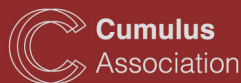


Cumulus Beijing CAFA 2023 Proceedings

Hosted by :
Cumulus Association
Central Academy of Fine Arts



中央美术学院
Central Academy of Fine Arts

C A F A

爱的阐释

Narratives
of Love

Narratives of Love

Cumulus Conference Proceedings CAFA Beijing 2023

11/2024 Beijing

Cumulus conference: Narratives of Love

Hosted by the School of Design, Central Academy of Fine Arts, China on November 22-24, 2023

Conference website: <https://cumulus2023beijing.cafa.edu.cn/>

Published by Cumulus

Cumulus the Global Association of Art and Design Education and Research. Aalto University, School of Arts, Design and Architecture PO BOX 31000, FI-00076 Aalto www.cumulusassociation.org

ISSN 2490-046X

ISBN 978-952-7549-01-8 (pdf)

No. 11 Cumulus Conference Proceedings Series

Editor-in-Chief: Cumulus President Lorenzo Imbesi

Publications in the Series:

01/17 Kolding, REDO

02/17 Bengaluru, Letters to the Future

03/18 Paris, To get there: designing together

04/18 Wuxi, Diffused Transition & Design Opportunities

05/19 Rovaniemi, Around the Campfire – Resilience and Intelligence

06/19 BogotD, The Design After

07/21 Rome, Design Culture(s) Volume #1, Volume #2

08/23 Guayaquil, Arts imagining communities to come

09/23 Detroit, Design for Adaptation

10/23 Antwerp, Connectivity and Creativity in times of Conflict

11/24 Beijing, Narratives of Love

Editors: Yuqi Liu, Beike Li, Fangxingzi Chen, Musang Xu,

Ninghui Hao, Tao Han, Xinrong Zhang, Hanhua Hu, Miaosen Gong

Orgnazing Team: Ziyuan Wang, Yufeng Li, Xuanzheng Wang, Jun Hai, Wenlong Li, Bo Zhou, Tianchong Xue, Yunyuan Shi, Yuwen-Wang, Liujun Liao, Yimeng Yu, Shiqi Li, Siyang Jing, Shutong Wang, Cai Shen, Shuxin Cheng, Shuai Feng, Hua Jiang, Xiaowen Chen, Jun Fei, Wenchao Zhang, Jie Wang, Mingguang Zhang, Ziwei Sun, Zishu Zhou, Huanqin Dong, Meng Wen, Hua Chen

Design Team: Yi Gong, Ruoyi Li, Tianyi Yu, Chunyu Luo, Gengyu Wang

Coordinating Team: Erlu Ni, Xueying Li, Jing He, Yanchao He, Bing Yuan, Ruoyi Li, Qinqing Liu, Huangrong Li, Binghua Yu, Liangming Zhang, Yuejia Wang, Jiayi Chen, Haihua Wang, Sidong Wang, Xinlin Li, Yichen Wei, Xiao Yu, Tianyi Yu, Luyao Zheng, Yingxi Yan, Jiarui Ning, Shangru Li, Aiwen Ding, Yuxiao Liu, Zinuo Zhang, Yunting Liu.

Preface

- I Cumulus Beijing CAFA 2023 Conference Narratives of Love
- II International Reviewer Board
- III Narratives of Love: Towards Healing, Transformation, and Transcendence

Track1 Narratives of Love

- 1 Exploring the functions of narratives coming from the wardrobe
Anikó Gál
- 6 Toward contemporary issues -"Learning from Plants" beyond human-centered design thinking
Beike Li
- 11 Beyond Empathy: The Students and the Vulnerable at Immersive Education on Social Design.
Cecilia Casas Romero
- 19 The role of haptics in the future of love and intimacy.
Emanuela Corti, Ivan Parati
- 25 Learning to Care for a Sustainable World: Cultivating Eco-Consciousness
Carla Paoliello
- 31 The Possibility of a Narrative of Love Between Humans and Artificial Intelligence.
Christophe Rolland
- 38 IT'S GOING TO BE OKAY. IT WILL: Depicting human experience that oscillates between reality and virtuality in a novel.
Michael Mackenzie
- 44 Digital Social Innovation for Inclusive Growth: A Lesson Learnt from Digital Participation Approach in Singapore
Minqing Ni
- 50 Analysis of Taiwan region's Social Design Development Characteristics and Context
Yusi Qi, Melvyn Liao
- 57 The construction of relationships in art and design in the Anthropocene: The practice of Interspecies love
Yuxin Wang
- 63 Data Saturation: How Technological Dependence Stole the Perception of the Future
Musang Xu

- 69 The Factors Forming Negative Learning Experiences of Korean Undergraduates within a Design-Oriented Creativity Course: A Grounded Theory Approach Exploring the functions of narratives coming from the wardrobe
Woolahm Yoon, Juyoung Chang
- 75 People's Park: A Manifestation of the Societal and Cultural Changes Through the Lens of Chinese Marriage Market
Jiashi Yu
- 81 Integrating Creative Art in the Healing Arts: Facilitating Positive Emotional Changes and Releasing Negative Emotions
Amic G. Ho
- 87 A Tribute to A Mother's Love: Black Hair and Empowerment
Gloria M. Milfetu1, Barbara Trippeer
- 93 Towards, Inwards, Outwards, Onwards Dancing with interdependence through design
Maria Claudia Coppola
- 100 Textile accessories as meaning making for Contextualizing Museum archives.
Alia Hadi Ali
- 106 Echoes of affection: crafting spaces of healing in sheltered workshops for the elderly
Izzy Yi Jian, Zi Yang, Yu Liu, Kin Wai Michael Siu
- 113 Insights into Sustainable Design Innovation Strategies for SDGs: A Study of 527 iF Design Talent Awards from 2020-2023
Weizhuan Hu, Jie Hou, Linghao Zhang
- 121 "Architectural Ornament" after the Postmodern Era
Cui Xiaosheng, Zhou Hanxiang
- 129 Creating creativity; radical pedagogy as a narrative of transformation.
Marc Boumeester, Bob Verheijden FRSA, Mara Joustra, Marijke Meester, Lucas Verweij
- 136 How Cats Connect Community
Jingyi Hou
- 143 Investigating the use of street furniture in central London to understand multiple levels of conflict found in public spaces
Haihua Wang
- 148 Creative Actors in Place-making: Creations of Individual Experience and Collective Memory
Ye Wanchun1, Kin Wai Michael Siu
- 154 A Narrative Approach to Exploring Values: Fashion Show as A Case Study
Si-guang Huo, Jie Sun

- 159 Revitalizing the Traditional Game Vitality: An Innovative Design for Children's Outdoor Play Spaces in the Park City
Feng Zihan, Wang Wei
- 167 Co-Design Sessions at Revigrés: Workshop 1.0 as a Catalyst for Design-Led Innovation and Transformative Culture
Gisela Pinheiro, Teresa Franqueira
- 184 Two kinds of love between new local elites a case study of the 'Four new types of villagers' in Pingnan, Fujian
Enru Wang, Chunyu Liao
- 190 A Study of the Intentionality of Love in Chinese Contemporary Art Exhibitions over the Past Decade
Qianyuan Zhang, Hanpu Zhang
- 198 A Love That Never Fades Away: Relic Remembrance, Design, and Healing
Guanqing Hua, Ying Deng, Tanhao Gao, Hongtao Zhou
- 205 Love and Healing Embodied in Public Art: An Interpretation of the "Rubber Duck"
Huiming Jia
- 211 Co-Creation through Local Art Activities A Case Study of the Nezu Project and the Interdiffusion of Place and Atmosphere
Tanhao Gao, Mengshi Yang, Hongtao Zhou
- 216 The Intersection of Intimacy and Technology: An Ethnographic Exploration of Instant Messaging Services in Long-Distance Relationships
Xiyuan Luo
- 224 Archive/Album and Other Images
Stephen Connolly
- 228 Benevolence in the Details: Exploring Compassionate User Experience in Sustainable Design
Mengyang Wu
- 236 "Love is the one thing that transcends space": Design of an online healing platform based on family constellation
Mengshi Yang, Tanhao Gao, Ruochen Hu, Hongtao Zhou
- 243 From Loneliness to Trust: Exploring the Value Co-Creation Model of Collective Elderly Care Services for Older Women
Yi Zhang, Li Zhang
- 248 Designing for Health: A Clothing "Chan" (褙) in The Ancient Chinese Medical Prescription
Zhao Shiqi

- 253 The Art and life of Loving the Place You Live
Cui Xiao
- 258 Exploring the Diverse Roles of Sound in Film: A Case Study of the Japanese Movie Liz and the Blue Bird
Mengzhen Dong, Wen Xiong
- 263 Unraveling the Healing Potential of Traditional Heritage and Childhood Scenarios — Using Narrative Public Art Installations as Healing Catalysts During Transformation Era
Tanhao Gao, Mengshi Yang, Hongtao Zhou
- 270 Design Study on Constructing a Three-dimensional Slow Traffic Network Based on the Context of Urban Renewal
Jiang Zihan
- 275 Research on the user experience elements of the future social kitchen in China from the perspective of affordance
Jinzhao Liu, Xiaobo Qian
- 280 Healing Rooted in Love: Discursive Design Healing with Intellectual Reflection as the Core
Yujia Liu¹, Li Zhang
- 287 Genuine Love and Rational Love: An Exploration of the Practical Logic of AI in Painting Arte
Liu Zheng
- 292 Healing as a mode of reconstruction: The use of virtual reality to engage stakeholders.
Nicolas Marechal, Liu Ling-Chun, Shengfang Chou
- 299 A life cycle study on the HPP Event booth of cosmetics products in the context of circular economy
Duan Wu, Zixin Ren, Shuxiao Zhong, Haoyue Lei, Shijian Zhao
- 307 Research on the Construction of Public Space in Northwest Sichuan Based on the Spirit of Place -
- Taking Jianguyou Qinglinkou Ancient Town as an Example
Tan Yuxin, Wang Wei
- 310 Translating Sense of Place with Slices of Time: Experience from Miyazaki, Japan
Yang Hsin-Yi, Lu Mengyao, Yang Zhen
- 316 Smart Material Inspired Emotional Design based on Biosignal Measurement
Jing Zhao, Jianing Wang, Xiaoyou Liu, Yiming Ma
- 323 Research on the renewal design of public space in marine villages based on symbiotic thought —
Taking the fishing platoon of Xunzhou Village, Raoping County, eastern Canton as an example
Dingyu, Wangwei
- 329 Research on Image Style and Emotion Expression in Maalbeek
Li Lutong
- 332 Constructing Child-Friendly Recreational Spaces: A Social Innovation Perspective

- Liu Weia, Wang Wei*
339 Sense of Value: Thinking about the Stance of Design through "Community Engagement"
Liu Zhenmiao
- 344 Visual Design Practice Exploration of Dazu Rock Carvings with Glitch Art in the Context of Cultural Heritage Crisis and Opportunity
- 350 *Zihan Qu, Deao Wang*
Love-driven craft sustainability in rural areas: A comparative study in Chongming, China and Fife, Scotland
- 356 *Peining Sheng*
Artistic Expression Of Body Language In VR Dance Therapy
Zhang Huifeng
- 361 Organon Type of a Narrative of Love: Inspirations for the Study of Eastern Care Design
Xiao Zheng
- 366 Design and grief: the loss and connection of love
Meng Zhang, Li Zhang, Haorui Tian
- 374 Holistic design in eco-village: Framework, local practice and implications
Zhu Mingjie
- 379 Multifaceted Care: The Integration of Art and Technology in Contemporary Exhibition Design
Liu Tianyu, Sun Yu
- 385 A Narrative of Love - The Wisdom of love in Chinese Traditional Folk Culture
Shiyan Lin
- 395 Control Relationships and Emotional narrative-Speculative Design Practice Utilizing Historical Data
- 402 *Yi-Wen Tseng, Ruochen Niu*
Traversing the Mist of Growing-up: Design as a Reflective Process for Self-Healing
Jiacheng Chen
- 408 Research on recreation scene construction of beautiful and harmonious community park with intergenerational sharing between the elderly and children
- 415 *Cui Yueting, Wang Wei*
Community mutual aid trends in the context of an inclusive society
Dong Hao
- 423 Interpretations of "Love" in Contemporary Artworks within Eastern and Western Contexts
Yue Gu
- 429 Cultural Design for Benevolence in Different Periods of New China
Wang Wei, Li Wenya

- 436 The Law of Love: A Philosophy of Gender Equality through the Symbolism of the Zipper
Li Yu
- 445 Aesthetic feeling nourishes the soul: Research on the display design of children's art experience
Museum
Liu Chunfang
- 452 Camellia chrysantha: Illuminating the Rare Flower through Information Visualization Design
Nan Ma, Mengzhen Dong
- 458 Designology of the Live Creature: Designing for love — Research Series on the Construction of
the Theoretical System of Modern Designology in China
Qi-Chang Zou, Wen-Xin Sun
- 463 More than human-centered design: Drawing Nourishment from Chinese Philosophy
Dan Wang, Linghao Zhang, Qixun Zhao
- 471 Innate Self-Redemption: An Exploration of the Healing Power of Art
Zheng Han
- 476 Research on the application of Compound Frame of Visual Thinking in basic course of art Design
Specialty
Zou Yun

Track2 Foresight Plan

- 486 Transferability vs. Repeatability: Consolidating the Ontological Nature of Design Research
Ashley Hall, Fernando Galdon
- 494 Advanced Design for human-non-human digital and creative ecosystem
Virginia Vignali, Alberto Calleo, Clara Giardina, Michele Zannoni
- 502 Design Strategy for Agricultural Waste Recycling System Based on UTAUT2 Model Psychological
Needs and Behavior Analysis
Xiaoye Li, Jiaye Liu
- 523 Nature-based solutions: Understanding the value and limits for the promising future
Yu Liu, Yangyang Pan, Jian Yi, Peter Hasdell
- 528 Evolving scenarios of AI in the design practice
Viktor Malakuczi, Miriam Saviano, Mariia Ershova, Andrea Gentile, Lorenzo Imbesi
- 536 Design Comedy: Shaping Speculative Design with the Power of Humor
Ruiheng Sun
- 541 Conceptualizing Digital Humans: A Historical Overview of Existing Design Practice
Yixuan Tai, Jie Wu

- 551 Designing the future of society: from the participatory scenario perspective
Tang Muyuan, Wei Xintong, Liu Zhensheng
- 557 Perceived Value of Design Thinking tools and Future of Design Education: A Case Study of Xi'an Jiaotong-Liverpool University
Mariia Zolotova
- 566 How artificial intelligence could reduce inequalities in human society
Shutong Wang, Yimeng Yu, Yuchen Wang
- 573 Fashion Futuring: Fashion Curation as a Critical Medium
Tong Jiyang
- 578 Eco-design Pedagogical Model and Academic Practices Based on the Krebs Cycle of Creativity
Siyang Jing
- 588 Study on Elderly Mobility in the Digital Age — Research Report Based on 835 Elderly Residents from 7 Communities in Beijing
Ding Fuhong, Gao Ya
- 596 Designing Healthcare Services for Longevity
Sheng-Hung Lee
- 603 Envisioning narrative scenarios for alternative futures: heuristic cards and design tools for critical design
Tiantian Li, Zhiyong Fu, Yuqi Liu
- 610 Picturing A Utopian Countryside: The Rural Settlement Recomposition Framed by the Urban-rural Continuum
Mao Lin, Xiao Chu
- 618 Towards a Resilient Future: Improving living Street resilience in Small and Medium Sized Towns in the Jiangnan Region, China, Based on Soft Systems Methodology
Chen Liul, Jia Liu
- 623 Knowledge Graph Analysis of Traditional Village Cultural Heritage Research
Liu Yicen
- 630 Future of Textile: Sustainable Design via ChatGPT
Yijun Liu
- 633 Exploring the transformation from tradition to 'living tradition' within Textiles
Yingying Ren
- 639 The Design-Driven Symbiotic Innovation of Plants New Roles under the Sustainable Dialogue - Take Phytoshpere as an Example
Hang Su, Dongfang Yang, Yuan Liu
- 647 Study of Fashion Intelligent Design for Future
Wang Wen

- 652 Cultural application and value of traditional lacquer art in modern design
Yunqi Wang
- 657 Experimental study of the morphology of mixed waste fabrics and ceramic residues
Jingyu Xu
- 661 Research on the design of "Trunk Bazaar" for youth groups based on the 4E theory of experience economy
Rong Zhang
- 672 The Evolution of New Media Art Driven by Artificial Intelligence: An Interpretation and Application of Deleuzian Multiplicity
Zhang Yuzhuo, Wang Mengya
- 678 Walls as resilient functional interfaces for the last-mile delivery of gated communities in response to the public health crisis
Cai Yanni, Zhou Hongtao
- 682 The Mushrooms of Plato's Cave
Francesca Brunetti
- 686 Practical application and research of foresight thinking model in design discipline
Cai Yanni, Zhou Hongtao
- 693 A Virtual Exhibition Design Guideline: Coordinating 3D Roaming and Efficiency
Wenhui He, Yi Xiaol, Yu Xie
- 699 Backcasting for a preferred future: A Review of the Literature
Weizhuan Hu, Linghao Zhang, Jie Hou
- 711 Steps to Well-being: Nurturing Personal, Social and Environmental Well-beings through an Urban Walking Practice
Gareth Jones
- 713 Research on the integration trend of emerging application technologies and automotive design
Shi Haoxin
- 720 Resilient Cities: Exploring the Transformation and Iteration of Living Spaces from the Perspective of Love and Healing
Tao Xinran
- 727 Empowering Sustainable Fashion Consumption: NurtureDenim Campaign for Generation Z Consumers Combines Digital Technology and Trend-Centric Element
Xueting Wang
- 732 Engaging with the Other: Participatory Curatorial Models, Weaving Perception, Action, and Relation to Confront Digital Biopolitics through Embodiment Performativity.
Yalin Wang
- 739 Research on the application of ceramic figures formed by clay tablets in ceramic art

Xianghong Yang, Fang Yu, Siping Zhang

- 744 Unveiling New Horizons in Chinese Environmental (Art) Design Education through Design Thinking Transition: A Case Study on the "Design Your Campus" Workshop
Yang Yeqiu

Track3 Design Flow

- 754 Transdisciplinary Innovation Design Education: A Case Study from the Central Academy of Fine Arts
Shuxin Cheng
- 760 The Two Main Forms of Design Flow
Hanhua Hu
- 764 Trying to Crack the Secret of China's Shared Economy
Wei Li, Mei Gong
- 770 Shanshui Architecture: An Evolution of Tradition?
Xi Guo, Tao Han
- 777 Research on China's Industrial Design Trends in the Context of "China-Chic"
Qiannan Wang, Xuanzheng Wang
- 784 Form-Finding in Turbulent Fluidic Environments Through Self-Assembly
Alejandro Puentes-Amézquita
- 792 Should the design process be re-imagined? The interplay of human creativity and AI innovation
Francesco Burlando, Xavier Ferrari Tumay, Federica Maria Lorusso
- 801 Gamification and Serious Games: Technological and Social Transformation through Video Game Interactions
Alberto Calleo
- 809 Beyond Limits: Enhancing Creativity by Breaking Perceptual Blocks in Design Flow
Yating Li, Henry Ma, Elaine Wong
- 815 The Expression of Emotional Interaction Design in Museums in the Digital Era — A Case Study of the British Museum
Wangwei, Mamin
- 820 Creative Methodologies for the Development of Spatial Intelligence in Environmental Design
Lin Chen
- 828 A Study of Cultural Space Construction in Small Town Centers in Northwest China in the Context of Urban Renewal
Jing Li, Feng Ye, Xuanzheng Wang, Yong Liao

- 834 Transferability vs. Repeatability: Consolidating the Ontological Nature of Design Research
Ashley Hall, Fernando Galdon
- 842 Street Markets as Places of Value Creation in Neighborhoods: A Case of Hasanpaşa Bazaar Place
Miray hamarat, Istanbul Technical University
- 848 The Stage Art Design Flow Under Critical Design Thinking
Yuqing Chen, Yi Xiao, Tie Ji, Wenyu Sun, Yi Ji
- 856 Research on the Application of Data in the Process of User Journey Mapping Construction
Jie Hou, Zhiqian Hu, Linghao Zhang
- 863 The strategic design process: a case of improving inclusiveness in China's public sector
Shiyi Li, Jun Hai, Nanqian Xu
- 869 Ecological Speculative Design Methodology: Four Shifts - A Case Study of the "Unqualified" Factory
Ni Erlu
- 876 From the perspective of cultural anthropology, The cause of variant characters in the Ma Wang Dui silk manuscripts
Yujuan Tang
- 882 Hotel Smart and Healthy Guest Room Renovation Service Design
Yu Wang, Yong Sui, Shangqing Gao
- 897 Towards Digital Culture Ecosystem: Platform Enables the Flow of Chinese-Style Culture Data
Hangxuan Wen
- 904 Sustainable Cultural Tourism: Gamification Experience Design of a Mobile Augmented Reality Application for Hongkong Tourists
Yuanli Yu, Xinyi Wang
- 912 Characterisation and Scenario Creation of Landscape Bridges on the Jincheng Greenway under the Perspective of Tour-Art-Learning
Zhang Mengli, Wang Wei, Yin Fei
- 919 Research Review of Human-Machine Interaction Design and Intelligent Vehicle Cockpits
Zihan Zhao, Shutong Wang, Xuanzheng Wang
- 925 A Semantic Expression Approach to Artifact Design from the Perspective of Embodied Cognition
Zhou Zirun, Xi Xiaochao
- 937 Virtual Self Care: Explorations in using immersive technology to support positive mental health and wellbeing
Caleb Josey Fahey
- 942 From Imitating Nature to Transforming Nature: A New Typology of Biodesign
Haorui Tian, Li Zhang, Meng Zhang
- 949 Loc-globalisation Design: A New Approach to Systematically Reconciling Globalisation and

Local Visions

Haipeng Tian, Lijun Chen, Yijin Huo, Vladimír Kočí, David Tichý

- 958 Bodily Games: A Study on Body-Centric Approaches in Digital Jewelry Teaching
Zhilu Cheng
- 980 An exploration of visual design culture in the context of the "space fever" era
Ding Fuhong
- 972 Building a new framework for service qualia evaluation: a user experience perspective
Li Wanqiang, Zhao Jiaqi, Hu Fei
- 980 An Integrated Theoretical Framework Based on Sketch Taxonomies to Enhance Sketching
Activity Flow
Zhenyu Ma
- 986 Cross-Border conservation for socio-environmental sustainability: a complex system perspective
— Taking the Shenzhen-Hong Kong border as example
Yangyang Pan, Yu Liu
- 991 Synesthesia in Design: Visualizing Literary Vocabulary Online
Jing Zhang, Liangliang Qiang
- 996 Design Study of Global Submarine Cable System: a Perspective of Three Types of Flow
Song Jin, He Lida
- 1001 Research on the dematerialization of fashion curation and its strategy
Wang Menghan
- 1005 Working Flows Between Digital and Material
Virginia Ellyn Melnyk
- 1010 Design-driven multi-subject participation in community place-making: a case study of Yulin East
Road Community in Chengdu
Duan Wu, Haoyue Lei, Francesca Valsecchi, Yuze Song, Zixin Ren
- 1016 The Integration of Artificial Intelligence and Design
Lei Yu

Evolving scenarios of AI in the design practice

Viktor Malakuczi¹, Miriam Saviano², Mariia Ershova³, Andrea Gentile⁴, Lorenzo Imbesi⁵

Sapienza University of Rome

¹viktor.malakuczi@uniroma1.it

²miriam.saviano@uniroma1.it

³ershova.1935415@studenti.uniroma1.it

⁴gentile.1815504@studenti.uniroma1.it

⁵lorenzo.imbesi@uniroma1.it

Abstract

This contribution concentrates on how the design work may be enhanced by generative Artificial Intelligence (AI) tools as well as the roles that designers and AI play in their collaboration, considering ethics of human-machine interaction. Recent developments in AI tools foreshadow fundamental changes in the future of the design practice, with concurrent effects including both an increase in the efficiency of creative professionals, and the democratisation of producing creative outputs by non-experts. While AI can be a component of designed solutions, this research focuses the design process itself, examining how AI can be a transformative force of not only for content generation, but also user research and conceptual development. Therefore, we aim to analyse existing generative AI tools for designers and describe potential "AI + Designer" strategies within currently widespread workflows. Initially, this article explores the potential of AI in creative fields, where the authors identify possible roles of AI to improve design work, such as AI as mediator between creative languages, or AI as a facilitator of user participation. Subsequently, the research describes a mapping and benchmarking activity of available AI tools for Designers, categorised by output type (3D, Graphics, Raster, Text, Utility, Vector, Audio & Video) and critically assessed according to the stages of the Design thinking process (Empathise & Define, Ideate, Prototype & Implement, and Validate). The mapping is organised to provide a multi-level perspective, and is divided into four main sections: a list with output-based clusters, info sheets (a product specification document), a map (a visual summary of the tools), and an introduction page. To evaluate the effectiveness of the AI tools during the design process, these were tested by replicating the processes of several projects and their output obtained by repeating tasks using AI tools. Thus, the mapping and testing showed interesting potential of AI tools in some phases of Design Thinking, but also a limited utility in the phases of empathising and validation.

Ultimately, the study focuses on the opportunities and issues of human-machine interaction and raises questions about ethics and copyright, bias and discrimination, errors and the impact on creative processes. The potentially transcendental power of AI over the thinking process poses urgent risks and opportunities, evident already today in various creative domains. Therefore it is crucial to build a strategic foresight and hence a positive vision of AI-enhanced design in order to understand how the role of the designer will change. Among possible scenarios, we conclude with the hope that the innovation model of "AI + Designer" can alleviate technical tasks, help connecting knowledge areas, and understand better people, this enforcing the Designer in the role of "sensemaker" who shapes the culture of everyday life.

Author keywords

Generative AI; Design Thinking; Creative skills; Design tools; Mapping; Benchmarking.

Introduction

The recent developments of Artificial Intelligence tools anticipates a significant change in future design, starting with an apparent democratisation of the creative process, giving non-experts an opportunity to produce creative content, while also facilitating certain tasks in the professional design process. Such phenomena can be seen as an opportunity for a more widespread diffusion of design efforts, but also as a menace to certain professional roles, raising issues about how effective (and meaningful) the "efficient" AI-enabled Design is.

These advances open up opportunities for generative AI to become trusted teammates alongside Designers (Figoli, Rampino and Mattioli, 2022), as experimented also within the ideation process of fashion design (Jeon et al. 2021). AI can be beneficial not only in the initial phases of the design process but also in the prototyping through monitoring and forecasting based on data coming from sensors and equipment (Arinez et al. 2020), such as real-time error detection and correction in 3D printing (Brion and Pattinson, 2022). In a similar vein, designers can leverage AI to enhance user experience, thereby fostering technology drive innovation at both the system and service levels (Yildirim et al. 2022). It is crucial that design works aided by generative AI are adequately aligned with human interests, including not only the short-term interests of a designer or client, but even more importantly the long-term interests of humanity, such as sustainable development or social justice, therefore, this contribution focuses also on potential ethical issues and mitigation strategies of collaboration between design and technology. In particular, we aim to offer a better understanding of currently available Generative AI tools that are useful to design work, evaluating how they can be integrated into the design process, and critically assessing the potential of the innovation model of "AI + Designer".

Participation and Creative Work with AI

While Generative AI in design is still in its infancy, we could already outline four interesting roles it may fulfil in the creative process, ranging from AI as an intermediate between creative languages and the democratisation of visual quality to a facilitator of user participation.

Firstly, AI can serve as a mediator between creative languages, and translate from one creative language to another. Creative languages in this context assume various means of expressing creativity; in design there are mainly visual (such as images, drawings, sketches, diagrams, renderings). However, with the emergence of AI, it became possible also to translate text into visual content without special design knowledge.

This leads to another possible role of AI in the creative field, namely AI as a means of democratisation of quality visual content through direct "prompting" and advanced non-expert design tools. This trend is enabled by low-code and no-code AI as a result of recent advances in the conversational AI sector, driven by interest in improving human-machine interaction. New projects are emerging also to make AI more understandable to users, such as eXplainable AI for Designers (XAID), which can be supplemented by a human-centred approach to focus on a specific user group (Zhu et al., 2018). In addition to the technical availability of AI, the work of the professionals themselves has become more accessible, because AI has made some of the design duties easier to perform, therefore their work will require less time.

The democratisation of AI, in turn, leads to the possibility for non-experts to co-produce creative AI output (e.g. graphics), allowing economic actors or social groups on tight budgets to have decent quality design interventions, even if limited in terms of originality.

The last role is the use of AI as a facilitator of participation in the design process, especially during user research. Initially, AI can function as a user research agent, interacting directly with people and using standard

methodologies such as interviews, questionnaires, and so on. After collecting user data, designers can benefit from AI that processes user generated content and identifies their needs and preferences, such as patterns of user behaviour. Based on these patterns it will be possible to develop a user simulator for designers to receive quick feedback during the design process, so follow the Human-centred approach in all the phases.

Mapping AI Tools for Design

As already mentioned, this paper aims to provide an overview and critical reflection about the current state of Generative AI tools useful for creative design activities.

There are numerous methodologies to conceptualise the structure of the design work, but, due to its widespread popularity, Design Thinking has been chosen as a way to structure the mapping of Generative AI tools.

As promoted by IDEO founders and later Stanford University, Design Thinking is a problem-solving approach structured in 5 steps: empathise, define, ideate, prototype, and test.

Due to the overlap observed between the first and second, the final four groups of the AI tools are Empathise & Define, Ideate, Prototype & Implement, and Validate.

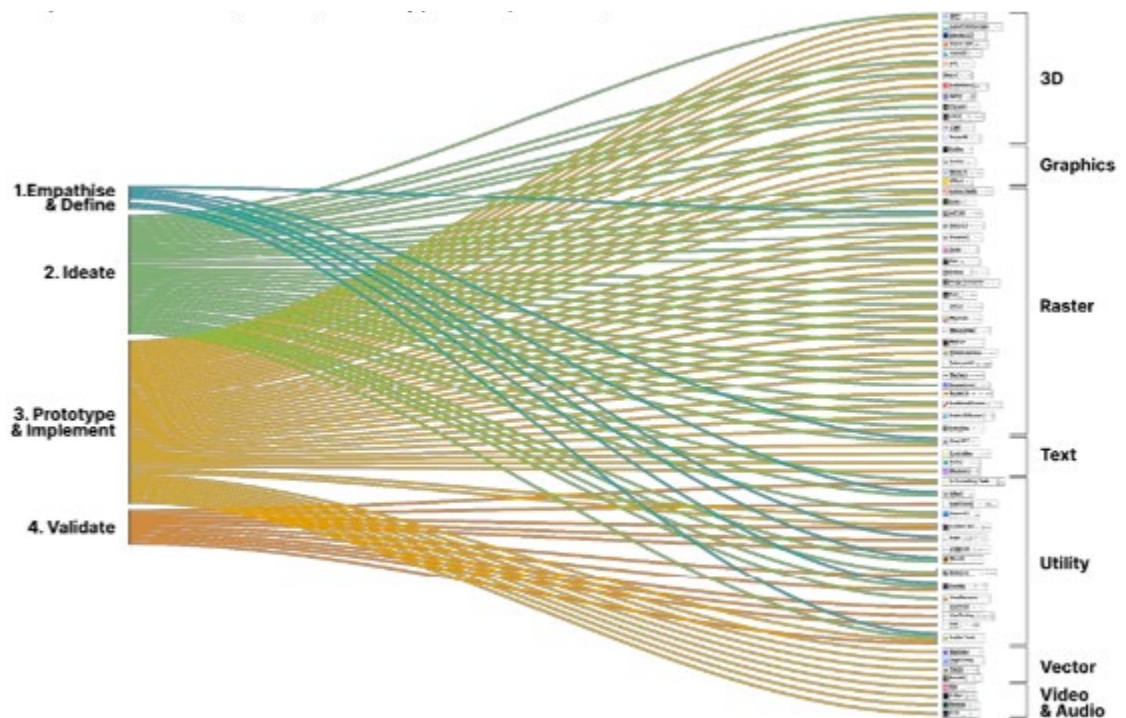


Figure 1. Map, Alluvial diagram. The collection can be explored on an open Figma board

Moreover, the possible AI outputs were classified into 7 categories:

- 1.3D. Topology optimisation or generating 3D models, including capabilities for texturing, rendering, and animating 3D assets.
- 2.Graphics. Combination of images and text, providing output suitable for UI design development and presentations, creating graphics by integrating pictures and text elements.
- 3.Raster. Useful to create visually captivating raster images, including the creation of mood boards, intermediate or final product pictures, as well as designing patterns and backgrounds to complement them.
- 4.Text. Ability to generate text content and code, making it a valuable tool for various design stages, whether it's

assisting in conceptualisation, ideation, or refining final drafts.

5.Utility. Streamlining and systematising communication within working teams, as well as optimising work processes, facilitating efficient collaboration, while including user needs investigation through Desk and Field analysis, data collection, and in-depth insights to ensure comprehensive problem-solving approaches.

6.Vector. Generation of high-quality vector images, including illustrations, icons, and logos useful to create individual images or produce whole batches of vector-based graphics, allowing for scalable and versatile designs.

7.Audio & Video. Create and edit audio and video content to support presentations or prototype demonstrations. Whether it's adding background music, voiceovers, or assembling video footage, this feature enhances multimedia production capabilities and facilitates effective communication.

To begin, we built a database to store all the tools found, tracking costs, benefits, drawbacks and input/output they produced. The final collection is organised to offer a multi-level perspective, and may be broken down into four primary sections: a list, info sheets, a map, and an introduction page. The map (Fig.1) provides a visual summary of the tools gathered about processes and outputs they offer, while dedicated simplified tool cards also display the crucial information.

Each tool is discussed in depth in the info sheet, a product specification document of each tool that includes functionality and unique characteristics, an analysis of advantages and disadvantages, and showcasing images. Finally, the list consolidates all the tools into distinct output-based clusters, enabling users to easily locate the desired tool for their intended outcomes. While omitting redundant or unproductive tools, our research at the time of writing found a total of 66 tools, and out of those is possible to identify 7 for Empathise & Define, 37 for Ideate, 51 for Prototype & Implement, and 11 for Validate, but it should be noted that some of them are useful for multiple steps.

From this subdivision emerged that there are only a few tools available that can help during the phases of process structuring, stakeholder engagement, preliminary research and final validation. Additionally, even though the majority of the tools are focused on the Prototype & Implement step, they frequently also assist the designer during the Ideate phases. Output clusters include instead 13 for 3D, 4 for Graphics, 22 for Raster, 4 for Textual, 15 for Utility, 4 for Vector, and 4 for Video & Audio. Here, it is evident that Raster outputs are among the most popular, but there is also a growing interest in Utility tools. The collection can be explored on an interactive Figma board, or in the table below.

Table 1. List of the AI Enabled Tools selected, with clickable hyperlinks.

3D & texture	Graphics	Raster	Text	Utility	Vector	Audio & Video
3DFY	Galileo	Adobe Firefly	MidJourney	Chat GPT	Ai Consulting	Illustroke
Agisoft	Genius	Ando	NVIDIA	Controllino	Tools	Logo Livery
Metashape	Slides AI	ARTSIO	CanvasPotter	Duino	Albus	Stelvio
Elevate 3D	UIZard	DAI.L-E 2	nedAI	Magician	AppliTools	Recraft
Fusion 360	Design.AI	Dreamer	Playform		Canva AI	
Luma AI	Tome AI	Durer	Prompthunt		Content Bot	
poly		Flair	Rocket AI		Evolv	
Shap-E		Genus	Scribblediffus		Lookback	
SolidWorks		Image	ion		Miro AI	
Spline		Computer	Stable		Notion AI	
Vizcom		Kive	Diffusion		Sembly	
vmod		Lexica	Stockimg		User Persona	
CSM		Magestic	Clupdrop		Userbram	
PromoAI		Mokker			UserTesting	
					VAS	
					Goblin Tools	

T o

test

the effectiveness of the tools during the workflow, case studies were carried out where we tried to replicate the process of two projects output in the field of Product and Interaction Design by repeating the tasks using AI tools (Fig. 2). Initially in Empathise & Define, experiments were carried out in the User Research and Desk Research phases using Albus to create a vision board while researching information and images. During the Ideate phase, Chat GPT was used to create the concept taking advantage of its work speed and adaptability, even if in some cases it lacks human empathy. Next, the User Persona tool was employed, which effectively created a Persona from the project description and then the Recraft tool for Storyboard illustrations. For the Prototype & Implement phase, PromeAI transformed sketches directly into final renderings with relevant textures and then Adobe Firefly helped to add the background to them. The Interaction Design project benefited from Controllino AI to write an MQTT enabled code, while for video presentation of both of the projects Fliki tool was useful thanks to its ability to find appropriate stock video from text and generate voice overs. Finally, during the Validate phase, Chat GPT played the role of an agent that provided feedback and possible improvements that selectively made sense. AI can already assist designers in many phases of their work, despite the fact that good quality tools have not yet been found for User Research, creation of 3D models, IoT systems and websites, which could be the basis for future projects and research.



Figure 2. Tool testing: a task is carried on with the use of AI tools. The first image is the tool info sheet, the other images illustrate the process and notes about pros and contra.

Despite the rapid growth of AI-enabled tools, it is possible to highlight some usability shortcomings. The first point of intervention is the development of a new form of incremental prompting that allows the user of the tool to make small gradual changes, instead of requiring a new prompt for each output. Secondly, for the tool to actively participate in the process, the collaboration dimension must be investigated, allowing the tools to see beyond the specific task and understand the overall context of the design process. Finally, considering the inherent empathic nature of Design, it must be taken into account that AI has limitations in understanding and expressing emotions (Bakpayev et al., 2022). The toolkit was created with educational application in mind, providing a special opportunity to investigate and put design thinking concepts supported by AI into practice.

Recent rise in popularity of AI models has opened up new perspectives for students to experience the potential of these tools in Design (Bozkurt et al., 2023). However, it is important to understand potential negative consequences and rethink the roles of technology and human educators. Our collection aims to contribute to this discussion by providing the necessary tools to explore the potential of AI in educational use.

Issues and Mitigation Strategies

The benefits offered by Artificial Intelligence are numerous and extensive. However, there are various potential and practical issues already uncovered by past research. Algorithms often conceal risks, overlooked in the pursuit of innovation and cost-efficiency. AI's ethical implications stir debates in science and society: professionals in the creative fields feel attacked by the democratisation of AI tools that give free access to creative content to the general public, reducing their possibilities of employment; while, the scraping tools behind the generative tools appropriate their contents, raising issues with copyrights. Yet, some (Aziz, 2023) even propose to include AI as a copyright-worthy author. This complex issue deepens AI's societal disparities. However, limiting the fair use of machine learning might interfere with its progress (Sobel, 2017). Ethical principles alone will not ensure responsible AI; additional support and governance mechanisms at the organisational and social levels are required (Sanderson et al., 2023), such as the EU guidelines' aim to provide safe, transparent, traceable, non-discriminatory, eco-friendly AI, emphasising human supervision (European parliament, 2023).

A second risk in the use of Artificial Intelligence is that of bias: in fact, human-sourced data contaminated with sexism, racism, ableism, and religious prejudices result in corrupt and discriminatory intelligence. We are already witnessing tools such as chatbots, machine translation, and speech recognition, or generative tools that can encode and perpetuate gender stereotypes (Suresh, 2021) and ethnic discrimination (Buolamwini, 2016). Having diverse and representative data is thus essential for creating realistic and inclusive AI systems: responsible AI requires not only technical interventions but also changes in Societal recognition (Waelen & Wieczorek, 2022). An accurate and uncorrupted source is essential, as it is established that AI needs human-sourced data. Otherwise, the risk is the phenomenon of "AI hallucination", as illustrated by Alemohammad and colleagues (Alemohammad et al., 2023), who reached the condition of Model Autophagy Disorder (MAD) by repeatedly feeding the generative AI with cycles of synthetic data. Leaving complete control to algorithms is thus still counterproductive and unpredictable, and it is thus necessary to supervise and, most importantly, cooperate on an equal footing between users and AI (Larsson et al., 2022).

AI, like previous technological advancements, threatens employment due to its wide-ranging automation potential (Su, 2018). Creative jobs were once considered immune to AI, relying on intuition and human qualities hard to replicate (Birtchnell, & Elliot, 2018). However, as AI grows more sophisticated in generating top-tier content, concerns arise about artists and designers losing relevance, shrinking job opportunities, and devaluing man-made labour (Zhou & Nabus, 2023). Despite these risks, the authors have concluded that collaboration between creatives and AI generates fruitful outcomes, backed by research showing AI's positive impact on computer-intensive fields, boosting employment and productivity (Georgieff & Hyee, 2021). Nevertheless, AI can't replace creative minds in the present and near future, as it lacks the creative capabilities (Horton et al., 2023) and eco-spiritual values (Cooney, 2023) essential to replace humans.

Discussion and Conclusions: new designer roles

In his book "Fully automated luxury communism" (2019), Bastani sees technology as a potentially liberating force that could emancipate people from alienating repetitive work and enable them to pursue creative and cultural interests. This poses the question: In a scenario of AI-driven design, what are our creative margins and how to

shift creative capabilities and education?

With the potential of AI to participate in creative and innovative processes, it is crucial to understand how the role of the designer will change. According to Verganti and colleagues (2020), the designer-AI symbiosis may elevate the designer to the role of leader, capable of identifying a problem and providing instructions on how to solve it, thus shifting the focus on sensemaking. This strategical adaptation positions designers as vital actors in shaping the creative and general culture. Here, designers take a keen interest in how users perceive their creations and how seamlessly they integrate into users' lives and stories (Krippendorff, 2005). This perspective transforms design into a discipline that fosters not only cross-field collaboration but also between products and their users, as well as between designers and stakeholders (Cross, 1982).

The collaboration between Artificial Intelligence and Creative Intelligence (or "the acts of the imagination, ingenious reasoning and problem-solving, and curiosity, play, and exploration," (Shevlin, 2021)) will pave the road to a "Hybrid Intelligence" fostered through continuous human-AI interactions (Jarrahi et al., 2022). The authors suggest that the new competencies of designers should be associated with the ability to effectively use AI and, in addition, develop creative thinking that will allow them to operate on high-level concepts and curation.

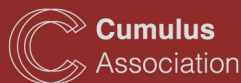
References

- Alemohammad, S., Casco-Rodriguez, J., Luzi, L., Humayun, A. I., Babaei, H., LeJeune, D., ... & Baraniuk, R. G. (2023). Self-consuming generative models go mad. arXiv preprint arXiv:2307.01850.
- Arinez, J. F., Chang, Q., Gao, R. X., Xu, C., & Zhang, J. (2020). Artificial intelligence in advanced manufacturing: Current status and future outlook. *Journal of Manufacturing Science and Engineering*, 142(11).
- Aziz, A. (2023). Artificial Intelligence Produced Original Work: A New Approach to Copyright Protection and Ownership. *European Journal of Artificial Intelligence and Machine Learning*, 2(2), 9-16.
- Bakpayev, M., Baek, T. H., van Esch, P., & Yoon, S. (2022). Programmatic creative: AI can think but it cannot feel. *Australasian Marketing Journal*, 30(1), 90-95.
- Bastani, A. (2019). *Fully automated luxury communism*. Verso Books.
- Birtchnell, T., & Elliott, A. (2018). Automating the black art: Creative places for artificial intelligence in audio mastering. *Geoforum*, 96, 77-86.
- Buolamwini, J. (2016). How I'm fighting bias in algorithms [Video]. TED Talks. https://www.ted.com/talks/joy_buolamwini_how_i_m_fighting_bias_in_algorithms?utm_campaign=tedsread&utm_medium=referral&utm_source=tedcomshare
- Bozkurt, A., Xiao, J., Lambert, S., Pazurek, A., Crompton, H., Koseoglu, S., ... & Jandrić, P. (2023). Speculative futures on ChatGPT and generative artificial intelligence (AI): A collective reflection from the educational landscape. *Asian Journal of Distance Education*, 18(1).
- Brion, D. A. J., & Pattinson, S. W. (2022). Generalisable 3D printing error detection and correction via multi-head neural networks. *Nat Commun* 13.
- Cooney, S. (2023, June). Imagining LIMITS: Can ChatGPT radically re-imagine a new world?. In *Ninth Computing within Limits 2023*. LIMITS.
- Cross, N. (1982). Designerly ways of knowing. *Design studies*, 3(4), 221-227.
- EU AI Act: first regulation on artificial intelligence | News | European Parliament. (2023, August 6). <https://www.europarl.europa.eu/news/en/headlines/society/20230601STO93804/eu-ai-act-first-regulation-on-artificial-intelligence>
- Figoli, F. A., Rampino, L., & Mattioli, F. (2022). AI in design idea development: A workshop on creativity and human-AI collaboration. *PROCEEDINGS OF DRS*, 1-17.

- Georgieff, A., & Hyee, R. (2021). Artificial intelligence and employment: New cross-country evidence.
- Horton, C. B., White, M. W., & Iyengar, S. S. (2023). Will AI Art Devalue Human Creativity?.
- Jarrahi, M. H., Lutz, C., & Newlands, G. (2022). Artificial intelligence, human intelligence and hybrid intelligence based on mutual augmentation. *Big Data & Society*, 9(2), 20539517221142824.
- Jeon, Y., Jin, S., Shih, P. C., & Han, K. (2021, May). FashionQ: an ai-driven creativity support tool for facilitating ideation in fashion design. In *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems* (pp. 1-18).
- Krippendorff, K. (2005). *The semantic turn: A new foundation for design*. crc Press.
- Larsson, T., Font, J., & Alvarez, A. (2022, October). Towards AI as a creative colleague in game level design. In *Proceedings of the AAAI Conference on Artificial Intelligence and Interactive Digital Entertainment* (Vol. 18, No. 1, pp. 137-145).
- Sanderson, C., Douglas, D., Lu, Q., Schleiger, E., Whittle, J., Lacey, J., ... & Hansen, D. (2023). AI ethics principles in practice: Perspectives of designers and developers. *IEEE Transactions on Technology and Society*.
- Shevlin, H. (2021). Rethinking creative intelligence: comparative psychology and the concept of creativity. *European Journal for Philosophy of Science*, 11(1), 16.
- Sobel, B. L. (2017). Artificial intelligence's fair use crisis. *Colum. JL & Arts*, 41, 45.
- Su, G. (2018). Unemployment in the AI Age. *AI Matters*, 3(4), 35-43.
- Suresh, H., & Guttag, J. (2021). A framework for understanding sources of harm throughout the machine learning life cycle. In *Equity and access in algorithms, mechanisms, and optimization* (pp. 1-9).
- Verganti, R., Vendraminelli, L., & Iansiti, M. (2020). Innovation and design in the age of artificial intelligence. *Journal of Product Innovation Management*, 37(3), 212-227.
- Waelen, R., & Wiczorek, M. (2022). The struggle for AI's recognition: understanding the normative implications of gender bias in AI with Honneth's theory of recognition. *Philosophy & Technology*, 35(2), 53.
- Yildirim, N., Kass, A., Tung, T., Upton, C., Costello, D., Giusti, R., ... & Zimmerman, J. (2022, April). How Experienced Designers of Enterprise Applications Engage AI as a Design Material. In *Proceedings of the 2022 CHI Conference on Human Factors in Computing Systems* (pp. 1-13).
- Zhou, K. Q., & Nabus, H. (2023). The Ethical Implications of DALL-E: Opportunities and Challenges. *Mesopotamian Journal of Computer Science*, 2023, 17-23.
- Zhu, J., Liapis, A., Risi, S., Bidarra, R., & Youngblood, G. M. (2018, August). Explainable AI for designers: A human-centered perspective on mixed-initiative co-creation. In *2018 IEEE conference on computational intelligence and games (CIG)* (pp. 1-8). IEEE.

Cumulus Beijing CAFA 2023 Proceedings

Hosted by :
Cumulus Association
Central Academy of Fine Arts



中央美术学院
Central Academy of Fine Arts

C A F A

爱的阐释

Narratives
of Love