Machine Learning for Design, Week 2

Mood Boards and Inspiration

A mood board for the café chair











The brief: a new side chair for a museum café, drawing on 56 historical chairs

9 images I picked by hand from 350 museum images: two café paintings, two checked cloths, a settee, a cup and saucer, a card table and two chairs

Public-domain images (CC0) from The Metropolitan Museum of Art and the Art Institute of Chicago

The same brief as a search

By hand











Searching the 350 images with the brief











What should AI add to a mood board, and what should stay with the designer?

Today

1. Mood boards
2. May AI
3. SemanticCollage
4. Discussion
5. Workshop: build a mood board
6. Team and partner

1. Mood boards

Optional reading: Lucero, “Framing, Aligning, Paradoxing, Abstracting, and Directing: How Design Mood Boards Work,” DIS 2012



DIS 2012 • In the Wild June 11–15, 2012 • Newcastle, UK

Framing, Aligning, Paradoxing, Abstracting, and Directing: How Design Mood Boards Work

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ABSTRACT
This paper builds upon the earlier work of Gaver on design workbooks by taking another design method and making a case for using it in HCI and interaction design. In this paper I discuss *design mood boards*, which consist of a collection of visually stimulating images and related materials. I present the results of an empirical study of how experienced designers from different disciplines (i.e., fashion, textile and industrial design) use mood boards as part of their work. The results suggest that mood boards can play five main roles in the early stages of the design process: *framing, aligning, paradoxing, abstracting,* and *directing*. I also reflect on design practice by providing concrete examples of mood boards and the resulting prototypes for an interaction design project. These examples are used to ground the discussion on the five roles found in the study.

Author Keywords
Interaction design, ideation, creativity, conceptual design.

ACM Classification Keywords
H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

General Terms
Design

INTRODUCTION
In this paper, I discuss how *design mood boards* are created and used in design practice. Mood boards are an idea development tool used by designers and their clients to communicate, think, and share their different views that emerge from the design brief while defining future products or trends. Mood boards mostly consist of visually stimulating images, but can also include color and material swatches, textures, drawings, and physical objects that are affixed to A0, A1, A2 or A3 foam boards. Images from magazines and books are used to tell a story about the company, product, or audience. There is no right or unique interpretation of a mood board [22].

The original idea for this paper is to build upon Gaver's work on design workbooks [15] by looking into another design method, *design mood boards*, and introduce it to the HCI and interaction design communities. This paper consists of both a reflection on design practice and an empirical study of how experienced designers from different disciplines (i.e., fashion, textile and industrial design) use mood boards as part of their work. I take both the findings from retrospective interviews and the reflections of use to suggest and illustrate five roles that mood boards play in the early stages of the design process. First, mood boards play a *framing* role by defining the limits of the design task, which includes both problem setting and problem solving. Second, mood boards assist in the transmission of a mindset or vision by *aligning* the different stakeholders and getting them on the same wavelength. Third, mood boards support designers in visually researching apparently conflicting or contradicting ideas or *paradoxing*. Fourth, mood boards play an *abstracting* role by allowing designers to juxtapose both concrete and abstract imagery depending on the project and client. Finally, mood boards play a *directing* role by setting a trajectory for future design efforts.

This paper is structured as follows. To ground the discussion, I first provide a concrete example of a mood board created for an interaction design project. Second, I describe the relationship between mood boards and other design methods, as well as how they are used in different design disciplines. Third, I present the results of retrospective interviews with 14 experienced designers who regularly use mood boards as part of their work. From this study, I identify five main roles that *design mood boards* play in the design process. Fourth, to ground these five roles in practice, I present a second example of a mood board in interaction design. Finally, I discuss what HCI and interaction design can learn from how other fields use mood boards and provide examples of two prototypes that were created by using mood boards in the early stages of the design process.

ONE EXAMPLE OF A MOOD BOARD
I begin by introducing a concrete example of a mood board. This will help both illustrate how mood boards are used in the design process, as well as ground the discussion.

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DIS 2012, June 11-15, 2012, Newcastle, UK.
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Lucero's senses mood board

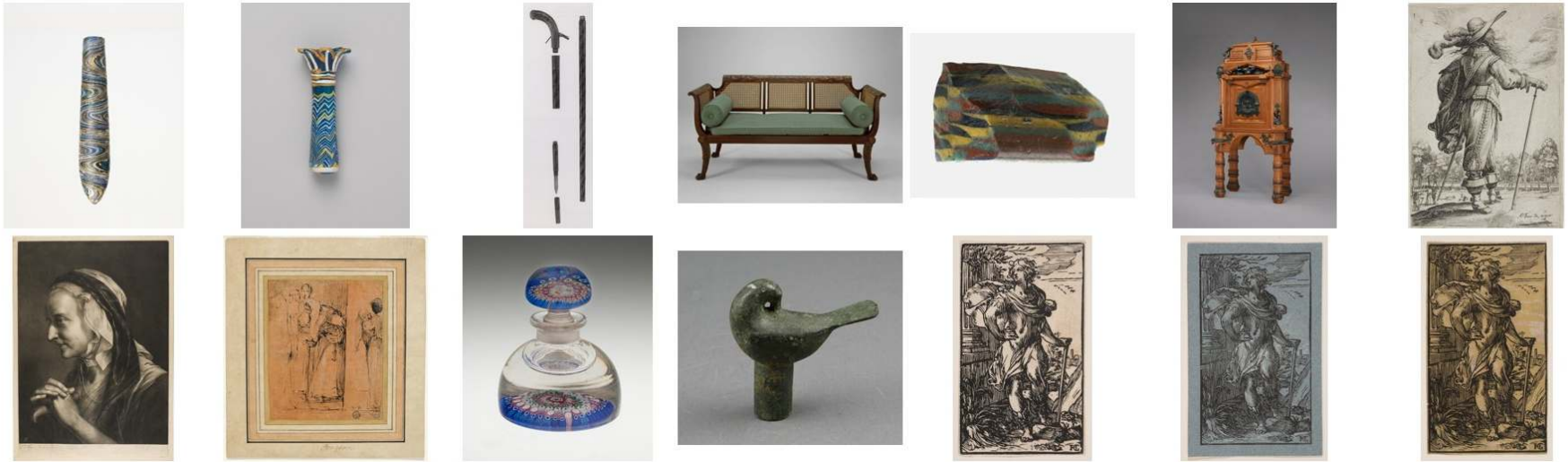


Five roles, from 14 designers:

Framing the limits of the task
Aligning the people on it
Paradoxing: trying ideas that conflict
Abstracting: concrete and abstract images
Directing what comes next

Lucero, DIS 2012, Fig. 1: a mood board for an augmented reality tool that uses all five senses

The museum's search for “cane”

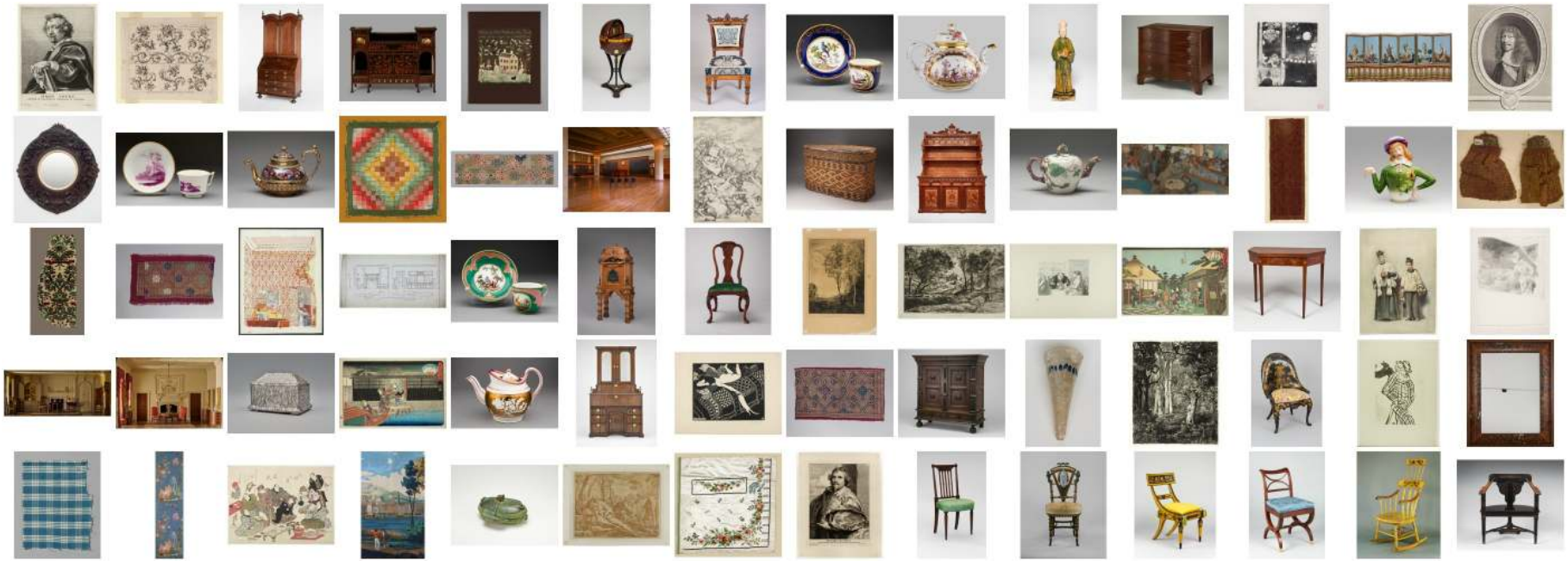


1 of 14 shows woven cane (the settee). The others include glass, walking canes and prints of people holding canes.

“sometimes it is painful to find the right search keyword to find the image”

Left: Art Institute of Chicago search for “cane”, the first 14 public-domain images that are not chairs. Right: a designer in Koch et al.'s survey of 15 designers, DIS 2020

Our pool: 350 images



The 56 chairs from the Met and the Art Institute of Chicago, and 294 images from 21 searches of the Art Institute's public-domain collection: café, restaurant, dining room, damask, velvet, check, cane, oak, teapot, wallpaper, lamp and others

70 of the 350, every fifth image in file-name order

2. May AI

Today's reading: Koch et al., “May AI? Design Ideation with Cooperative Contextual Bandits,” CHI 2019



May AI?

Design Ideation with Cooperative Contextual Bandits

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ABSTRACT

Design ideation is a prime creative activity in design. However, it is challenging to support computationally due to its quickly evolving and exploratory nature. The paper presents cooperative contextual bandits (CCB) as a machine-learning method for interactive ideation support. A CCB can learn to propose domain-relevant contributions and adapt their exploration/exploitation strategy. We developed a CCB for an interactive design ideation tool that 1) suggests inspirational and situationally relevant materials (“may AI?”); 2) explores and exploits inspirational materials with the designer; and 3) explains its suggestions to aid reflection. The application case of digital mood board design is presented, wherein visual inspirational materials are collected and curated in collages. In a controlled study, 14 of 16 professional designers preferred the CCB-augmented tool. The CCB approach holds promise for ideation activities wherein adaptive and steerable support is welcome but designers must retain full outcome control.

CCS CONCEPTS

• **Human-centered computing** → **Interactive systems and tools**; • **Computing methodologies** → *Machine learning*; • **Applied computing** → *Arts and humanities*.

KEYWORDS

Interactive machine-learning; ideation support; creativity support tools; mood board design

ACM Reference Format:
Janin Koch, Andrés Lucero, Lena Hegemann, Antti Oulasvirta. 2019. May AI? Design Ideation with Cooperative Contextual Bandits . In *CHI Conference on Human Factors in Computing Systems Proceedings (CHI 2019), May 4–9, 2019, Glasgow, Scotland UK.* ACM, New York, NY, USA, 12 pages. https://doi.org/10.1145/3290605.3300863

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1 INTRODUCTION

This paper discusses a machine-learning based interactive support for *design ideation*: the process of generating and curating original and useful ideas so as to define and explore what is desirable in a design project [16]. In design ideation, designers move between analysis and synthesis of ideas or concepts to construe a potential future [42]. Abductive reasoning [38] and abstraction are argued to allow designers to “break through to the a-ha! moment of inspiration”[40].

Scholars have suggested that computational support holds particular use potential in searching and collecting of materials [40]. However, advanced creativity support tools are rarely, if ever, deployed in early stage design [33]. The hurdle is to make creative contributions without distracting design thinking [15, 17, 21]. This is a challenge for non-interactive approaches in machine-learning, or for any approach assuming *pre-defined* objectives, which may yield irrelevant proposals [46]. Hence, it is important to study methods that allow designers to work *with* an algorithm rather than *for* it.

Ideation often involves verbal, visual or tangible material, which may be intentionally ambiguous to facilitate abstraction. However, the ability to ‘see’ and reason on it is fundamental to designerly thinking. Hence, visual material is considered to be most suitable to support the construction of new ideas [42]. In this paper, we look at *mood board design* as a representative and challenging area of ideation. A mood board is a visual collage composed of images, text, and objects. Its construction “stimulates the perception and interpretation of more ephemeral phenomena such as color, texture, form, image and status” [14]. They are used in the earlier stages of a design project for visualizing hard-to-express ideas for further inspiration-seeking and decision-making. The ideation process itself is dynamic and iterative in which designers switch between searching and making, going back to find the missing image that fits [30]. Designers engage here in both problem-defining and problem-solving [5]. The final collage can assist in the transmission of a new mindset, story, or vision to stakeholders [27].

Thus far, work on interactive mood board design focused mainly on collaboration and collocation. Lucero [28] identified six stages in mood board-making: *defining*, *collecting*, *browsing*, *connecting*, *building*, and *presenting*. The *Funky Coffee Table*[29] is a tabletop system that supports *browsing* by storing images in virtual layers. The *Funky Wall* [30]

May AI's mood board tool



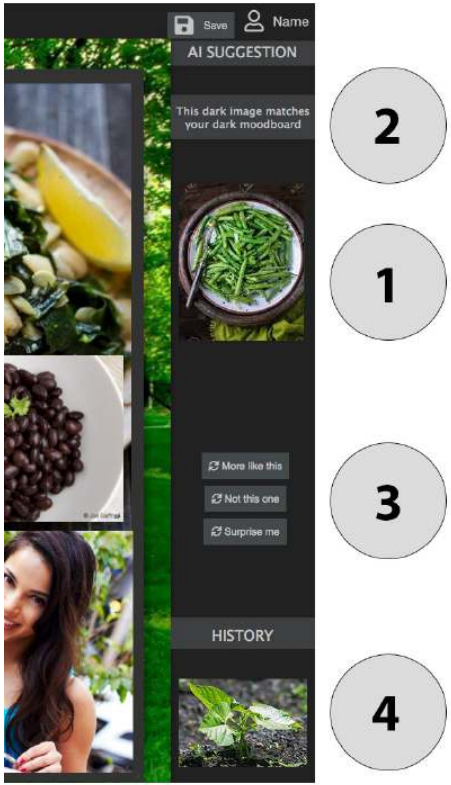
Koch et al., CHI 2019, Fig. 1: suggestion (1), explanation (2), steering buttons (3), history (4), image search (5), editing tools (6)

How May AI picks a suggestion

Each time an image is added or removed,
it reads the board's main colors

More like this: images with similar features
Surprise me: images with different features
Not this one: its usual suggestions

It learns from what the designer keeps, removes, or takes back from the history



Koch et al., CHI 2019, Section 3 and Fig. 1 (right side)

May AI with 16 designers



(a) with CCB



(b) with CCB



(c) no CCB

14 of 16 preferred the tool with the AI panel
13 of 16 kept at least one suggestion: 2.3 images on average, 25.5% of the final board
Without the AI panel, they rated the tool simpler and more clearly structured

Koch et al., CHI 2019, Fig. 4 and Section 6: boards made with the AI panel (a, b; the paper calls it CCB) and without (c)

What the designers said about May AI

“It has its own agenda, and it was making suggestions, but I had the choice to not follow that”

“There was a couch. I did not even understand why, but [...] afterwards I actually thought ‘ah, café’”

“could it be also forcing me to become lazier, because it brings the images itself?”



(b) with CCB

Koch et al., CHI 2019, Section 6: P3, P14, P14. Right: Fig. 4b, a board made with the AI panel

More like these and surprise me

From my board







More like these



















9 of 9 are chairs, how alike: **0.91**

Surprise me



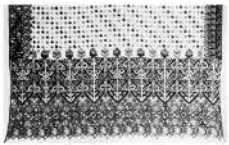
















0 of 9 are chairs, how alike: **0.62**

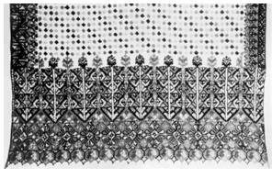
How alike: the average CLIP similarity between every pair of images on a board (my board: 0.69)

Surprise me's nine images









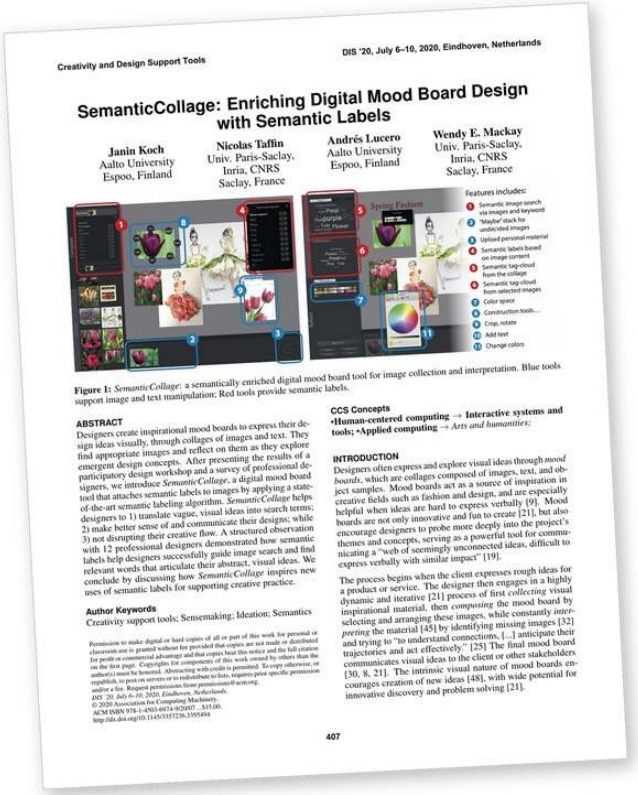


Chicago Stock Exchange Trading Room
Degas, Henri Degas and His Niece Lucie Degas
Massachusetts Dining Room, 1795 (a miniature room)
Interior of St. Mark's, Venice
Vues de Lyon, two wallpaper panels
Maryland Dining Room, 1770–74 (a miniature room)
A scarf
The Restaurant of the Great Art Exhibition (a print)

Titles from the Art Institute of Chicago's records

3. SemanticCollage

Today's reading: Koch et al.,
“SemanticCollage: Enriching Digital Mood Board Design with Semantic Labels,” DIS 2020



SemanticCollage: Enriching Digital Mood Board Design with Semantic Labels

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Saclay, France

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Saclay, France

Features includes:
1. Semantic image search via images and keyword
2. "Maybe" stack for undecided images
3. Upload personal material
4. Semantic labels based on image content
5. Semantic tag-cloud from the collage
6. Semantic tag-cloud from selected images
7. Color space
8. Construction tools...
9. Crop, rotate
10. Add text
11. Change colors

Figure 1: *SemanticCollage*: a semantically enriched digital mood board tool for image collection and interpretation. Blue tools support image and text manipulation; Red tools provide semantic labels.

ABSTRACT

Designers create inspirational mood boards to express their design ideas visually, through collages of images and text. They find appropriate images and reflect on them as they explore emergent design concepts. After presenting the results of a participatory design workshop and a survey of professional designers, we introduce *SemanticCollage*, a digital mood board tool that attaches semantic labels to images by applying a state-of-the-art semantic labeling algorithm. *SemanticCollage* helps designers to 1) translate vague, visual ideas into search terms; 2) make better sense of and communicate their designs; while 3) not disrupting their creative flow. A structured observation with 12 professional designers demonstrated how semantic labels help designers successfully guide image search and find relevant words that articulate their abstract, visual ideas. We conclude by discussing how *SemanticCollage* inspires new uses of semantic labels for supporting creative practice.

Author Keywords

Creativity support tools; Sensemaking; Ideation; Semantics

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http://dx.doi.org/10.1145/3357236.3395494

CCS Concepts

•**Human-centered computing** → **Interactive systems and tools;** •**Applied computing** → *Arts and humanities;*

INTRODUCTION

Designers often express and explore visual ideas through *mood boards*, which are collages composed of images, text, and object samples. Mood boards act as a source of inspiration in creative fields such as fashion and design, and are especially helpful when ideas are hard to express verbally [9]. Mood boards are not only innovative and fun to create [21], but also encourage designers to probe more deeply into the project's themes and concepts, serving as a powerful tool for communicating a "web of seemingly unconnected ideas, difficult to express verbally with similar impact" [19].

The process begins when the client expresses rough ideas for a product or service. The designer then engages in a highly dynamic and iterative [21] process of first *collecting* visual inspirational material, then *composing* the mood board by selecting and arranging these images, while constantly *interpreting* the material [45] by identifying missing images [32] and trying to "to understand connections, [...] anticipate their trajectories and act effectively." [25] The final mood board communicates visual ideas to the client or other stakeholders [30, 8, 21]. The intrinsic visual nature of mood boards encourages creation of new ideas [48], with wide potential for innovative discovery and problem solving [21].

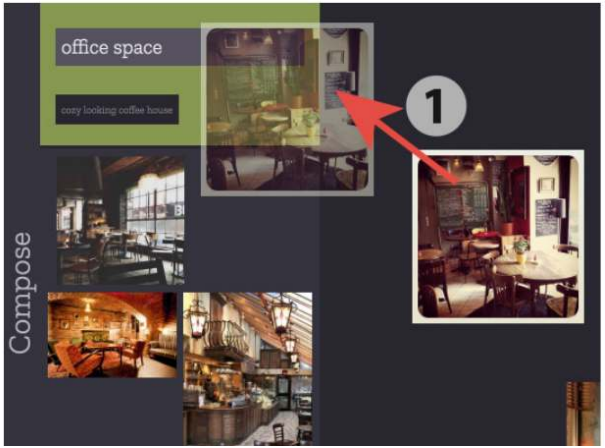
SemanticCollage



Each image gets the 10 labels that Google Cloud Vision is most confident about. Designers can change how much each label counts, or add their own.

Koch et al., DIS 2020, Fig. 1: blue tools edit images and text, red tools show labels

Searching with an image and words





Tom's brief: a “coffice”, part café, part office

1. Searches “cozy looking coffeehouses”
2. Finds “office spaces” cold
3. Drags a coffeehouse image into the search
4. Removes its label “room”, searches again

Koch et al., DIS 2020, Fig. 4 and the scenario on pp. 410-411

Label clouds



Top cloud: the labels of every image on the board

Bottom cloud: the labels that the selected images share

Tom's selected images shared “architectural styles”

Koch et al., DIS 2020, Fig. 5: Tom's mood board

SemanticCollage with 12 designers







Preferred the labels while composing: **64%** (none preferred no labels)
Preferred the labels while reflecting: **58%** (25% preferred no labels)

“This picture is kind of nice, but I want something more similar to that one.”

“articulate the reason why I chose it, because the gut feeling is somehow very difficult to explain”

Koch et al., DIS 2020, Fig. 7 (boards for the coffice, the MEETbar and a shoe store) and Section 6; quotes from P3 and P8

CLIP labels for our board



dining, painting, conversation, café, restaurant



woven, fabric sample, linen, checked pattern, rattan



chair, rattan, furniture, **upholstery**, wicker

CLIP ViT-B/32: the 5 closest of 64 words I wrote, such as “cane”, “checked pattern”, “café” and “cozy”

Image and words on our pool

The Thonet chair only









The Thonet chair and “a chair with a woven cane seat”









Chairs with a cane seat: **1 of 6** with the image only, **3 of 6** with the image and words

CLIP ViT-B/32: the 6 closest images to the chair's numbers, or to the chair's numbers plus the words' numbers

Four boards for the café chair

By hand



2 chairs
How alike: **0.69**

Search with the brief



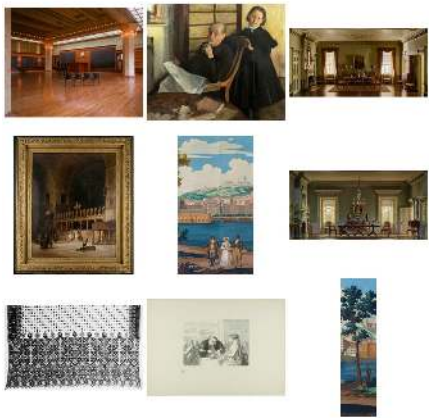
9 chairs
How alike: **0.89**
2 also by hand

More like these



9 chairs
How alike: **0.91**
1 also by hand

Surprise me



0 chairs
How alike: **0.62**
0 also by hand

Chairs: images from the 56 chair photos. How alike: the average CLIP similarity between every pair of images on a board.

Discussion

1. When did a suggestion change what a board was about?
2. What can't you tell the model with “more like these” and “surprise me”?
3. What does a label tell your partner, and what does it leave out?

Led by this week's discussion leads, with questions from the reading posts

Workshop: build a mood board

1. Run the notebook on the example
2. Collect 100 or more images for your partner's brief, or for the café chair
3. Pick 9 by hand, before you look at the model's boards
4. Compare your board with one of the model's boards

Due before week 3: the two boards side by side, and a few sentences on which one would help your partner's designers more, and why

Team and partner

Due this week: a team of 3 or 4
and an organization to work with

Next: Week 3

Prototyping with Generative Models

Read before the studio:

- Houde & Hill, “What Do Prototypes Prototype?” 1997
- Rombach et al., “High-Resolution Image Synthesis with Latent Diffusion Models,” CVPR 2022
- Schön, “Designing as reflective conversation with the materials of a design situation,” 1992