THE DIAGRAMS OF AI (IMAGE)

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A history of images about images is as mesmerising in its own right as images themselves are. This is not merely a history of the copy—the attempt to reproduce an image through an image—but also of the various guides and diagrams that tell a story of production of images. This is also the entry point for my argument about the changing ontology of the image.

This argument about ontology concerns then not merely what an image is in its essence, but how images function as as operative ontologies[1]: described, drawn, pictured, instructed, guided, and diagrammed into existence. Such diagrams are an educational arm of knowledge about images, but obviously they are also images already in themselves.

Diagrams occupy a central role as a modern form of knowledge about images. Diagrams that describe the operations and insights of image geometry are a special case in point, where the linear perspective in (and since) the Renaissance period has given rise to a long line of commentary, in the art-historical way of tracking the changing ontologies of the image. How to calculate image surfaces, lines, and ratios becomes instrumentalised into a productive machinery and subsequently into an analytical machinery, as is the case in the various techniques of reading the geometric data packed into an image. From Johan Heinrich Lambert's *Die freye Perspective, oder Anweisung Jeden Perspektivischen Aufriß Von Freyen Stücken Und Ohne Grundriß Zu Verfertigen* (1759) to Colonel Aimé Laussedat's works on photogrammetry (or "metrophotography") toward the latter part of the 19th century, the work of descriptive geometry becomes crucial to the diagram of the technical image and image as data.[2] They are manuals of "this is how that operates" and take on a second order quality themselves: a cultural technique that recursively images an image. One can also observe a similarity with the function of the metapicture, as per WJT Mitchell's term that refers to such images that "might be capable of reflection on themselves, capable of providing a second-order discourse that tells us—or at least shows us—something about pictures."[3]

In terms of the contemporary image, the shift from questions on the ontology of digital images (do they capture reality? Do

they fabricate reality? Do they simulate it?) to the centrality of image as data, as well as the image classification and preparation pipeline, is significant and exhibits analogous relation to the diagram. While AI and machine vision are often described in terms of "invisibility" (as Trevor Paglen or Hito Steyerl in their different ways have proposed) or "invisuality,"[4] the images about AI imaging are inscribed as diagrams. Or, even more precisely: the diagrams describe how the invisible image is made visible.

According to John Bender and Michael Marrinan's history of the diagram (that for them starts with the 18th-century *Encyclopedia* by Diderot and D'Alembert): "A diagram is a proliferation of manifestly selective packets of dissimilar data correlated in an explicitly process-oriented array that has some of the attributes of a representation but is situated in the world like an object."[5] Diagrams are process-oriented and relational, and particularly well suited to the task of describing material ontologies of engineering and technical construction (including that of images).

The diagrams that populate various contemporary papers and publications about machine learning and image processing (and datasets) are *found images*. These images form the backbone of a different set of "experimental images" than the found images of 20th century avant-garde. They emerge in the technical grey literature (even an informational genre perhaps) that populates ML as its theoretical-administrative backbone, while articulating what images are and how they operate. **(Fig. 1)**

These are the diagrams that describe what has happened to images (and image collections in their millions) as they are pushed through the pipeline of dataset production, ML algorithms, and creation of models from training data. Diagrams show what happens to images in different machine learning techniques— how convolutional networks or deep image reconstruction works. The diagrams do not mimic but demonstrate an operation of an image.[6] Quoting Rosemary Lee, we can argue that this is a "form of visual literacy in which assessments of images exceeds their visible attributes and entails the consideration of how a knowledge of the technical processes behind images adds to the way they are understood."[7]

To double up the take on diagrams and the AI image, the former also feature as critical visual techniques through which the distributed infrastructure and labour of the AI image becomes visible. For example, Vladan Joler's visual design on the Anatomy of an AI System in collaboration with Kate Crawford (anatomyof.ai)
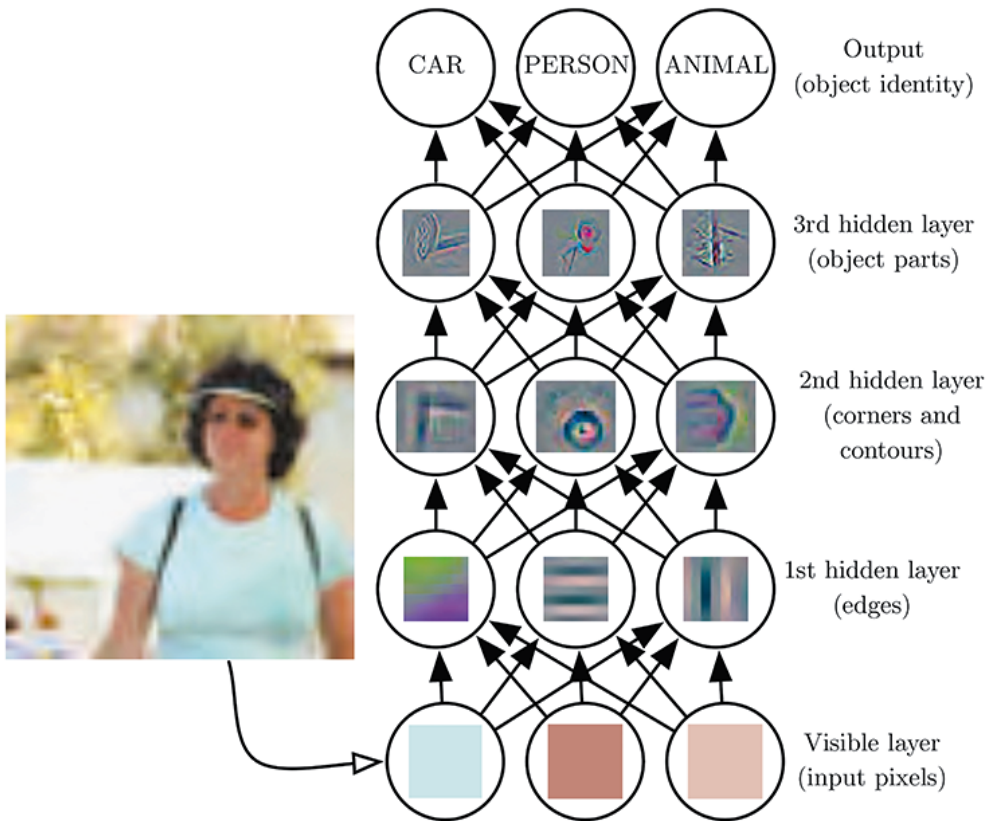
Fig. 1
An image of a deep learning model as diagrammed in Goodfellow, Bengio and Courville's *Deep Learning*.[8]

as well as similar collaboration on the Nooscope with Matteo Pasquinelli (nooscope.ai) stand out as exemplary. Also, David Benqué's creative work on speculative diagramming (Institute of Diagram Studies) addresses contemporary algorithmic culture.[9]

Thus, to reinstate the point: considering the massive scale of the contemporary image as it features in AI techniques and planetary infrastructures, the diagrammatic visualisation presents both the transformation (of ontology) of technical images and is itself an image in that very same mix. Diagrams recursively help to understand the operations of images, while simultaneously featuring as prominent epistemic images across different institutional uses.

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1   Sybille Krämer, "Die Rettung des Ontologischen durch das Ontische? Ein Kommentar zu 'operativen Ontologien," *Zeitschrift für Medien – und Kulturforschung* 8 no. 2 (2017): 125-141.

2   Cf. Friedrich Kittler, *Optical Media: Berlin Lectures 1999*, trans. Anthony Enns. (Cambridge: Polity 2010), 94.

3   WJT Mitchell, *Picture Theory: Essays on Verbal and Visual Representation* (Chicago: University of Chicago Press 1994), 38.

4   Adrian Mackenzie and Anna Munster, "Platform Seeing: Image Ensembles and Their Invisualities" in *Theory, Culture & Society*, 36 no. 5 (2019): 3-22.

5   John Bender and Michael Marrinan, *The Culture of the Diagram*. (Stanford, CA: Stanford University Press 2010), 7.

6   See also Rebecca Uliasz, "Seeing like an algorithm: operative images and emergent subjects" in *AI & Society*, 2020, https://doi.org/10.1007/s00146-020-01067-y.

7   Rosemary Lee, *Machine Learning and Notions of the Image*, PhD Thesis, Center for Computer Games Research Department of Digital Design IT – University of Copenhagen 2020, 138.

8   Ian Goodfellow, Yoshua Bengio, and Aaron Courville, *Deep Learning*. (Cambridge, MA: The MIT Press 2016), 6.

9   See davidbenque.com.