

Visual analysis of machine learning MOOC imagery

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For this report, I analysed visual imagery related to ‘machine learning’ courses. The scope of this exercise was limited to the ‘front pages’ of three Massive Open Online Courses (MOOCs) and the imagery placed there.

Process

I entered the term ‘machine learning’ into various MOOC website search engines, and selected three courses with images aligned to my research interests (algorithmic systems and agency) and which appeared to broadly relate to philosophical perspectives surrounding humans and technology. I acknowledge that the selection (and analysis) of these images was not a neutral process, and was informed by my pre-existing assumptions.

As my intention was to interpret general themes across all images, I took a thematic approach to analysis and coding through ‘across-case’ comparisons (Given 2008). As a framework for interpretation of visual materials, I took as a starting point Gillian Rose’s (2016: 25, fig. 2.2) visualisation of the intersections between sites and modalities (see Figure 1).

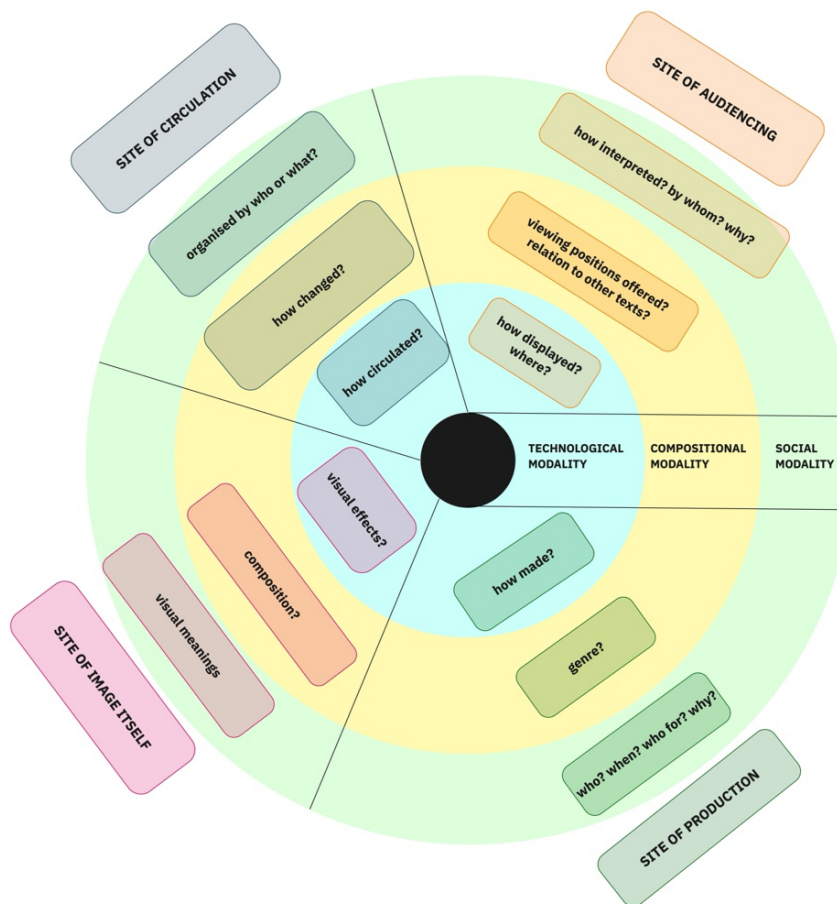


Figure 1: Sites and modalities for interpretation of visual materials. Reproduced from Rose (2016: 25, fig. 2.2).

I mapped out the process onto a [Miro board](#) (see Figure 2, [accessible online](#)) including the image selection and subsequent ‘reverse image search’, involving uploading the images to Google Images. While I acknowledge my entanglement with further (non-neutral) algorithmic systems during this stage, it provided further context as to where the image had been used; I was also able to appropriately attribute ‘stock’ imagery since, as Rose (2016: 37-38) points out, copyright law affects circulation. The images and screenshots were added to the [Miro board](#), with a copy of Figure 1 per image, and I added comments alongside different aspects holistically throughout.

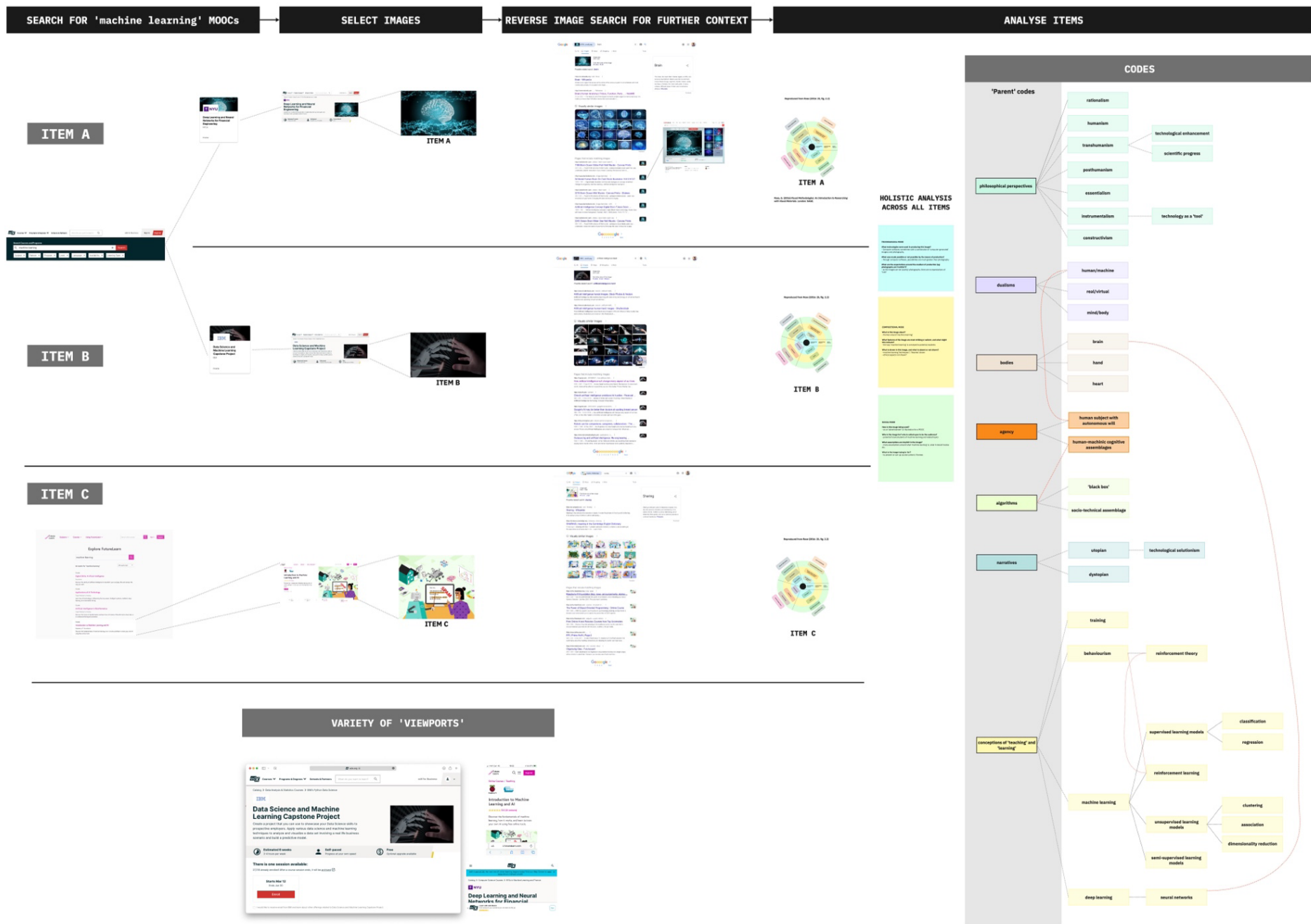
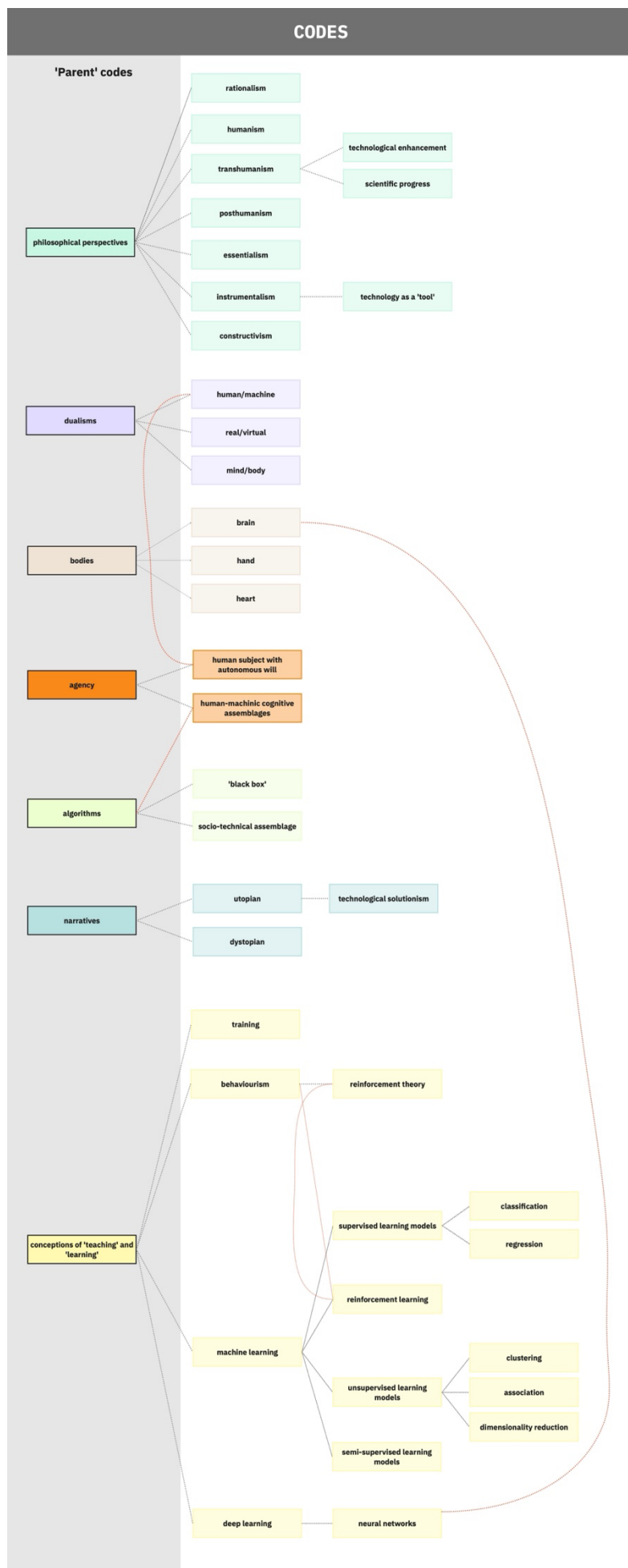


Figure 2: [Miro board](#) detailing process



Various themes emerged and were continually refined throughout the process, which I mapped out under the ['Codes' section](#) (Figure 3). These came from the images themselves, and from theoretical concepts related to education and technology.

A hierarchical structure was used, although I was aware of connections between codes under different 'parents'. I visualised these with *red lines* on Miro, however limitations of Dedoose shaped my decision to maintain this hierarchical structure while adding multiple codes to images. I added codes and memos in Dedoose to guide my analysis, which I discuss next.

Figure 3: Coding structure on [Miro board](#)

Results and discussion

Taking as a point of departure Rose's (2016: 23) assertion that 'visual imagery is never innocent; it is always constructed through various practices, technologies and knowledges', I will interpret each item in turn, and then continue with further across-case analysis.

Item A



Figure 4a: Image from [Deep Learning and Neural Networks for Financial Engineering \(edX\)](#), New York University. Original source: [Shutterstock \(Pdusit\)](#).

Item A (Figure 4a), a stock image, is apparently a composite image of illustrations depicting a human brain, inside and outside of which propagate 'neural networks' – a subfield of 'deep learning' mimicking the human brain's biological neurons (IBM Cloud Education: n.d. a; b). The implication here appears to be that the human brain can, or should, be mimicked, a distinctly humanist approach to learning which also reaffirms the dualism that 'mind' and 'body' are separated.

Item B



Figure 4b: Image from [Data Science and Machine Learning Capstone Project \(edX\)](#), IBM. Original source: Shutterstock (no longer hosted there).

Item B (Figure 4b), another stock image, appears again to be a composite combining a photograph of a ‘human’ hand reaching towards the ‘equivalent’ hand of a ‘machine’, mirrored in gesture through a ‘forcefield’. The ‘human’ and ‘machine’ interacting – yet irrevocably separated – reaffirms ‘human’/‘machine’ and ‘real’/‘virtual’ dualisms and the ‘boundaries of the autonomous subject’ questioned by Hayles (1999: 2). Moreover, the image conveys a (trans)humanistic perspective on agency, whereby humans retain autonomous will, and where the ‘equivalent’ machine might offer ‘enhanced’ decision-making.

Item C



Figure 4c: This image was created by the Raspberry Pi Foundation for [Introduction to Machine Learning and AI \(FutureLearn course\)](#) (also by National Centre for Computing Education) and is licensed under the [Open Government Licence v3.0](#).

The illustrated characters and objects in Item C (Figure 4c) represent different ‘machine learning’ topics. The playful cartoon-style genre of illustration, and smiling faces, infer utopianism, although cultural references to *Frankenstein* (Shelley 1818) and the ‘heartless’ Tin Man from *The Wizard of Oz* (Fleming 1939) hint at other narratives.

The question marks and checklists surrounding the ‘self-driving’ robot figure suggest an underlying technological solutionist ideology (Morozov 2013) where ‘problems’ are ‘solved’. ‘Neural networks’ are again represented through ‘brain’ imagery, while the (distinct) robot and ‘human’ characters at the forefront (depicting ‘supervised learning’) reaffirm the ‘human’/‘machine’ dualism.

The noughts and crosses board represents an example of ‘reinforcement learning’ – a technique where an algorithm is ‘trained’ to ‘behave rationally’ by rewarding ‘optimal’ behaviours (Tim Jones 2017), in this case ‘winning’ the game – which is rooted in behavioural psychology (Knox et al. 2020: 32).

Across-case comparison

Media	Codes																																															
	agency	human subject with autonomous	human-machinic cognitive	algorithms	'black box'	socio-technical assemblage	bodies	brain	hand	heart	conceptions of 'teaching' and	behaviourism	reinforcement theory	deep learning	neural networks	machine learning	reinforcement learning	semi-supervised learning	supervised learning models	classification	regression	unsupervised learning models	association	clustering	dimensionality reduction	training	dualisms	human/machine	mind/body	real/virtual	narratives	dystopian	utopian	technological solutionism	philosophical perspectives	constructivism	essentialism	humanism	instrumentalism	technology as a 'tool'	posthumanism	rationalism	transhumanism	scientific progress	technological enhancement	Totals		
Item A: Deep Learning and Neural								1						1	2													1	1	1								1					1	1	1	1	11	
Item B: Data Science and Machine		1							3							1												1	1		1				2			1					1	1	1	1	14	
Item C: Introduction to Machine		1		1	1			2		1		1	1		1	2	2		4	2	1	1		1		1	1	1	1	1	1		1	2	3					1	1	1		1				36
Totals		2		1	1			3	3	1		1	1	1	3	3	2		4	2	1	1		1		1	3	3	2	2		1	4	3				2	1	1		1	2	2	2			

Figure 5: Presence of codes across items (Dedoose).

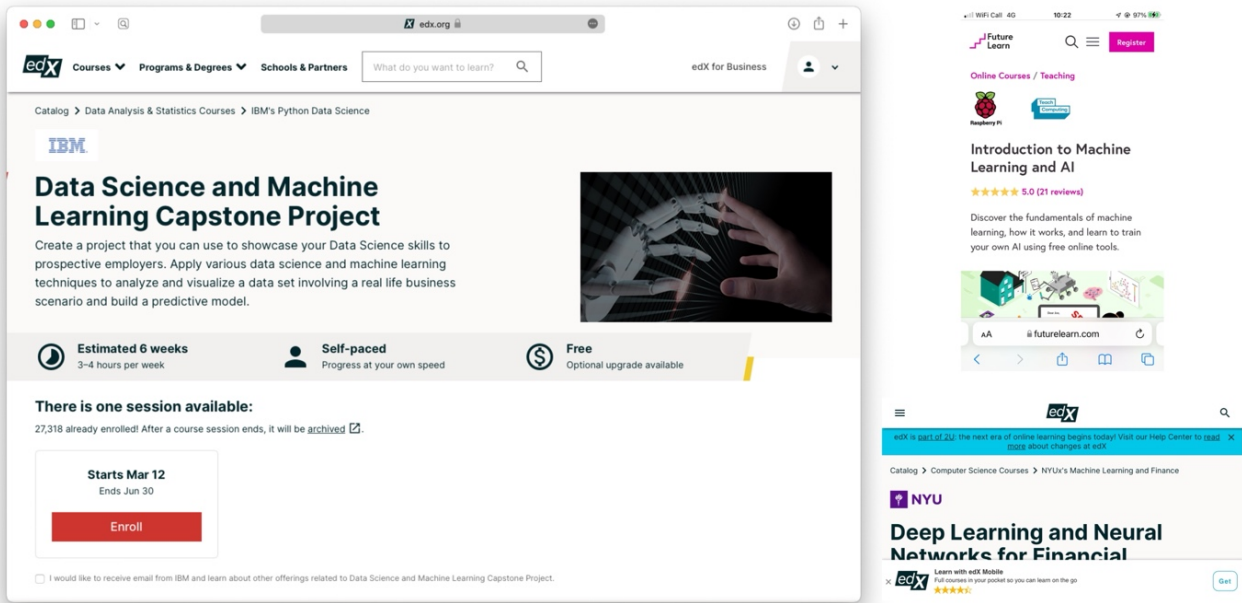


Figure 6: Interfaces ‘responding’ to different ‘viewport’ sizes.

The coding results shown in Figure 5 demonstrate that all items arguably privilege specific philosophical perspectives, such as (trans)humanism and rationalism, and reaffirm ‘human’/‘machine’, ‘mind’/‘body’ and ‘real’/‘virtual’ dualisms. Furthermore, ideas rooted in behavioural psychology are made visible, while blinding the viewer to conceptions of learning and agency suggesting ‘human-machinic cognitive relations’ (Amoore 2019: 7), ‘cognitive assemblages’ (Hayles 2017) or entangled ‘intra-relations’ (Barad 2007).

Reflecting on the “compositional” function of the interface as image’ (Bayne 2008: 397), Figure 6 shows the ‘viewports’ (visible areas) of the MOOC websites although, as Kress and van Leeuwen (1996: 222) argue, these are semiotic spaces rather than a (transparent) ‘window on the world’. Through ‘responsive web design’ (Marcotte 2010), they ‘respond’ to available screen space by altering their design, resulting in a myriad of possible layouts determining the (in)visibility of imagery.

Conclusions

My exploration into visual analysis was limited in scope, as is the breadth of my conclusions, however several key themes have emerged. Visual imagery is not innocent (Rose 2016: 23) nor neutral, and the images reaffirm ideas rooted in specific worldviews including rationalism and (trans)humanism, and from behavioural psychology. Meanwhile, conceptions of learning and agency which question underlying dualistic frameworks established in traditional Western philosophy are made invisible through what is *not* shown. Furthermore, the spatial organisation of the (responsive) interfaces constructs meaning through an intersection of sites and modalities (ibid.: 25-26) – the technological devices ‘circulating’ and ‘interpreting’ these websites, the compositional function of the ‘responsive’ interfaces and the wider social context through which all these aspects take place.

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Word count (excluding footnotes and endnotes): 1,063