

An architectural rendering of a modern building complex. The building features multiple levels with large glass windows, revealing interior spaces with people. In the foreground, there is a large, circular, light-colored plaza where many people are walking and gathering. Above the plaza, several large, dark, geometric, cage-like structures are suspended in the air, some containing plants and people. The background shows a city skyline across a body of water, with trees on the left side. The sky is overcast.

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28 Nov 2024

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Abstract

This paper introduces a computational framework driven by a generative algorithm that allows both architects and non-experts to create various floorplan layouts for predefined residential unit boundaries. This generative tool, implemented in GhPython and Grasshopper, enables users to customize floor plans by defining specific area requirements, accommodating diverse user preferences and facilitate the design process. Also, a catalog of module-based slices containing different functional spaces with determined dimensions have been designed as a reference for the algorithm to generate the final layouts. The generative algorithm, which uses numerical data from each slice, produces floorplan configurations based on the adjacency of functional spaces and user-defined parameters. The bottom-up approach of the algorithm means that the results are noticeably influenced by the designed slices. With the intention of providing the users with a more intuitive understanding of housing layouts, the generated floorplans are presented as furnished 3D models, clustered under specific categories.

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Summary of the paper

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这篇论文探讨了将大型语言模型（LLM）作为建筑设计过程中的设计伙伴，而不仅仅是一个被动的问题回答机器。通过结合对话理论（CT）和LLM，提出了一种新的设计框架，旨在通过口头和非口头反馈与设计师进行持续的对话，并通过收集对话数据进行微调，逐步提高对话的有效性。

- 背景与研究框架：
 - 当今AI的流行及其对设计学科的影响：强调了技术应用的现实世界背景的重要性，指出了计算技术的滥用可能导致设计学科中的不期望后果。
 - 对话作为人机交互的重点：介绍了控制论的起源及其在人机交互中的应用，强调了对话在设计环境中的重要性。
 - 大型语言模型（LLMs）的潜力：讨论了LLMs在自然语言处理（NLP）中的应用及其通过迁移学习成为领域专家的能力。
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 - 方法和Rhino-Grasshopper实现：使用Rhino和Grasshopper进行模拟，收集设计行为和脑电波数据，并将其发送给LLM进行处理和反馈。
 - 步骤一：设置环境：包括安装脑电波传感器和初始算法设置。
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- 讨论：
 - 结论和贡献：展示了LLM在建筑设计场景中的实际应用潜力，但也指出了概念和技术上的挑战。
 - 未来研究方向：包括从一对一场景扩展到多对多场景，以及探索声音、温度等其他空间特质的反馈。
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解释

这段话介绍了一篇论文中提出的一个计算框架，这个框架是由一个生成算法驱动的，它允许建筑师和非专业人士为预定义的住宅单元边界创建各种平面图布局。这个生成工具在GhPython和Grasshopper中实现，使用户能够通过定义特定的面积要求来定制平面图，满足不同的用户偏好，并促进设计过程。此外，还设计了一个基于模块的切片目录，其中包含具有确定尺寸的不同功能空间，作为算法生成最终布局的参考。生成算法使用每个切片的数值数据，根据功能空间的邻接性和用户定义的参数产生平面图配置。算法的自下而上的方法意味着结果明显受到设计切片的影响。为了使用户更直观地理解住房布局，生成的平面图以布置好的3D模型的形式呈现，并归类在特定的

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Too-generic AI summary

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- 致谢：**

With Tencent Yuanbao

研究背景

- 研究问题：**这篇文章探讨了如何利用人工智能（AI）和扩散模型来增强建筑设计过程中的创造力与创新性。具体来说，研究了在建筑设计初期阶段，通过组合使用扩散模型和参数化建模来预测、开发和优化环保设计提案的可能性。
- 研究难点：**该问题的研究难点包括：如何有效地将AI生成的图像应用于建筑设计过程，如何在设计初期阶段实现气候适应性的设计提案，以及如何整合多学科的方法来应对这一挑战。
- 相关工作：**相关工作包括Neri Oxman提出的Krebs循环创造力理论，Generative Adversarial Networks（GANs）及其各种版本（如Progressive GANs、StyleGANs、Conditional GANs、Creative GANs等），以及最新的latent Diffusion Models（LDMs，如DALLE 2、MidJourney和Stable Diffusion）。


研究方法

这篇论文提出了一种名为“设计智能策略”的方法，用于解决建筑设计过程中创新和可持续设计解决方案的早期阶段问题。具体来说，


- 气候原型参数：**首先，研究建立了气候原型参数的参考表，包含选定的生物气候设计参数摘要。这些参数用于提示和图像生成、评估和优化阶段的参考。

Climate Prototype	Low-Energy Climate	Temperate Climate	Hot and Dry Climate	Hot and Humid Climate
Goals	Low energy consumption, low environmental impact, high quality of life.	Low energy consumption, low environmental impact, high quality of life.	Low energy consumption, low environmental impact, high quality of life.	Low energy consumption, low environmental impact, high quality of life.
Design Strategy	Passive design, natural ventilation, natural lighting, natural cooling.	Passive design, natural ventilation, natural lighting, natural cooling.	Passive design, natural ventilation, natural lighting, natural cooling.	Passive design, natural ventilation, natural lighting, natural cooling.
Key Features	Low energy consumption, low environmental impact, high quality of life.	Low energy consumption, low environmental impact, high quality of life.	Low energy consumption, low environmental impact, high quality of life.	Low energy consumption, low environmental impact, high quality of life.
Key Challenges	Low energy consumption, low environmental impact, high quality of life.	Low energy consumption, low environmental impact, high quality of life.	Low energy consumption, low environmental impact, high quality of life.	Low energy consumption, low environmental impact, high quality of life.
Key Solutions	Low energy consumption, low environmental impact, high quality of life.	Low energy consumption, low environmental impact, high quality of life.	Low energy consumption, low environmental impact, high quality of life.	Low energy consumption, low environmental impact, high quality of life.

- 提示工程：**其次，研究进行了三个实验，探索了不同提示结构在扩散模型中生成的图像。每个实验包括两个生成步骤：第一步仅包含文本输入，第二步则提供输入图像（片段）和前一步的提示结构。实验结果表明，包含具体、具体词语和输入图像的提示结构效果最佳。



- 生成优化：**最后，研究使用RhinoCeros/Grasshopper算法建模工具，将选定的2D图像转换为参数化的3D模型进行优化。优化过程中定义了三个标准：开口的通风和形式比例、材料与资源可用性相关的材料消耗和房屋大小。



实验设计

实验设计包括以下三个阶段：

Deep-reading function
More specific for literature review

Part 2: AI as a poster and banner design partner



Part 2: AI as a poster and banner design partner

Software used:

AI-image generation, expansion: [Fooocus](#) (locally installed)

AI-image enlargement: [Fooocus](#) (locally installed) / [HiPictureAmplifier](#) 嗨格式图片无损放大器 (paid)

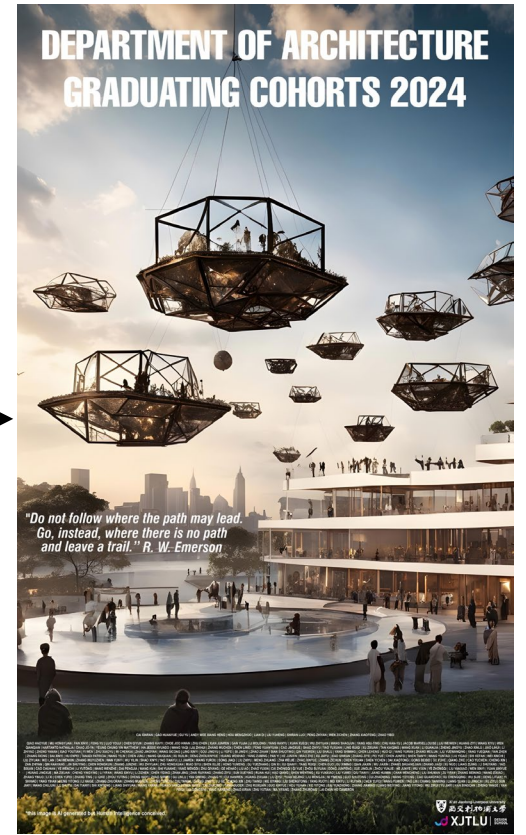
Image editing: Adobe Illustrator / Photoshop



AI-generated



AI-expansion



AI-enlarge, edit

Part 2: AI as a poster and banner design partner

Software used:

AI-image generation, expansion: [Fooocus](#) (locally installed)

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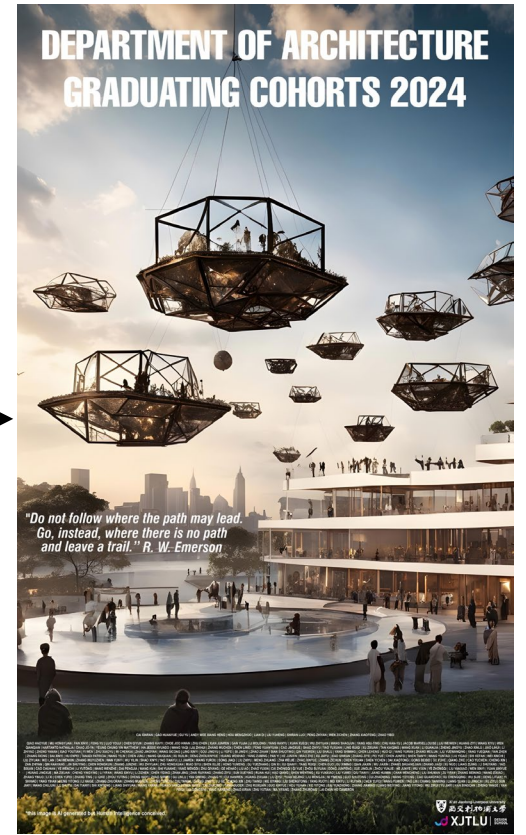
Image editing: Adobe Illustrator / Photoshop



AI-generated



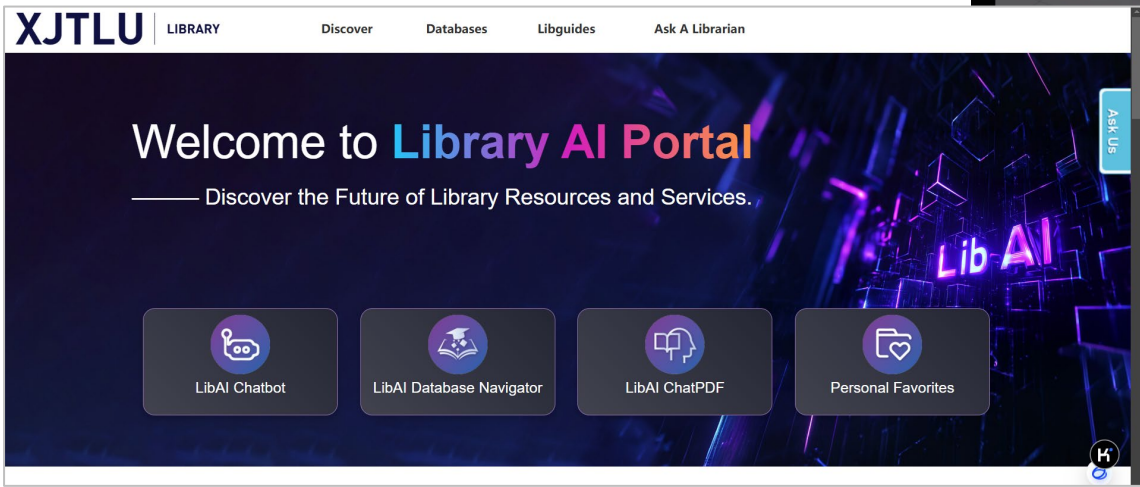
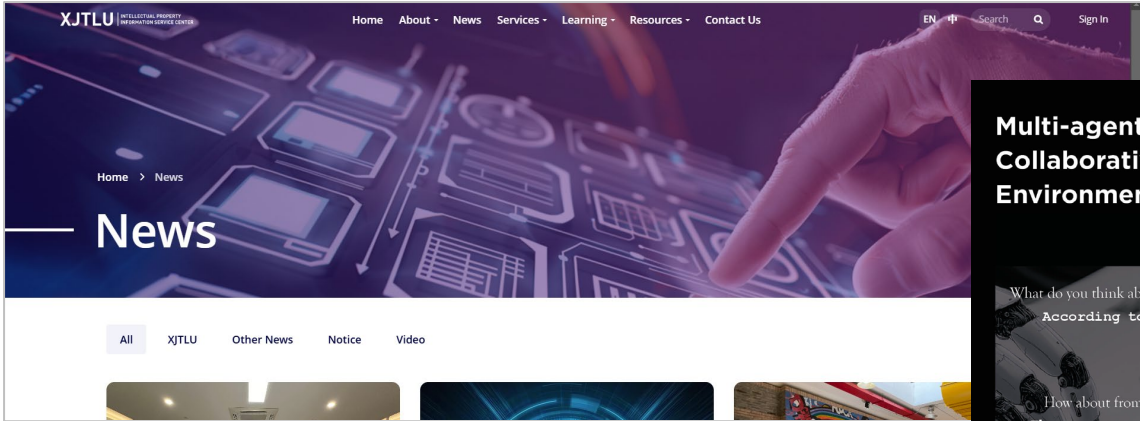
AI-expansion



AI-enlarge, edit

Part 2: AI as a poster and banner design partner

fast poster and banner design



Summary

- **Part 1: AI as a reading partner**

- Aim: demonstrates how AI and other on-hand tools help in daily efficient literature searching and reading
 - a) **A browser plugin for searching and identifying journal levels**
 - Tool: [easyScholar](#)
 - b) **A browser plugin for real-time translating and Q&A abstract**
 - Tool: [Kimi Explorer](#)
 - Alternative: [Zhipu Extension](#)
 - c) **A web-based AI application for quick-reading literature**
 - Tool: [Tencent Yuanbao](#)(腾讯元宝)
 - Alternative: [ChatDoc](#)

- **Part 2: AI as a poster and banner design partner**

- Aim: demonstrate how AI and other tools help in fast poster and banner design
 - a) **AI image generation**
 - Tool: [Fooocus](#) (local)
 - Alternatives: [Zhipu](#), [HuluAI](#) (Paid)
 - b) **Image editing (expanding, enlarging)**
 - Tool: [Fooocus](#) (local), [HiPictureAmplifier](#), Adobe Illustrator
 - Alternatives: [InvokeAI](#) (local), Midjourney, DALLÉ-3, Adobe Photoshop
 - c) **Adding texts and touch-up**
 - Tool: Adobe Illustrator
 - Alternatives: Adobe Photoshop / any image editing software



Archived: <https://henrikclh.com/2024/11/27/AI-Learning-Day.html>



Thank you

Lok Hang Cheung (Henrik)



Archived: <https://henrikclh.com/2024/11/27/AI-Learning-Day.html>