inquiry relates to how ASG are changing the conditions of work and working life. For instance, in their study of new food delivery platforms such as Deliveroo and UberEATS, Veen et al. (2020) shows how the platforms and algorithms work to ensure huge information asymmetries between workers and employers and how the latter can draw on this together with the precarious conditions for the workers to facilitate new forms of exploitation. Close to these empirical takes are also works that examine how ASG can be understood as new forms of machines, thus affecting the means of production and thereby the relationship between workers and capitalists (Pasquinelli, 2014).

Often, by ideology, what is meant in these circumstances is not “just” a moralizing discourse or a political party position, but rather the works we have encountered here draws on later Marxist definitions in line with Antoni Gramsci or Louis Althusser. Thus, as in the works of Mager (2012, p. 773) the capitalist ideology represents “a set of shared beliefs, inscribed in institutions, bound up with action, and hence anchored in reality.” Therefore, in her study of search engines, the political is articulated through precisely the fact that “capitalist ideology gets inscribed […] and woven into the mathematics of search algorithms” (Mager, 2012, p. 770). Thus, an important task for researchers who focus on capitalism and its relationship with ASG is to understand how they function as part of new modes of capitalist production.

For example, we find a critique formulated here that points out how data is poorly conceptualized throughout the scholarly community where it often is treated as “just” a new form of commodity, or not properly assessed in terms of exploitation and extraction of value from people by capitalist powers (Thatcher et al., 2016). Rather, if data instead were to be conceptualized as a form of capital, the dynamics of digital capitalism could be analyzed beyond data’s property as a commodity that can be converted into monetary value. Indeed, from the point of view of this strand of research, “[f]raming data as a form of capital casts new light on the imperatives motivating contemporary organizations, the ways value can be derived from data, and the normative importance of data extraction” (Sadowski, 2019, p. 2).

4.3.1. Paradigmatic example 3—Machinic dispossession and augmented despotism: Digital Work in an Amazon warehouse

This article by Alessandro Delfanti (2021) examines how algorithms and data are integral and vital parts of new forms of capitalist production. Specifically, drawing on 25 interviews with so-called “associates” at one of Amazon’s Fulfillment Centers (FC), Delfanti (2021, p. 43) “aims at theorizing digital capitalism’s attempts to discipline and control labor beyond the automation of management.” Inspired by Deleuze and Guattari as well as the Italian operaismo tradition, Delfanti mobilizes a number of analytical concepts to grapple with the new forms of
control and exploitation made possible by ASG. The most central of these concepts for the analysis are *machinic dispossession* and *augmented despotism*.

The interviews allow Delfanti to reconstruct an account of how Amazon organizes the massive flow of commodities moving in and out of the FC through the means of algorithmic control of workers’ movement in the warehouse. This process rests on Amazon’s use of “chaotic storage” in their inventory “which allows for a more efficient use of storage space, as well as for the optimization of a complex form of cooperative work” (Delfanti, 2021, p. 45). Part of this arrangement is the notion of machinic dispossession which designates “Amazon’s ability to take knowledge away from workers by incorporating it in its distant algorithmic systems” (Delfanti, 2021, p. 45). The algorithms deployed connect workers and management so that the former basically move through a work day completely guided by barcode scanners and automatically assigned tasks, while the latter rely heavily on data and continuous tracking of the workers in their management tasks. This shifts the role of the management since they now primarily become “tasked with political rather than organizational roles: a form of augmented despotism enhanced both by the use of technology to surveil and discipline workers and by the import of elements from Silicon Valley corporations” (Delfanti, 2021, p. 49).

In short, Delfanti’s work is paradigmatic of how politics in relation to ASG can be explicitly or implicitly articulated as connected to the role of capitalism, both as a system of production and as an ideology that disperses power in particular ways. In this case specifically “the fundamentally political nature of hierarchies and division of labor within the workplace” (Delfanti, 2021, p. 51).

5. Concluding discussion

In this article we have analyzed the exponentially growing research on the politics of ASG by drawing on a sample of 1667 peer-reviewed articles. By way of further selection and analysis we have shown that only a fraction of this research actively engages with the concept of politics in the sense that it investigates the political dimensions of ASG, rather than just drawing on such systems as tools for analysis. Furthermore, among the 254 articles that do articulate the notion of politics with respect to ASG, we have illustrated how it is generally published in high ranking and well-reputed journals, however, political science is poorly represented among these. Additionally, we have also shown how this strand of research can be reconstructed from a multitude of topics into seven themes. In general, the research can also be said to be marked by theoretical and conceptual discussions rather than empirical works, and while there are some differences among the themes in this regard, they are not particularly pronounced. We have also illustrated how, over time, the focus has shifted from “data” to “AI” and “algorithms” probably reflecting a general development where AI has risen to prominence. Importantly, all AI and algorithms runs on data, and while it makes sense to focus on the operations that predict and conclude based on this data, it should not be forgotten that the politics of ASG remain firmly connected to what data is, how it is collected and how it is processed.

Finally, we have suggested three major modes of describing how the political is articulated by scholars interested in ASG as we highlighted (1) questions of ontology and the political as part of the very fabric of reality and ASG; (2) ways of gaining knowledge of the political effects of ASG or, in other words, questions of epistemology; (3) the political as manifested in the relationship between current capitalist ideology and ASG. We argue that this is an important insight for the current state of the art in this field, practically as well as theoretically. For one thing, it shows how governing and regulating ASG has many facets that need to be taken into account when drafting policy. Additionally, it also underscores how ASG can be said to govern and enact political dimensions beyond the intentional strategies of various actors, speaking to some of the ongoing discussions in the field (cf. Ulbricht & Yeung, 2022; Yeung, 2018).

Our initial point of departure was that ASG cannot be considered neutral tools to produce unbiased or more accurate decision making for the public. The research we have worked with here certainly underscores this position, regardless of the way it conceives the political nature of ASG. Drawing on our comprehensive reading and analysis we therefore argue that in the current state of the art it is possible to discern three particularly important aspects, that intersect in various ways, for researchers to take into account moving forward. In a sense, they cut through themes and modes of political articulation, sometimes explicitly and other times implicitly.
The first aspect is marketization and public private partnerships. Throughout Europe, and as part of its agenda to be world leading with respect to ASG, a wide range of policy initiatives have been put into motion. This includes to automatically select schools for children, to detect welfare payment fraud, to optimize buildings, to innovate health care, to mitigate the climate crisis, to work with face recognition surveillance, to control drug prescriptions and to attempt to forecast gender violence. In more or less all of these circumstances, we are dealing with complex public-private partnerships where the expertise to maintain, develop and in the end govern ASG is highly dependent on private interests. Not least since many ASG feature proprietary trade secrets, while being positioned in the midst of welfare politics. Indeed, a wide variety of the research we studied for this article emphasizes not only how there might be contradictions between private and public actors, but rather how private interests are very active in promoting their products and targeting public domains. The second aspect concerns the fact that, so far, the majority of studies on the politics of ASG are theoretical. It seems reasonable to move from examples and theoretical reasoning to detailed and careful empirical analyses of these ongoing processes, particularly with respect to the marketisation of the public sector. Drawing on our survey, such empirical studies are needed across all modes of articulating the political dimensions of ASG, however, we recognize that there are challenges ahead. For instance, researchers need access to empirical settings that may be hard to reach, particularly as they have to navigate the public-private terrain. Finally, we find it notable that scholars and journals of political science are not more actively taking point in this research. There are likely a number of different reasons for this, however, it seems vital for political scientists to catch up. Afterall, while sociologists, geographers and media scholars are doing a great job, the domains of politics and public administration are the signature areas of expertise for political scientists and we should not continue to just draw on ASG as methodological tools, we should study them as political instruments.

Acknowledgments

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Data availability statement

The data that support the findings of this study are available in Scopus at https://www.scopus.com/search/form.uri?display=basic#basic. These data were derived from the following resources available in the public domain: Scopus, https://www.scopus.com/search/form.uri?display=basic#basic.

References