

# Design for Creativity

Jin L.C. Guo  
SOCS McGill University



# Agenda

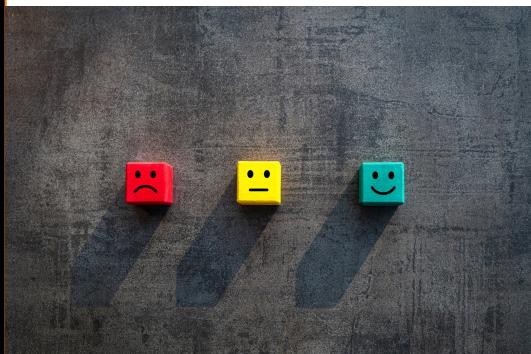
- What is creativity
- Creativity Support Tools
- Examples of Human-AI Co-Creation
- Examples of AI for Group Collaboration

# Activity

1. What do you consider as creative activities?
2. Who and what tools are involved during those activities?
3. What is Creativity?

Individualist view: Creativity is a new mental combination that is expressed in the world.

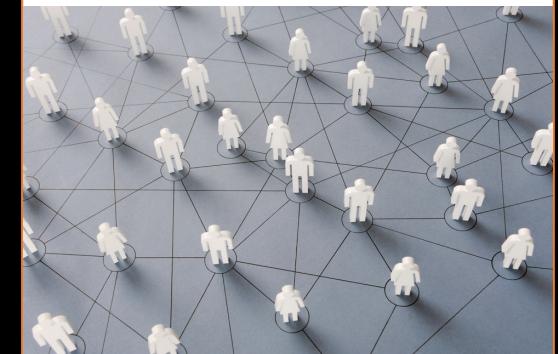
## Personality



## Internal mental process



## Creative social systems



Sociocultural view: Creativity is the generation of a product that is judged to be novel and to be appropriate, useful, or valuable by a suitable knowledgeable social group.

# Samples of classes of creativity support tools and samples or product

*Ben Shneiderman. 2007. Creativity support tools: accelerating discovery and innovation. Commun. ACM 50, 12 (December 2007), 20–32. DOI:<https://doi.org/10.1145/1323688.1323689>*

Individual and Group Creativity Support Tools	
Information visualization tools	Spotfire, SAS JMP, DataDesk, ManyEyes, Digg
Specialized visualization tools: GIS	Google Maps, ArcInfo
Specialized visualization tools: gene expression analysis	GeneSpring, DNASTAR
Mathematical manipulation	MatLab, Mathematica
Engineering, architectural, industrial, product design	Autocad Inventor, DataCAD, SolidWorks
Simulation	SPICE, Tierra
New media development environments	Max/MSP, Pd, processing
Animation and interaction	Flash, FLEX, OpenLaszlo
Music	Cinescore, Cakewalk Sonar
Video editing	Premier, Final Cut Pro, Lightworks, iMovie, Windows MovieMaker
Concept mapping	Inspiration, MindMapper, MindManager, Axon
Group and Social Creativity Support Tools	
Software development	Eclipse, JDeveloper, Visual Studio
Wikis	Wikipedia, Wikia
Citizen journalism	Blogger, Ohmynews, Slashdot
Media sharing	Flickr, YouTube
Music	Garageband, MacJams

# Design Principles for Creativity Support Tools (CSLs)

Support exploratory search

Enable collaboration

*Ben Shneiderman. 2007. Creativity support tools: accelerating discovery and innovation. Commun. ACM 50, 12 (December 2007), 20–32. DOI:<https://doi.org/10.1145/1323688.1323689>*

# Design Principles for Creativity Support Tools (CSLs)

Support exploratory search

Enable collaboration

Provide rich history-keeping

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# Design Principles for Creativity Support Tools (CSLs)

Support exploratory search

Enable collaboration

Provide rich history-keeping

Design with low thresholds, high ceilings, and wide walls

*Ben Shneiderman. 2007. Creativity support tools: accelerating discovery and innovation. Commun. ACM 50, 12 (December 2007), 20–32. DOI:<https://doi.org/10.1145/1323688.1323689>*

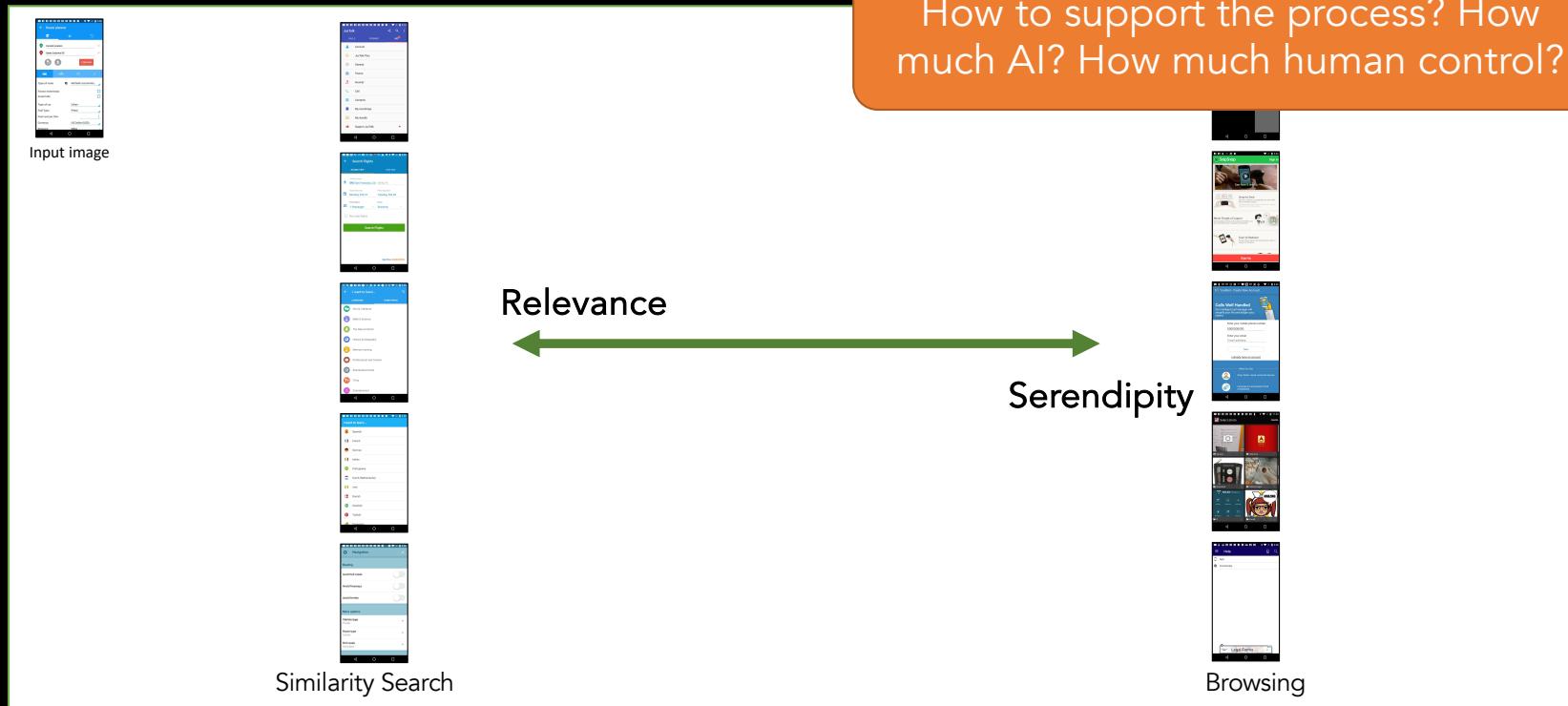
Author	Year	Analog	Phone	Tabletop	Wall display	Tablet	Laptop/PC	Tangibles	No device	Devices	Complex.	Availability	Maturity	Part of the process	User group	Evaluation	Collab.
Fischer	1999									Low complexity	Mid complexity	High complexity	Not available	Idea generation	Novice	No evaluation	Individual use
Streitz et al.	1999												Needs special hardware	Evaluation/critique	Casual	Hypothesis-driven	Collaborative tool
Prante et al.	2002												Online, but setup req.	Implementation	Expert	Qualitative	Machine creativity
Abrams et al.	2002												Readily available	Iteration	Unspecified	Quantitative	
Bryan-Kinns	2004												Widely publicly adopted	Meta/project management		Mixed-methods	
..... .....																	
Yeh & Kim	2018																
Gilon et al.	2018																
Clark et al.	2018																
Sun et al.	2018																
Wang et al.	2018																
Smit et al.	2018																
Maiden et al.	2018																

Jonas Frich, Lindsay MacDonald Vermeulen, Christian Remy, Michael Mose Biskjaer, and Peter Dalsgaard. 2019. Mapping the Landscape of Creativity Support Tools in HCI. *Proceedings of the 2019 CHI*. DOI:<https://doi.org/10.1145/3290605.3300619>

# AI in Co-Creation Process

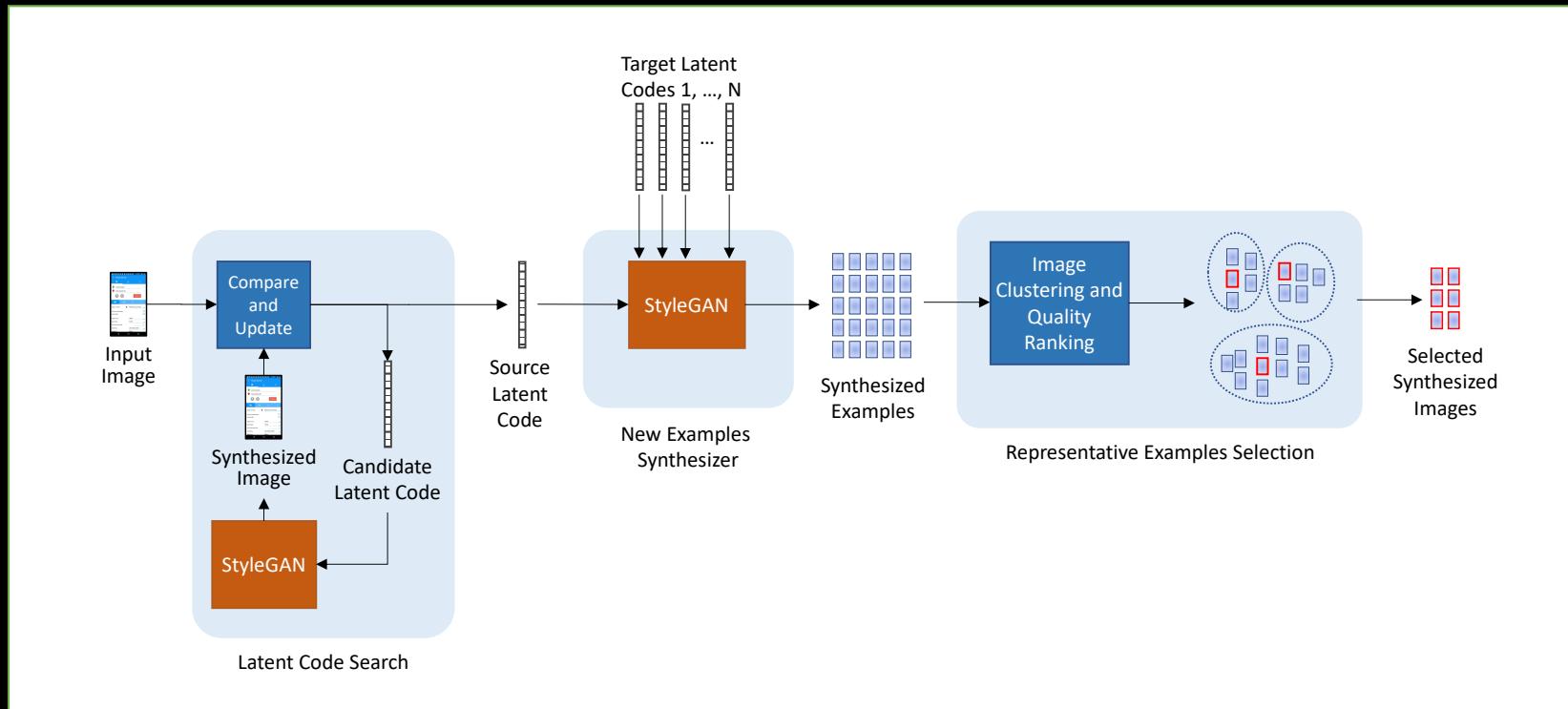
- Human-AI co-creation
  - Drawing
  - Creative writing
  - Graphic Design
  - Video game content
  - GUI
  - ...

# Example: GANSpiration



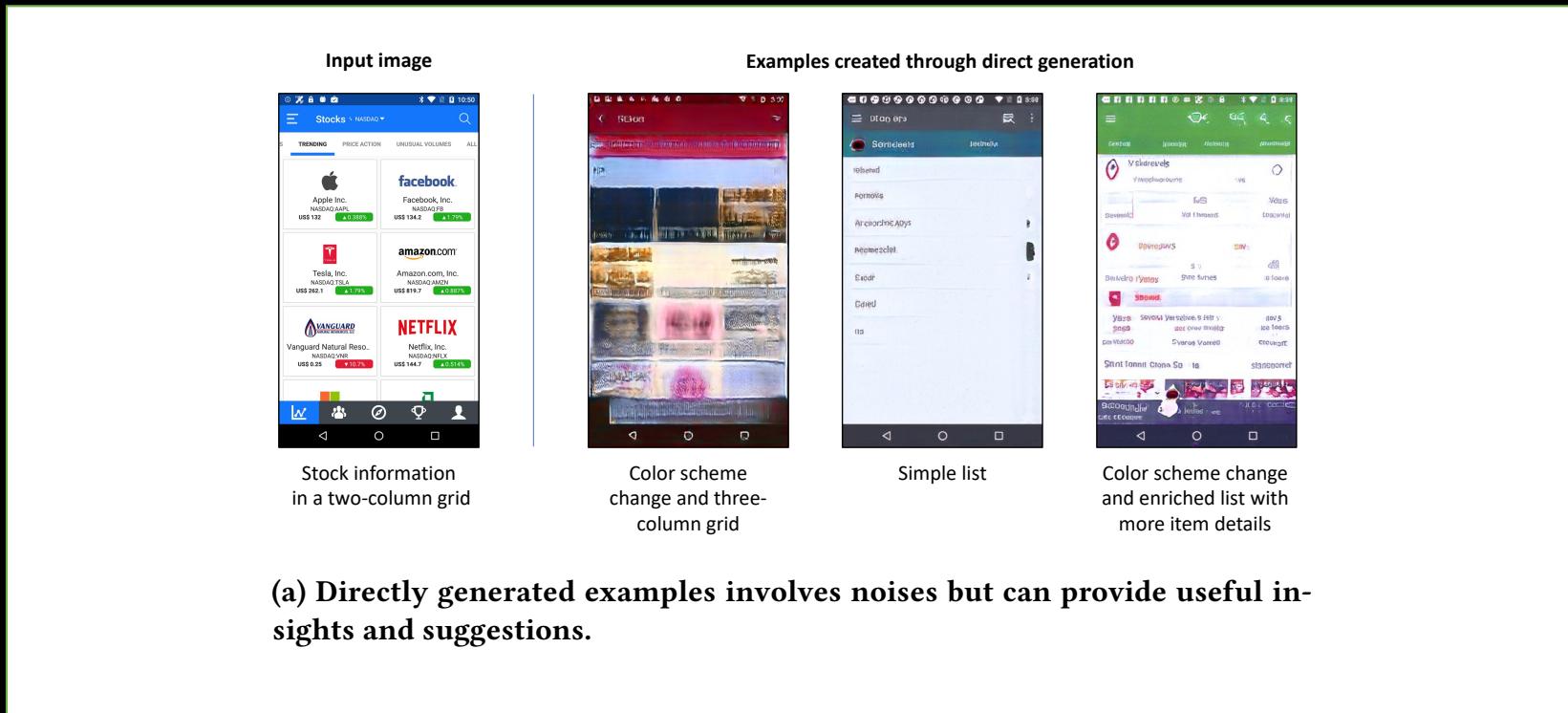
Mozaffari, M.A., Zhang, X., Cheng, J. and Guo, J.L., 2022, April. GANSpiration: Balancing Targeted and Serendipitous Inspiration in User Interface Design with Style-Based Generative Adversarial Network. In *CHI Conference on Human Factors in Computing Systems* (pp. 1-15).

# Example: GANSpiration



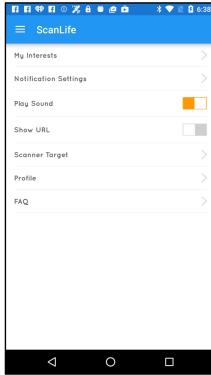
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# Example: GANSpiration



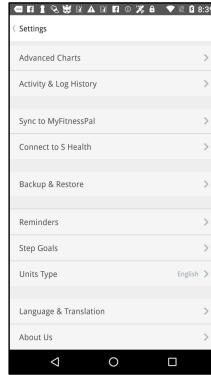
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# Example: GANSpiration



**Input image**

Setting menu with toggles

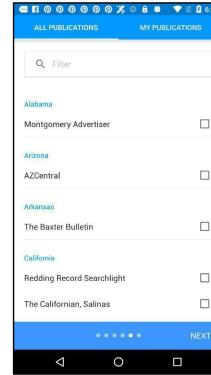


**Examples created through generation + search**

Color scheme change



Setting menu as a drawer



Checkboxes instead of toggles

**(b) Searched examples based on generated images are cleaner and can provide useful insights and suggestions.**

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# Example: Visual Blend

How to support the process? How much AI? How much human control?

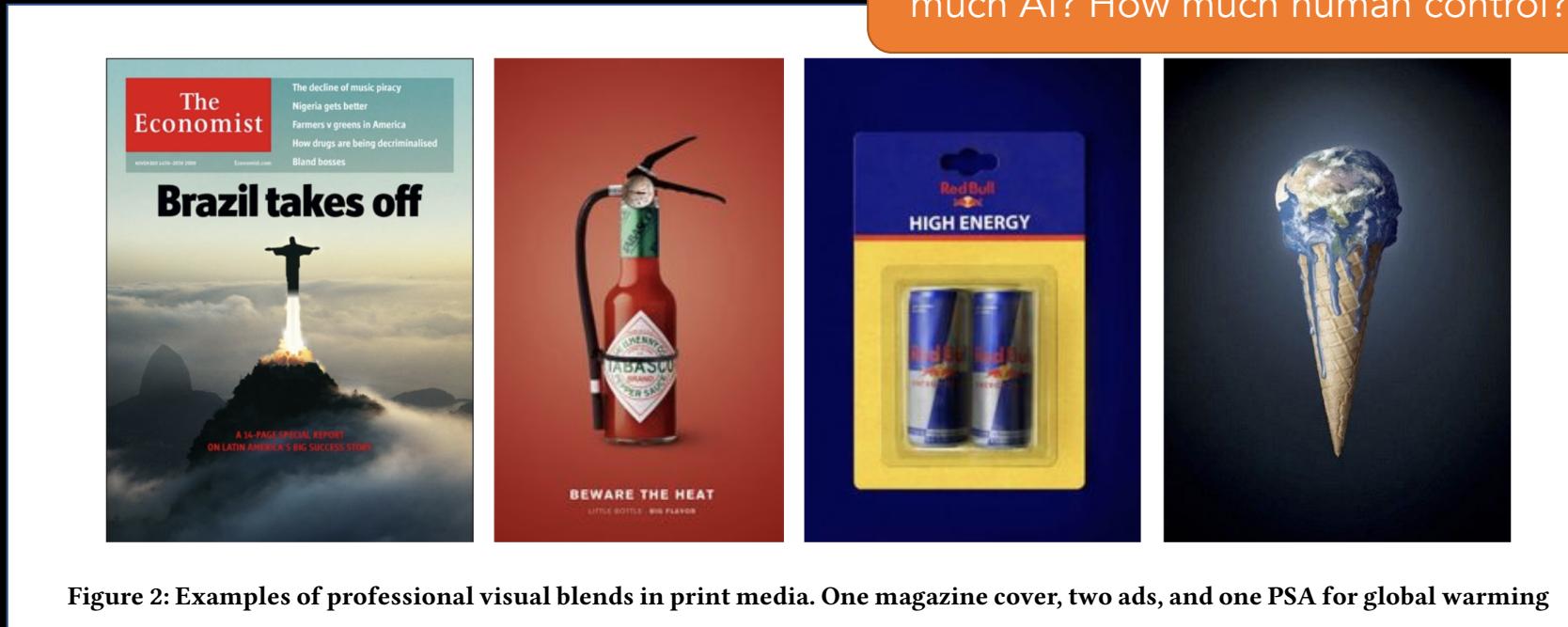
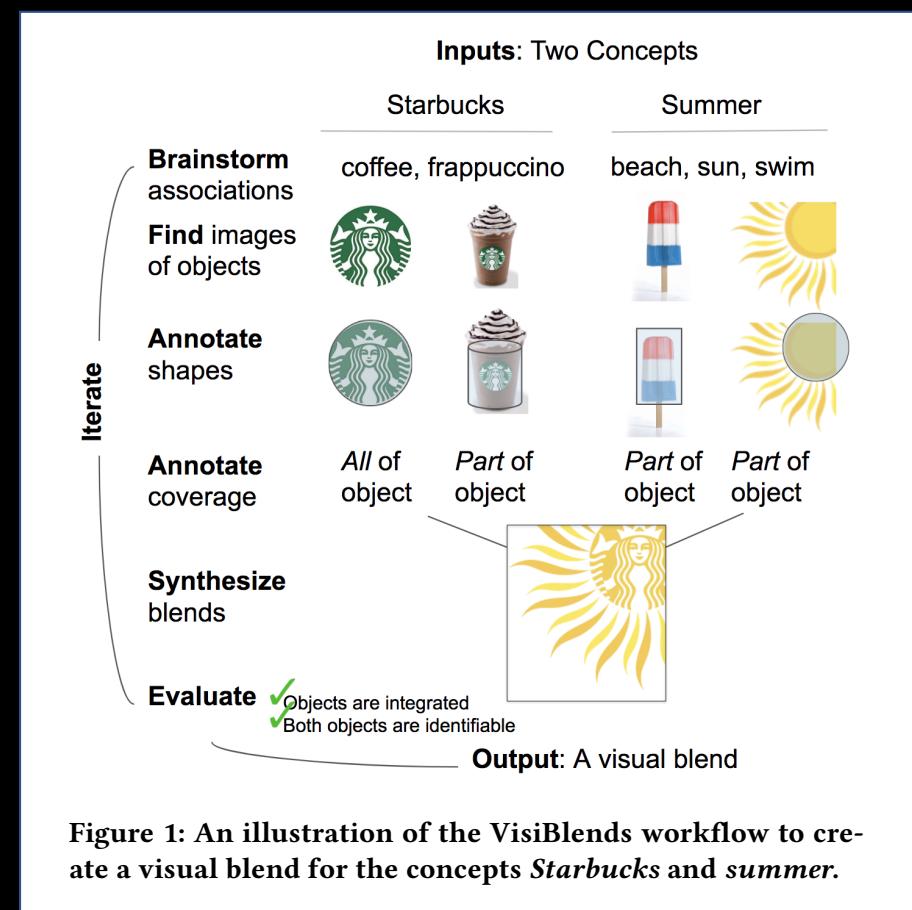


Figure 2: Examples of professional visual blends in print media. One magazine cover, two ads, and one PSA for global warming

Lydia B. Chilton, Savvas Petridis, and Maneesh Agrawala. 2019. VisiBlends: A Flexible Workflow for Visual Blends. Proceedings of CHI 2019. DOI:<https://doi.org/10.1145/3290605.3300402>

# Example: Visual Blend



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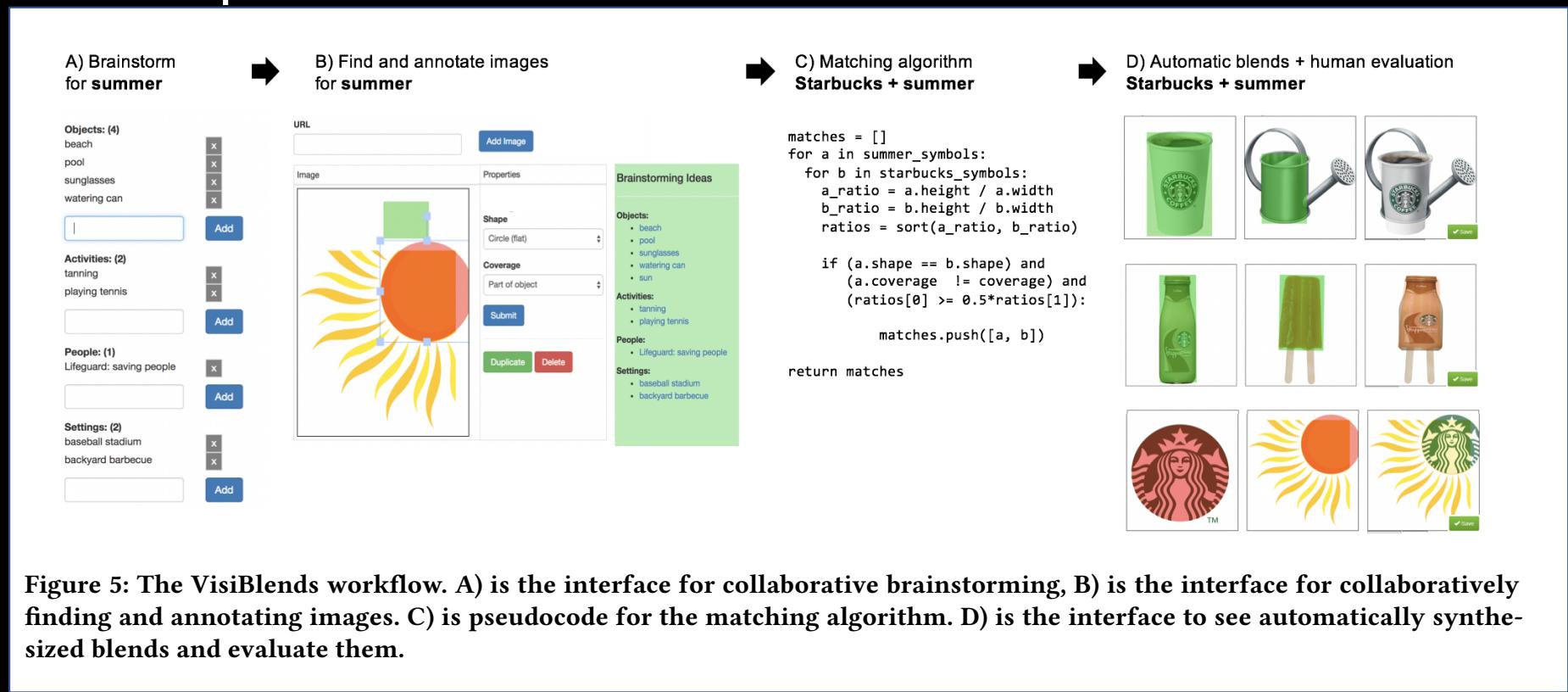


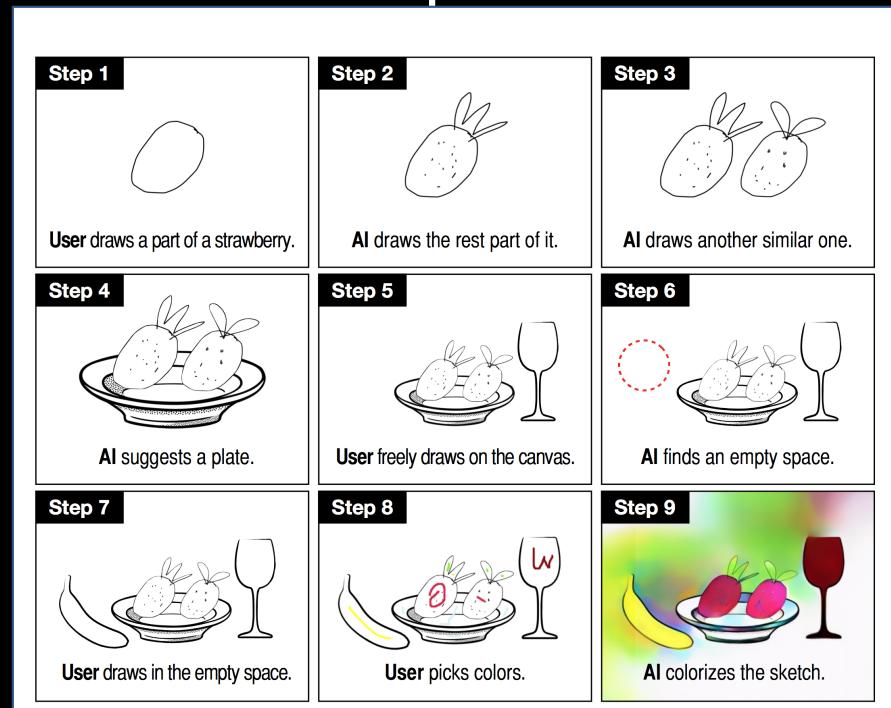
Figure 5: The VisiBlends workflow. A) is the interface for collaborative brainstorming, B) is the interface for collaboratively finding and annotating images. C) is pseudocode for the matching algorithm. D) is the interface to see automatically synthesized blends and evaluate them.

Lydia B. Chilton, Savvas Petridis, and Maneesh Agrawala. 2019. VisiBlends: A Flexible Workflow for Visual Blends. Proceedings of CHI 2019. DOI:<https://doi.org/10.1145/3290605.3300402>

# More on Designing the User Experience

- Who should take the initiative?
- How detailed should the communication between AI and user?

# More on Designing the User Experience



**Figure 1. Drawing using DuetDraw in the Lead mode. With DuetDraw, users and AI can collaboratively draw pictures.**

Changhoon Oh, Jungwoo Song, Jinhan Choi, Seonghyeon Kim, Sungwoo Lee, and Bongwon Suh. 2018. I Lead, You Help but Only with Enough Details: Understanding User Experience of Co-Creation with Artificial Intelligence. Proceedings of Chi2018. DOI:<https://doi.org/10.1145/3173574.3174223>

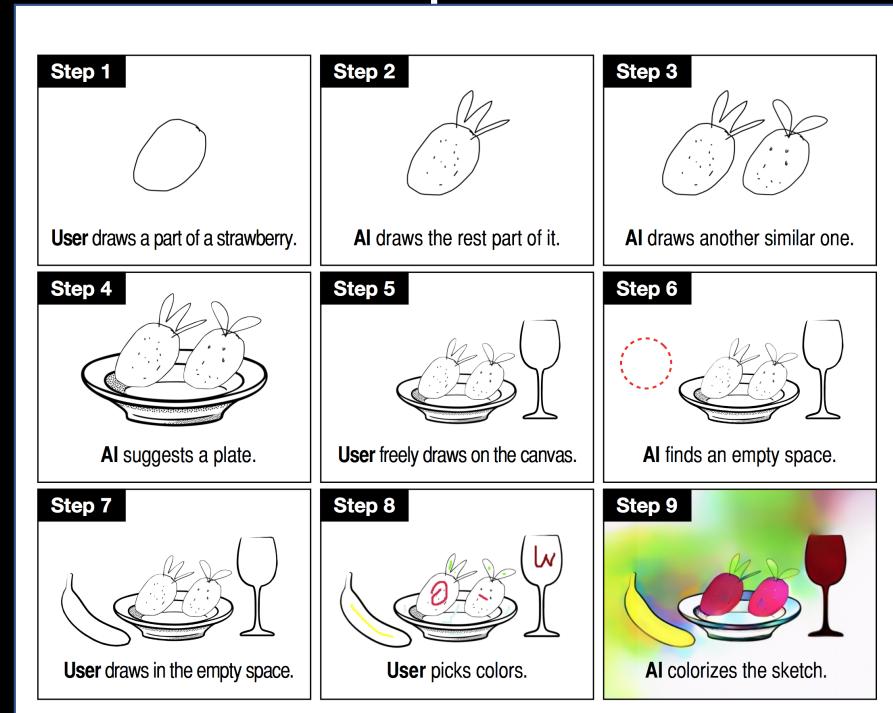
# More on Designing the User Experience

*Most participants prefer detailed instructions. But detailed mode did not guarantee a good experience.*

*Participants always want to LEAD.*

*Participants were pleased with unexpected results.*

*Participants felt confused when the ability of the AI differed across functions.*



**Figure 1. Drawing using DuetDraw in the Lead mode. With DuetDraw, users and AI can collaboratively draw pictures.**

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# AI in Co-Creation Process

- Human-AI co-creation
- AI for Group Collaboration
  - As collaborate teammates
  - As mediator of teamwork

How AI could affect collaborative dimensions such as interpersonal dynamics, impression formation, trust and conflict?



# Activity

- Creative writing as a pair.
- The topic is about “Puzzle”. You are free to use any style that your team decides.
- Use one AI model to support you during this process.

# Example: Cococo

The image shows a screenshot of the Bach CoCoCo application interface. The interface is overlaid on a background photograph of a piano keyboard and a guitar neck.

**UI Elements:**

- Header:** "Bach CoCoCo"
- Score Area:** Shows a musical score with multiple staves. A purple box labeled (1) highlights a green horizontal bar on the top staff. A purple box labeled (6) highlights a blue horizontal bar on the middle staff. A purple box labeled (7) highlights a dark blue horizontal bar on the bottom staff.
- Control Panel:** Includes:
  - A vertical column of buttons labeled S, A, T, B.
  - Buttons for "GENERATE" (with a blue icon), "3 sequences", "Conventional" (radio button), "Surprise" (radio button), "Minor" (radio button), "Major" (radio button), "Similar" (radio button), and "Different" (radio button).
  - A box labeled "original".
  - A red-bordered box labeled (5) containing three small musical snippets.
  - A "CHOOSE" button.
- Bottom Controls:** Includes a play button, a back button, a forward button, a pencil icon, a grid icon, a trash bin icon, and dropdown menus for "Bass Voice" (set to "Bass") and "Quantization" (set to "1/8").
- Key Signature:** "C MAJOR"

Minhyang (Mia) Suh, Emily Youngblom, Michael Terry, and Carrie J Cai. 2021. AI as Social Glue: Uncovering the Roles of Deep Generative AI during Social Music Composition. Proceedings of CHI 2021. DOI:<https://doi.org/10.1145/3411764.3445219>

# Example: Cococo

## Impact of AI in the co-creation process

Additional decision-making points on when, where, and how to use AI in their collaboration

- 1) deciding where and when to request that the AI generate content (voices and time segments);
- 2) deciding what quality of music they wanted in that segment by adjusting the sliders;
- 3) evaluating and selecting which of the N AI-generated options sounded best;
- 4) deciding which partner would be the main driver of these decisions above, each time they occurred.

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# Example: Cococo

## Role of AI in the co-creation process

AI as common ground

*"AI's generated output provided a seed for discussion that participants found helpful for finding common ground. It also provided initial momentum for getting the composition started. "*

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# Example: Cococo

## Role of AI in the co-creation process

AI as common ground

AI as a psychological safety net.

*"AI may help provide psychological safety by offloading the burden of generating acceptable content, acting as a safety net that re-mediates or smooths over human-created rough edges, and introducing an air of playfulness through its surprises and idiosyncrasies."*

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# Example: Cococo

## Role of AI in the co-creation process

AI as common ground

AI as a psychological safety net.

AI as a force for progress.

*"AI helped the co-composition process move forward more quickly, providing initial content as a starting point, narrowing a large decision space to a few concrete decision parameters, generating alternative ideas when users were stuck, and filling in large chunks of unfinished work, all of which enabled participants to speed up their progress."*

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# Example: Cococo

## Role of AI in the co-creation process

AI as common ground.

AI as a psychological safety net.

AI as a force for progress.

AI as social lubricant.

*"AI helped uncover and mitigate latent friction, both by offering a path for moving forward, and by shifting social dynamics away from human-human differences towards human-AI differences."*

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# Example: Cococo

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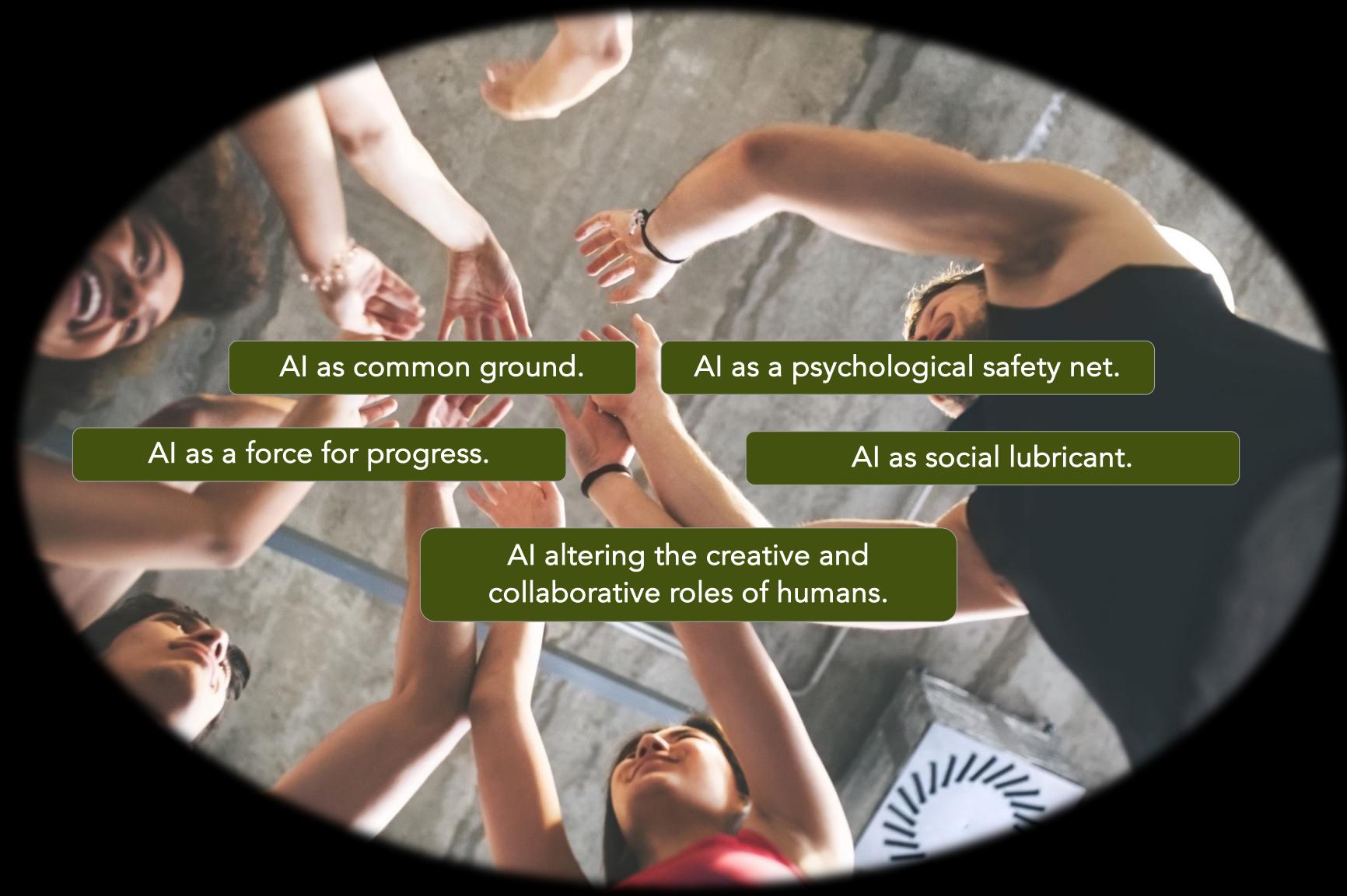
AI as a force for progress.

AI as social lubricant.

AI altering the creative and collaborative roles of humans.

*"AI could limit their depth of collaboration, despite it enhancing their ease of collaborating together. Intrinsic constraints of the AI algorithm itself may have limited users' creative scope and freedom"*

Minhyang (Mia) Suh, Emily Youngblom, Michael Terry, and Carrie J Cai. 2021. AI as Social Glue: Uncovering the Roles of Deep Generative AI during Social Music Composition. Proceedings of CHI 2021. DOI:<https://doi.org/10.1145/3411764.3445219>



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collaborative roles of humans.

# Review

- What is creativity
- Creativity Support Tools
- Examples of Human-AI Co-Creation
- Examples of AI for Group Collaboration

Next

# Security and Privacy