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Images of Inequality: AI Created Depictions of Ancient Social Stratification

1. Introduction

The study of historical inequality has recently gained significant attention, particularly within the field of archaeology.[1] Our understanding of the past is invariably influenced by contemporary perspectives, in particular for concepts such as inequality, which was perceived very differently in historical contexts than it is today.[2] Therefore, to better understand past, it is essential to examine our contemporary receptions and interpretations of the past. This article aims to do so by analyzing images of ancient inequality – focusing on the ancient Roman world – generated through artificial intelligence (AI).

AI generates images from textual prompts using tools trained on millions of images and their associated captions. With the growing popularity of AI-generated images – often used as complementary visual stimuli alongside text and presentations – these images may significantly shape how various topics, such as ancient inequality, are perceived in the future. This article explores four key questions, each addressed in the following sections: 1. What do the selected AI image generators produce in response to prompts related to antiquity and inequality? (Section 3) 2. What can be inferred about the training data of these AI image generators based on the images they produce? (Section 4) 3. How useful are these generated images for studying ancient

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[1]   E.g. *Ten Thousand Years of Inequality: The Archaeology of Wealth Differences*. Edited by Timothy Kohler and Michael Smith. The University of Arizona Press, Tucson 2018; *The Archaeology of Inequality: Tracing the Archaeological Record*. Edited by Orlando Cerasuolo. State University of New York Press, Albany 2021; *Archaeology of Inequality, World Archaeology*, 54:4, 2022. Edited by Sarah Semple and Rui Gomes Coelho; Adam Green et al., *Cities and Citadels: An Archaeology of Inequality and Economic Growth*. Routledge, London 2023.

[2]   Although, notions of egalitarianism, inegalitarianism, and even on some level the equal distribution of wealth were not entirely unfamiliar to ancient thinkers (Paula Gottlieb, "Aristotle on Inequality of Wealth". *Democracy, Justice, and Equality in Ancient Greece: Historical and Philosophical Perspectives*. Edited by Georgios Anagnostopoulos and Gerasimos Santas. Springer, Cham 2018; John Weisweiler, "Inequality". *Oxford Classical Dictionary*, 2022), the inequality was not usually viewed as negative phenomena. For example, slavery – although also criticized – was widely accepted (Peter Garnsey, *Ideas of Slavery from Aristotle to Augustine*. Cambridge University Press, Cambridge 1996, 9–34).

inequality and its reception? (Section 5) 4. What insights do these AI-generated images offer for the study of ancient inequality? (Section 6)

The images analyzed in this article were created using two free text-to-image artificial intelligence tools: DeepAI Image Generator and Adobe Firefly AI Image Generator. The prompts used to generate the pictures included the word "inequality", and additional definitions such as "social", "wealth", and "health" were used. The study focuses on three levels. The first level is the most general, using the term "ancient". The second level is more specific, yet still broad: "Roman". The third level is more specific: "Pompeii". These concepts overlap: Pompeii is a Roman city, and the Roman Empire was a part of ancient world in general.

The concept of ancient inequality is too complex to be comprehensively summarized here. In general, many ancient societies appear hierarchical, with power concentrated in a small upper class.[3] Although ancient Greece had democratic city-states and Rome was a Republic for part of its history, power remained concentrated among a minority of people.[4] Wealth inequality is generally seen to have increased over time during the ancient period – especially in Eurasia.[5] Similar conclusions can be drawn regarding the ancient Mediterranean world on the basis of house sizes.[6] Nonetheless, these calculations of wealth inequality does not include families/people who did not own property.

Studies have thus far mainly focused on social stratification and wealth, while many other aspects of inequality, such as health, have only been explored very

[3]   See e.g. Weisweiler 2002; Josiah Ober, *The Rise and Fall of Classical Greece*. Princeton University Press, Princeton 2015, 6–11; Kurt Raaflaub, "Introduction". *Origins of Democracy in Ancient Greece*. Edited by Kurt Raaflaub, Josiah Ober, and Robert Wallace. University of California Press, Berkeley 2007; Michael Peachin, "Introduction". *The Oxford Handbook of Social Relations in the Roman World*. Oxford University Press, Oxford 2011.

[4]   See e.g. Peter Liddel, "Democracy Ancient and Modern". *A Companion to Greek and Roman Political Thought*. Edited by Ryan Balot. Blackwell, London 2009; Jeffrey Tatum, "Roman Democracy?". *A Companion to Greek and Roman Political Thought*. Edited by Ryan Balot. Blackwell, London 2009.

[5]   Timothy Kohler et al., "Greater Post-Neolithic Wealth Disparities in Eurasia than in North America and Mesoamerica". *Nature*, 551, 2017; Timothy Kohler et al., "Deep Inequality: Summary and Conclusions". *Ten Thousand Years of Inequality: The Archaeology of Wealth Differences*. Edited by Timothy Kohler and Michael Smith. The University of Arizona Press, Tucson 2018; Branko Milanovic, Peter Lindert, and Jeffrey Williamson, "Pre-Industrial Inequality". *The Economic Journal*, 121, 2010.

[6]   Geoffrey Kron, "Comparative Evidence and the Reconstruction of the Ancient Economy: Greco-Roman Housing and the Level and Distribution of Wealth and Income". *Quantifying the Greco-Roman Economy and Beyond*. Edited by François de Callataÿ. Edipuglia, Bari 2014, 128–129, especially Table 2.

sporadically.[7] However, the economic growth in the Roman Empire during the late Republic and early Imperial era seems to have led to increased wealth inequality and worsened health conditions.[8] The eruption of Mount Vesuvius, which buried Pompeii in 79 CE, occurred during this period. At that time there was significant economic inequality in the city, but citizens still had political influence through elections. Nonetheless, women were excluded from power, and slavery created steep social divisions, similar to many other societies in the ancient Mediterranean.[9]

Recently, there has been a desire to study the past from the perspective of equality, known as the archaeology of equality.[10] This is a positive development, as it encourages us to question our perceptions of the past. However, the archaeology of equality will require a rigorous methodology. For example, examining only the archaeological remains of Pompeii could provide a somewhat more egalitarian view of the city – although still very unequal – compared to incorporating our broader

[7]   E.g. Anna Lagia, "Health Inequalities in the Classical City: A Biocultural Approach to Socioeconomic Differentials in the Polis of Athens during the Classical, Hellenistic and Imperial Roman Periods". *Corps, Travail et Statut Social: L'Apport de La Paléoanthropologie Funéraire Aux Sciences Historiques*. Edited by Anne-Catherine Gillis. Presses universitaires du Septentrion, Villeneuve d'Ascq 2014; Lindsay Petry, "Echoes in the Bones: An Osteological Analysis of the Biochemical Impact of Roman Rule at Corinth, Greece". *Chronika: Graduate Student Journal*, 10, 2020; Anna Karligkioti et al., "Approaching Life (in)Equality and Social Transformations in Eastern Attica from the Classical to the Roman Era". *Journal of Archaeological Science: Reports* 47, 2023; Matthew Notarian, "A Spatial Network Analysis of Water Distribution from Public Fountains in Pompeii". *American Journal of Archaeology* 127, no. 1, 2023; Samuli Simelius, "Networks of Inequality: Access to Water in Roman Pompeii". *Journal of Computer Applications in Archaeology*, 7, no. 1, 2024.

[8]   Willem Jongman, Jan Jacobs, and Geertje Klein Goldewijk, "Health and Wealth in the Roman Empire". *Economics & Human Biology*, 34, 2019.

[9]   On wealth inequality in Pompeii, see Miko Flohr, "Quantifying Pompeii: Population, Inequality, and the Urban Economy". *The Economy of Pompeii*. Edited by Miko Flohr and Andrew Wilson. Oxford University Press, Oxford 2017; Samuli Simelius, "Unequal Housing in Pompeii: Using House Size to Measure Inequality". *World Archaeology*, 54, no. 4, 2022. On Pompeian elections and possibilities to influence in politics, see e.g. Paavo Castrén, *Ordo Populusque Pompeianus. Polity and Society In Roman Pompeii*. Bardi, Roma 1975; Henrik Mouritsen, *Elections, Magistrates and Municipal Élite: Studies in Pompeian Epigraphy*. L'Erma di Bretschneider, Roma 1988; Eeva-Maria Viitanen, "Pompeian Electoral Notices on Houses and in Neighborhoods? Re-Appraisal of the Spatial Relationships of Candidates and Supporters". *Arctos – Acta Philologica Fennica*, 55, 2021; Eeva-Maria Viitanen and Laura Nissin, "Campaigning for Votes in Ancient Pompeii: Contextualizing Electoral Programmata". *Writing Matters: Presenting and Perceiving Monumental Inscriptions in Antiquity and the Middle Ages*. Edited by Irene Berti et al. De Gruyter, Berlin 2017; Samuli Simelius, "Moving Magistrates in a Roman City Space: The Pompeian Model". *Running Rome and Its Empire: The Places of Roman Governance*. Edited by Antonio Lopez Garcia. Routledge, Abingdon 2024.

[10]   David Graeber and David Wengrow, *The Dawn of Everything: A New History of Humanity.* Farrar, Staraus and Giroux, New York 2021; Aris Politopoulos et al., "An Anarchist Archaeology of Equality: Pasts and Futures Against Hierarchy". *Cambridge Archaeological Journal* 2024.

understanding of Roman social stratification.[11] Despite this, this article is inspired by the archaeology of equality, even though it focuses on inequality. Its primary contribution is to examine our perception of the past and its underlying assumptions, which can help us understand and recalibrate our historical vision.

AI-generated images are a relatively new development, and thus have been rarely used in ancient studies. In classical archaeology, artificial intelligence has primarily been applied to create reconstructions of damaged architecture and visual artifacts such as coins and mosaics.[12] As AI offers a tempting tool for cultural heritage restoration, it is crucial to examine how AI reconstructs the past and what biases influence these reconstructions. Research on computational methods has identified various categories of bias, one of which is pre-existing bias, stemming from the datasets used in the AI tools.[13] The findings of this article reveal that AI-generated images replicate and amplify the biases present in historical datasets – specifically, they reflect the Roman elite's perspective on social structure while incorporating elements from later periods, including those of the artists who created the pictures on which the reconstructed pictorial representations are based. To my knowledge, no prior studies have examined this specific issue, and consequently the next section is used to explain the methodology.[14]

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[11]   Simelius 2022.

[12]   E.g. Mark Altaweel, Adel Khelifi, and Mohammad Zafar, "Using Generative AI for Reconstructing Cultural Artifacts: Examples Using Roman Coins". *Journal of Computer Applications in Archaeology*, 7 no. 1, 2024; Fernando Moral-Andrés, Elena Merino-Gómez, Pedro Reviriego, and Fabrizio Lombardi, "Can Artificial Intelligence Reconstruct Ancient Mosaics?". *Studies in Conservation*, 69 no. 5, 2024; Kawsar Arzomand, Michael Rustell, and Tatiana Kalganova, "From ruins to reconstruction: Harnessing text-to-image AI for restoring historical architectures". *Challenge Journal of Structural Mechanics*, 10, no. 2, 2024.

[13]   E.g. Batya Friedman and Helen Nissenbaum, "Bias in Computer Systems". *ACM Transactions on Information Systems*, 14, no. 3, 1996; Renee Shelby, Shalaleh Rismani, Kathryn Henne, AJung Moon, Negar Rostamzadeh, Paul Nicholas, N'Mah Yilla-Akbari, Jess Gallegos, Andrew Smart, Emilio Garcia, and Gurleen Virk, "Sociotechnical Harms of Algorithmic Systems: Scoping a Taxonomy for Harm Reduction". *AAAI/ACM Conference on AI, Ethics, and Society (AIES '23), August 08–10, 2023, Montréal, QC, Canada*. ACM, New York 2023; Anton Berg and Matti Nelimarkka, "Do you see what I see? Measuring the semantic differences in image-recognition services' outputs". *Journal of the Association for Information Science and Technology*, 74, 2023; Anton Berg, *Commercial image recognition representing religion*, 2024. For pre-existing bias, see Friedman and Nissenbaum 1996, 333–335; Berg 2024, 42.

[14]   However, for AI-bias studied in the perspective of art history, see Ramya Srinivasan and Kanji Uchino, "Biases in Generative Art – A Causal Look from the Lens of Art History". *ACM Conference on Fairness, Accountability, and Transparency*, 2021, and for evaluation of AI-images that are supposed to depict the Roman world, see Phillip Ströbel, Zejie Guo, Ülkü Karagöz, Eva Willi, and Felix Maier, "Bringing Rome to life: evaluating historical image generation". *Proceedings of the Computational Humanities Research Conference 2024, Aarhus, 4 December 2024 - 6 December 2024*, 2024. Although these studies somewhat overlap with this article, their scope and research questions are different from those here.

2. The methodology of producing the data set, and the methodology of the analysis

To generate the AI-generated images analyzed in this study, I used two text-to-image artificial intelligence tools. Both are commercial, though some of their tools are freely available. Firefly requires an account for access. The DeepAI Image Generator is developed by DeepAI Inc., while the Firefly AI Image Generator is part of Adobe Inc. The former focuses primarily on AI tools, whereas the latter is a well-established computer software company.

First, I produced images using DeepAI. These images were created without an account login, which resulted in a lengthy creation period from June 27 to July 24, 2024. DeepAI generates images based on millions of pictures and text captions that it has been trained on.[15] For the image creation process, I used the default settings: the model was set to standard, preference to speed, style to text2image, and no specific shape was chosen.

Second, I employed Firefly, using my Adobe account. All images used for the following analysis were created on July 27, 2024. Firefly generates images based on thousands of pictures from Adobe Stock, public domain content with expired copyrights, and openly licensed works.[16] Here, I also used the default settings: the model was Firefly Image 3, aspect ratio was Square (1:1), content type was Art, no reference was added for composition, visual intensity was set to the middle of the scale, effects were set to Popular, and color and tone, lighting, and camera angle were all set to None.

The text prompts used to create the images were as follows: ancient inequality, ancient social inequality, ancient wealth inequality, ancient health inequality, Roman inequality, Roman social inequality, Roman wealth inequality, Roman health inequality, Pompeii inequality, Pompeii social inequality, Pompeii wealth inequality, and Pompeii health inequality. I generated five images for each prompt with DeepAI, while Firefly automatically generated four images per prompt if the settings were not altered, and thus I used those four pictures for each prompt. The complete set of images can be found on Zenodo.[17]

Given that the dataset consists of 108 images, the analysis was primarily conducted by systematically reviewing each image, identifying recurring features, and comparing them to similar non-AI-generated images. To help identify similar images and the potential of training data influencing the AI-generated images, I used Google's reverse image search. For each AI-generated image I recorded the top two search results in the Zenodo Appendix. The search does have some limitations, such

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[15]   https://deepgram.com/ai-apps/deepai.

[16]   https://www.adobe.com/products/firefly/features/text-to-image.html. Adobe Stock: https://stock.adobe.com.

[17]   DOI: 10.5281/zenodo.15235133. https://zenodo.org/records/15235133.

as variations in results based on the location of the search. Despite these challenges, the search results serve as a complementary tool for analysis, providing alternative insights that extend beyond my own interpretations and associations with the AI-generated images.

Section 3 examines the features identified in the AI-generated images, with a particular focus on recurring themes. The analysis is primarily quantitative. However, the images are often unclear and sometimes contain shapes that are difficult to interpret. As a result, it can be challenging to discern all the details in an image, such as whether a shape represents a statue or a human figure (Figure 1). While alternative interpretations may arise, the number of unclear cases is relatively small and does not significantly affect the overall conclusions. Section 4 focuses on the results of Google's reverse image search across the entire dataset, maintaining a primarily quantitative approach. In Sections 5 and 6, the analysis takes a more qualitative turn, concentrating on selected images through both my interpretation of the visuals and the results from Google's reverse image search.

Figure 1. Image made with DeepAI using the prompt "Pompeii social inequality".

3. How does artificial intelligence interpret antiquity and inequality?

Among the generated pictures, there are several instances where perspectives are incorrect and figures appear unclear or deformed. Despite these frequent optical distortions, the images generally provide reasonably understandable depictions and, for the most part, follow the laws of nature. As a result, it is possible to understand and analyze what they are supposedly depicting. There is a notable difference between the sets of images created by the two different artificial intelligence tools. The images generated by DeepAI can be described as snapshots of life, often resembling urban landscapes or built environments captured in the midst of daily life. In contrast, Firefly's images tend to be more symbolic, resembling artwork one might find in video games. As a result, they are often more imaginative and do not always adhere as strictly to the laws of nature (see e.g. Figure 2).

Figure 2. Image made with Firefly using the prompt "Pompeii social inequality"

Figure 3. Image made with DeepAI using the prompt "Roman wealth inequality".

Nonetheless, DeepAI's images also occasionally feature unnatural elements. For example, in Figure 3 the upper part of a column appears to be hovering above an entrance. Additionally, many architectural depictions raise questions about structural feasibility – whether the lower parts could truly support the upper structures. However, since these are two-dimensional images, that can only be speculated on.

Although the images are somewhat understandable depictions, they still pose challenges for analysis. Anyone even remotely familiar with AI-generated images is aware of their limitations – for example, depicting humans has been a persistent issue.[18] This is evident in many images from this study, and it is sometimes difficult to determine whether a figure is supposed to be a human. Similar ambiguities arise with other subjects, such as animals, pots, and even mountains. I have chosen to approach subject identification loosely: if a figure even remotely resembles a particular entity – such as a human – I have interpreted it as such.

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[18]   E.g. Ali Borji, "Qualitative failures of image generation models and their application in detecting deepfakes". *Image and Vision Computing*, 137, 2023, 6–9; Moral-Andrés, Merino-Gómez, Reviriego, and Lombardi 2024, 320.

These AI-generated images based on various prompts related to past inequality share some common features. While no single feature appears in all the images, elements such as columns, pilasters, pillars, buildings, people, and stairs/levels are frequently depicted, especially in the images generated by DeepAI. Firefly's images, on the other hand, quite frequently feature representations that resemble symbols. Table 1 presents an analysis of the most common features identified in the AI-generated images. These features include human-like figures, buildings, columns (including pillars/pilasters), outdoor settings, stairs/architectural levels, symbols, and mountains.

Table 1. The number and percentage of various identified figures in the images created with DeepAI and Firefly. The pictures that are not interpreted as depicting outdoor scenes are not necessarily intended to represent indoor settings; rather, they are often general depictions where making a clear distinction is not possible.

Prompt	AI generator	Figure															
		human-like figure(s)		building(s)		column(s)		outdoor		stair(s)		ruin(s)		symbol(s)		mountain(s)	
		n.	%	n.	%	n.	%	n.	%	n.	%	n.	%	n.	%	n.	%
Ancient inequality	Deep AI	5	100	4	80	5	100	4	80	3	60	2	40	0	0	0	0
	Firefly	2	50	0	0	0	0	0	0	0	0	0	0	2	50	0	0
Ancient social inequality	Deep AI	5	100	5	100	3	60	5	100	2	40	1	20	0	0	1	20
	Firefly	3	75	1	25	2	50	2	50	1	25	1	25	2	50	1	25
Ancient wealth inequality	Deep AI	5	100	4	80	5	100	5	100	4	80	1	20	0	0	0	0
	Firefly	1	25	1	25	1	25	1	25	1	25	0	0	2	50	0	0
Ancient health inequality	Deep AI	5	100	2	40	3	60	4	80	2	40	0	0	0	0	0	0
	Firefly	4	100	1	25	0	0	2	50	2	50	0	0	2	50	1	25
Roman inequality	Deep AI	5	100	5	100	5	100	5	100	5	100	0	0	0	0	0	0
	Firefly	4	100	1	25	1	25	0	0	1	25	0	0	3	75	0	0

Roman social inequality	Deep AI	5	100	5	100	5	100	5	100	3	60	0	0	0	0	0	0
	Firefly	4	100	0	0	2	50	2	50	1	25	0	0	2	50	0	0
Roman wealth inequality	Deep AI	5	100	5	100	5	100	5	100	5	100	0	0	0	0	0	0
	Firefly	4	100	0	0	3	75	1	20	2	50	0	0	1	25	0	0
Roman health inequality	Deep AI	5	100	5	100	5	100	5	100	5	100	0	0	0	0	0	0
	Firefly	2	50	2	50	0	0	2	50	0	0	0	0	0	0	0	0
Pompeii inequality	Deep AI	5	100	5	100	4	80	5	100	4	80	5	100	0	0	4	80
	Firefly	3	75	4	100	4	100	4	100	4	100	3	75	0	0	3	75
Pompeii social inequality	Deep AI	5	100	5	100	5	100	5	100	5	100	5	100	0	0	1	20
	Firefly	4	100	3	75	3	75	3	75	4	100	1	25	0	0	0	0
Pompeii wealth inequality	Deep AI	3	60	5	100	5	100	5	100	4	80	5	100	0	0	5	100
	Firefly	3	75	2	50	3	75	2	50	3	75	1	20	1	25	1	25
Pompeii health inequality	Deep AI	4	80	5	100	5	100	5	100	5	100	5	100	0	0	1	20
	Firefly	2	50	2	50	3	75	2	50	2	50	0	0	1	25	0	0
In total		93	86	72	67	77	71	79	73	68	63	30	28	16	15	18	17

Although the images are generally quite similar, there are some distinct differences between the prompts. The images generated from prompts containing the term "ancient" exhibit a broader range of diversity of identified figures compared to those generated with the terms "Roman" and "Pompeii". In addition to the features listed in Table 1, for example, depictions of pottery can be found in nearly 20 percent of the images, whereas pottery is entirely absent in the images generated with the "Roman" prompt, and rare in those generated with the "Pompeii" prompt.[19]

This discrepancy is to be expected, as the term "ancient" encompasses a much broader scope than the more specific terms "Roman" and "Pompeii". Many of the images related to ancient inequality evoke associations with the Americas or East Asia, suggesting that, for artificial intelligence, "ancient" does not necessarily imply a Mediterranean or Levantine context. This reflects a broader trend in how people use the word "ancient" – not always specifically tied to the classical world, but encompassing many global ancient cultures. For instance, in Figure 4 the trees evoke the feeling of a tropical forest and the decorations on the architectural structures do not follow typical Greco-Roman styles, but could instead be associated with Central America or East Asia.

The "Roman" prompt notably lacks some features, such as mountains and ruins. The structures depicted resemble buildings that are in use. "Roman" as a category has temporal longevity, as it can describe periods extending beyond antiquity, even into modern times. This is highlighted by the "Roman health inequality" prompt generated by Firefly. These images depict modern Rome, with both the architecture, equipment, and individuals portrayed conveying a contemporary rather than ancient appearance (e.g. Figure 5). The topic of ancient Roman health inequality has been sparsely researched, and thus health inequality as a phenomenon is more

Figure 4. Image made with Firefly using the prompt "Ancient health inequality".

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[19]   Appendix: Depictions of pottery with "ancient" prompts: 1.2.1, 1.2.2, 1.2.5, 1.3.9, 1.4.1, 1.4.2, 1.4.4. The depictions of pottery with "Pompeii" prompt: 3.3.6.

easily connected to modern times than to ancient Rome.[20]

The images produced by the "Pompeii" prompts have two distinct features compared to those produced by the "ancient" and "Roman" prompts: depictions of ruins and mountains. Pompeii's landscape is mountainous, with Mount Vesuvius providing a famous backdrop for the city and serving as a symbol of the eruption that buried it, which explains the increased presence of mountains. Additionally, the city's ruins are what have made it famous today, making their depiction understandable. There is also a slight dominance of built

Figure 5. Image made with Firefly using the prompt "Roman health inequality".

spaces in the "Pompeii" prompts compared to "ancient" and "Roman" prompts, with buildings, columns, and stairs appearing more frequently. Furthermore, human-like figures are slightly less common in the "Pompeii" images than in the "ancient" and "Roman" images, although 81 percent of "Pompeii" images still feature them.

4. The influence of the AI generators' training data as seen in the produced images

The generated images mostly resemble paintings or drawings rather than attempting to emulate the appearance of a photograph – this is partly due to the settings, such as Firefly's photo setting not being used. There is a clear difference between the DeepAI and Firefly images. The DeepAI images resemble snapshots of landscapes, often urban or built environments, which could be interpreted as depictions of daily life. These images are reminiscent of paintings from the early modern/modern period. In contrast, Firefly predominantly produces images that resemble modern cartoons or video game-like graphics, though some do have a painting-like appearance. Architectural depictions are very common in the DeepAI's images, while they play a less prominent role in the Firefly images, where human-like figures or symbolic representations are often the focal point.

The connection between the images produced by DeepAI and early modern and modern paintings – particularly those from the 18th and 19th centuries – is evident

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[20]   For studies on Roman health inequality, see notes 7 and 8.

from the results of analysis conducted using Google's reverse image search. The majority of DeepAI images, 60 percent (36 images), have at least one early modern painting among the top two search results.

Google's reverse image search often links the images created with Firefly to pictures found on various social media sites or commercial sites related to visual products. The majority (58 percent, 28 images) of these images appear to be generated by AI. While AI-generated images also appear in the search results for DeepAI images, they are not as dominant as with Firefly-generated pictures. There are also many references to paintings in the Google reverse image search results for Firefly, but the results appear more temporally varied compared to DeepAI, where the dominance is clearly among 18th and 19th century paintings.

The overall appearance of the generated artificial intelligence images suggests that they aim to imitate paintings or drawings – whether digital or traditional. However, there are two instances where this is less clear. The images produced with the prompt "Roman health inequality" lean more towards modern life than antiquity and have a somewhat photograph-like quality (see e.g. Figure 5). Additionally, Google's reverse image search linked these images to photographs. Similarly, the search often connected images created with various "Pompeii" prompts to photographs. The Pompeii images tend to depict ruins, linking them more to the modern archaeological site of Pompeii rather than the living ancient city. This suggests that these AI-generated images link the past visually to paintings or drawings, while the connection with modernity appears more photograph-like.

5. The usefulness of AI-generated images in studying ancient inequality and its reception

The concept of inequality is not explicitly highlighted in the generated images. However, it is present in the background, and understanding how the images reference inequality often requires knowledge of ancient history and stories, as well as modern or early modern painting and symbolism, as demonstrated in the following examples.

The generated images rarely clearly differentiate people into various social, economic, or health groups. This could have been achieved in several ways, such as through the appearance of individuals (e.g., clothing) or by using architectural features like levels or stairs to separate groups. However, these characteristics are rarely utilized by the artificial intelligence, though there are a few examples.

Figure 6 illustrates architectural elements that may distinguish between various social groups. On the right side of the image a building with columns, stairs, and a pediment is depicted. Individuals in the portico of this building, situated higher than most of the other figures in the scene, are predominantly dressed in red. Below them is a podium with several people positioned on top of it. The foreground of the image is

Figure 6. Image made with Firefly using the prompt "Pompeii social inequality".

divided into three sections: the center-left part features a large group of people behind a masonry wall, with the possibility of additional individuals on upper levels behind them – though this is not certain. Slightly below this group, on the other side of the masonry wall, a few people are positioned on a platform resembling a street. In the lower right corner, a small group of people is seen behind another masonry wall.

This arrangement could be interpreted as indicating that the individuals in the portico and on the podium occupy a higher societal position, potentially along with those on the street. The people in the lower right corner, who have more space compared to those behind the other masonry wall, may represent a middle social tier, whereas the rest of the people are likely commoners.

The visual cues present in Figure 6 are often lacking in other images, making it difficult to understand the depiction of inequality without knowing the prompt. However, there is a connection between many of the AI-generated images and ancient inequality. To fully grasp this connection, one needs a solid understanding of ancient history, as well as the traditions of early modern and modern painting and its topics.

For example, Louis Lafitte's painting *Brutus Listening to the Ambassadors from the Tarquins* (c. 1790, Figure 7) appeared several times among the top references in Google's reverse image search for the artificial intelligence-generated images. The theme depicts an event set during the transition from the early authoritarian rule of the city to the birth of the Roman Republic.[21] As such, the topic is clearly linked to Rome's social structure and inequality.

Figure 7. Louis Lafitte's painting Brutus Listening to the Ambassadors from the Tarquins (c. 1790). Los Angeles County Museum of Art. Image: Wikimedia Commons.

A similar connection between inequality and the paintings used to model the images can be detected in many other AI-generated depictions. For instance, similarities in composition, figures, and landscape/cityscape can be identified between several images produced with DeepAI and the many paintings depicting the theme of Virginia's death. For example, Figure 8 compares Guillaume-Guillon Lethière's painting

(c. 1800) *The Death of Virginia* with two AI-generated images created using the prompts "Roman social inequality" and "Roman wealth inequality". Both AI-generated images feature people on a pedestal on the right, individuals on a lower level in the middle, and a sense of dramatic movement. The background includes architecture with columns and pediments, similar to Lethière's painting.

Figure 8. Left: Guillaume-Guillon Lethière's painting The Death of Virginia (c. 1800). Los Angeles County Museum of Art. Image: Wikimedia Commons. Center: Image made with DeepAI using the prompt "Roman social inequality". Right: Image made with DeepAI using the prompt "Roman wealth inequality".

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[21]   For Brutus and the early Roman Republic, see e.g. Harriet Flower, *Roman Republics.* Princeton University Press, Princeton 2009.

The Death of Virginia is based on a story set around 450 BCE in Rome and told by Livy. In the story, the upper-class man Appius Claudius lusts after the girl Virginia/Verginia, who comes from a lower social position than Appius Claudius. The tale highlights class conflict between the patricians and plebeians – two social groups of early Roman republic – and also touches on the role of women in Roman society, with slavery playing a part in the narrative, as Virginia is sold into slavery.[22] The paintings depicting this story clearly reflect the themes of Roman inequality.

Google's reverse image search linked the artificial intelligence images in Figure 8 to depictions of the death of Julius Caesar. This event is also tied to social inequality in the Roman world, as it is commonly viewed as one of the key events that led to the end of the Roman Republic and the beginning of the Imperial era, signaling a restructuring of power dynamics between various groups in Rome.[23] For the majority of DeepAI images (22 out of 27) where Google's reverse image search returned an early modern/modern painting as one of the top two results, the topic – based on ancient stories – can be linked to injustice, poverty, and, consequently, inequality.

Firefly images, on the other hand, often connect to the theme of inequality through religion and spiritualism. To fully understand this connection, the viewer must be familiar with the symbolism that underpins references to various religious visual representations, such as imagery from Christianity and the Bible – primarily reflecting later visualizations rather than those from antiquity.

For example, certain types of human-like figures appear, such as in the artificial intelligence image created with the prompt "Pompeii health inequality", where the female character in the middle resembles an angel-like figure (Figure 9). However, this may not necessarily create an association with inequality for a modern viewer who is not deeply

Figure 9. Image made with Firefly using the prompt "Pompeii health inequality".

[22]   Liv. 3.44–48. See e.g. Sandra Joshel, "The Body Female and the Body Politic: Livy's Lucretia and Verginia". *Sexuality and Gender in the Classical World Rome*. Edited by Laura McCLure. Wiley, New York 2002; Lisa Mignone, *The Republican Aventine and Rome's social order*. University of Michigan Press, Ann Arbor 2016, 27–32.

[23]   E.g. Richard Alston, *Rome's Revolution: Death of the Republic and Birth of the Empire*. Oxford University Press, Oxford 2015, vii–xii, 1–30.

engaged with the study of Roman history, but rather with Christianity and religion in general. Nevertheless, the connection between early Christianity and lower social groups, as well as the poor, is often emphasized in the study of the Roman past.[24]

Among the images created by Firefly, Figure 10 can be connected to biblical themes, as Google's reverse image search suggests that it resembles Bonaventura Genelli's *Elisha and Rebecca at the Fountain* (1834) and Julius Schnorr von Carolsfeld's *Die Enthauptung Johannes des Täufers* (1857). However, even without understanding this connection, it is possible to interpret its link to ancient inequality. It is one of the few images where social and economic diversity among the depicted individuals can be discerned from the composition of figures and their clothing. In this image, individuals on the left – particularly two in the center – appear to occupy a lower social position, shown by wearing minimal clothing with only a cloth wrapped around their waists. In contrast, the clothing of the person on the right suggests wealth, while the white toga-like garments worn by individuals in the upper part of the image indicate a higher social status, further emphasized by their elevated position on stairs. This is one of the few examples set indoors, and the image may be associated with themes of the slave trade.

Although there are a few instances where a viewer can discern that the images are meant to represent past inequality, this is rare. However, if the viewer has a strong knowledge of Roman and Greek history, as well as ancient stories related to various religions, the connection between the images and inequality may be somewhat easier to understand. Still, it also requires familiarity with later modern and early modern visual imagery, making the representation of inequality likely difficult to fully comprehend without multiple layers of knowledge.

Figure 10. Image made with Firefly using the prompt "Pompeii wealth inequality".

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[24]   See e.g. Helen Rhee, *Loving the Poor, Saving the Rich: Wealth, Poverty, and Early Christian Formation*. Baker Academic, Grand Rapids 2012.

6. What information do these generated images provide for the study of ancient inequality?

The generated artificial intelligence images highlight two biases related to understanding ancient inequality. First, there is an accumulation of interpretations from later periods, which influences the portrayal of ancient themes. The presence of the later periods underlines that the generated images do not seem to imitate ancient wall or pottery paintings, although that could have been a possibility. Second, the images seem to imitate depictions of themes and events familiar from ancient literature, replicating its narratives. This reflects an upper-class perspective, as these sources were primarily produced by the elite layers of society.[25]

In addition to the frequent presence of ruins in the images, there are other features that can be associated with periods beyond antiquity. For example, Google's reverse image search suggested Giorgio de Chirico's *Piazza d'Italia* (1924–1925), Jean-Baptiste Le Prince's *Bain public de Russie* (1760), and Horace Vernet's *Street Fighting on Rue Soufflot, Paris, June 25, 1848* (1849, Figure 11) as reference images for the generated artificial intelligence pictures. These works are not meant to depict antiquity.

Vernet's painting is set during the so-called year of revolutions, 1848, making its connection to the theme of inequality clear. A similar link – through a picture that can be connected to non-ancient depictions of inequality – might be present in other AI-generated images, such as Figure 12. However, this connection may be

Figure 11. Horace Vernet's Street Fighting on Rue Soufflot, Paris, June 25, 1848 (1849). Deutsches Historisches Museum. Image: Wikimedia Commons.

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[25] E.g. Jerry Toner, *Popular Culture in Ancient Rome*. Polity Press, Cambridge 2009, 1–10; Robert Knapp, *Invisible Romans*. Harvard University Press, Cambridge, Massachusetts 2011; Rhee 2012, xiv–xv; Kristina Milnor, *Graffiti and the Literary Landscape in Roman Pompeii*. Oxford University Press, Oxford 2014; Michael Anderson, *Space, Movement, and Visibility in Pompeian Houses*. Routledge, London 2023, 19.

drawn through yet another loop. In the figure, the masts of the ships and the column-like structure in the background resemble Luca Carlevarijs' *The Wharf, Looking toward the Doge's Palace* (first half of the 18th century). Although Renaissance and early modern Venice are relevant to the history of republicanism,[26] and thus social inequality, there may be another reason why it evokes the AI-generated image made with the prompt "ancient wealth inequality". The image appears in a blog post by Guido Alfani, titled *Social Mobility and Inequality in the Republic of Venice, 1400-1700*, dated 2.4.2019.[27] This demonstrates how the modern need to add visual imagery to text can create a connection between a concept – such as inequality – and an image, like one depicting a Venetian port.

Figure 12. Left: Image made with DeepAI using the prompt "ancient wealth inequality". Right: Luca Carlevarijs' painting The Wharf, Looking toward the Doge's Palace (first half of the 18th century). Sanssouci Picture Gallery. Image: Wikimedia Commons.

Another aspect highlighted by the AI-generated images is that our concept of ancient and Roman inequality relies heavily on literary sources – even if it comes through later images, which were created to depict stories from ancient literature. There are no clear depictions of bones, grave goods, or private architecture, which are material sources often used in studies of ancient inequality.[28] However, images created with the "Pompeii" prompts present a slight exception to this.

The structures in the "Pompeii" prompt images often appear in a ruined state, referencing the original source – the remains of ancient buildings. It is, however, impossible to determine whether these structures represent the ruins of public or private spaces, making it difficult to draw a connection to private architecture.

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[26]   See e.g. Edward Muir, "Was there Republicanism in Renaissance Republics? Venice after Agnadello". *Venice Reconsidered: The History and Civilization of an Italian City-State*. Edited by John Marino and Dennis Romano. The Johns Hopkins University Press, Baltimore 2000.

[27]   https://ehs.org.uk/social-mobility-and-inequality-in-the-republic-of-venice-1400-1700/. For the research of Alfani, see e.g. "Economic Inequality in Preindustrial Times: Europe and Beyond". *Journal of Economic Literature*, 59, no. 1, 2021.

[28]   See e.g. references in notes 5, 6, 7 and 8.

Additionally, "Pompeii" images frequently feature people who resemble ancient figures more than modern ones. As a result, these images blend the modern and the ancient, combining ruins with depictions of ancient people, consequently blurring the line as to whether these are depictions of current sources for the study of antiquity or images trying to illustrate ancient life.

Pottery is relatively infrequently depicted in these images, despite its potential use as evidence for studying ancient inequality.[29] Figure 13 is an exception, as it prominently features pottery. However, the pottery shown is notably luxurious and elaborately decorated, which may not convey a strong sense of deep wealth inequality. Pottery can also be associated with trade, and besides pottery, there are depictions of other vessels that could be used for transportation and commerce, such as baskets or similar woven objects.[30]

Despite few exceptions, the artificial intelligence images are predominantly built on stories from ancient literature, reflecting its upper-class bias. Furthermore, the images include references to periods later than antiquity. Although these references may be linked to inequality, they introduce an additional layer of bias to AI-generated images, making their connection to ancient inequality even more complex.

Figure 13. Image made with Firefly using the prompt "ancient wealth inequality".

7. Conclusions

DeepAI and Firefly predominantly generate images set outdoors, featuring people and architectural elements – often including columns or similar supporting structures – when given prompts related to ancient inequality. There are slight variations between the images produced by certain prompts; for instance, those containing the

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[29]   Michael Smith, "Household Possessions and Wealth in Agrarian States: Implications for Archaeology". *Journal of Anthropological Archaeology*, 6, 1987.
[30]   E.g. Appendix 1.3.3, 1.4.3.

word "Pompeii" more frequently depict mountains and ruins compared to those using "Roman" or "ancient". However, the figures represented remain largely consistent across images. DeepAI's images tend to mimic early modern or modern paintings, suggesting that its training data associates the painting of these eras with depictions of ancient inequality. Firefly, on the other hand, produces more video game-like images, likely drawing from social media and commercial sites.

These AI-generated images rarely underline ancient social hierarchies or inequality. Only a viewer with deep knowledge of both ancient history and later visual symbolism might recognize their connection to past inequalities – but this requires significant expertise. Consequently, the value of AI-generated images lies in their ability to reveal how ancient material has been received and reinterpreted over time.

These images underline biases that shape our perception of ancient inequality. AI-generated representations are built on later visual interpretations of ancient stories, which are themselves drawn from literary sources that primarily reflect elite perspectives. Additionally, the images incorporate layers of influence from post-antiquity depictions of inequality. This pattern is common: gaps in our knowledge of antiquity are easily filled with modern assumptions. This highlights a key issue in using AI to reconstruct the past – it can only work with the data that we possess and that is accessible to it. As a result, it inevitably repeats existing biases, potentially making our understanding of the past overly uniform and repetitive. There is also a risk that this cycle will accelerate, as AI-generated images may increasingly serve as source material for creating new AI-generated images.

The possibilities for future research in this area are extensive, as this study represents only a preliminary attempt to analyze AI-generated images as a form of ancient reception. Future investigations could include experimenting with different AI tools to compare how they visualize ancient societies. Moreover, employing image recognition technology to analyze the outputs could offer new insights – though this approach would bring its own set of biases. Exploring longer and more detailed prompts may also yield richer and more nuanced results. An especially compelling direction would be to investigate whether themes grounded in well-known ancient visual sources lead to images that reflect or reproduce actual ancient imagery.

Abstract

The study of historical inequality has gained increasing attention in recent years, particularly in archaeology. Our understanding of the past is shaped by contemporary perspectives, especially when examining concepts such as inequality, which were perceived differently in antiquity than they are today. This article explores how artificial intelligence (AI) contributes to the visualization of ancient inequality by generating images based on textual prompts. Focusing on

the ancient Roman world, it examines the biases embedded in AI-generated images and their implications for historical understanding.

AI image generators, such as DeepAI and Adobe Firefly, produce visuals by drawing on extensive training datasets of images and captions. As AI-generated images become more prevalent – often used alongside textual narratives and oral presentations – they have the potential to shape public and scholarly perceptions of historical subjects, including ancient inequality. This article addresses four key questions: 1. What do AI image generators produce when given prompts related to antiquity and inequality? 2. What can the generated images reveal about the training data used in these AI models? 3. How useful are AI-generated images for studying ancient inequality and its reception? 4. What broader insights can these images offer for the study of ancient social structures?

To investigate these questions, this study analyzes AI-generated images of inequality using three levels of prompts: general ("ancient"), more specific ("Roman"), and highly specific ("Pompeii"), and with different types of other definitions, such as social, wealth, and health inequality. The results reveal that AI-generated images primarily depict outdoor scenes featuring people and architectural elements, often including columns and similar supporting structures.

A key finding is that the visual styles of these AI-generated images reflect the biases of their underlying datasets. DeepAI tends to generate images resembling early modern and modern paintings, suggesting that its training data associates these artistic traditions with depictions of ancient inequality. Firefly, by contrast, produces images with a more video game-like aesthetic, likely influenced by social media and commercial sites.

Although AI-generated images offer valuable insights into how ancient material has been received and reinterpreted over time, they do not explicitly highlight ancient social hierarchies or inequality. Recognizing their relevance to historical inequality requires extensive knowledge of both ancient history and later artistic traditions. Moreover, AI-generated images inherently reflect and amplify the biases of their source material. Since much of the surviving ancient literature represents elite perspectives, these biases are embedded in the AI-generated reconstructions. Additionally, the training material – often in the form of historical paintings/ pictures – likely embodies the preconceptions of the artists at the time the originals were created. These images serve as starting points, which the AI modifies using the full range of textual connotations associated with the concepts it is prompted to generate, further compounding the layers of historical and cultural bias.