

健康领域常用的建成环境审计工具

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武汉大学
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第一届遥感地理大会

健康地理与医学遥感分会场

戴劭劼

2024年5月12日



UNIVERSITY OF TWENTE.





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- 当前以**肥胖**为代表的**慢性病**已经成为全球影响人群健康的最大公共卫生挑战
- **建成环境**（所有人造地表内的相关要素）是关键的环境健康因子



Dai, S., Qiu, G., Li, Y., Yang, S., Yang, S., & Jia, P. (2024) State of the Art of Lifecourse Cohort Establishment. *China CDC Weekly*, 6(14), 300. (IF=4.7)



Part 1 建成环境与肥胖的关联研究

- 建成环境测度**不清晰**，**不统一**且存在**主观评价**问题

环境	因子	与体重相关行为	与体重相关的结局变量
建成环境	街道连通性	+	*
	居住密度	+	*
	道路限速	-	x
	土地利用混合	+	x
	城市蔓延	x	x
	绿色空间	+	x
	公共交通	+	x
	自行车道	*	x
	人行道	+	-
	美观程度	x	x

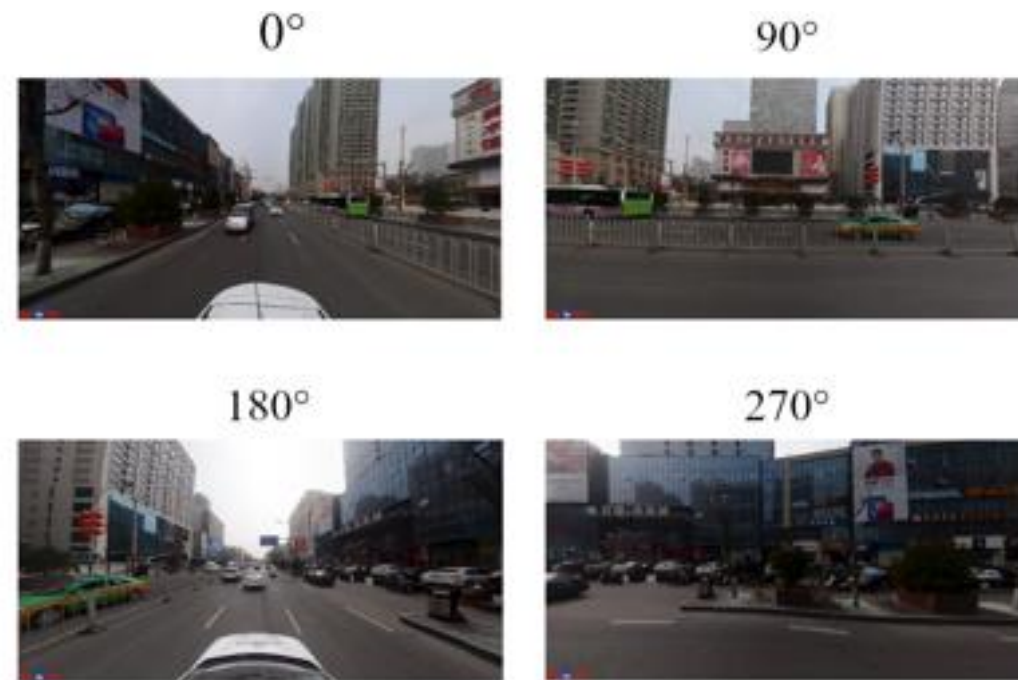
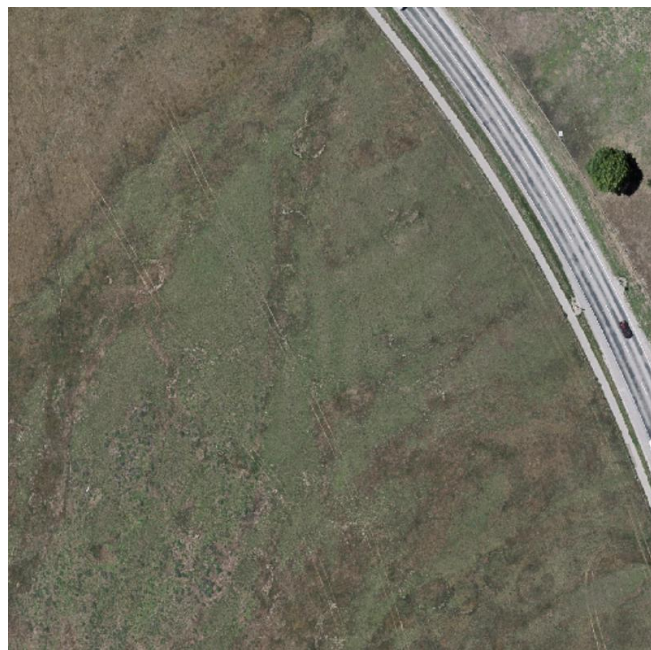
[+] 正向关联, [-] 负向关联, [*] 混杂关联, [x] 不明确的关联. 与体重相关行为为体力活动, 结局变量为BMI

Obesogenic Environment and Childhood Obesity. (2021) *Obesity Reviews*. (IF=8.9)

Jia, P., Shi, Y., Jiang, Q., **Dai, S.**, Yu, B., Yang, S., ... & Yang, S. (2023) Environmental determinants of childhood obesity: a meta-analysis. *The Lancet Global Health*, 11, S7. (IF=34.3)




- **地理大数据**: 对地观测 → **人本观测**



Dai, S., Qiu, G., Li, Y., Yang, S., Yang, S., & Jia, P. (2024) State of the Art of Lifecourse Cohort Establishment. *China CDC Weekly*, 6(14), 300. (IF=4.7)

● 建成环境审计：建成环境有什么？怎么样？



If you do not see a pedestrian, cycle, motorcycle, scooter, car, or bus please click NEXT. Note that vehicles can be moving or parked.

Else, specify the number of pedestrians, cyclists, parked cycles, and motor vehicles you see in the image. If you are unsure please put the closest answer without spending too long.

	0	1-3	4-6	more than 6
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Number of cyclists	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Number of parked cycles	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Number of cars	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Number of buses	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Number of motorcycles/scooters	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Number of vans/trucks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Flag an issue with the image

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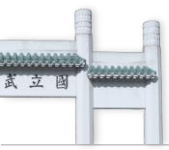
以PubMed 与Web of Science两个数据库进行文献检索。

时间截止至2023年10月。

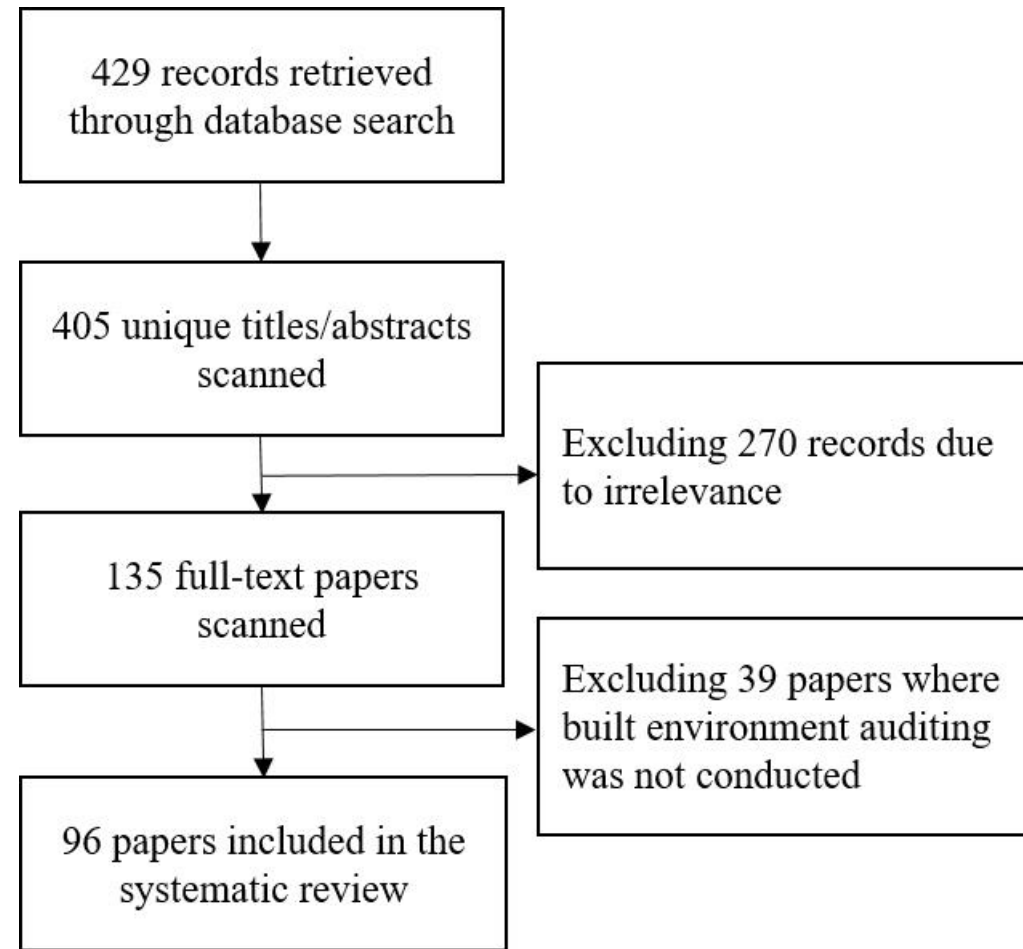
关键词包含：

- ‘built environment* audit’, ‘auditing’, and ‘virtual audit*’
- ‘streetview*’, ‘street view*’, ‘street-view*’, and ‘street view image*’

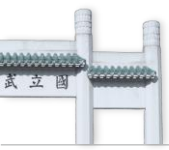
Dai, S., Li, Y., Stein, A., Yang, S., & Jia, P. (2024) Street view imagery-based built environment auditing tools: a systematic review. *International Journal of Geographical Information Science*, 1-22. (**IF=5.7**)



Part 2 循证医学式的系统综述框架

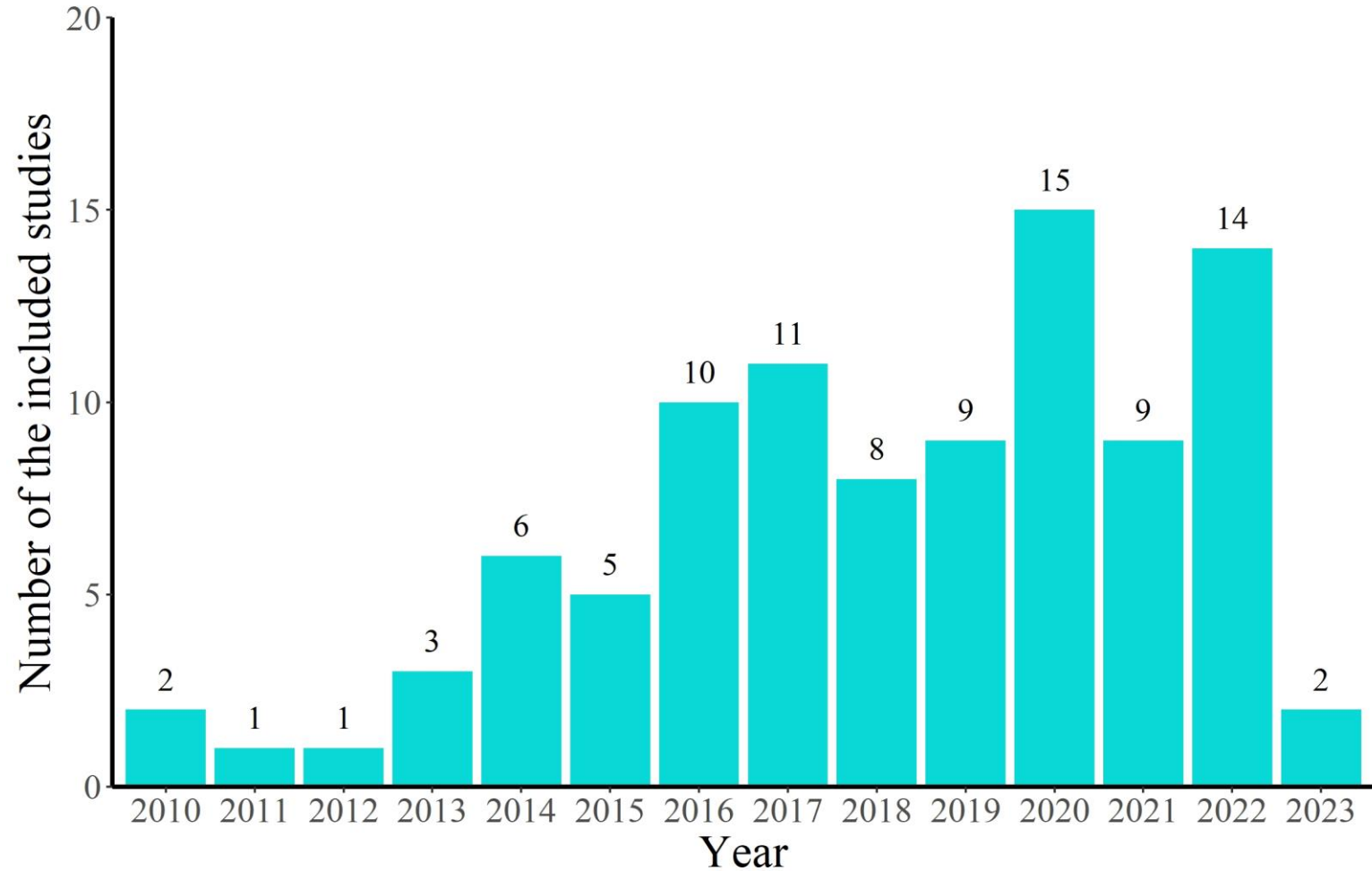


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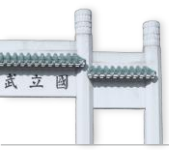


Part 3 地理大数据赋能建成环境测度

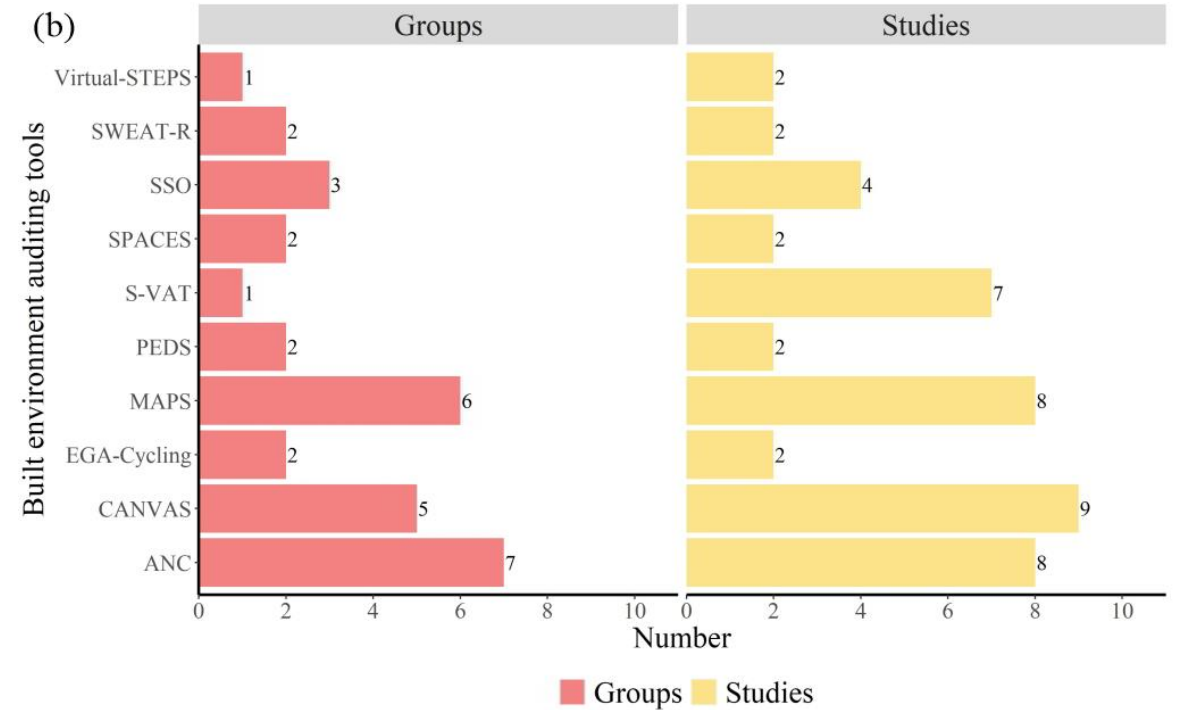
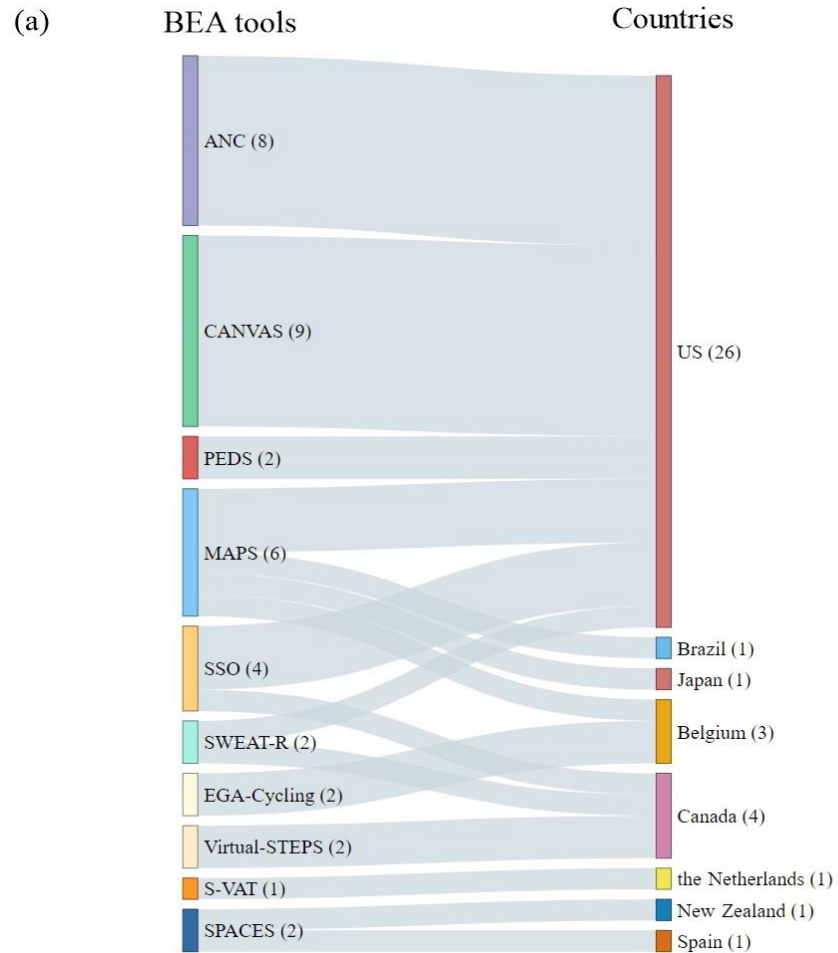
- 建成环境审计工具概述
- 92.7%基于谷歌街景
- 81.3%基于人工审计
- 深度学习的兴起



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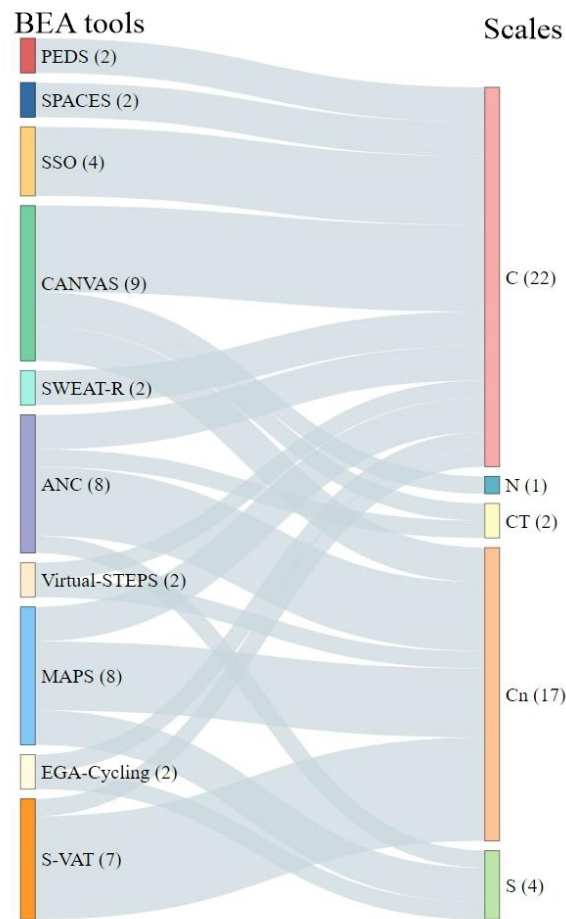
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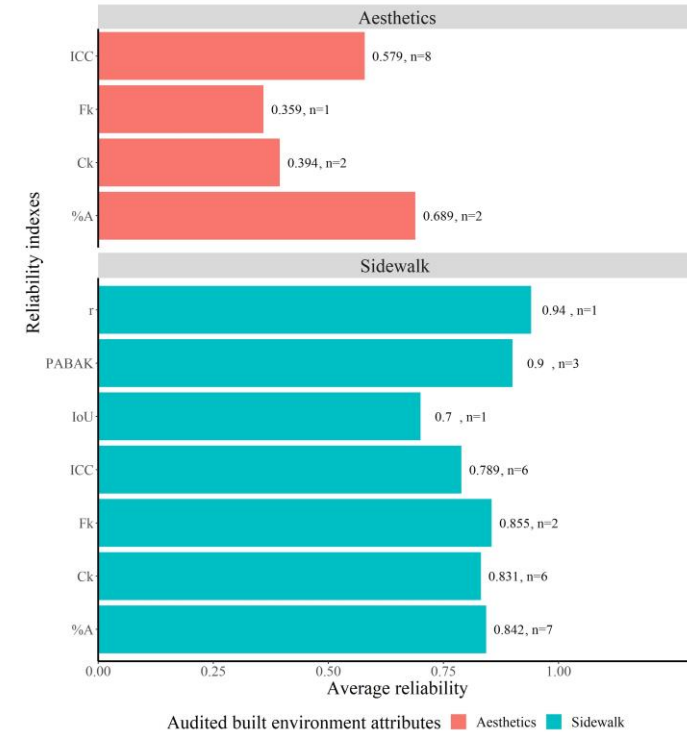
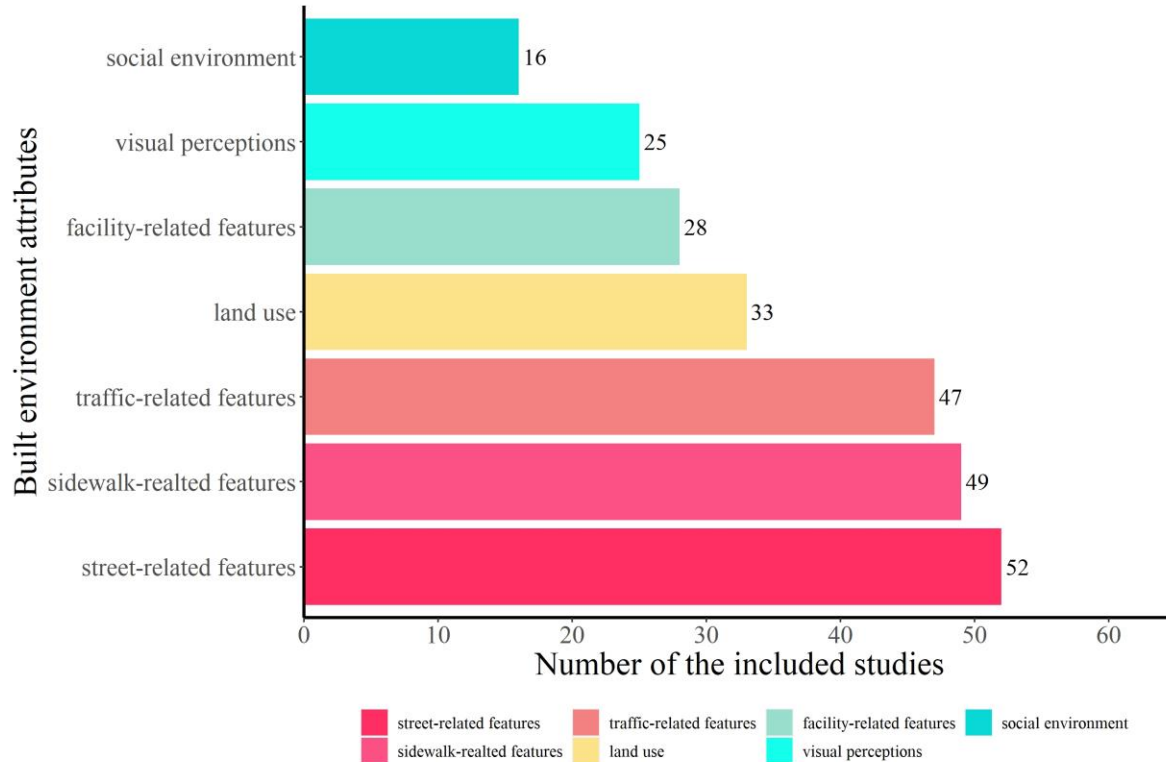


Auditing tools	Purpose	Applied scenes	Audited attributes
ANC	Accessing key street-level features related to physical activity	Physical activity-related studies	<ul style="list-style-type: none"> - Land use types - Sidewalks - Shoulders and bike lanes - Street characteristics - Quality of the environment for pedestrians
CANVAS	Measuring built environmental exposures of interest and environmental effect modifiers	Built environmental exposures and environmental effect-related studies	<ul style="list-style-type: none"> - Aesthetics - Physical disorder - Pedestrian safety - Motorized traffic and parking - Infrastructure for active travel - Sidewalk amenities - Human presence and social interactions
EGA-Cycling	Assessing the physical environmental characteristics of cycling routes to school	Cycling-related studies	<ul style="list-style-type: none"> - Land use types - Characteristics of street segment - Cycling facilities - Pedestrian facilities - Aesthetics
MAPS	Examining the associations between microscale environmental attributes and macro-level neighborhood walkability	Walkability-related studies	<ul style="list-style-type: none"> - Routes - Street segments - Crossings - Cul-de-sac
PEDS	Assessing the walking environment	Walkability-related studies	<ul style="list-style-type: none"> - Environment - Pedestrian facilities - Road attributes - Walking/Cycling environment
S-VAT	Identifying and comparing environmental characteristics to assess the obesogenicity of neighborhoods	Obesity-related studies	<ul style="list-style-type: none"> - Walking - Cycling - Public transport - Aesthetics - Land use mix - Grocery stores - Food outlets - Recreational facility-related items
SPACES	Assessing the walking and cycling environment	Active transport behaviors-related studies	<ul style="list-style-type: none"> - Walking/Cycling function - Walking/Cycling safety - Walking/Cycling aesthetics - Walking/Cycling destinations
SSO	Examining some phenomenon or aspect of behavior	Social-related studies	No uniform audited attributes
SWEAT-R	Understanding the influence of the physical environment on physical activity of older adults	Physical activity-related studies in elders	<ul style="list-style-type: none"> - Functionality - Safety - Aesthetics - Destinations and facilities
Virtual-STEPS	Auditing instruments that can be used for widespread surveillance at local, provincial, and national levels	Auditing infrastructure	<ul style="list-style-type: none"> - Pedestrian infrastructure - Traffic calming and streets - Building characteristics - Bicycling infrastructure - Transit - Aesthetics/disorder

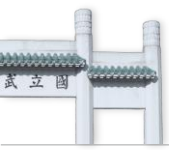
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- **街道**是最常审核的对象（54.2%），其次是**人行道**（51%）、交通（49%）和土地使用（34.4%）
- 与主观属性（例如邻里环境感知）相比，客观属性有更高的可靠性
- **Active Neighborhood Checklist**与**Microscale Audit of Pedestrian Streetscapes**是两种应用最广泛的建成环境审计工具

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- 街景图像在捕获建成环境环境的某些属性方面表现良好，能够有效地**提高**
审计准确性。
- 街景图像在促进环境健康中**城市建成环境观测**方面具有**巨大潜力**。与遥感
或实地观测等替代观测方法相比，街景图像提供了一种可以在**人的视线水平**
捕获城市物理环境的高效方法

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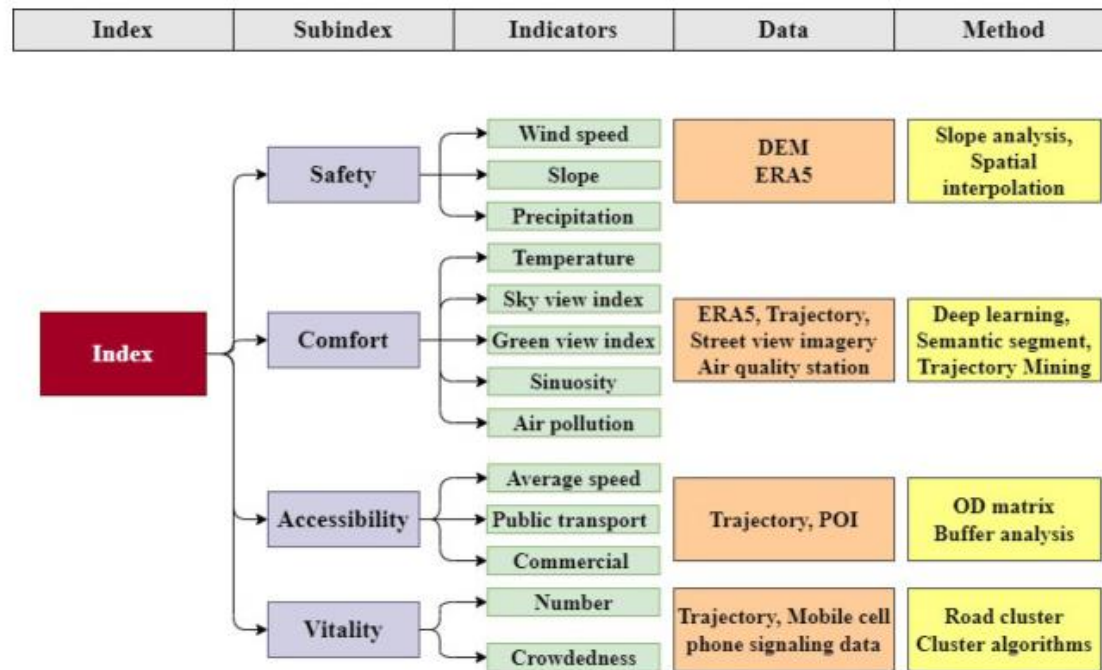


- 亟需将**人工智能**的力量与街景图像相结合，建立具有不变或稳定几何信息的通用审计建成环境特征的**标准数据集**
- 亟需探索使用**多源街景图像**与其他**遥感影像数据**的**融合**，以促进创建空间完整且时间一致的城市场景
- 重点关注针对**发展中国家**独特情况定制和验证建成环境审计工具至关重要。

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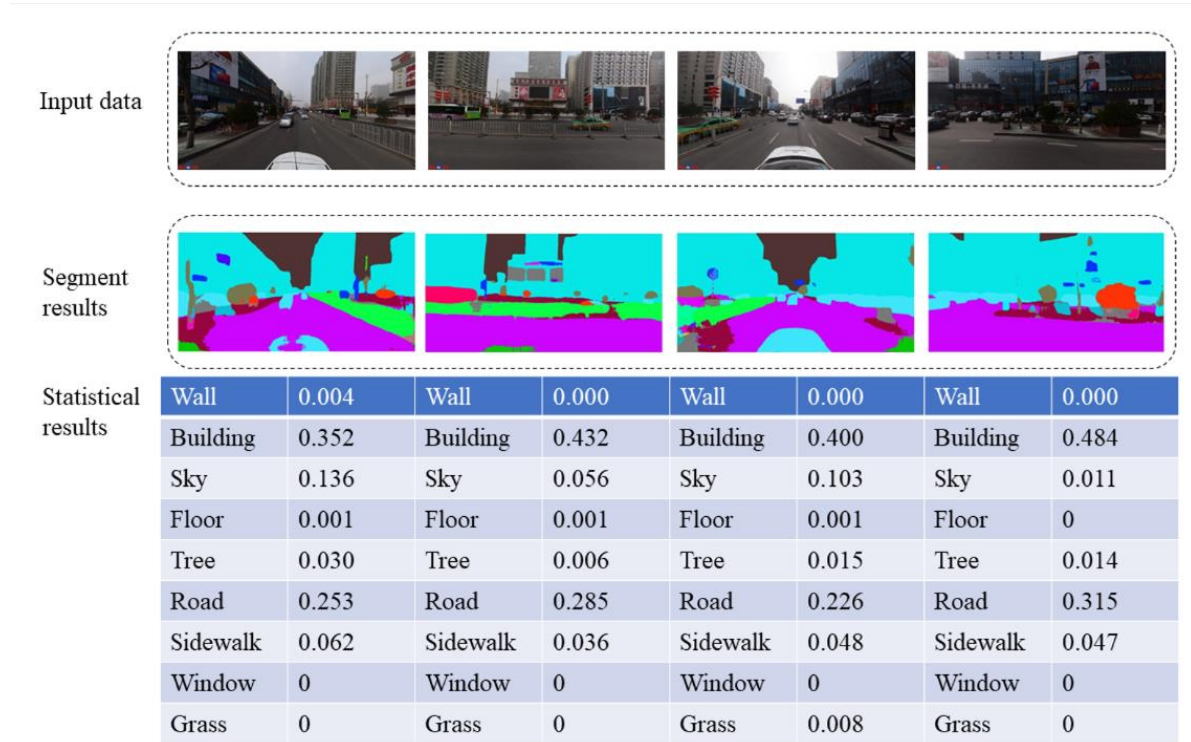
● 一些探索（建成环境与体力活动的关联）

- 传统可骑行性评估的指标
- 以人为本的环境感知指标
- 过去忽视的自然环境指标
- 实际骑行行为的轨迹指标



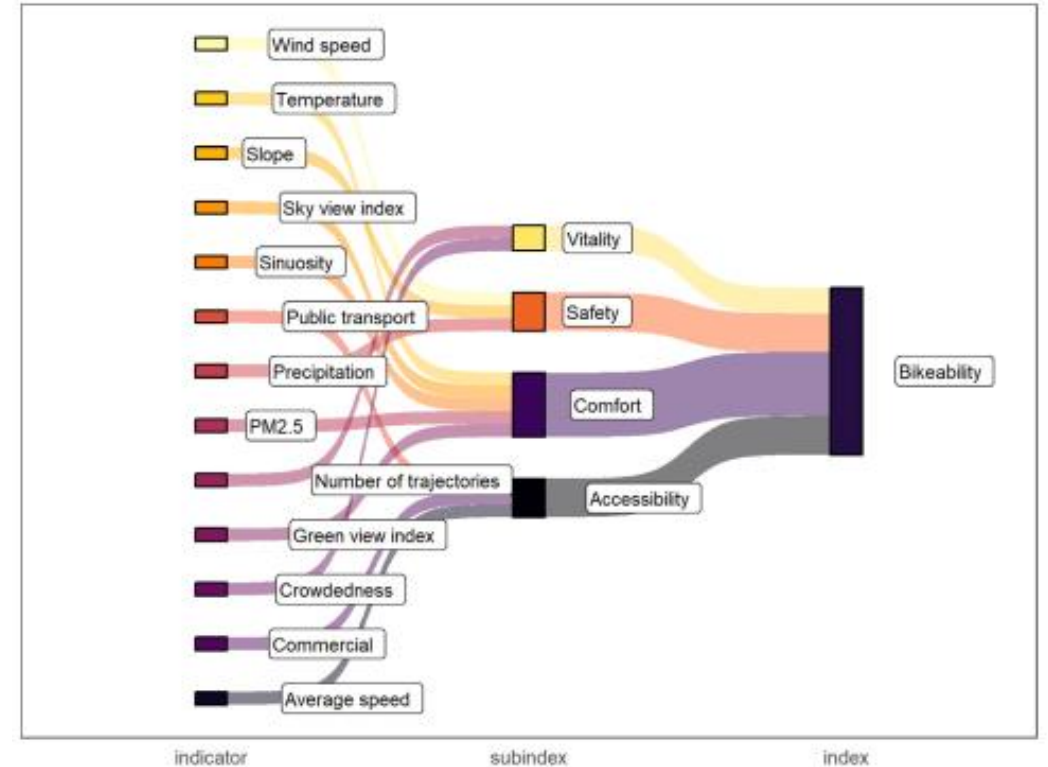
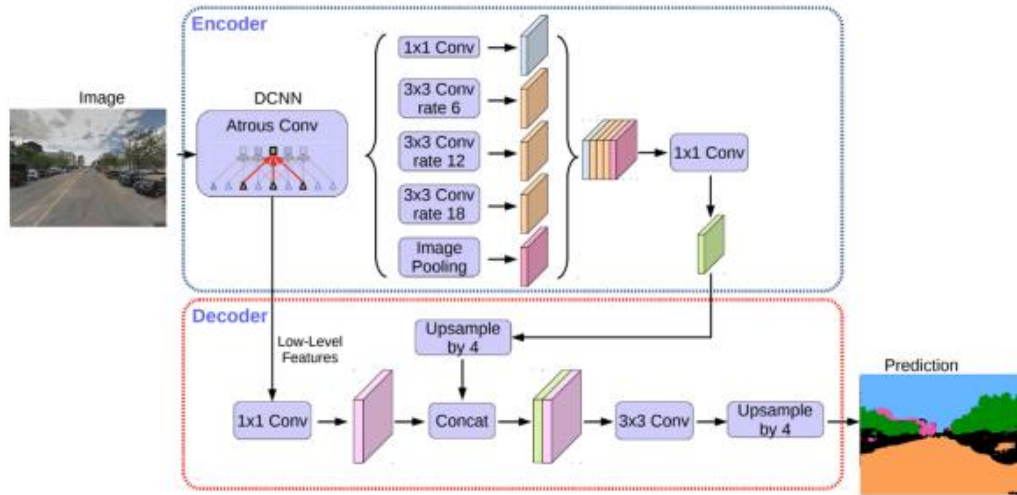
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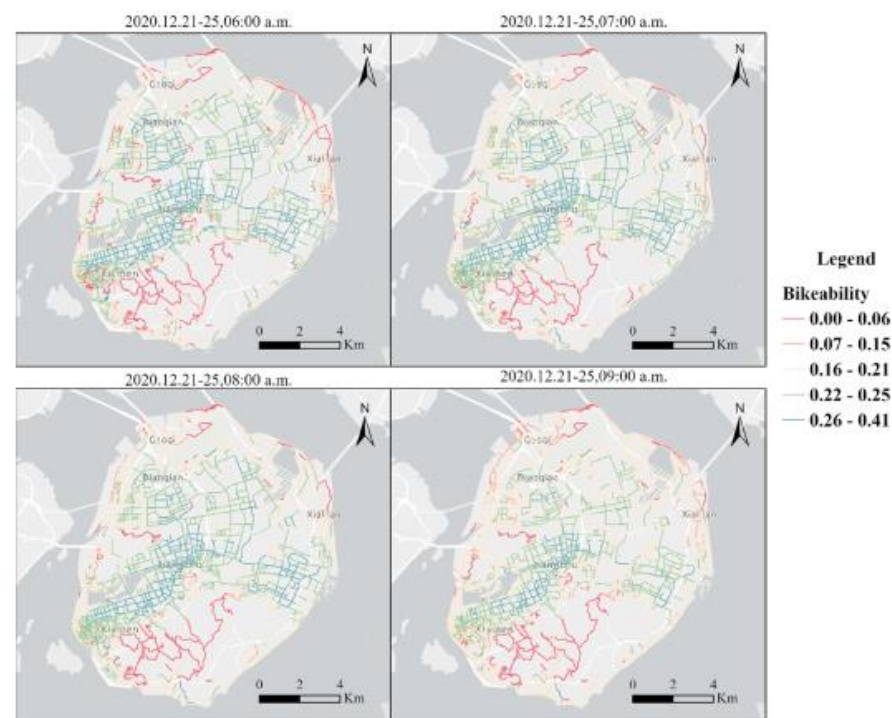
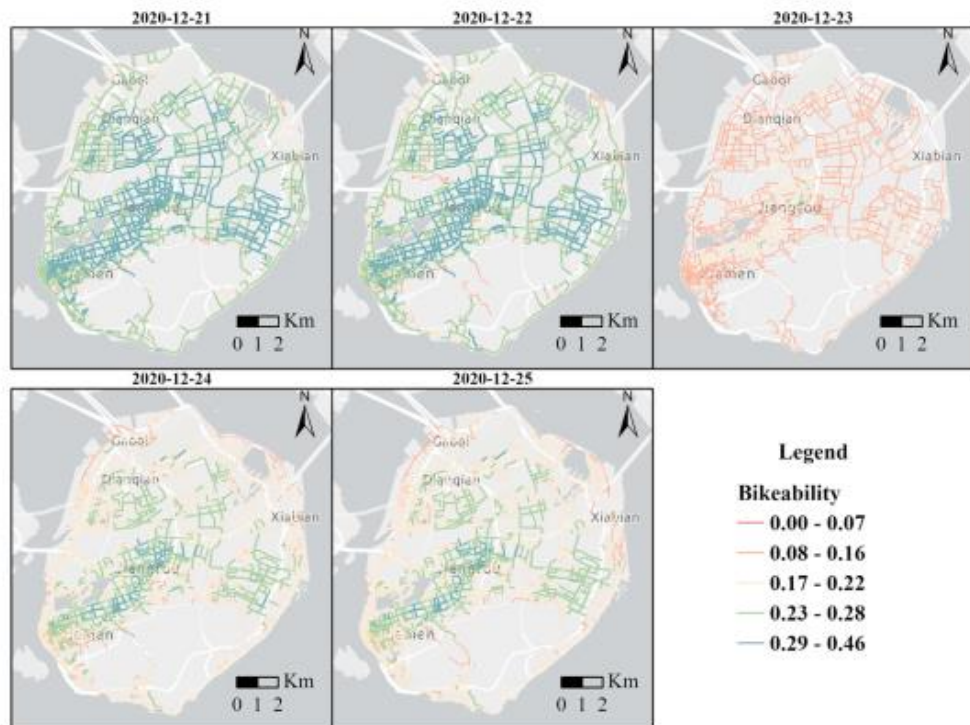
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非常感谢！
敬请诸位老师批评指正！

Thanks for your listening



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戴幼勍

2024.5.12
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