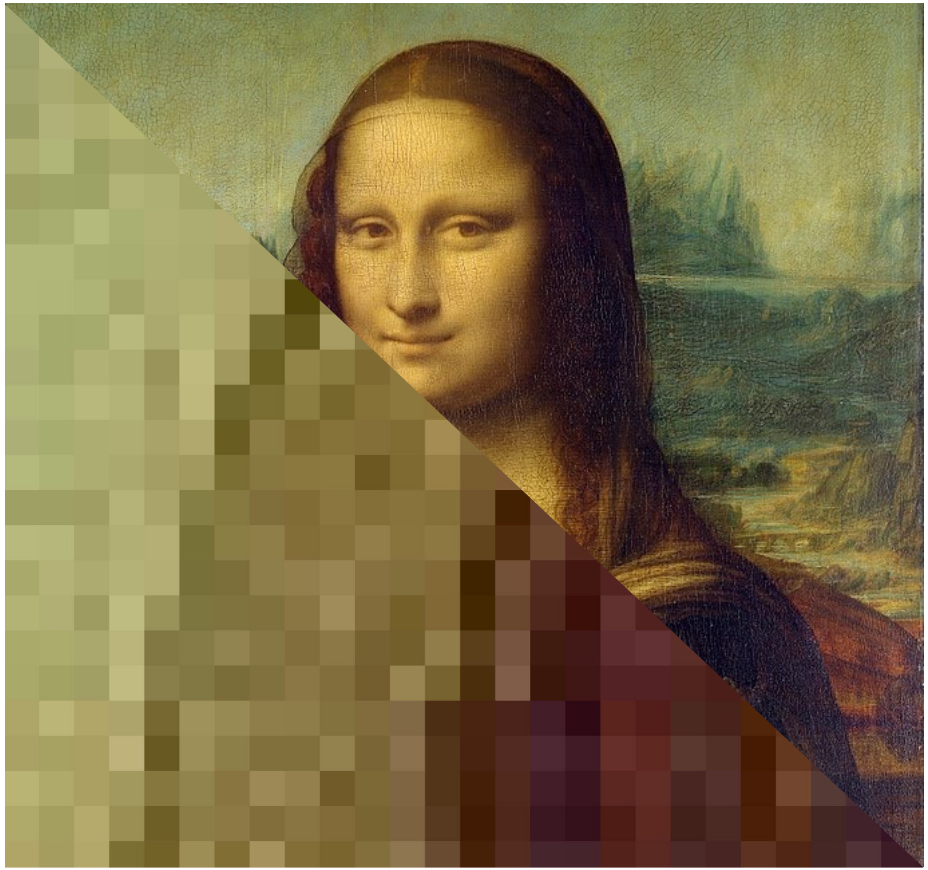
II. Digitisation and Data Management

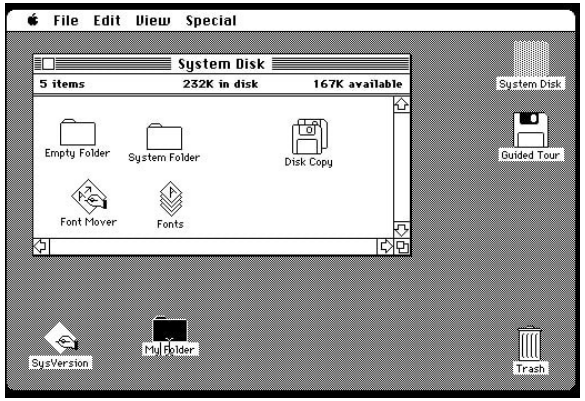
3. The Digital Image

Prof. Dr. Martin Langner

Schreibman / Siemens / Unsworth (2016) Kap. 17;
Jannidis / Kohle / Rehbein (2017) Kap. 12
Schröter, Jens: Digitales Bild, in: Jörg R.J. Schirra u.a. (Hg.): Glossar der Bildphilosophie, http://www.gib.uni-tuebingen.de/netzwerk/glossar/index.php?title=Digitales_Bild).



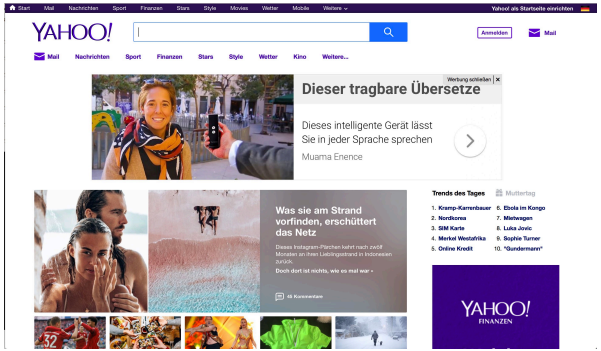
GRAPHIC USER INTERFACE, OPERATING SYSTEMS

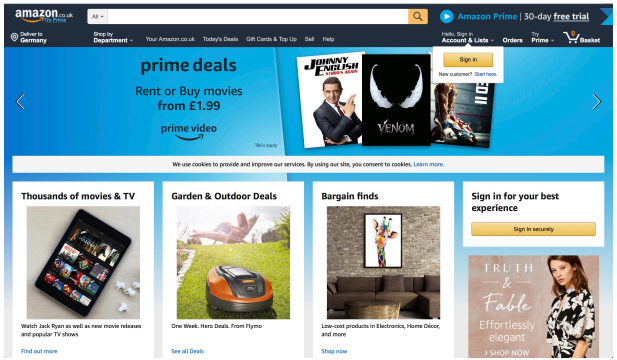


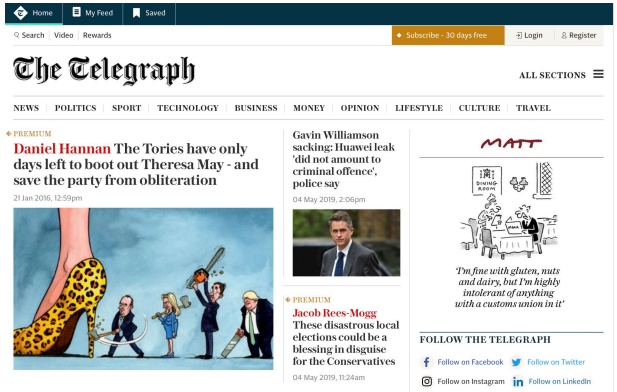
Macintosh System 1 (1984)
Windows 3.1 (1985)

MacOS 10.12 (2016)
Windows 10 (2015)

PICTORIAL / ICONIC TURN: WEBSITES







Yahoo 1995
Yahoo 2019

Amazon 1995
Amazon 2019

The Telegraph 1995
The Telegraph 2019

Iconic Turn: Social communication becomes visual

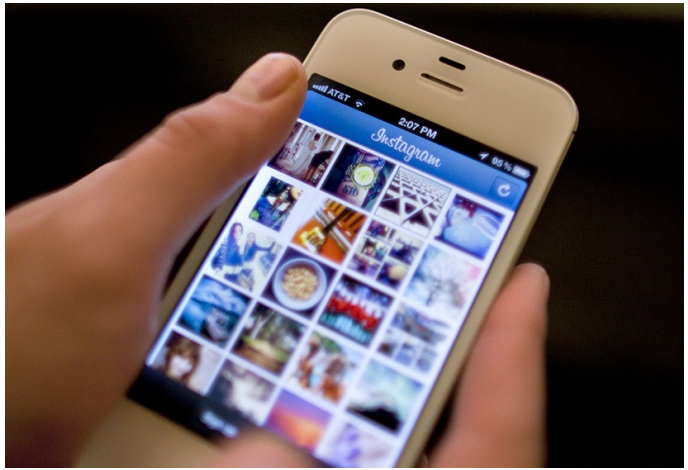
- Letterpress printing
- Copperplate engraving
- Photography and film
- Digital Photography

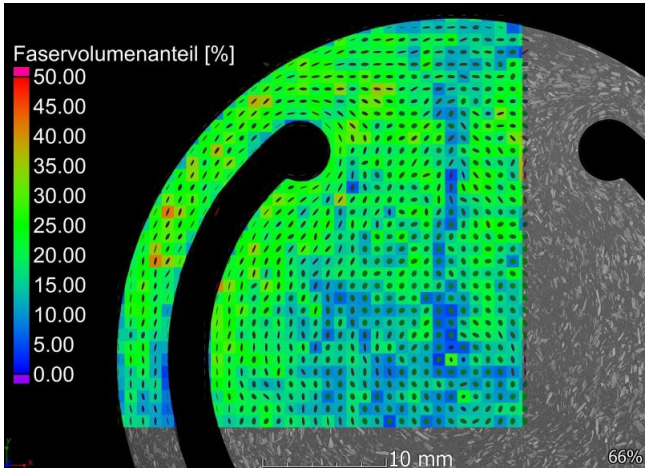
Albrecht Dürer, Ritter, Tod und Teufel (1513);
Hermann Krone, Selbstporträt mit Teilen seiner Ausrüstung (1858)

Ariane Mensger (ed.), *Déjà-vu? Die Kunst der Wiederholung von Dürer bis YouTube*, Ausst. Karlsruhe (Bielefeld, 2012)

„In general, images cannot be true or false because they have no unequivocal predicate to which truth or falsehood can be related. Images produce evidence.“

Increase of visually presented statements in social and scientific discussions and their fluidity

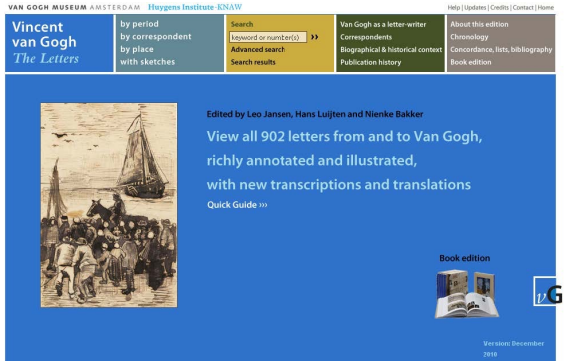




Renate Brosch, *Bilderflut und Bildverstehen. Neue Wege der Kulturwissenschaft*, Universität Stuttgart, Themenheft Forschung 4 (2007), 70–78 (https://www.uni-stuttgart.de/presse/archiv/themenheft/04/bilderflut.pdf)

Canonisation

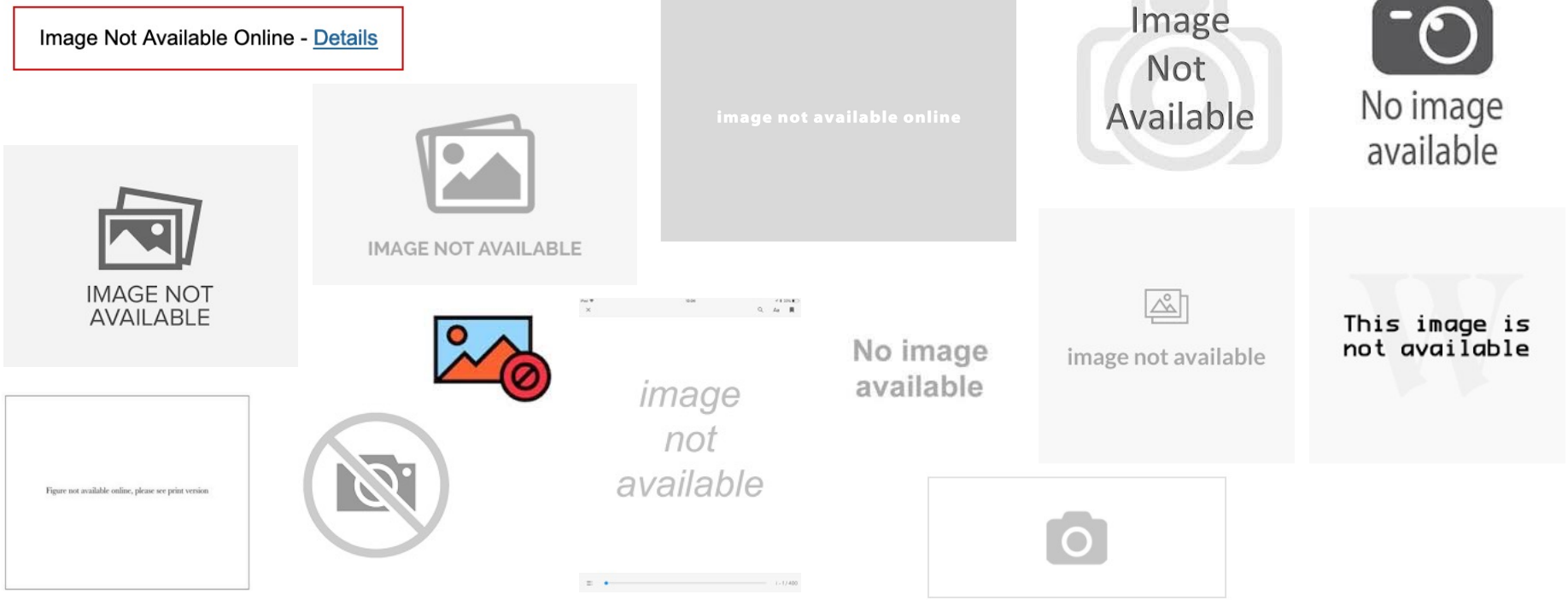
- Digitisation has mostly led to a further narrowing of the art canon in art historical and archaeological projects.



Rome Reborn (2007-2012) und das Rommodell im Museo della Civiltà Romana (1933-1971)

Margarete Pratschke, „Digitalität und Kunstgeschichte“, in: *Digitalität. Theorien und Praktiken des Digitalen in den Geisteswissenschaften*, Symposium in der Villa Vigoni, 26.-29.05.2016 (https://digigeist.hypotheses.org/99#more-99)

Image restrictions



Margarete Pratschke, „Digitalität und Kunstgeschichte“, in: *Digitalität. Theorien und Praktiken des Digitalen in den Geisteswissenschaften*, Symposium in der Villa Vigoni, 26.-29.05.2016 (https://digigeist.hypotheses.org/99#more-99)

1. FROM CODE TO IMAGE

a) Pixel and vector graphics

b) Image size, resolution

c) Colour depth and colour space

d) Processing and storage

2. THE DIGITAL IMAGE

a) Image data: Definition

b) Properties of the Digital Image

c) The Digital Image as a Double Image

3. DIGITAL ACQUISITION

a) Text oriented

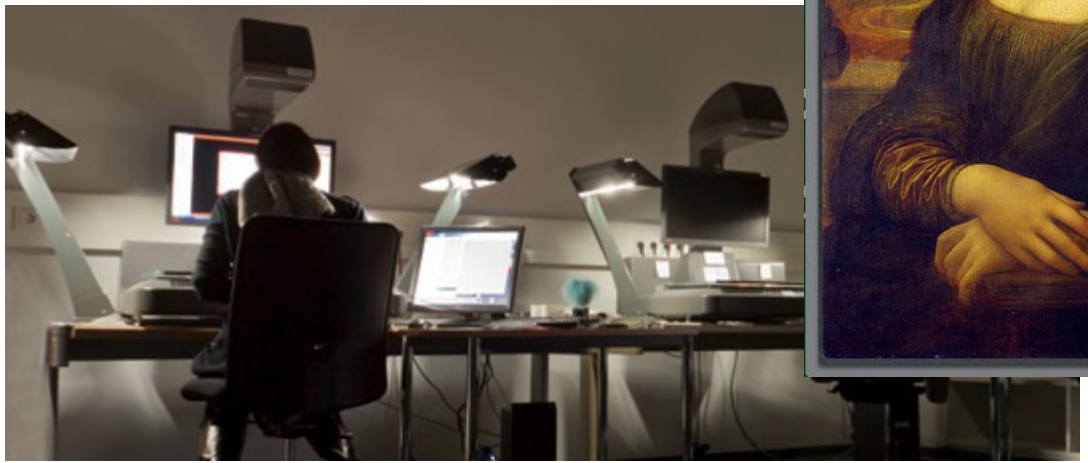
b) Image oriented

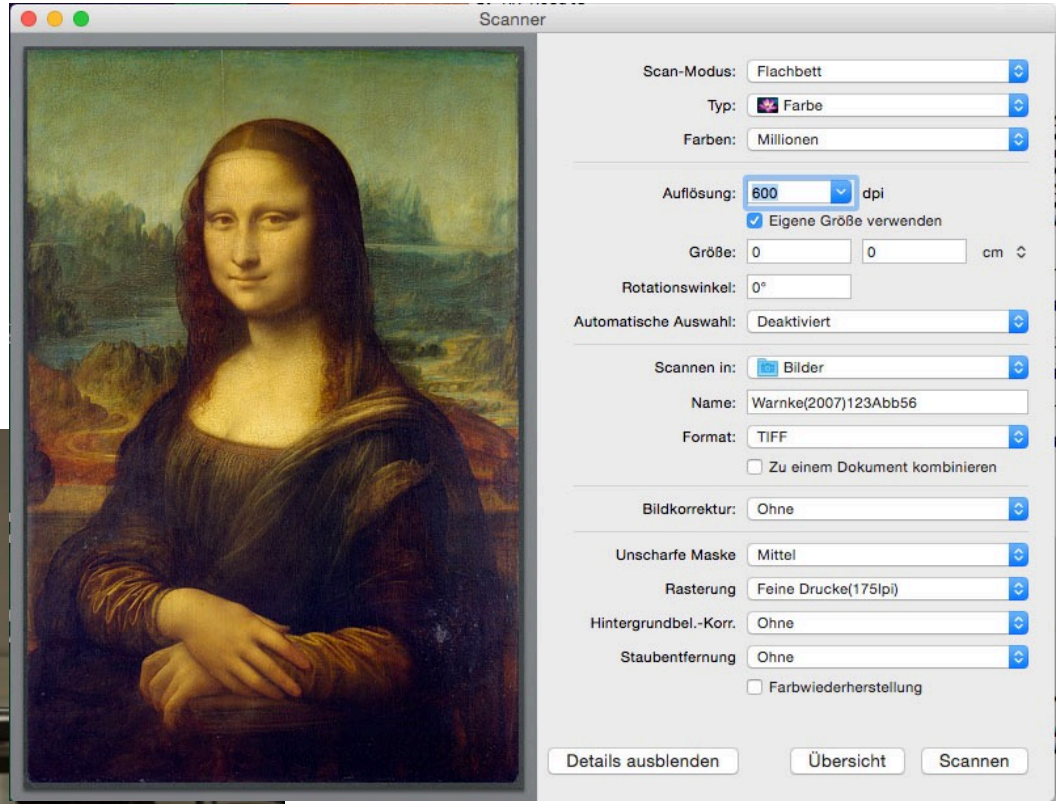
c) Annotation vs. Pattern Recognition

1. FROM CODE TO IMAGE

Scanner for photos and pictures from books

- Image capture device with light-sensitive sensors

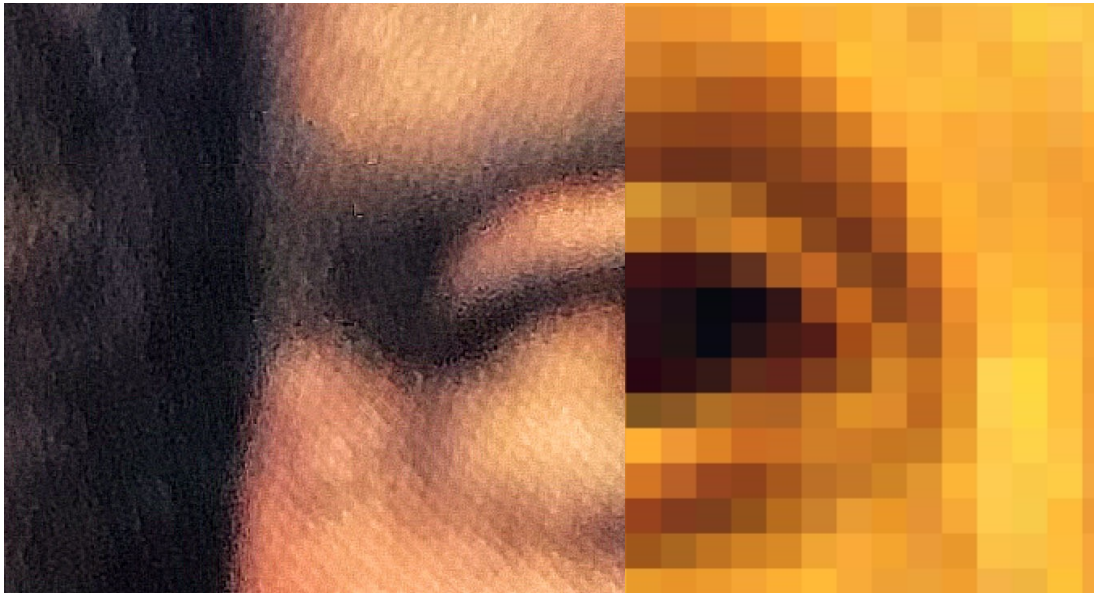


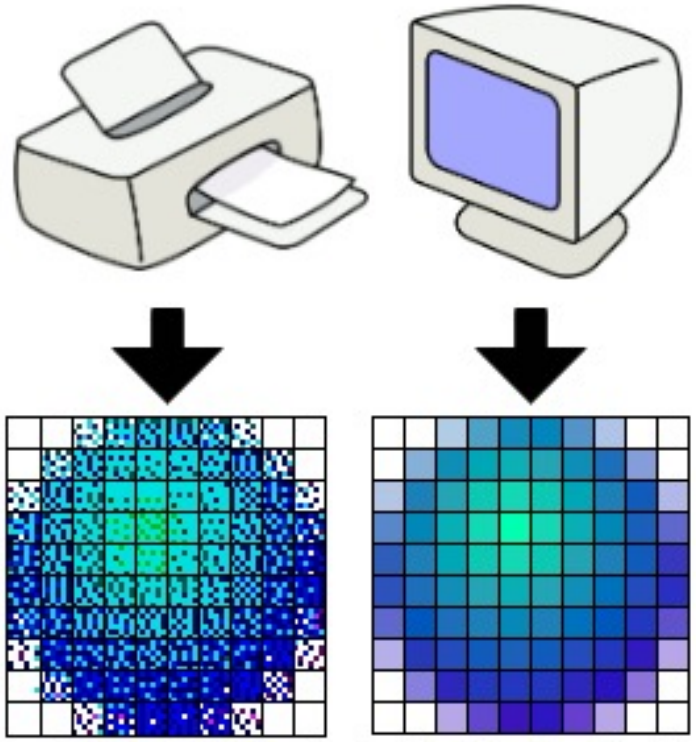


www.sub.uni-goettingen.de/kopieren-digitalisieren/goettinger-digitalisierungszentrum/

Raster graphic or Bitmap image

- consists of individual image points (picture elements = pixels).



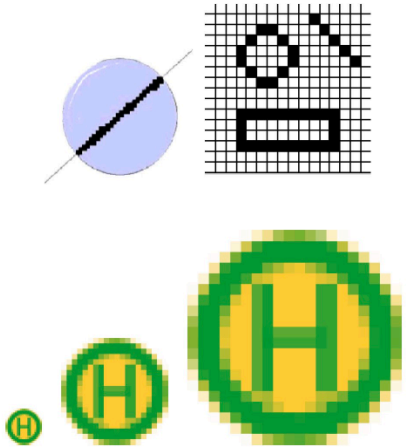


dpi (Dots per inch)

ppi (Pixel per inch)

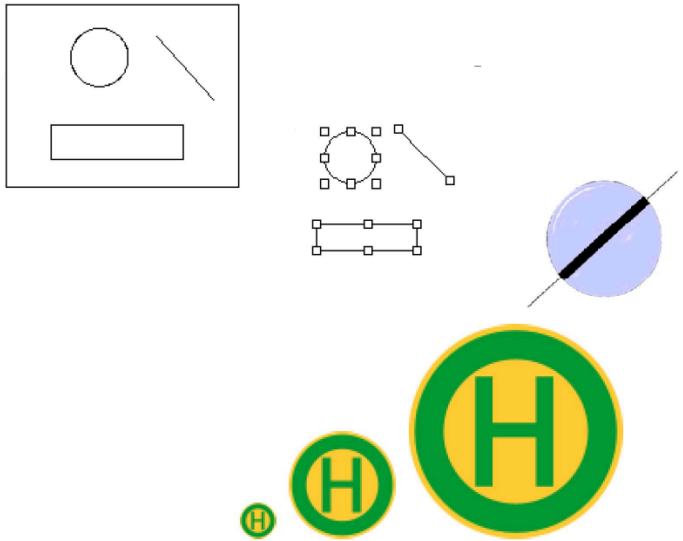
Bitmap images

- consists of individual image points (picture elements = pixels).
- Each point is stored in its position, colour value and brightness.



Vector graphics

- consists of individual lines
- can be scaled as desired without loss of quality

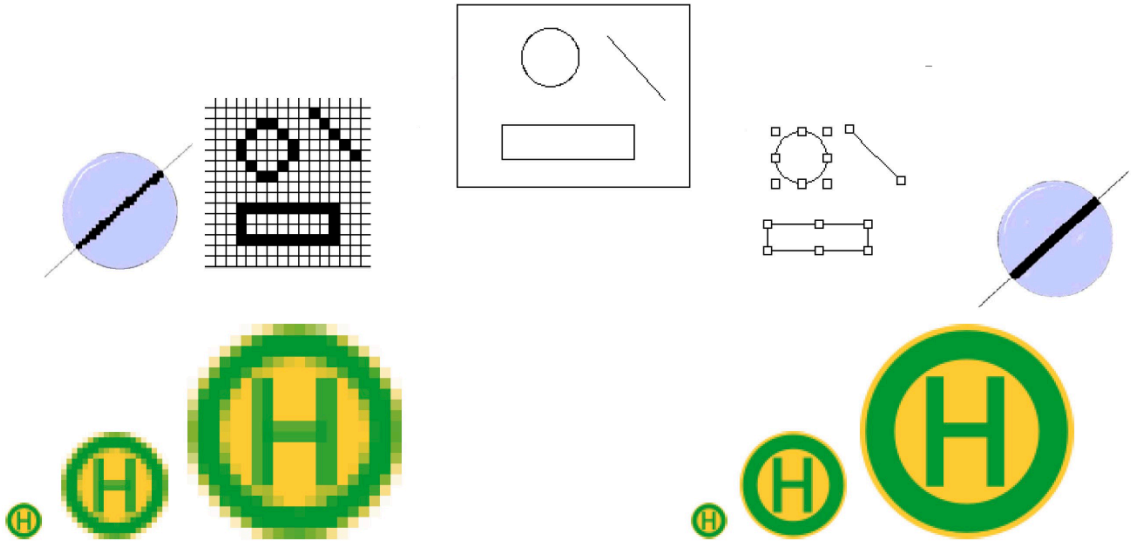


Bitmap images

Vectorisation

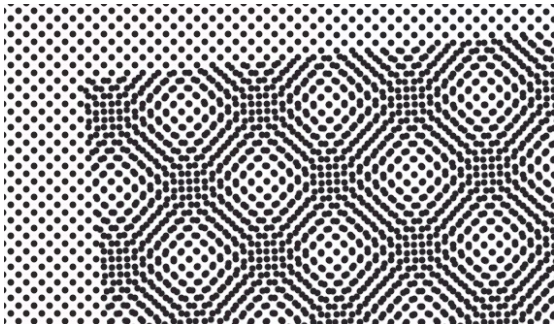
Rendering

Vector graphics

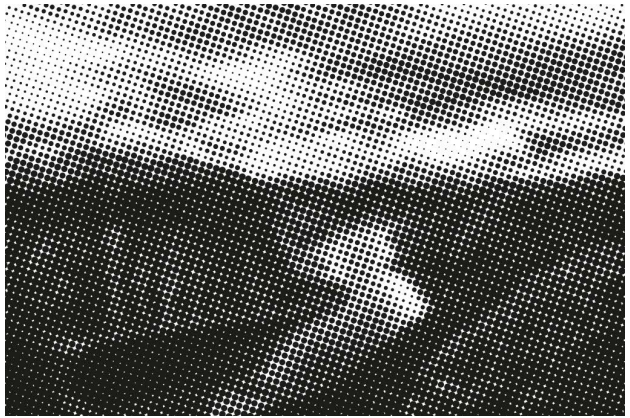


Rasterisation

Images are rasterised differently for display in print than on the screen. Therefore, Moiré effects tend to occur when scanning.



Moiré Effect



Amplitude-modulated rasterisation

Frequency-modulated rasterisation

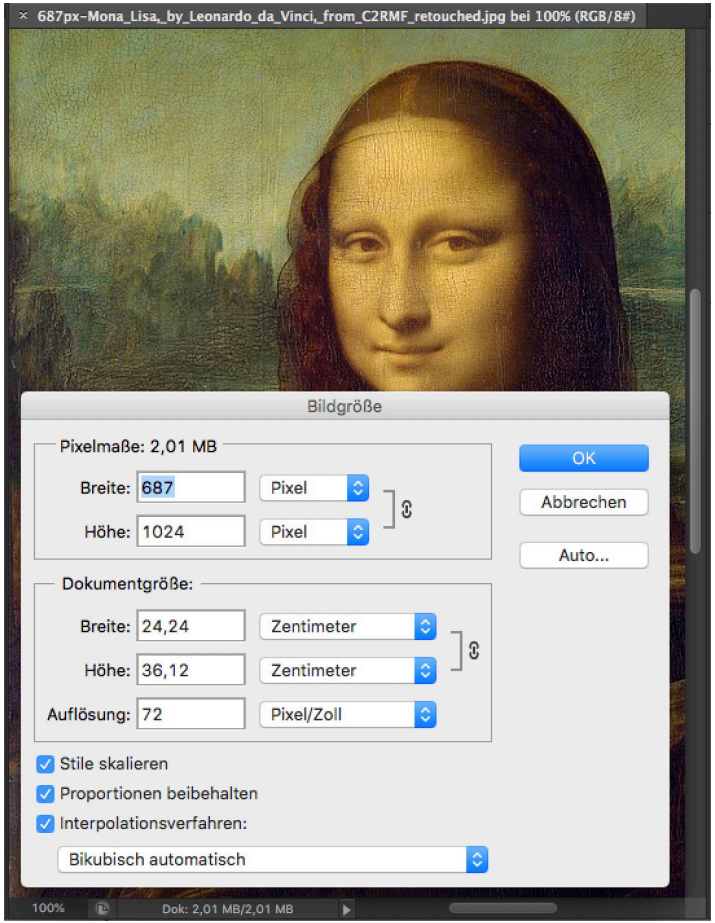


Image Size, Resolution

Raster screens are used as output devices for the digital image, which display the image as a raster of image points (pixels), each of which is assigned a color value.

Image size is the width × height in pixels, e.g. 600 × 900 px.

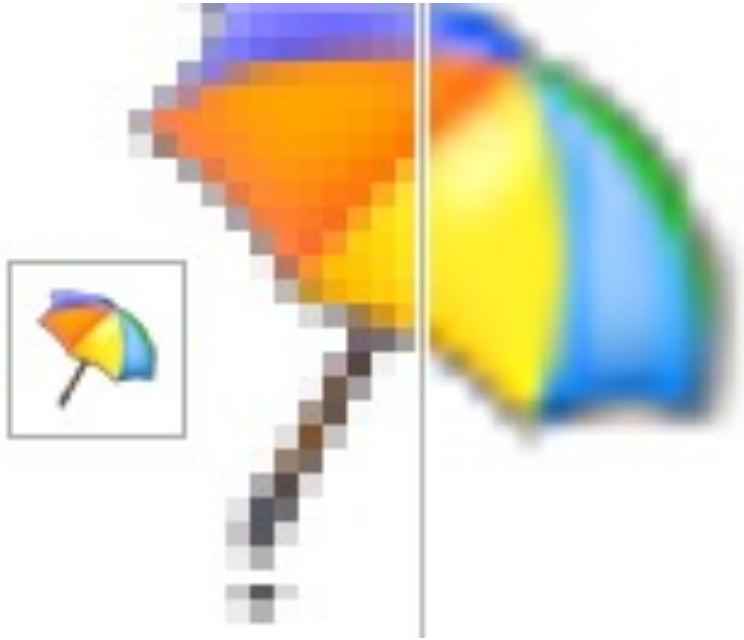
Monitors usually have a **resolution** of 72 pixels / inch (inch), but newer ones are significantly higher. 300 dpi (dots per inch) are mostly used for printing.

Dithering

- Optical help (simulation) for colour optimisation and scaling

Colours that do not exist are simulated by displaying a mixture of neighboring colours.

- "**Diffusion**" is the chosen dithering method. It scatters the pixels in a random pattern.



Colour depth

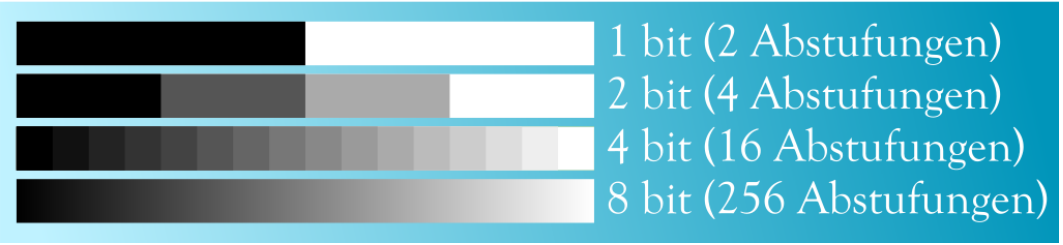
A pixel in a black-and-white graphic requires exactly one bit. If the bit is 1, the pixel becomes black, if it is 0, it remains white.

100 × 100 Pixel = 100 × 100 × 1 Bit = 10.000 Bit = 1250 Byte = 1,22 kByte.

Colour depth 8 Bit = 256 colours: 100 × 100 × 8 Bit = 80.000 Bit = 10.000 Byte = 9,76 kByte.

Colour depth 24 Bit= 16.777.216 colours: 100 × 100 × 24 Bit = 240.000 Bit = 30.000 Byte = 29,3 kByte.

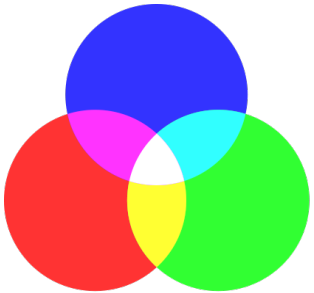
Colour depth in Bit	Number of colours per pixel	File size in byte
1	2	9.600
4	16	38.400
8	256	76.800
16	65.536	153.600
24	16.777.216	230.400
32	4.284.907.290	307.200



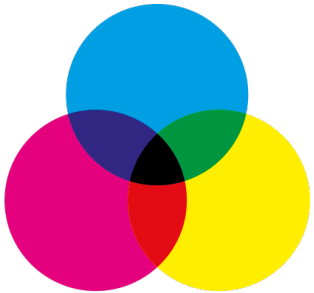
Farbraum

- **Physiological colour mixing (RGB):**

All colours of the colour wheel are created by mixing light, i.e. the wavelengths of the three primary colours red, green and blue are added (superimposed).



RGB



CMYK

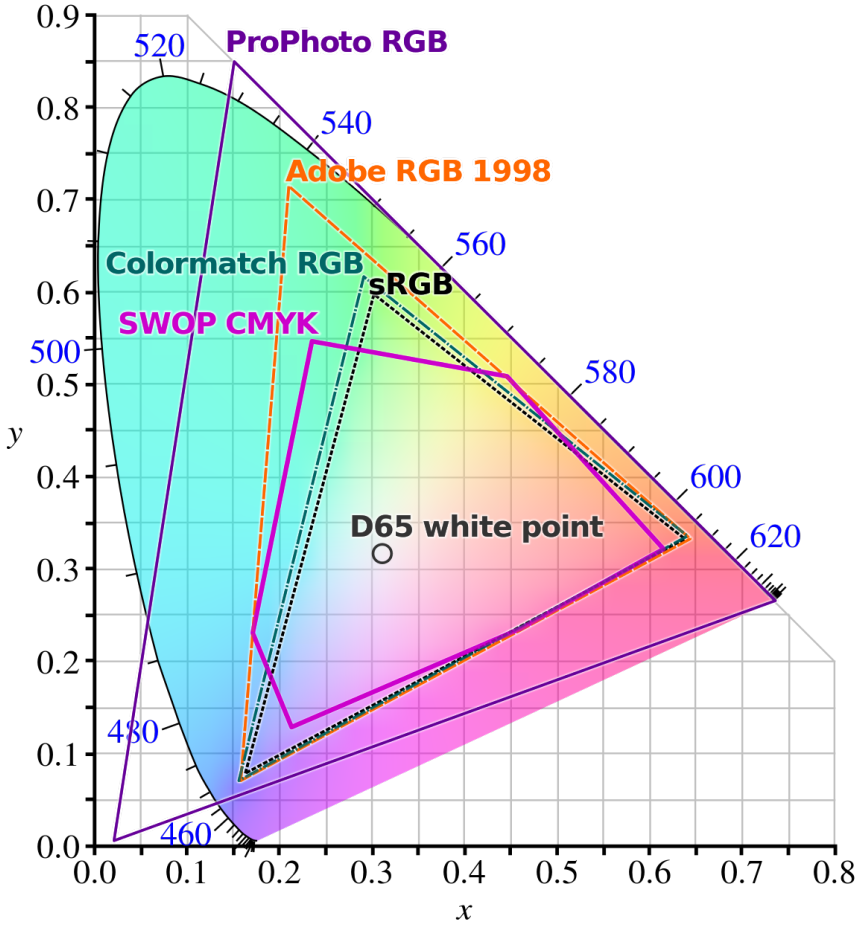
- **Physical colour mixing (CMYK):**

- Generative colour model that describes the technical mixing ratios of its four basic colours.
- describes the change of a colour stimulus when reflected on the surface of a body. With the help of three colour filters **cyan**, **magenta** and **yellow** connected in series, colours are not mixed, but a change in the light spectrum takes place, as a result of which only changed colours are seen.

Colour space

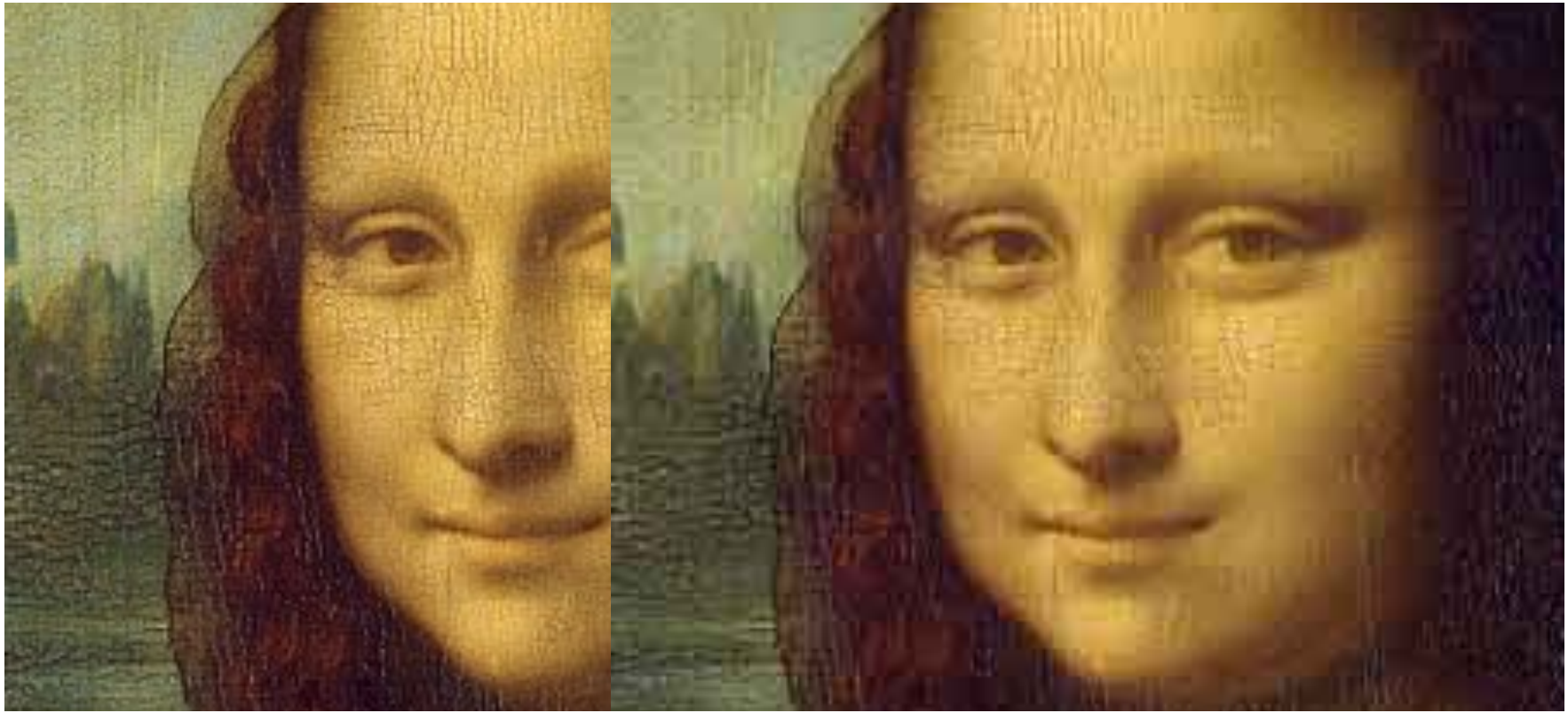
- The colour space of the human eye is larger than that of the screen display (RGB).

- In print (CMYK), not even half of the colours can be represented.
A scanned image therefore often looks different on screen than it does when printed..



https://en.wikipedia.org/wiki/Color_space

Komprimierung (Bsp.: JPEG Kompression)



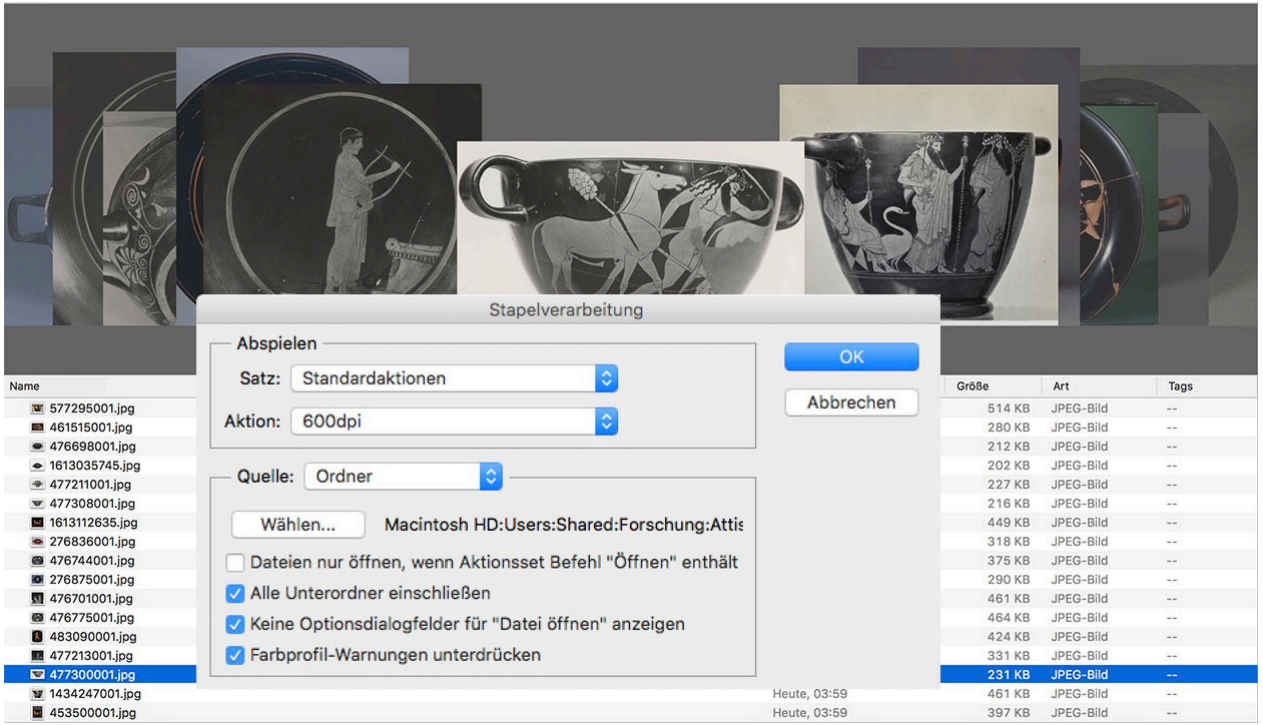
Typical image defects

1. Image noise (luminance noise, colour noise)
2. Chromatic aberration (colour fringing)
3. Spherical aberration (blurring)
4. Distortions (distortion / barrel and pincushion)
5. Geometric distortions (plunging lines)
6. Vignetting, image field curvature
7. Smearing/smear effect
8. Banding/streaking
9. Blooming
10. Rolling shutter effect
11. Moiré
12. JPEG artefacts
13. Dust

s. https://mediencommunity.de/system/files/06_Bildfehler_09042019_0.pdf

Automatic batch processing for similar process steps

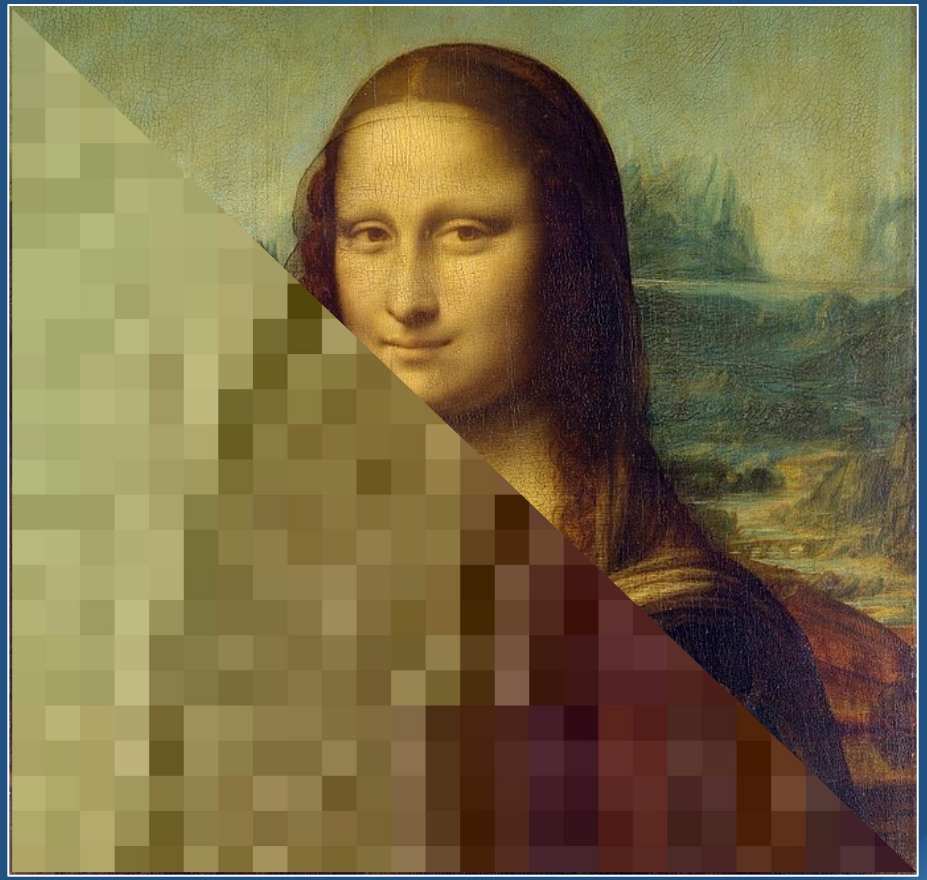
- Size
- Format
- Resolution
- Tags
- Metadata
- XMP etc.



Dateiformate

Suffix	.svg (Scalable Vector Graphic Format)	.png (Portable Network Graphics Format)	.jpg / .jpeg (Joint Photographic Experts Group)	.gif (Graphics Interchange Format)	.tif (Tagget Image File Format)
max. number of colours	24	281 Bio (48 bit)	256 (8-Bit)	256 (2-8 bit)	65.536 (16 bit)
Pixel/Vector	Vector	Pixel	Pixel	Pixel	Pixel
Cropping	yes	yes	no	yes	yes
Compression with loss?	no	yes	yes	yes	no
Animation	yes	no	no	yes	no

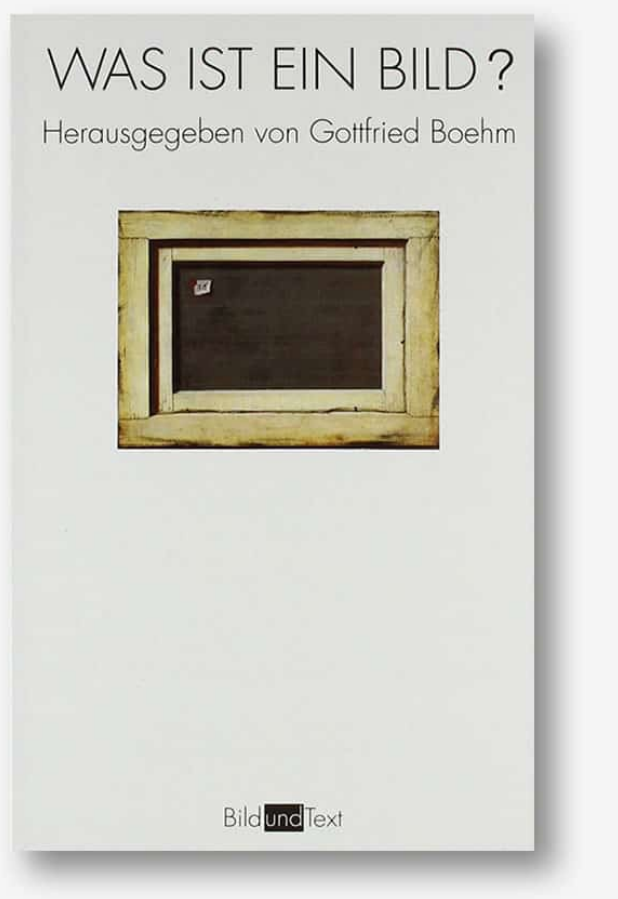
2. THE DIGITAL IMAGE



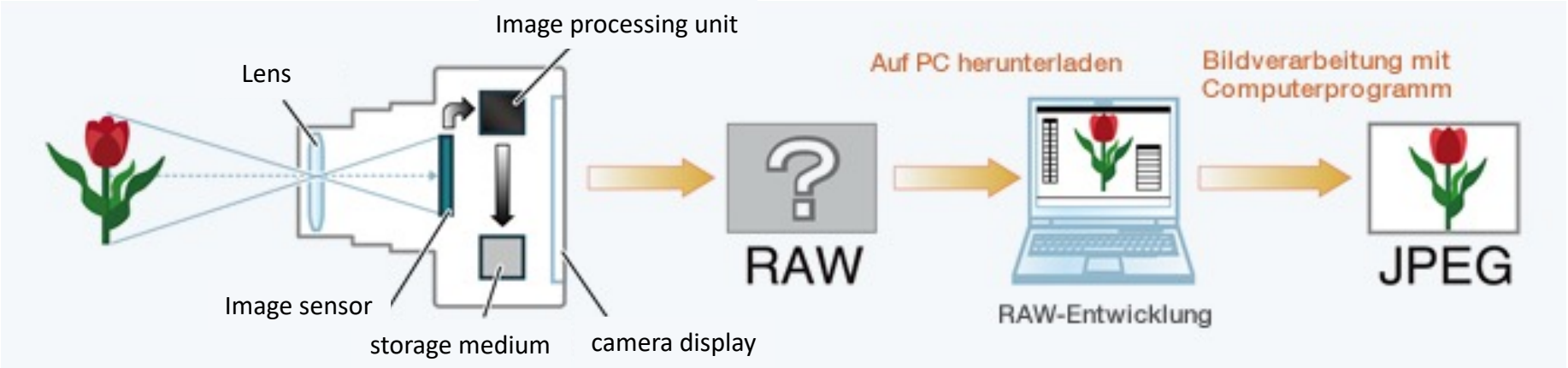
What exactly is an image?

„What we encounter as an image is based on a single basic contrast, that between a manageable total area and all that it includes in terms of internal events. The relationship between the vivid whole and what it contains in terms of individual determinations (of colour, form, figure etc.) has been optimised in some way by the artist“

Gottfried Boehm (ed.), *Was ist ein Bild?* (München: Fink, 1994)



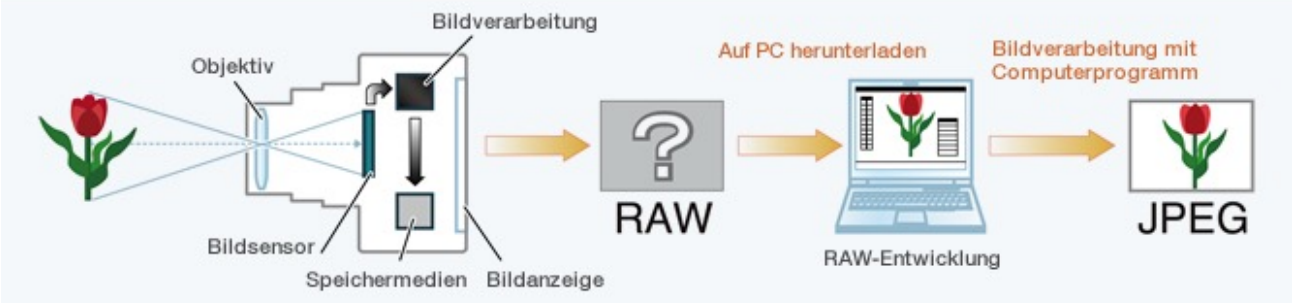
The Digital Image



Informations

- visualise ➔ Display or printer
- change ➔ Image editing software
- distribute ➔ email, internet, computer game etc.

The digital image



- is not existing

Claus Pias, „Das digitale Bild gibt es nicht. Über das (Nicht-) Wissen der Bilder und die informatische Illusion," in *Zeitenblicke* 2, no. 1 (2003), http://www.zeitenblicke.historicum.net/2003/01/pias/index.html

- is an image-like phenomenon with concrete properties created with digital code

Jens Schröter, „Digitales Bild," in *IMAGE* 25, Januar 2017, 89–106 (Erstabdruck 2013 in: Jörg R.J. Schirra u.a. (eds.): *Glossar der Bildphilosophie*, http://www.gib.uni-tuebingen.de/netzwerk/glossar/index.php?title=Digitales_Bild).

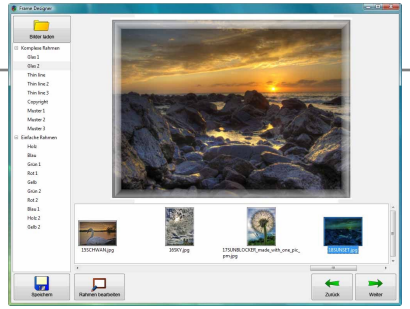
- Visual information

Harald Klinke, „Bildwissenschaft ohne Bildbegriff," in Harald Klinke und Lars Stamm (eds.), *Bilder der Gegenwart. Aspekte und Perspektiven des digitalen Wandels* (Göttingen, 2013) 11–28.

A universal concept of image

1. Information
2. Medium
3. Visual Phenomenon

Digital picture



1. colour information in bits
2. output on the display (variable brightness values of the RGB subpixel)

Painting

1. colour information in bound pigments.
2. image carrier (wood, canvas, etc.)

Photo

1. brightness information in silver nitrate molecules
2. image carrier (silver gelatine on paper)

Layer model of image science

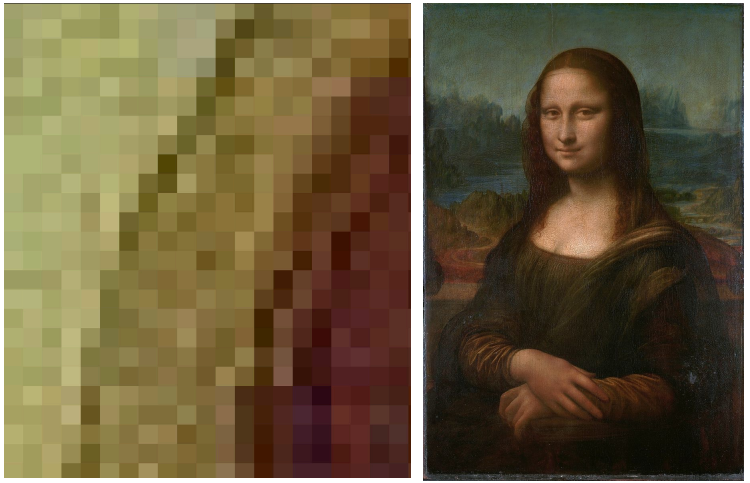
1. Information
2. Medium, media system
3. Visual Phenomenon
4. Object detection
5. Pre-iconographic description
6. Iconographic analysis
7. Iconological interpretation

Harald Klinke, „Bildwissenschaft ohne Bildbegriff,“ in Harald Klinke und Lars Stamm (eds.), *Bilder der Gegenwart. Aspekte und Perspektiven des digitalen Wandels* (Göttingen, 2013) 11–28.

File formats (structure of an image file)

Raster graphics

e.g. Windows Bitmap (BMP), Digital Negative (DNG), Graphics Interchange Format (GIF), JPEG File Interchange Format (JFIF), Portable network Graphics (PNG), Photoshop Document (PSD), RAW Graphics Format, Tagged Image File Format (TIFF)



Vector graphics

e.g. Adobe Illustrator (AI), Encapsulated PostScript (EPS), Windows Metafile (WMF), Windows Enhanced Metafile (EMF)

Annotated lists of file formats for images:

https://en.wikipedia.org/wiki/Image_file_formats

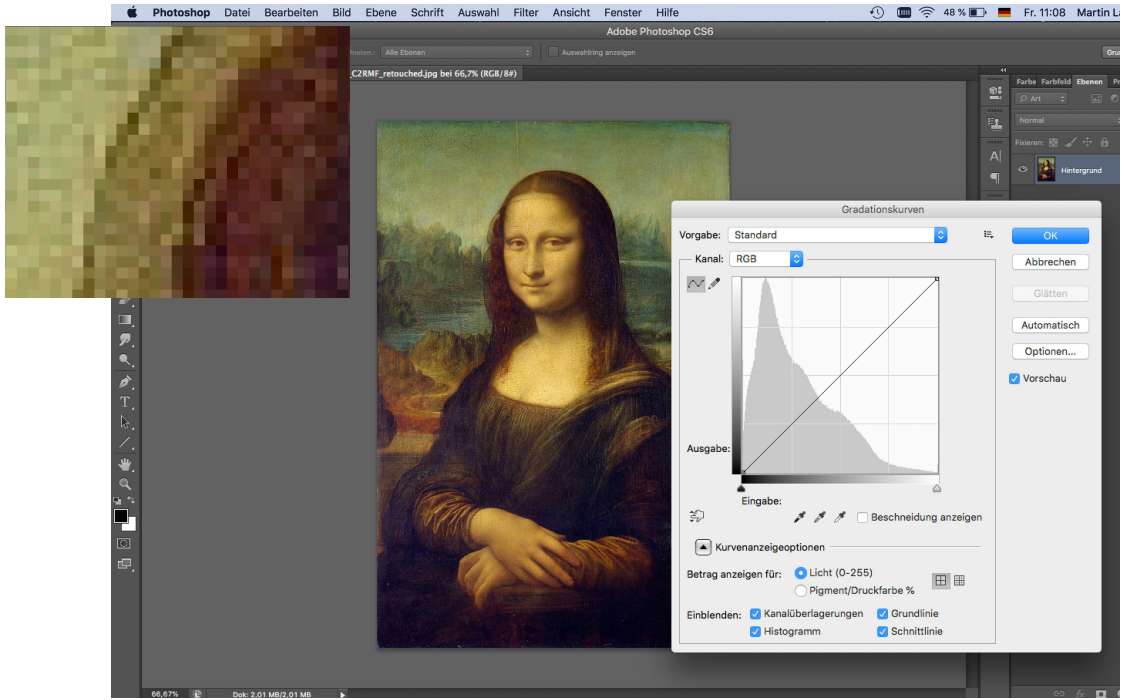
Structure of an image file

Metadata stored in the image file:

– Camera data (exposure time, aperture, etc.)
– Automatically generated information (date, shooting coordinates)
– Text fields for describing the image content

Granularity and addressability

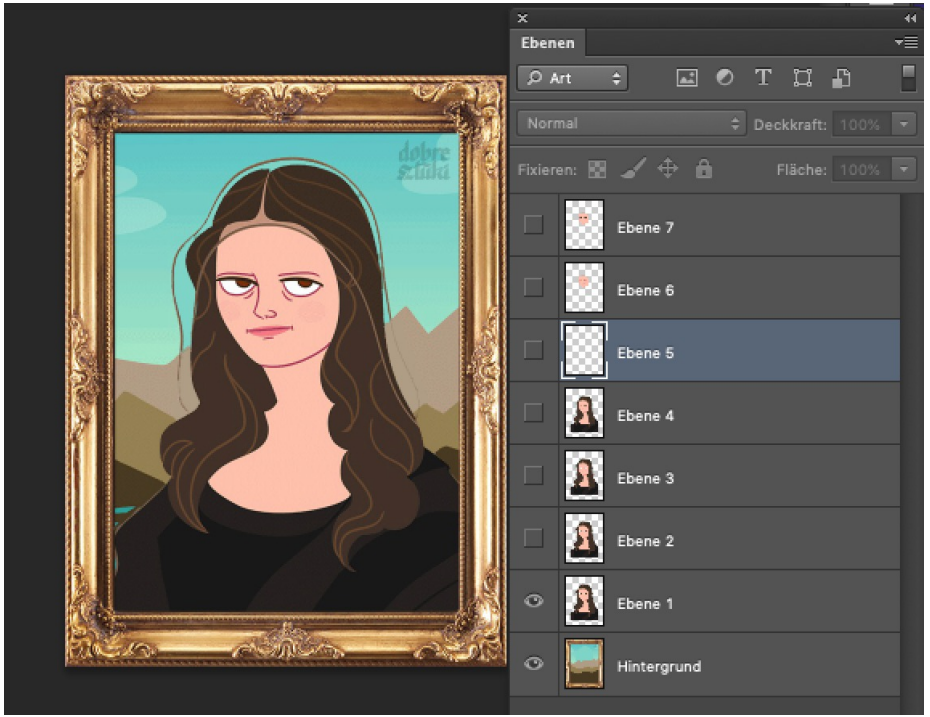
Pixel and gradation curves
≠ textually described illustration



Martin Warnke, „Digitale Schreibzeuge," in Hubertus Kohle (ed.): *Kunstgeschichte digital. Eine Einführung für Praktiker und Studierende* (Berlin, 1997)

Granularity and addressability

- Transparency
- Layers



www.behance.net/gallery/59879715/SET-OF-GIFS-3

Manipulability

- Colour corrections and distortions are possible without leaving traces

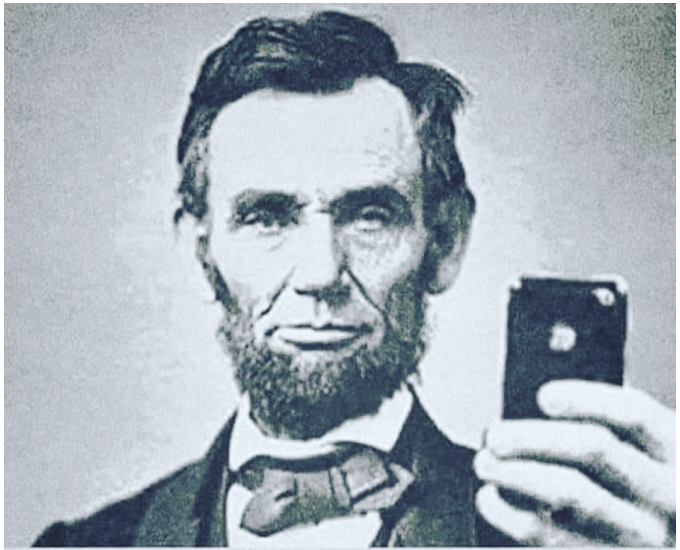
https://gizmodo.com/russian-state-tv-photoshops-an-awkward-smile-on-kim-jon-1826529277

www.buzzfeednews.com/article/davidmack/obama-fake-news-jordan-peele-psa-video-buzzfeed

Manipulability

- Colour corrections and distortions are possible without leaving traces

https://gizmodo.com/russian-state-tv-photoshops-an-awkward-smile-on-kim-jon-1826529277



A rare photo of President Abraham Lincoln with his iPhone that he won by sharing a post on Facebook.

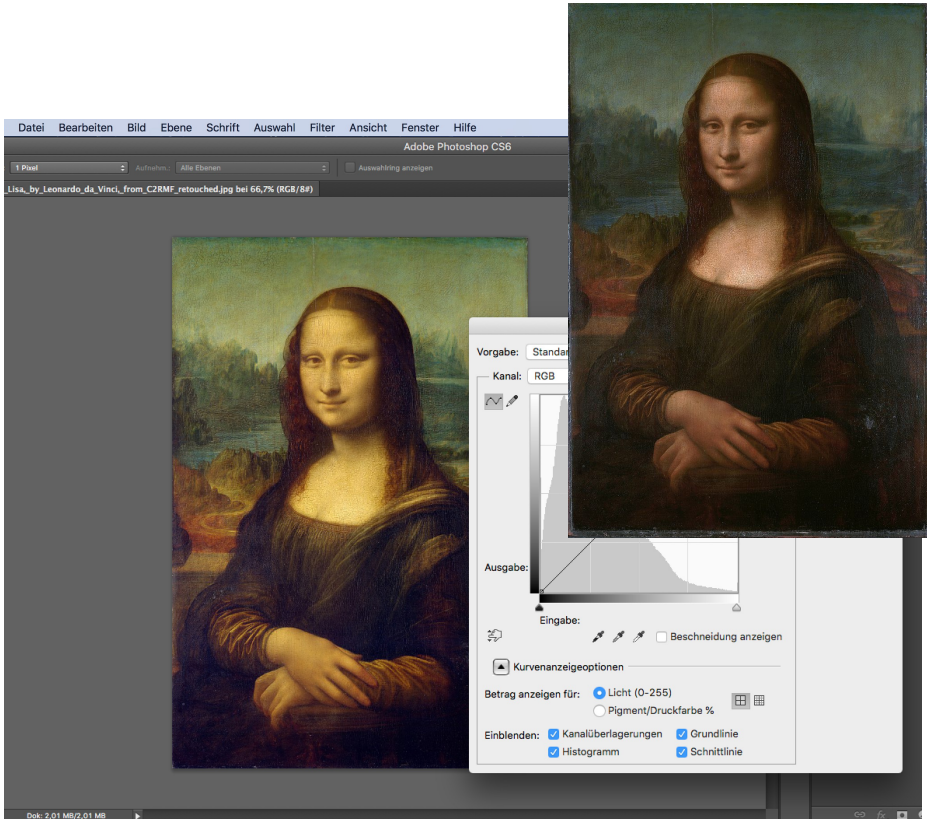
Please don't say this was "photoshopped." There was no Photoshop back then.

Variability and Processability

- Colour corrections and adulturations are possible without leaving traces

- Construction of reality, simulation instead of representation

- advantage:
  - restore past states
  - lossless copy



Fluidity, Performativity and Reconfiguration

are important concepts of the digital, because the digital image is always only a temporal manifestation and virtual configuration of information.

Marijke Goeting, „Digital Fluidity. The Performative and Reconfigurable Nature of the Digital Image in Contemporary Art and Design," *The International Journal of New Media, Technology and the Arts* 11 no. 4 (2016), 27–46

Ubiquity

- available as code simultaneously and globally
- scientifically usable

André Gunthert, *L'image partagée. La photographie numerique* (Paris 2015)

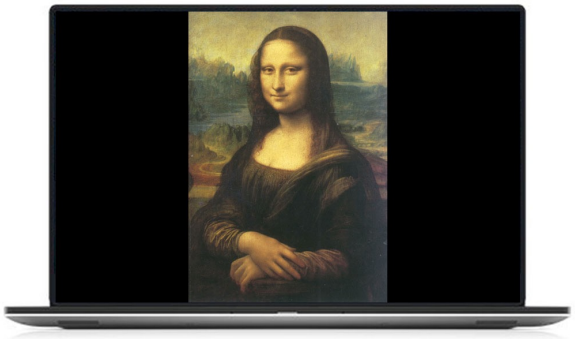
- delocalised processing, crowdsourcing

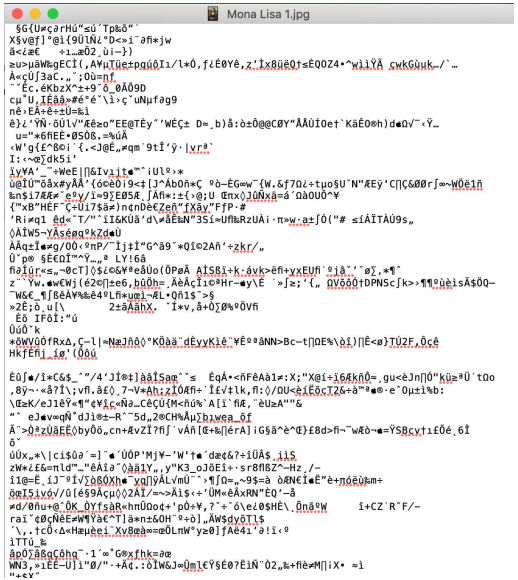
Hubertus Kohle, *Das digitale Bild. Eine Herausforderung für die Kunstgeschichte*: https://blog.arthistoricum.net/beitrag/2018/02/09/das-digitale-bild-eine-herausforderung-fuer-die-kunstgeschichte/

The digital image

- as a visual phenomenon on the 'surface' that can be interpreted by humans.

- as digitally encoded information on the 'subsurface' ("Unterfläche") that can be changed by the computer.

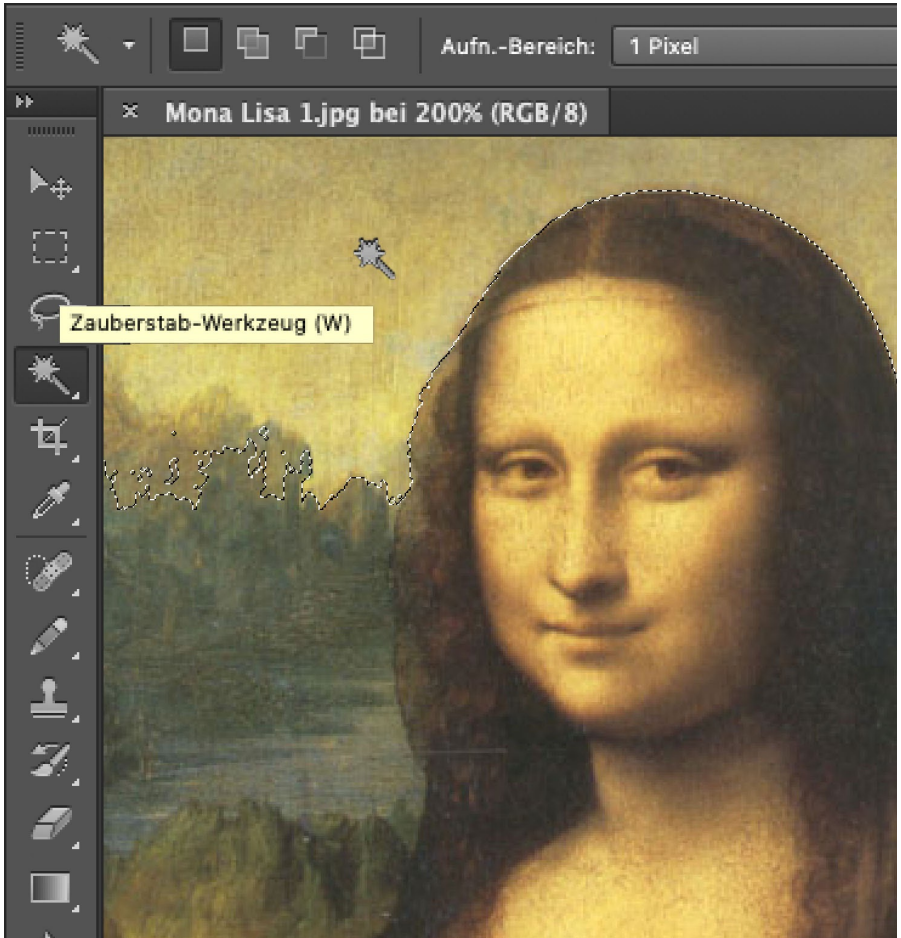




Frieder Nake, „Das Algorithmische Zeichen,“ in: Kurt Bauknecht et al. (eds.), *Informatik 2001: Wirtschaft und Wissenschaft in der Network Economy – Visionen und Wirklichkeit*; Tagungsband der GI/OCG-Jahrestagung, 25.–28. September 2001, Universität Wien, (Konstanz: UVK, 2001), 736–742.

Frieder Nake, „Das doppelte Bild,“ in: Margarete Pratschke (ed.), *Digitale Form* (Berlin: Akademie Verlag, 2005), 40–50.

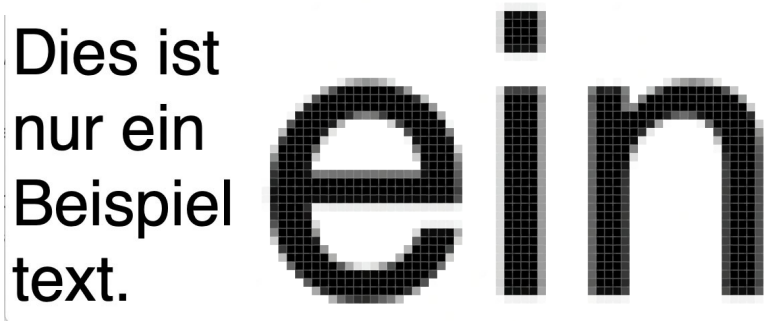
Frieder Nake, „Zeigen, Zeichnen und Zeichen: Der verschwundene Lichtgriffel,“ in Hans Dieter Hellige (ed.), *Mensch-Computer-Interface: Zur Geschichte und Zukunft der Computerbedienung* (Bielefeld: Transcript, 2008), 121–154.

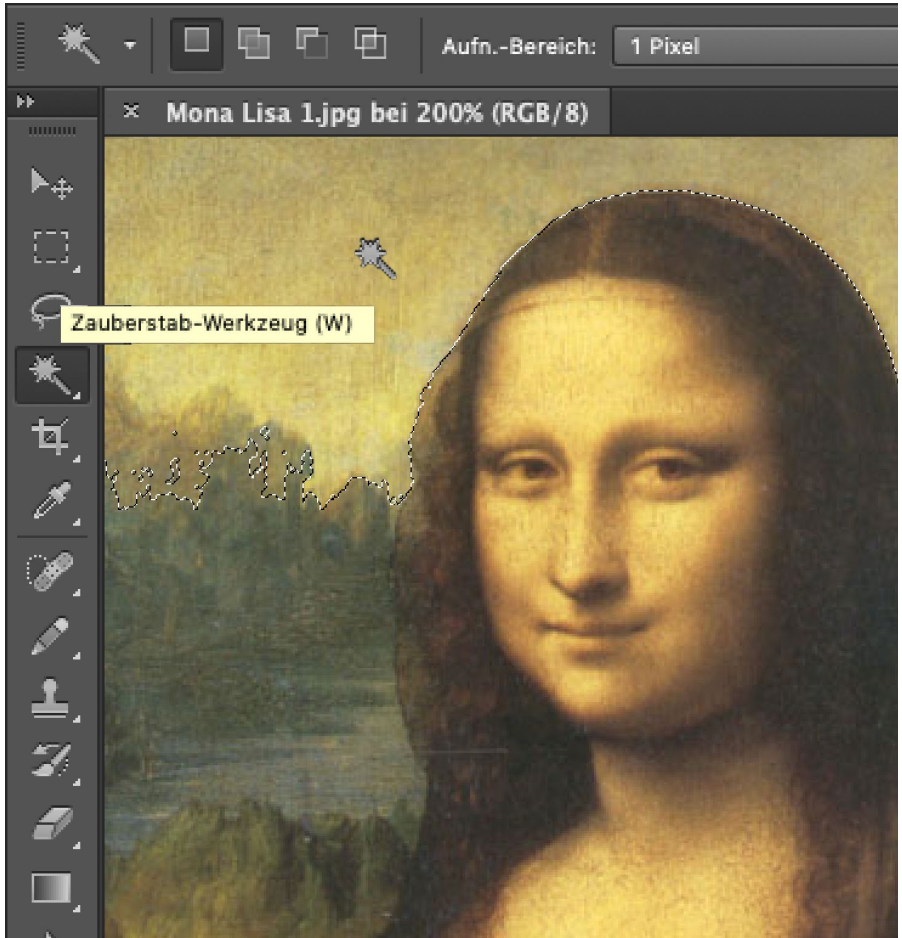

Aufn.-Bereich:
1 Pixel
Mona Lisa 1.jpg bei 200% (RGB/8)
Zauberstab-Werkzeug (W)


Weiche Kante:
0 Px
Mona Lisa 1.jpg bei 200% (RGB/8)
Lasso-Werkzeug (L)

It is not inherent in the code to be interpreted as an image and to be represented as such on the surface. Rather, it is the result of an imaging process, which is why the same appearance can be encoded differently or the same code can be represented differently.

```
Dies ist nur ein
Beispieltext.
```




Aufn.-Bereich:
1 Pixel
Mona Lisa 1.jpg bei 200% (RGB/8)
Zauberstab-Werkzeug (W)


Weiche Kante:
0 Px
Mona Lisa 1.jpg bei 200% (RGB/8)
Lasso-Werkzeug (L)

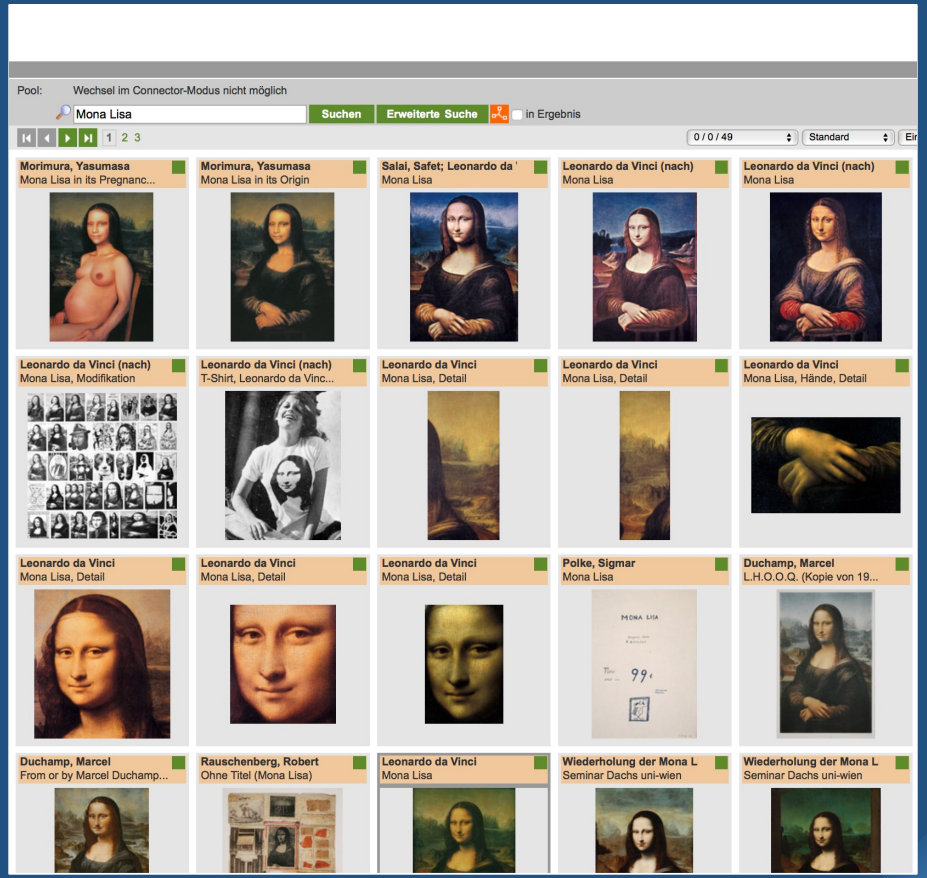
```
SELECT LEONARDO.ID,
LEONARDO.Werk
FROM ID;
```

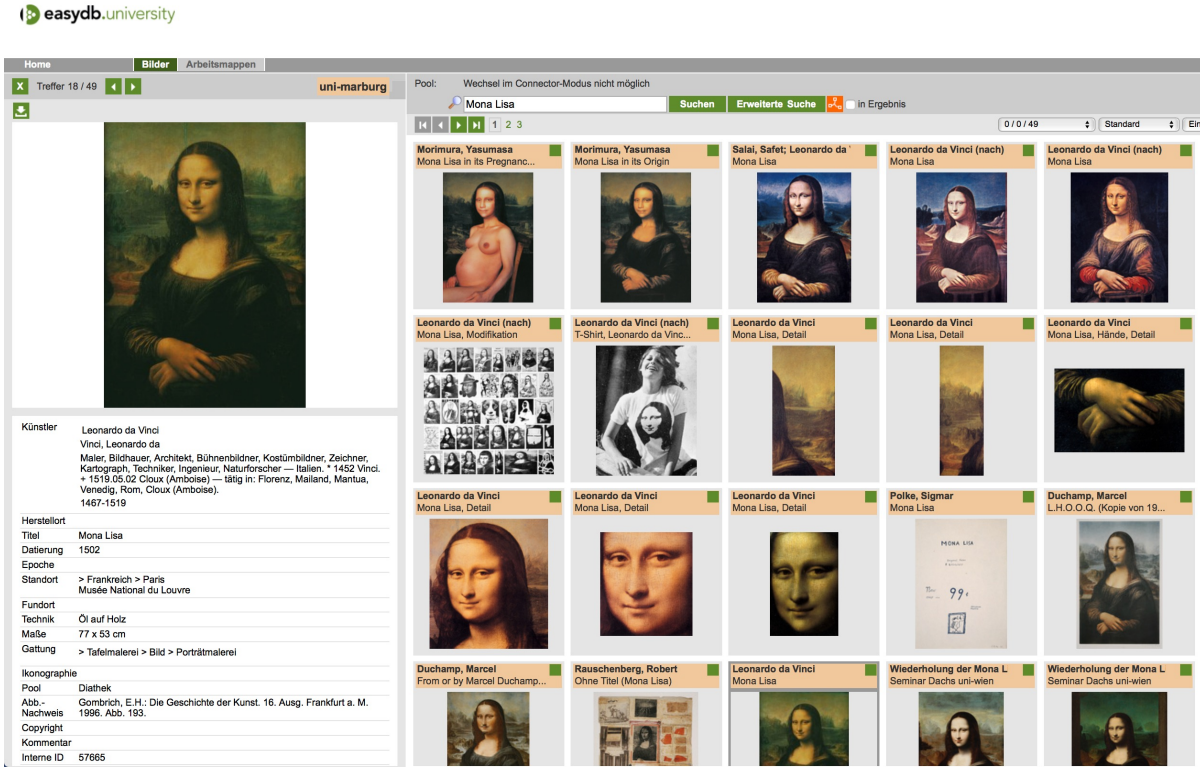
Abfrage2 : Auswahlabfrage

ID	Werk
129	Mona Lisa
206	Annunciazione
208	San Girolamo
278	Ultima Cena
282	Madonna Litta
331	Salvator Mundi
352	Scapigliata
391	Bacco
452	Madonna Benois
463	Sant'Anna, la
530	Annunciazione
639	San Giovanni B
0	

Marcus Burkhardt, *Digitale Datenbanken. Eine Medientheorie im Zeitalter von Big Data* (Bielefeld: transcript Verlag, 2015), https://www.transcript-verlag.de/media/pdf/c0/5f/7c/oa9783839430286H07urq92Up9bx.pdf

3. DIGITAL ACQUISITION





William Vaughan, „Computer-gestützte Bildanalyse und Bildrecherche“, in *Kunstgeschichte digital,* ed. Hubertus Kohle (Berlin, 1997) 97–106; Wolfgang Ernst and Stefan Heidenreich (eds.), *Suchbilder. Visuelle Kultur zwischen Algorithmen und Archiven* (Berlin, 2003); Jacques Thuiller, “L'informatique en histoire de l'art: où en sommes-nous? (Editorial)”, in: *Revue de l’art* 97, 1992, 5–10; James Cuno, “How Art History Is Failing in the Internet”, in: *The Daily Dot*, https://www.dailydot.com/via/art-history-failing-internet/

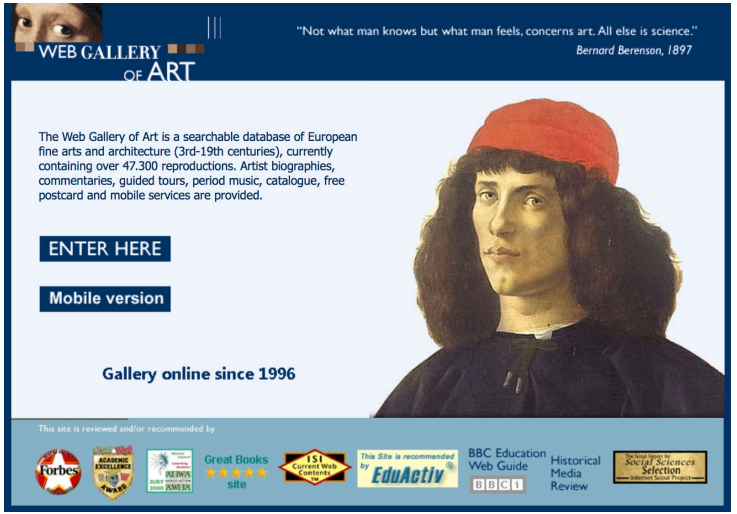
Archaeological image databases

A current list of archaeological image databases is provided by Heidelberg University Library:

http://www.ub.uni-heidelberg.de/fachinfo/archaeologie/Welcome.html

http://rzblx10.uni-regensburg.de/dbinfo/dbliste.php?dbt=16&bib_id=ubhe&colors=15&ocolors=40&lett=f&sort=type&gebiete=27#BILDDATENBANK

Web-based image databases for art



Pioneers of the 1990s:

- Art Renewal Center (http://www.artrenewal.org)
- Web Gallery of Art (http://www.wga.hu)
- CGFA (http://www.cgfaonlineartmuseum.com)
- The Athenaeum (http://www.the-athenaeum.org)
- Artcyclopedia (http://www.artcyclopedia.com)

Current Positions:

http://kunstgeschichte.info/media/tools/kunsthistorische-bilddatenbanken/

- Google Art Project (https://www.google.com/culturalinstitute/project/art-project?hl=de)

Examples of collection catalogues of larger museums:

- Metropolitan Museum New York (http://www.metmuseum.org/collection)
- MFA Boston (http://www.mfa.org/collections/mfa-images)

British Museum

Collection online

Search the collection

Search

Images only

Advanced search options

Welcome to the updated collection search. The entire database can be searched here and new records and images are added every week.

There are currently 2,163,928 records available, which represent more than 3,500,000 objects. 868,308 records have one or more images.

Last updated: 27 December 2014.

How to use this search ›

Share this page

Kanga: textiles from Africa ›

Paintings from the tomb chapel of Nebamun ›

Objects from the Roman cities of Pompeii and Herculaneum ›

Objects excavated from the Anglo-Saxon ship-burial at Sutton Hoo ›

Chinese ceramics from the Sir Percival David collection ›

The Mildenhall Treasure from Roman Britain ›

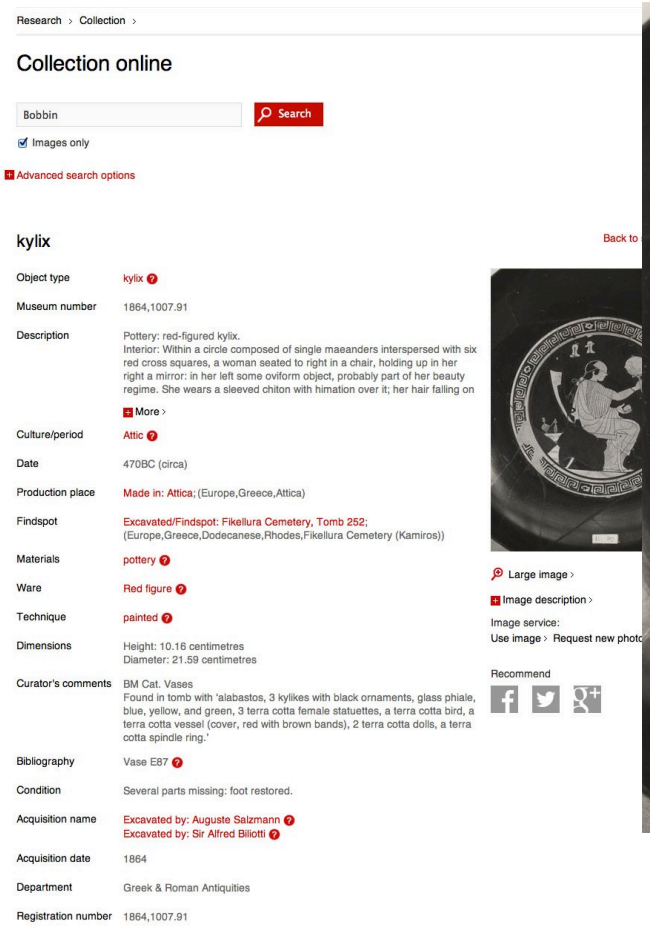
http://www.britishmuseum.org/research/collection_online/search.aspx

British Museum

Semantic web version

„British Museum collection data is available in the W3C open data standard, RDF, joining and relating to a growing body of linked data published around the world.“

http://www.britishmuseum.org/research/collection_online/about_the_database.aspx



Keywording / Ontologies

- ICONCLASS (http://www.iconclass.nl)
- Marburger Inventarisations-, Dokumentations- und Administrations-System (MIDAS, http://www.fotomarburg.de)
- Getty Vokabulary (http://www.getty.edu/research/tools)
- Art and Architecture Thesaurus (AAT, http://www.getty.edu/research/tools/vocabularies/aat/)
- Vokabular in der Museumsdokumentation des Deutschen Museumsbundes (www.museumsvokabular.de)

s. Regelwerke, Thesauri, Klassifikationen, Systematiken und Begriffslisten. Eine kommentierte Linksammlung des Team MusIS im Bibliotheksservice-Zentrum Baden-Württemberg (https://wiki.bsz-bw.de/doku.php?id=mare-team:museums-archivsysteme:musis:links:thesauri)

Kerameikos.org | Browse | Research Tools | Ontology | APIs | Documentation | SPARQL | Datasets | Search

Kerameikos.org

Kerameikos.org is a collaborative project dedicated to defining the intellectual concepts of pottery following the tenets of linked open data and the formulation of an ontology for representing and sharing ceramic data across disparate data systems. While the project is focused primarily on the definition of concepts within Greek black- and red-figure pottery, Kerameikos.org is extensible toward the definition of concepts in other fields of pottery studies.

See the github account at https://github.com/kerameikos, which contains repositories for the RDF data and the publication framework. This framework could be applied to other linked data thesauri.

Scientific Committee

The scientific committee includes both pottery and cultural heritage informatics experts.

- Vladimir Alexiev, Ontotext
- Renee Gondek, University of Mary Washington
- Ethan Gruber, American Numismatic Society
- Thomas Mannack, Oxford University
- Tyler Jo Smith, University of Virginia
- Anne-Violaine Szabados, Lexicon Iconographicum Mythologiae Classicae (LIMC-France)

Support

NATIONAL ENDOWMENT FOR THE Humanities

In August 2018, the National Endowment for the Humanities awarded Kerameikos $85,382 as part of the Digital Humanities Advancement program. An 18-month long Level II project, this will fund the creation of all necessary Archaic and Classical Greek pottery concepts the building of various aggregation or data harvesting tools.

Collaborators

IATH

The Institute for Advanced Technology in the Humanities at the University of Virginia hosts Kerameikos.org.

UNIVERSITY OF OXFORD

The Beazley Archive, Classical Art Research Center, University of Oxford has provided the

RDF (Resource Description Framework) Data for the Attic potter Exekias

```
<?xml version="1.0" encoding="utf-8"?>
<rdf:RDF xmlns:dc="http://purl.org/dc/terms/" xmlns:nm="http://nomisma.org/id/"
      xmlns:cc="http://creativecommons.org/ns#"
      xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
      xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
      xmlns:rdfa="http://www.w3.org/ns/rdfa#"
      xmlns:dcterms="http://purl.org/dc/terms/"
      xmlns:skos="http://www.w3.org/2004/02/skos/core#"
      xmlns:geo="http://www.w3.org/2003/01/geo/wgs84_pos#"
      xmlns:xsd="http://www.w3.org/2001/XMLSchema#"
      xmlns:foaf=http://xmlns.com/foaf/0.1/>


...
```

```
<ecrm:E53_Place xmlns:ecrm="http://erlangen-crm.org/current/"
            xmlns:owl="http://www.w3.org/2002/07/owl#"
            xmlns:foaf="http://xmlns.com/foaf/0.1"
            xmlns:osgeo="http://data.ordnancesurvey.co.uk/ontology/geometry/"
            rdf:about="http://kerameikos.org/id/attica">
              <rdf:type rdf:resource="http://www.w3.org/2004/02/skos/core#Concept"/>
              <skos:prefLabel xml:lang="en">Attica</skos:prefLabel>
              <skos:prefLabel xml:lang="de">Attika</skos:prefLabel>
              <skos:prefLabel xml:lang="pl">Attyka</skos:prefLabel>
              <skos:prefLabel xml:lang="zh">阿提卡</skos:prefLabel>
              <skos:prefLabel xml:lang="ru">Аттика</skos:prefLabel>
              <skos:prefLabel xml:lang="fr">Attique</skos:prefLabel>
              <skos:prefLabel xml:lang="pt">Ática</skos:prefLabel>
              <skos:prefLabel xml:lang="ja">アッティカ</skos:prefLabel>
              <skos:prefLabel xml:lang="it">Attica</skos:prefLabel>
              <skos:prefLabel xml:lang="sv">Attika</skos:prefLabel>
              <skos:prefLabel xml:lang="es">Ática</skos:prefLabel>
              <skos:prefLabel xml:lang="nl">Attika</skos:prefLabel>
              <skos:definition xml:lang="en">Attica is an historical region that encompasses the city of Athens, the capital of Greece.</skos:definition>
              <skos:exactMatch rdf:resource="http://pleiades.stoa.org/places/579888"/>
              <skos:exactMatch rdf:resource="http://dbpedia.org/resource/Attica"/>
              <skos:exactMatch rdf:resource="http://vocab.getty.edu/tgn/7593167"/>
              <skos:exactMatch rdf:resource="http://collection.britishmuseum.org/id/place/x30950"/>
        <geo:location rdf:resource="http://kerameikos.org/id/attica#this"/>
</ecrm:E53_Place><geo:SpatialThing xmlns:ecrm="http://erlangen-crm.org/current/"
            xmlns:owl="http://www.w3.org/2002/07/owl#"
            xmlns:foaf="http://xmlns.com/foaf/0.1"
```

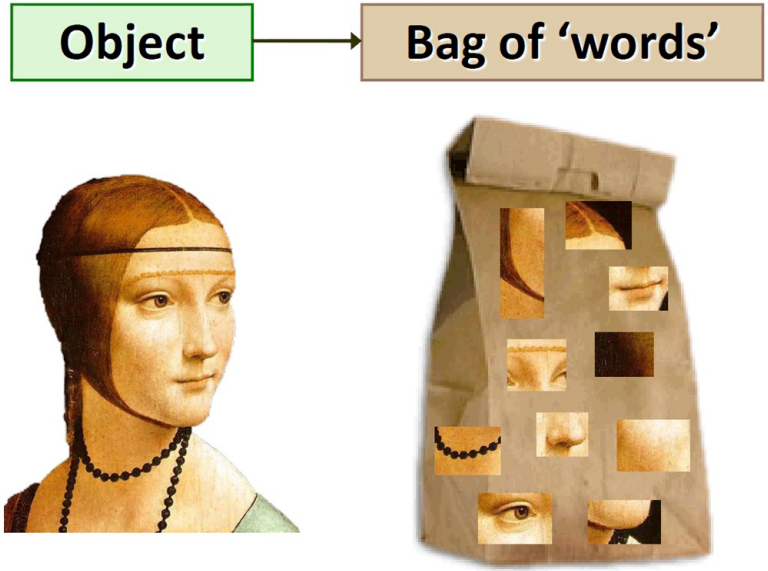
```
<kon:Technique xmlns:ecrm="http://erlangen-crm.org/current/"
               xmlns:owl="http://www.w3.org/2002/07/owl#"
               xmlns:kon="http://kerameikos.org/ontology#"
               xmlns:kid="http://kerameikos.org/id/"
               rdf:about="http://kerameikos.org/id/black_figure">
    <rdf:type rdf:resource="http://www.w3.org/2004/02/skos/core#Concept"/>
    <skos:prefLabel xml:lang="en">Black Figure</skos:prefLabel>
    <skos:prefLabel xml:lang="nl">Zwartfigurige stijl</skos:prefLabel>
    <skos:prefLabel xml:lang="sv">Svartfigurig keramik</skos:prefLabel>
    <skos:prefLabel xml:lang="pt">Registro de pintura negra em cerâmica grega</skos:prefLabel>
    <skos:prefLabel xml:lang="ru">Чернофигурная вазопись</skos:prefLabel>
    <skos:prefLabel xml:lang="es">Cerámica de figuras negras</skos:prefLabel>
    <skos:prefLabel xml:lang="de">Schwarzfigurige Vasenmalerei</skos:prefLabel>
    <skos:prefLabel xml:lang="pl">Styl czarnofigurowy</skos:prefLabel>
    <skos:prefLabel xml:lang="it">Ceramica a figure nere</skos:prefLabel>
    <skos:prefLabel xml:lang="zh">黑彩陶器</skos:prefLabel>
    <skos:definition xml:lang="en">Black-figure pottery painting, also known as the black-figure style or black-figure ceramic (Greek, μελανόμορφα, melanomorpha) is one of the styles of painting on antique Greek vases. It was especially common between the 7th and 5th centuries BC, although there are specimens dating as late as the 2nd century BC.</skos:definition>
    <skos:exactMatch rdf:resource="http://dbpedia.org/resource/Black-figure_pottery"/>
    <skos:exactMatch rdf:resource="http://collection.britishmuseum.org/id/thesauri/x14736"/>


    <skos:exactMatch rdf:resource="http://vocab.getty.edu/aat/300387209"/>
  </kon:Technique>
```

```
<foaf:Person xmlns:owl="http://www.w3.org/2002/07/owl#"
             xmlns:ecrm="http://erlangen-crm.org/current/"
             rdf:about="http://kerameikos.org/id/exekias">
               <rdf:type rdf:resource="http://www.w3.org/2004/02/skos/core#Concept"/>
                 <skos:prefLabel xml:lang="en">Exekias</skos:prefLabel>
      <skos:prefLabel xml:lang="zh">埃克塞基亚斯</skos:prefLabel>
      <skos:prefLabel xml:lang="ru">Эксекий</skos:prefLabel>
      <skos:prefLabel xml:lang="it">Exekias</skos:prefLabel>
      <skos:prefLabel xml:lang="pl">Eksekias</skos:prefLabel>
      <skos:prefLabel xml:lang="ja">エクセキアス</skos:prefLabel>
      <skos:prefLabel xml:lang="nl">Exekias</skos:prefLabel>
      <skos:prefLabel xml:lang="pt">Exéquias</skos:prefLabel>
      <skos:prefLabel xml:lang="sv">Exekias</skos:prefLabel>
      <skos:prefLabel xml:lang="es">Exequias (pintor)</skos:prefLabel>
      <skos:prefLabel xml:lang="fr">Exékias</skos:prefLabel>
      <skos:prefLabel xml:lang="de">Exekias</skos:prefLabel>
                 <skos:definition xml:lang="en">Exekias (Ancient Greek: Ἐξηκίας, Exēkías) was an ancient Greek vase-painter and potter who was active in
Athens between roughly 545 BC and 530 BC.</skos:definition>
                 <skos:exactMatch rdf:resource="http://collection.britishmuseum.org/id/person-institution/58234"/>
                 <skos:exactMatch rdf:resource="http://dbpedia.org/resource/Exekias"/>
                 <skos:exactMatch rdf:resource="http://viaf.org/viaf/57427027"/>
                 <skos:exactMatch rdf:resource="http://viaf.org/viaf/4245236"/>
                 <skos:exactMatch rdf:resource="http://viaf.org/viaf/95850860"/>
                 <skos:exactMatch rdf:resource="http://viaf.org/viaf/204689226"/>
                 <skos:exactMatch rdf:resource="http://d-nb.info/gnd/119536366"/>
                 <skos:exactMatch rdf:resource="http://www.idref.fr/052199363/id"/>
                 <skos:exactMatch rdf:resource="http://vocab.getty.edu/ulan/500027430"/>
```

Image meta search

- Indexing / search via metadata such as keywords or links (attribution, hierarchisation, linked data, image paths etc.)



Content Based Image Retrieval (CBIR)

Indexing via visual content such as colour, texture, shapes etc.

Athens, Parthenon

- Semantic Retrieval

e.g. the query "Find pictures of the Parthenon".
-> Database-driven comparison of texture, colour and shape.
In fact, retrieving images as a *higher-level concept* still requires human feedback

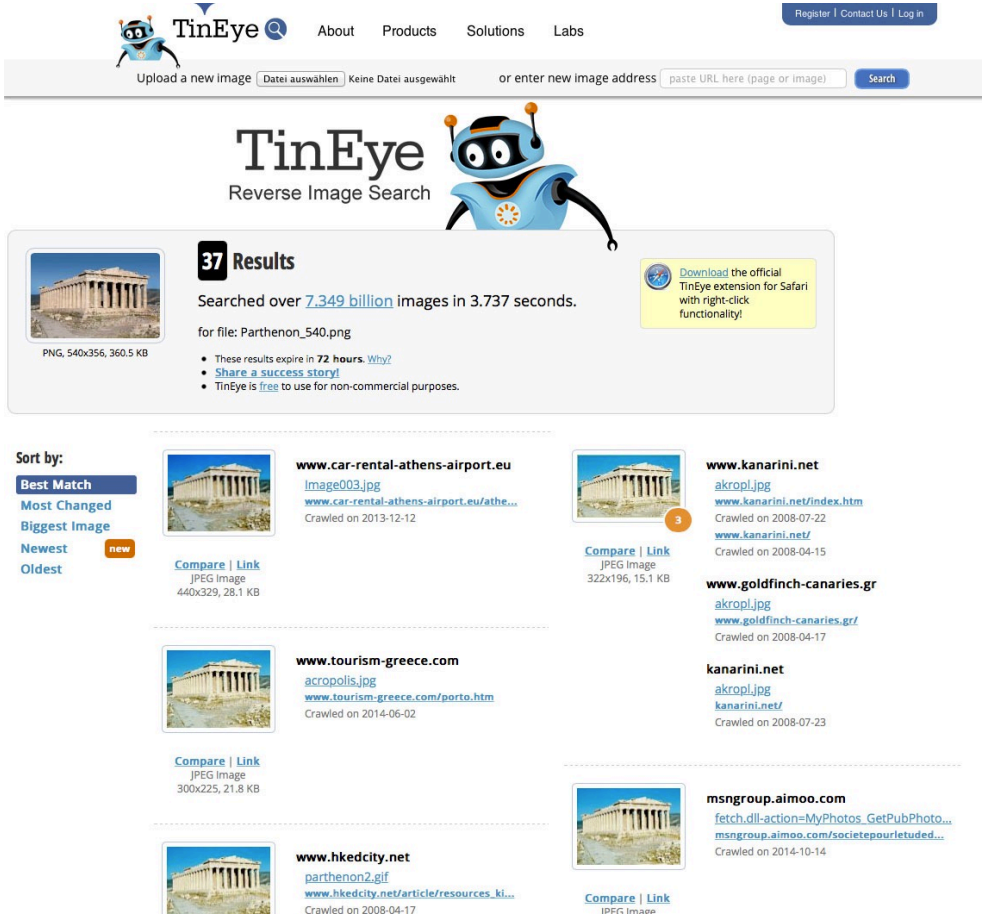
- Relevance feedback (human interaction)

by marking images in the results as "relevant", "not relevant" or "neutral" to the search query

Vipin Tyagi, *Content-Based Image Retrieval. Ideas, Influences, and Current Trends* (Heidelberg: Springer, 2017)

TinEye

http://tineye.com



TinEye Labs

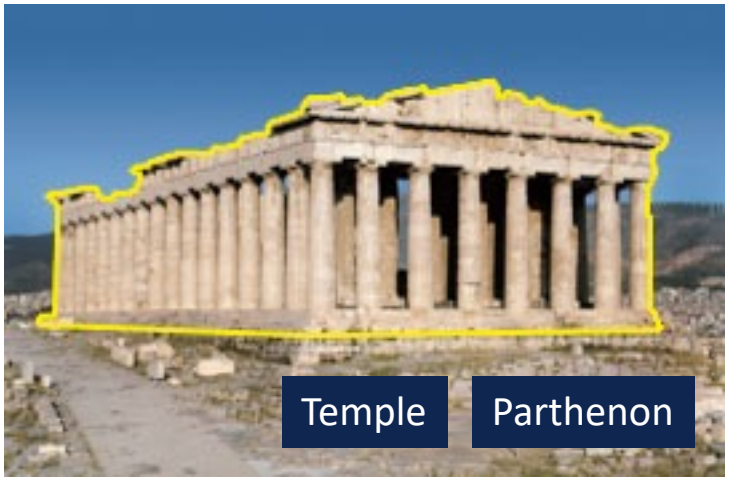
http://labs.tineye.com

Search 20 million Creative Commons images from Flickr by color

Automatic Image Annotation

(also: *Automatic Image Tagging* or *Linguistic Indexing*)

automatically assigns metadata in the form of subtitles or keywords to a digital picture.



- Machine learning technique that uses extracted feature vectors and training annotations to automatically apply annotations to new images.

- a kind of classification for several (very many) classes that matches the text vocabulary with the "visual vocabulary" via relevance models.

https://en.wikipedia.org/wiki/Automatic_image_annotation

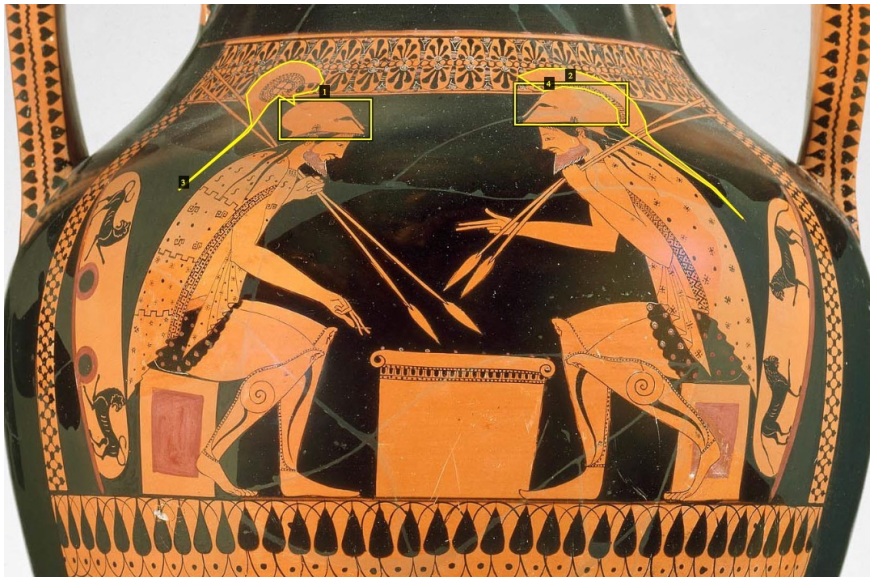
Automatic image recognition through annotation

Road Lines

Cubes

https://gist.github.com/bigsnarfdude/d811e31ee17495f82f10db12651ae82d

Image annotation: Bounding Boxes and Full Segmentation



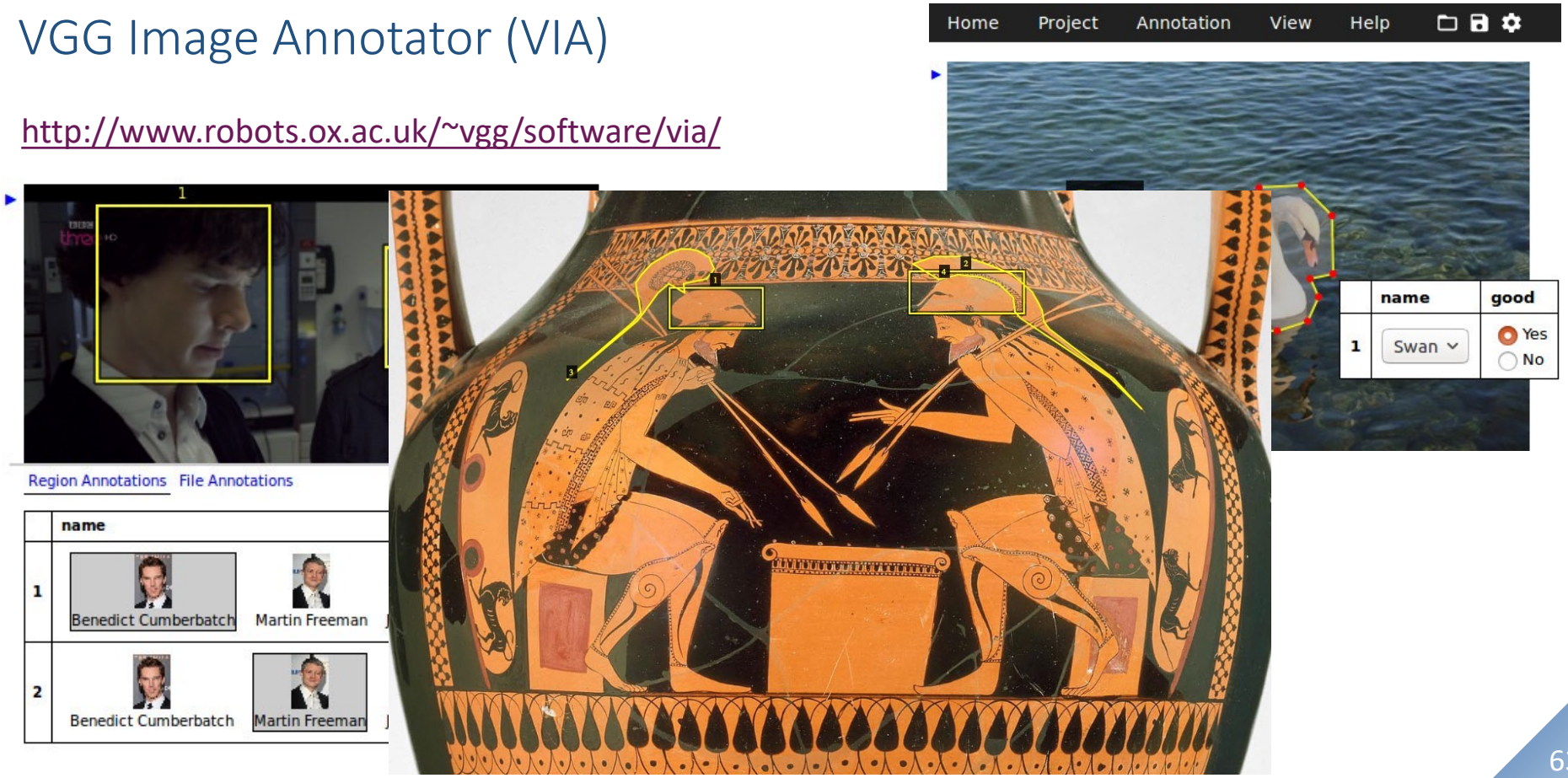
Lists with Image Annotation Tools: https://en.wikipedia.org/wiki/List_of_manual_image_annotation_tools

https://gengo.ai/articles/image-annotation-tools-for-computer-vision/

https://hackernoon.com/the-best-image-annotation-platforms-for-computer-vision-an-honest-review-of-each-dac7f565fea

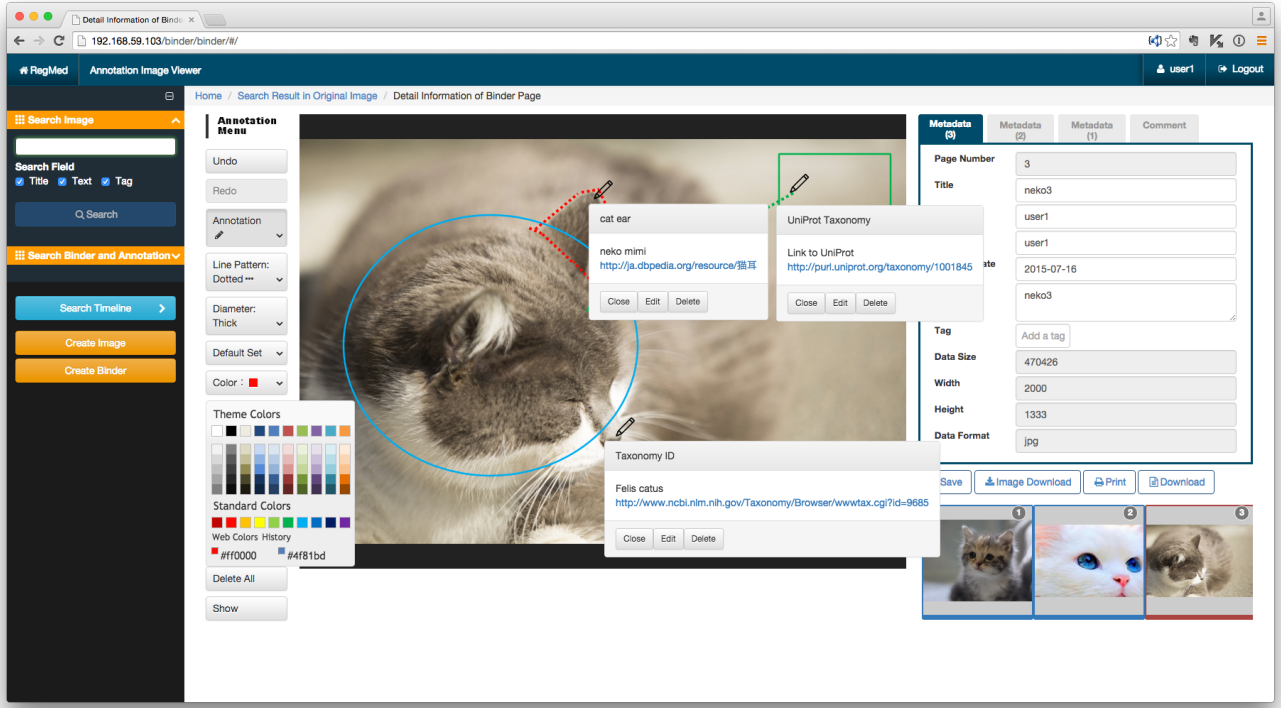
VGG Image Annotator (VIA)

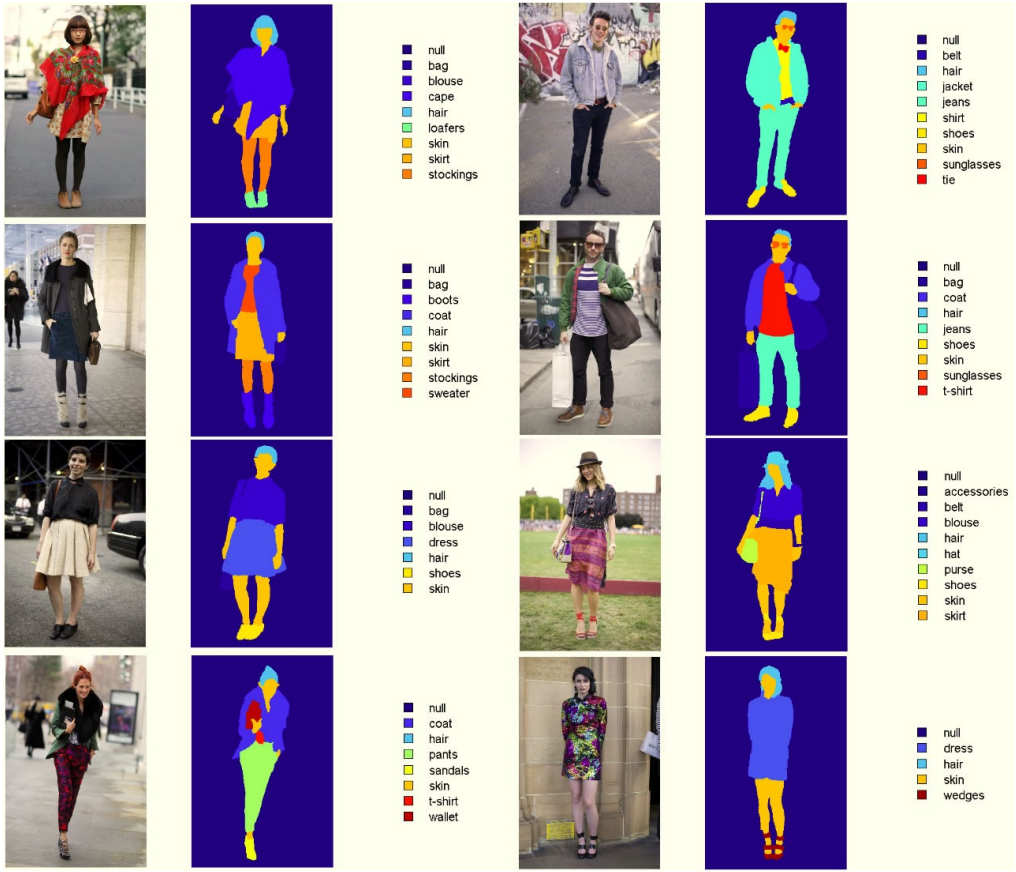
http://www.robots.ox.ac.uk/~vgg/software/via/



OpenIAV (Image Annotation Viewer)

https://regmed.hgc.jp/aiv.html





MATLAB Computer Vision Toolbox

https://de.mathworks.com/products/computer-vision.html

https://github.com/bearpaw/clothing-co-parsing/blob/master/README.md

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Halsornament	Inschriften	Mittelmotiv	Faktor Symmetrie	Bildmitte	Deckfarbe	Besonderheit
Lotos-Palmetten-Kette	ACHILLEOS, Ausspruch	0	95,65	Inschriften	0	

Helm1	x Sichelform auf Kopf	x Sichelform auf Schild	Helm2
Schild1	x böotischer Schild angelehnt	x böotischer Schild angelehnt	Schild2
Schildzeichen	Maske	Maske	Schildzeichen2
Brustpanzer1	x	x	Brustpanzer2
11 Mantel1	x Webmuster	x Webmuster	Mantel2
Speere1	x Doppelspeer 45° in der Hand	x Doppelspeer 45° in der Hand	Speere2
Beinschienen1	x Gravur	x Gravur	Beinschienen2
Kopfhaltung1	gesenkt	gesenkt	Kopfhaltung2
Körperhaltung1	vorgebeugt	vorgebeugt	Körperhaltung2
Sitzhaltung1	auf Kante, Beine 45°	auf Kante, Beine 45°	Sitzhaltung2

	links	rechts	Kopf / Körper / Arm	rechts	links	
Arm1	angewinkelt, Speere	135°	● 0 ○ gerade n.l. ○	135°	angewinkelt, Speere	Arm2
Hand1	geschlossen	am Brett	● 0 ○ gerade	am Brett	geschlossen	Hand2
			● 0 ○ H ○ V			

Beifigur links: 0

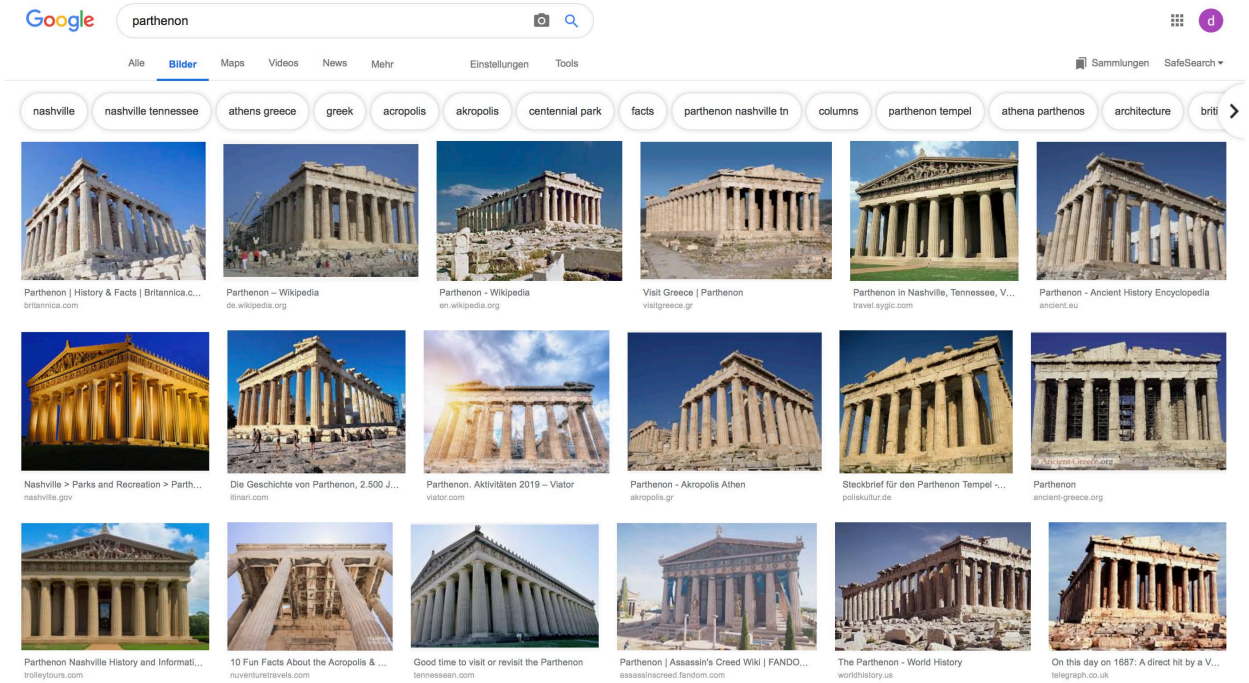
BeifigurRechts: 0

Hocker1	Block	Spieltisch	Block+Brett	Hocker2	Block
		Spielsteine	0		

The advantage of automatic image annotation over content based image retrieval (CBIR) is that queries can be entered textually. However, in ignorance of the training data, the results are not always comprehensible.

Google Images

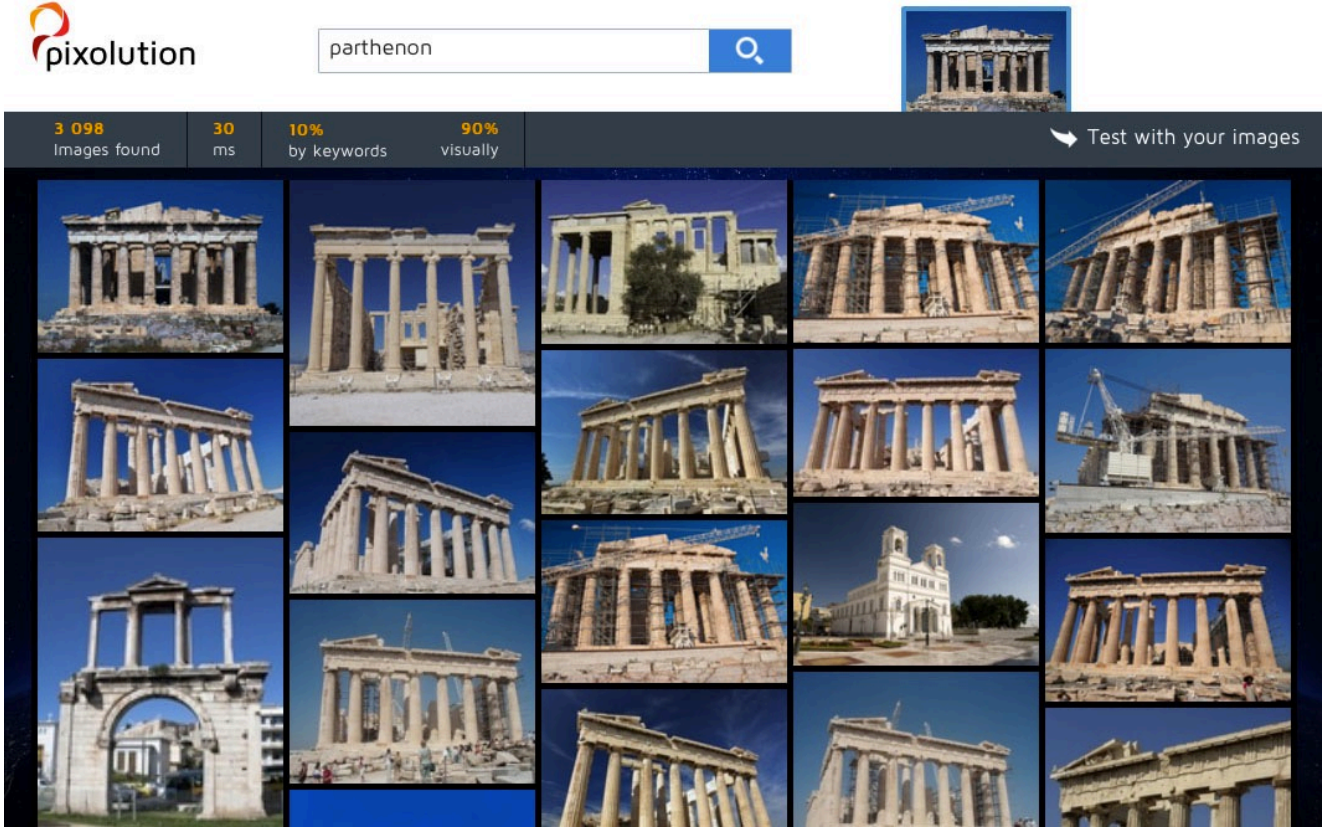
https://images.google.com



Pixolution

https://pixolution.org

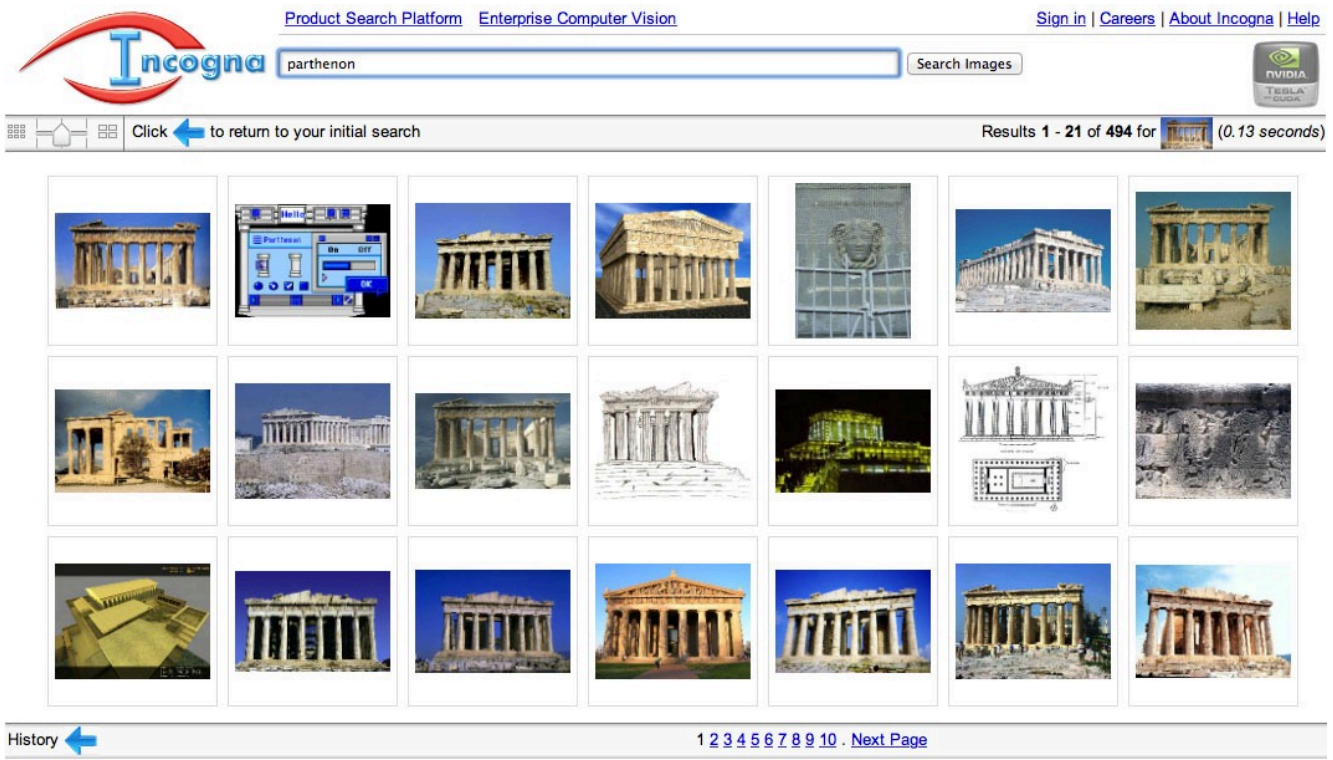
In the meantime chargeable



Incogna

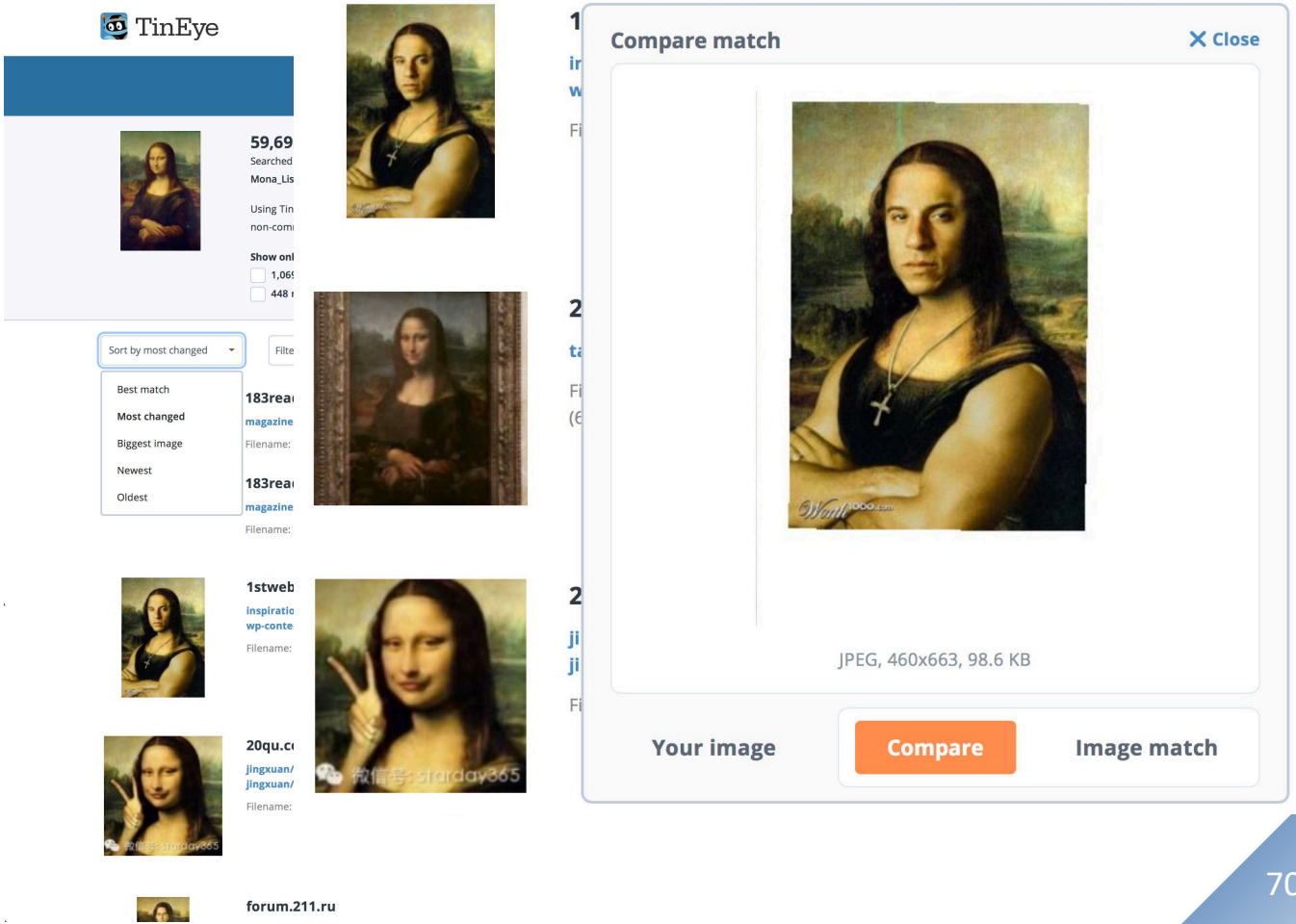
http://www.incogna.com

Closed in 2018 due to data-mining attacks



TinEye Similarity search via „most changed“

http://tineye.com



Discussion of the methods of digitisation

ANNOTATION

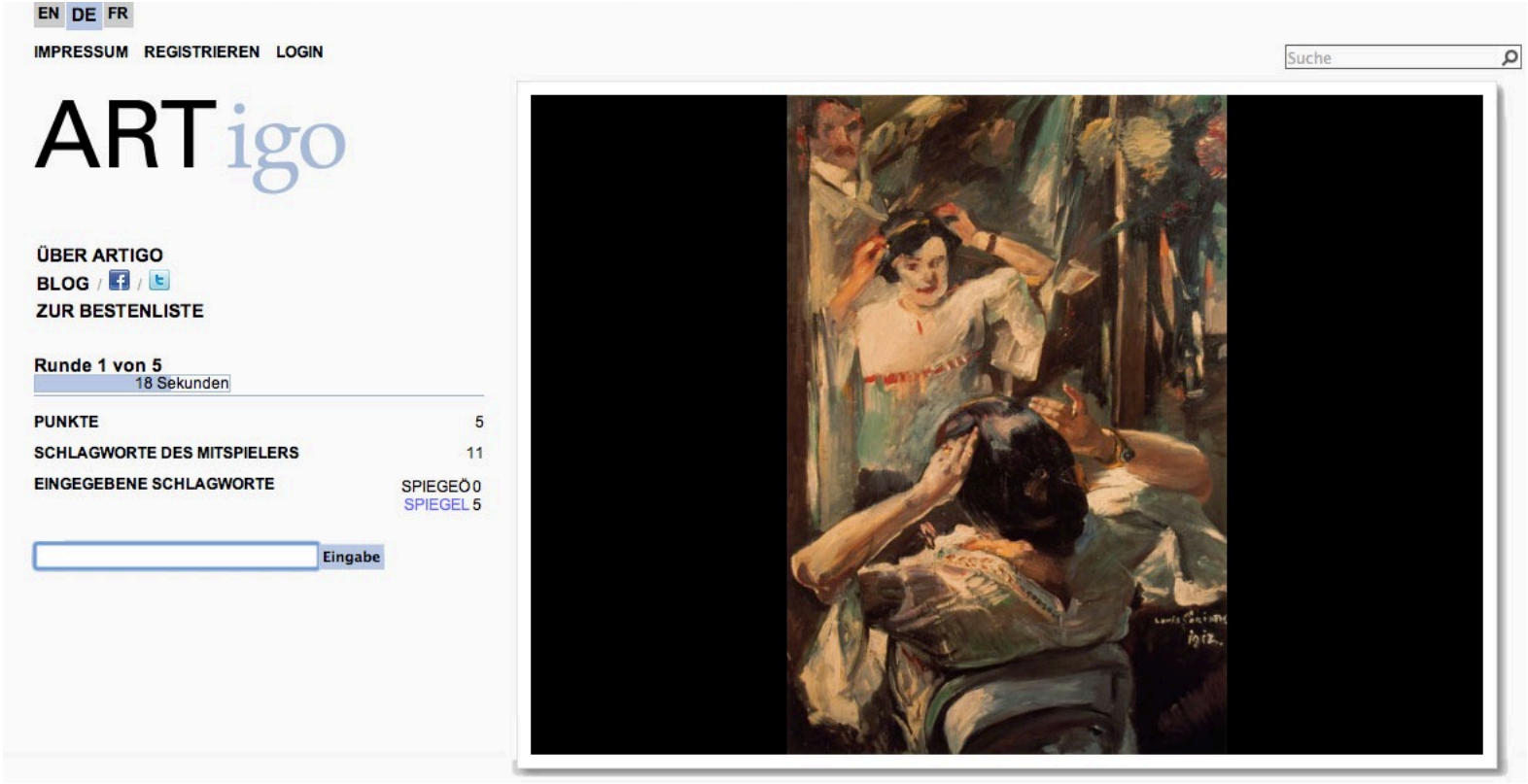
Controlled vocabularies,
taxonomies, ontologies
(expert knowledge)

+ accurate
+ highly structured
+ schema-consistent
+ transparent
+ good for small amounts of data with many dimensions of meaning

- expensive
- dependent on perception
- comparatively slow
- not good with large amounts of data

ARTigo and Crowd Sourcing

http://www.artigo.org



Discussion of the methods of digitisation

PATTERN RECOGNITION

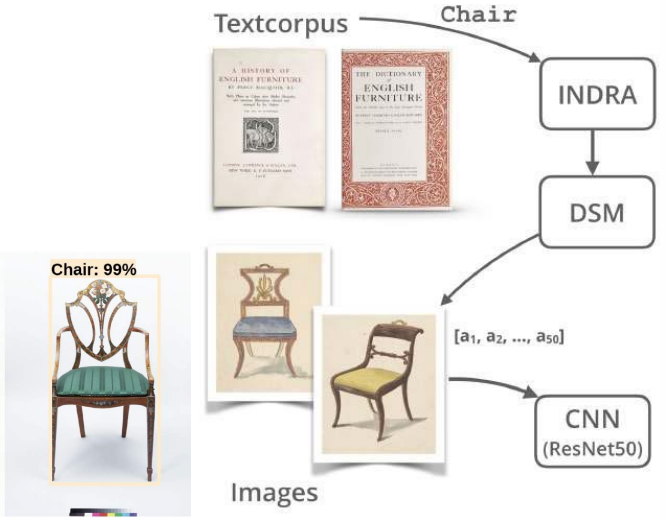
Statistical and probabilistic models (data mining, image analysis, natural language processing, ...)

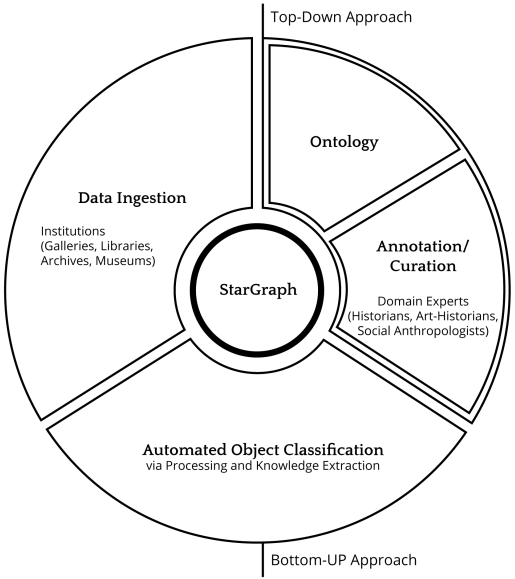
+ automated
+ fast
+ inexpensive
+ large amounts of data
+ process-consistent
+ reproducible

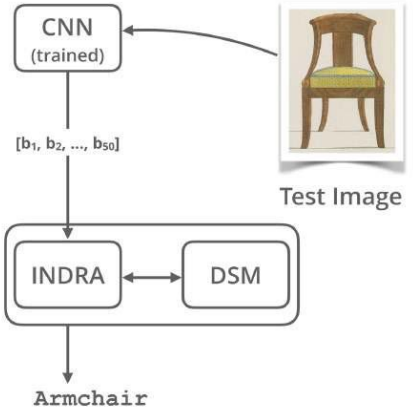
- non-transparent (black-box)
- correlations, not causality
- only good for large amounts of data
- expects uniform distribution of characteristics

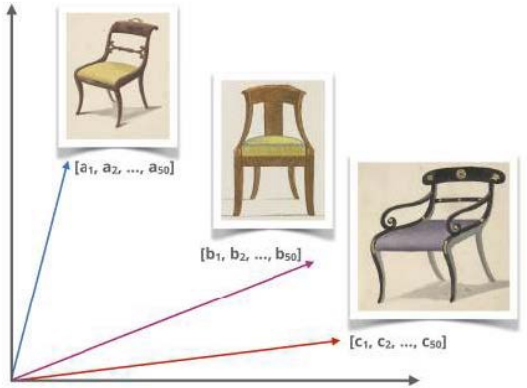
Neoclassica

https://neoclassica.fim.uni-passau.de









Simon Donig u.a., Vom Bild zum Text und wieder zurück, Digital Humanities im deutschsprachigen Raum 2019, 227–232 (https://neoclassica.fim.uni-passau.de/wp-content/uploads/Neoclassica-2019-DHd-2019-Digital-Humanities-multimedial-multimo.pdf)

Corpus formation remains an important goal

CHALLENGES IN DEALING WITH THE DIGITAL IMAGE

- Capturing and indexing pictorial works in accordance with the image
- critical, reflective handling of visual phenomena and their fluidity
- Theory of the digital image and the manifestations of the Digital Turn

- Basics of information visualisation
- Basic understanding of the properties of graphics (image size, resolution, colour depth, colour space, compression, transparency, layers etc.)
- File formats for storing pictorial information and their differences
- Current positions on the concept of the image and its relevance for the humanities
- Possibilities of textual marking and visual annotation of images
- Relevance of metadata in (and to) image files

- Selection of suitable graphic formats for different usage scenarios and long-term archiving
- Editing digital images (sizing, manipulation, cropping, working with multiple layers and suitable saving) using an image editing program
- Use of automatic batch processing for similar process steps (size, format, resolution, tags, metadata, XMP etc.)

What is referred to as "image size" in computer graphics?

Slide 15

What is a digital image? What properties does it have and what effects does it have?

Slide 26–42

Which file format would you use for a printed publication, which for an image database? Please give reasons for your answer.

Slide 23

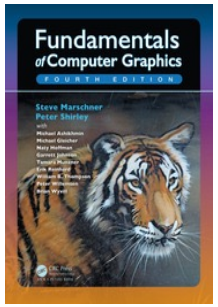
Which possibilities do you know for image-based data search?

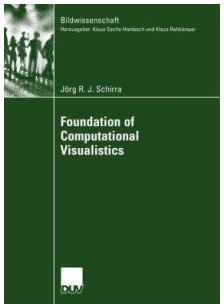
Slide 57–60. 67–70

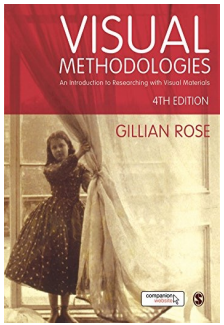
What is meant by Iconic Turn? What part does the computer play in this development?

Slide 2–7

What differences do you see between text and image data?







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Die angegebenen Websites wurden zuletzt am 1.3.2020 aufgerufen. Die Vorlage für die vielfältigen Bearbeitungen der "Mona Lisa":
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i IMPRESSUM

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