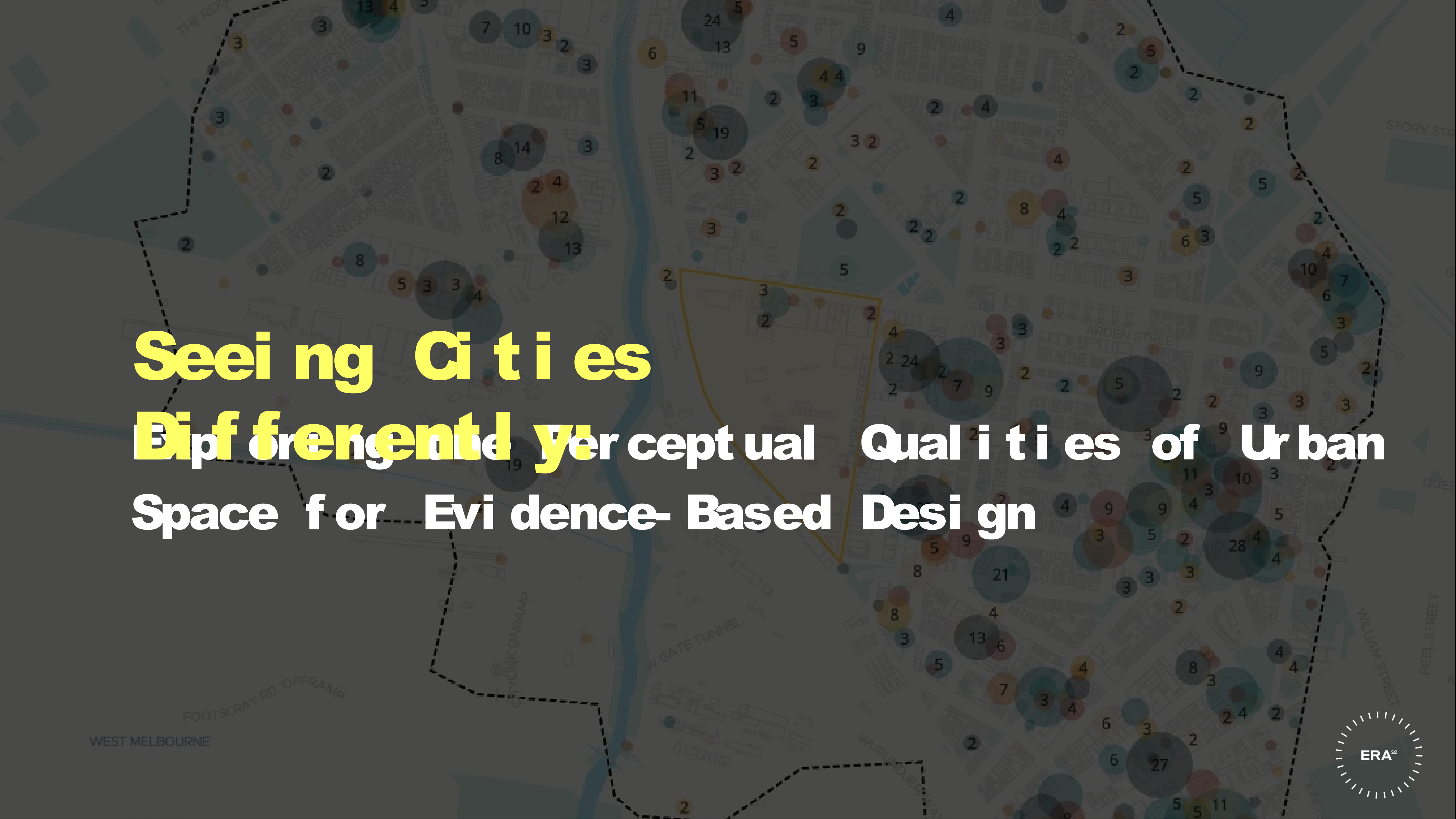
Seeing Cities Differently:

Exploring the Perceptual Qualities of Urban Space for Evidence-Based Design



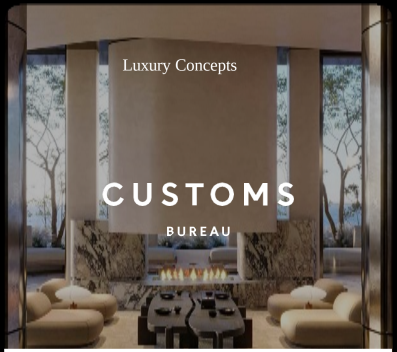
Total Place Design Network

Our network of leading place brands

Placemaking Consultancy

Sustainability Consultancy

Architecture & Design



Luxury Design

PART OF THE 7C.NETWORK

Our Collective Ambition	To be the most trusted and influential voice for the future of our built world

WOODS BAGOT AND ERA-CO ARE PART OF THE 7C NETWORK.

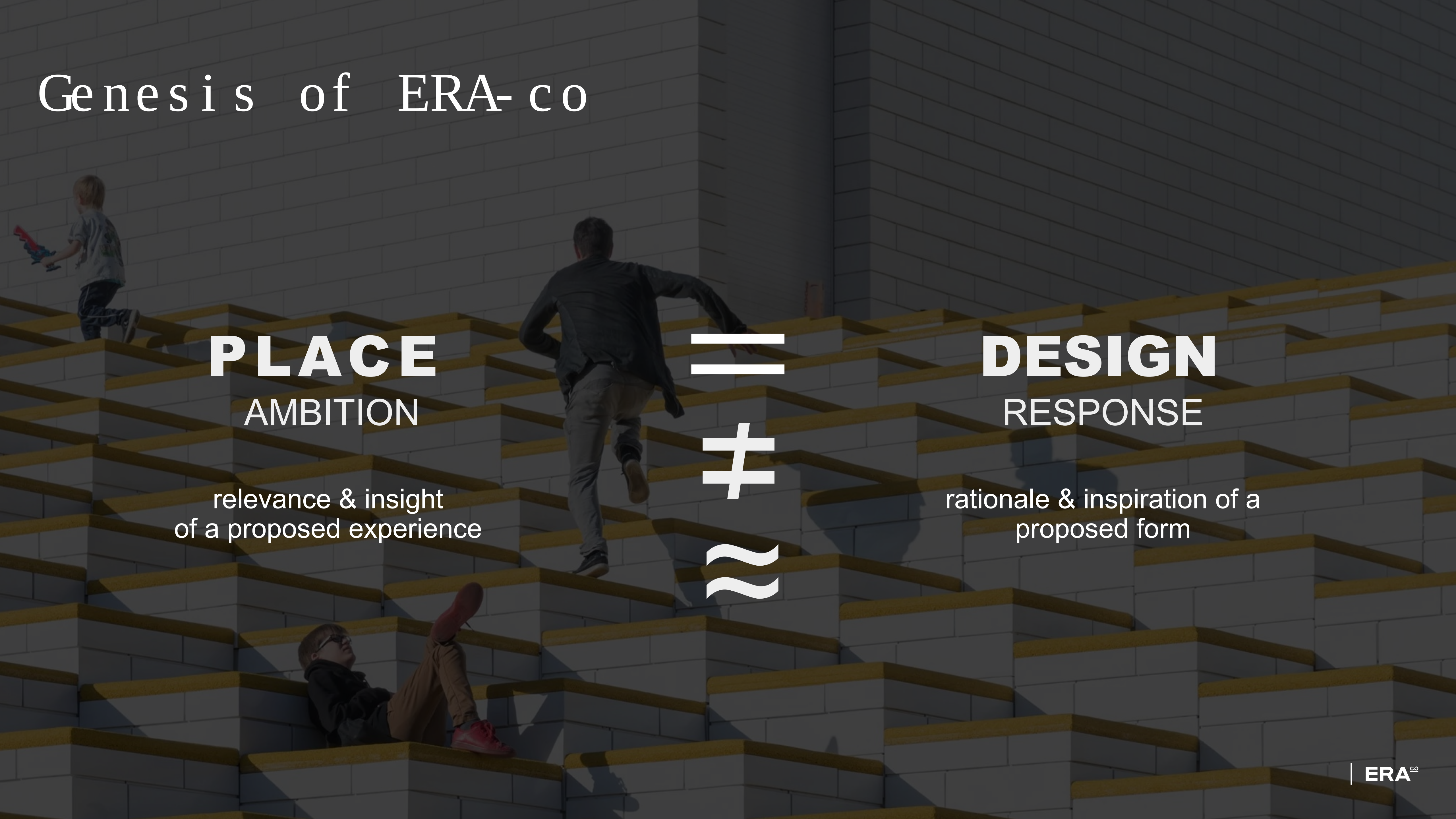
We are on a mission to improve our built world across seven continents.

A wholly owned network of leading place brands operating from 18 global cities.

We understand the complexity and challenges of our time. To generate the best possible outcomes for people and place, our brands provide visionary thinking and a holistic approach to design.

We connect specialist knowledge across our network to deliver strategic outcomes and long-term impact.

Through Total Place Design, we stay ahead of the greatest challenges, the limitless opportunities, and the rising ambition of the built world.



Genesis of ERA-co
PLACE
AMBITION
relevance & insight
of a proposed experience
=
≠
≈
DESIGN
RESPONSE
rationale & inspiration of a
proposed form


FROM
CITY

TO
COMMUNITY

TO
CURB

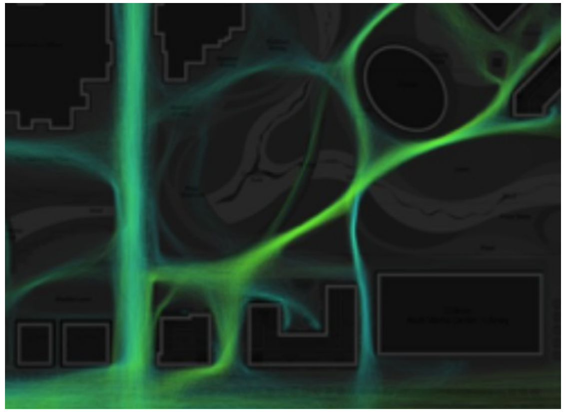
OUR PROJECTS

MARAFY MASTERPLAN, JEDDAH, KSA

RUZINOV MASTERPLAN, BRATISLAVA, SLOVAKIA

85 GRACECHURCH, LONDON, UK

QUANTIFYING PLACE : FORECASTING EXPERIENCE

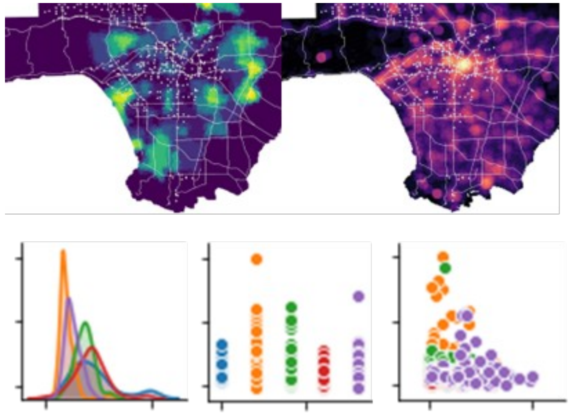


/ Persona Movement

Flow Analysis models how people move through cities, testing layouts and land uses to shape public experiences.

/ Clustering Models

Clustering and connectivity analysis reveal drivers of place types and guide refinement of emerging designs.



/ Geospatial Analysis

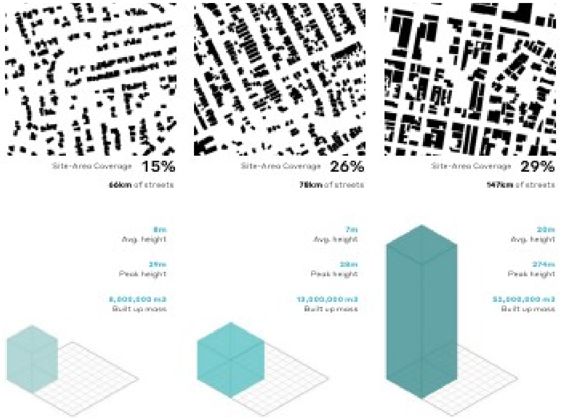
Data and statistical analysis reveal hidden urban patterns, unlocking overlooked opportunities and insights across scales.

/ Land Use Studies

Our tools objectively guide land-use allocation by linking movement and hierarchy while adapting to project ambitions and context.

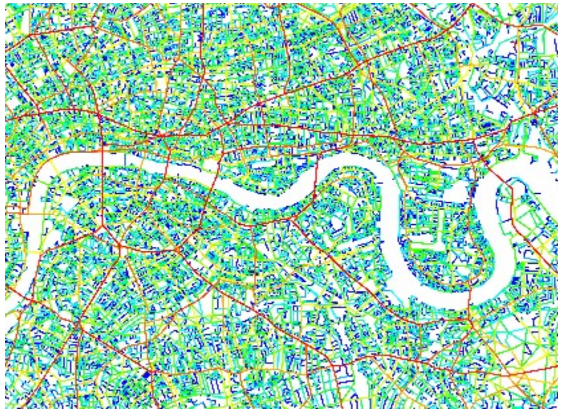
/ AI Place Definition

We use AI models to quantify image and video data, giving an objective lens on urban environments which we use for benchmarking.



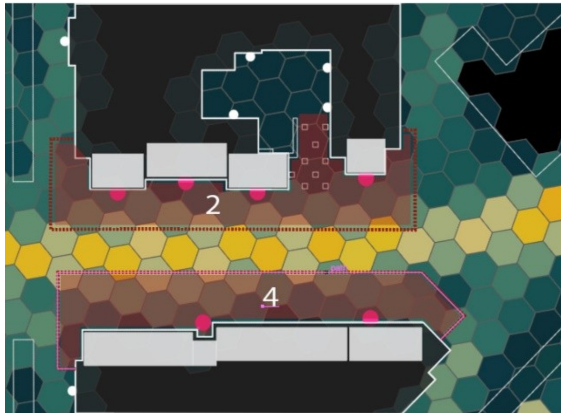
/ Benchmarking Places

Our benchmarking identifies key local features, compares them globally, and uses data analytics to reveal measurable insights.



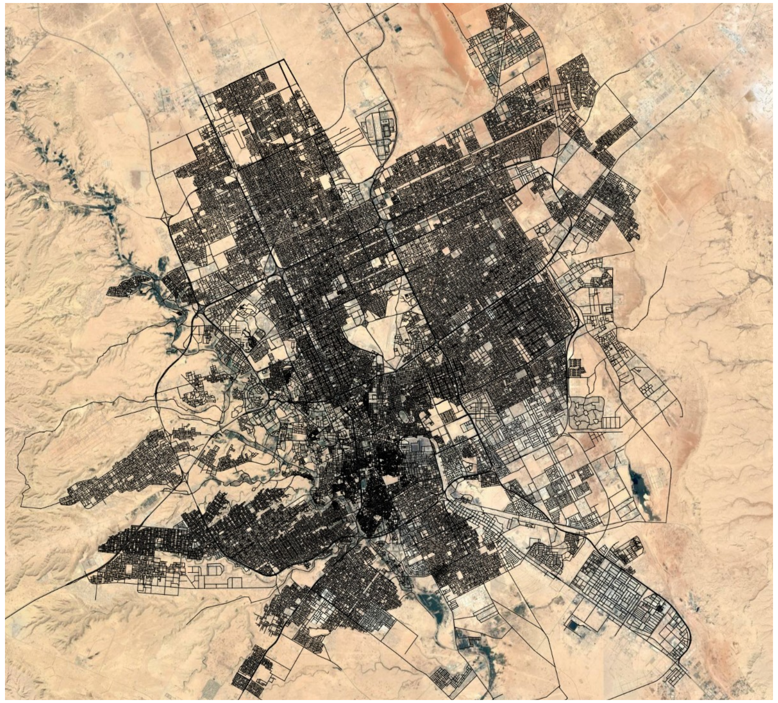
/ Spatial Opportunities

Our spatial network models assess how streets and paths attract movement, helping us test and optimize proposals for urban integration.

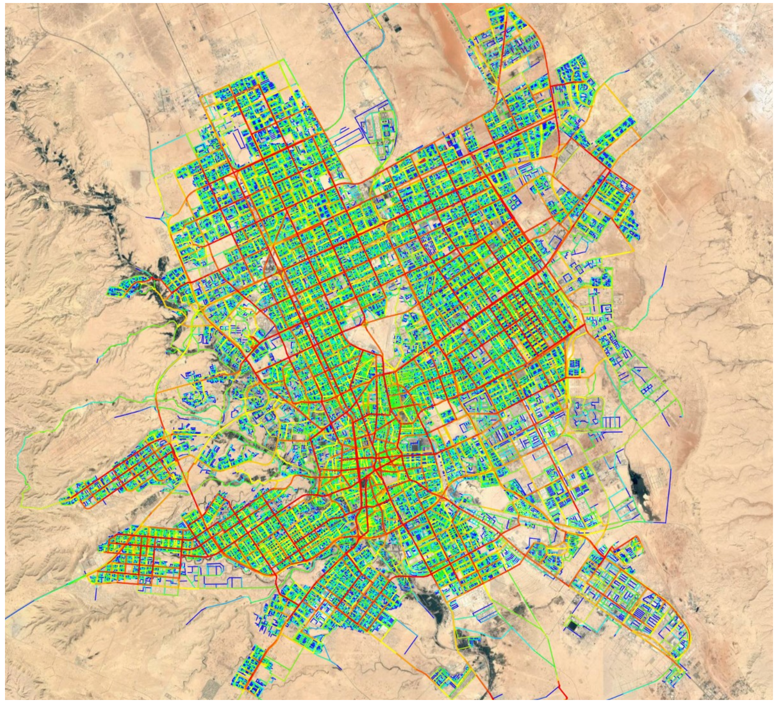


/ Movement & Activation

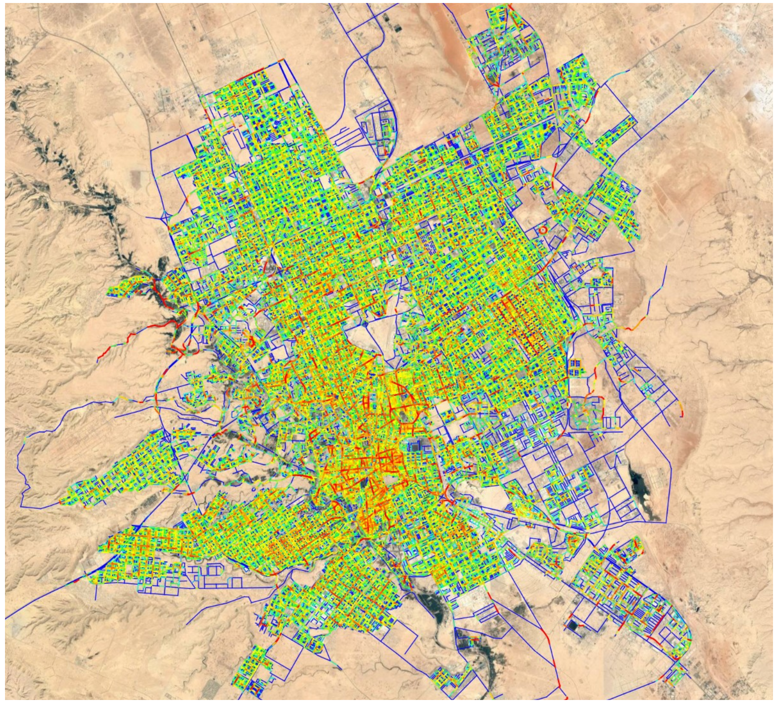
We simulate people-movements and journeys, combined with land use and layout, to assess asset placement, footfall potential, and public-realm effectiveness.



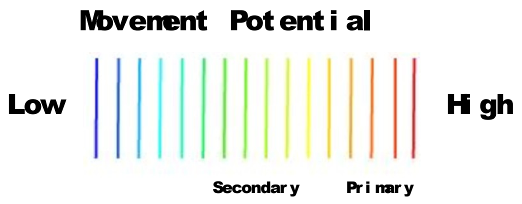
Exploring Connections and Configurations of Cities



Strategic connections (10kms +)



Strategic connections ~800m ~1,200m

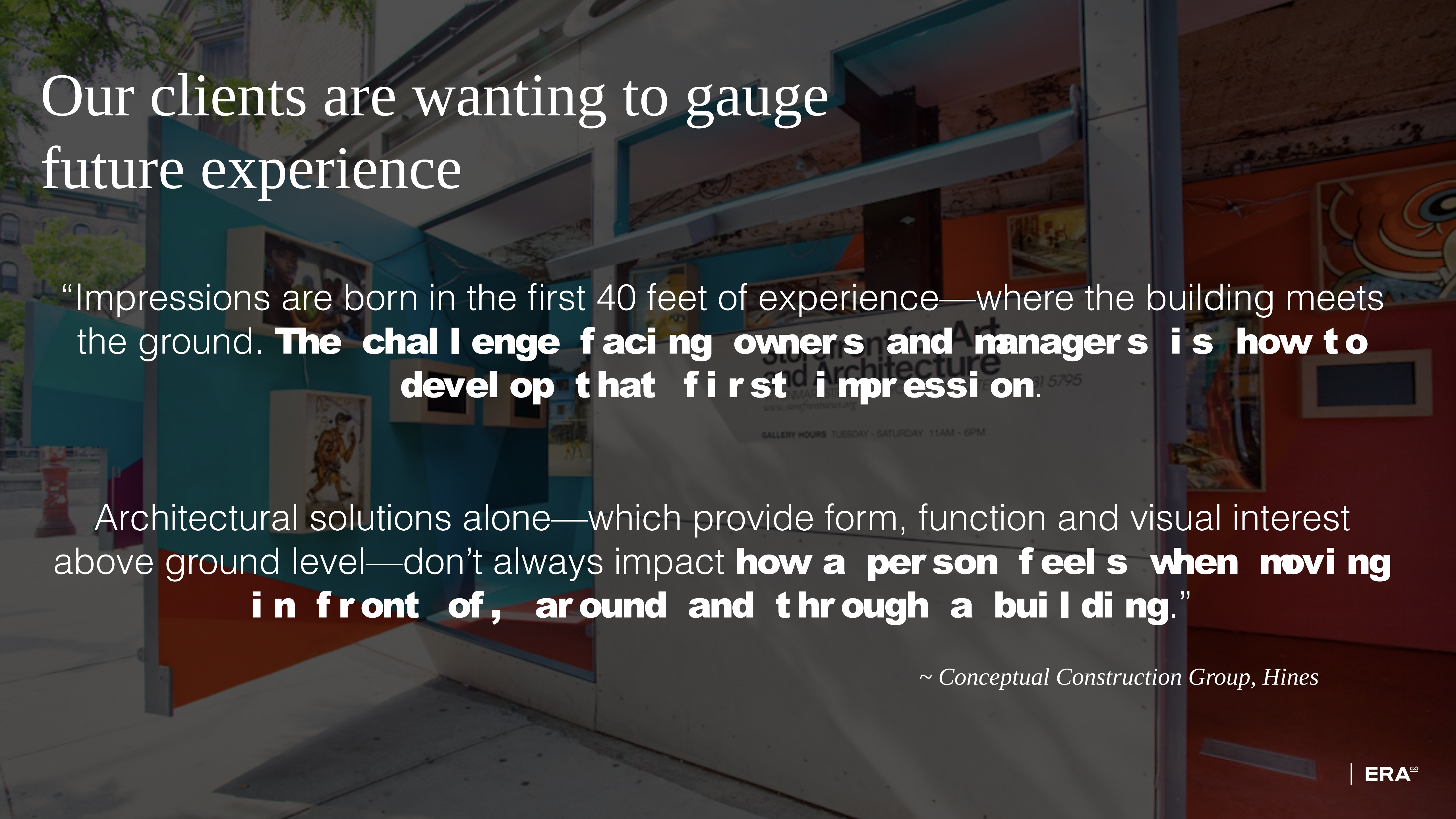


Our clients are wanting to gauge future experience

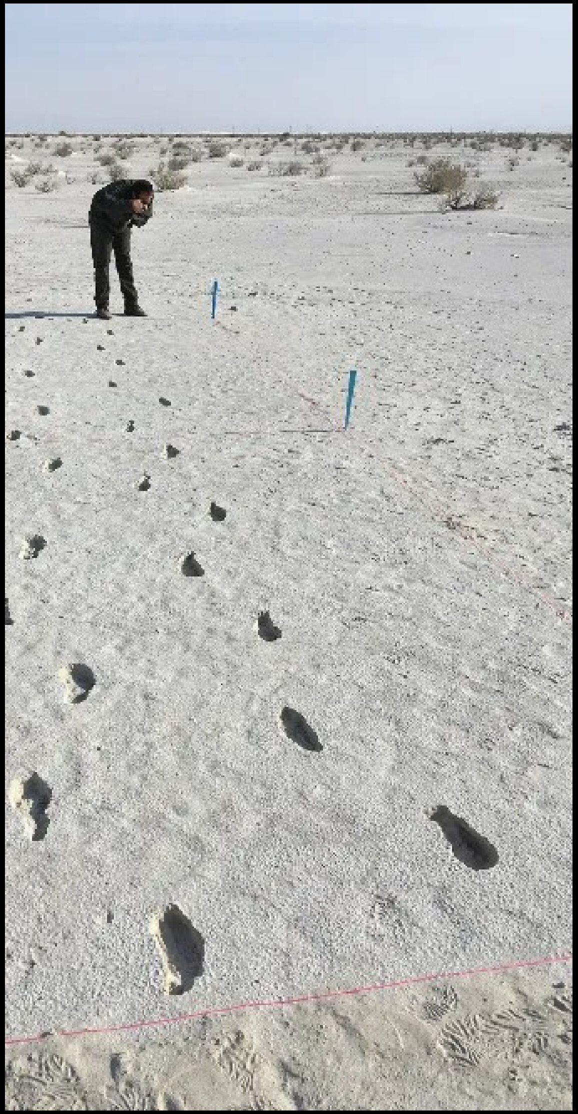
“Impressions are born in the first 40 feet of experience—where the building meets the ground. **The challenge facing owners and managers is how to develop that first impression**.

Architectural solutions alone—which provide form, function and visual interest above ground level—don’t always impact **how a person feels when moving in front of, around and through a building**.”

~ Conceptual Construction Group, Hines



The fundamentals haven't changed



10,000 BCE White Sands National Park, New Mexico

Striving for human-centricity in an increasingly digital world.

Scenario 2: Weekend Evening Peak

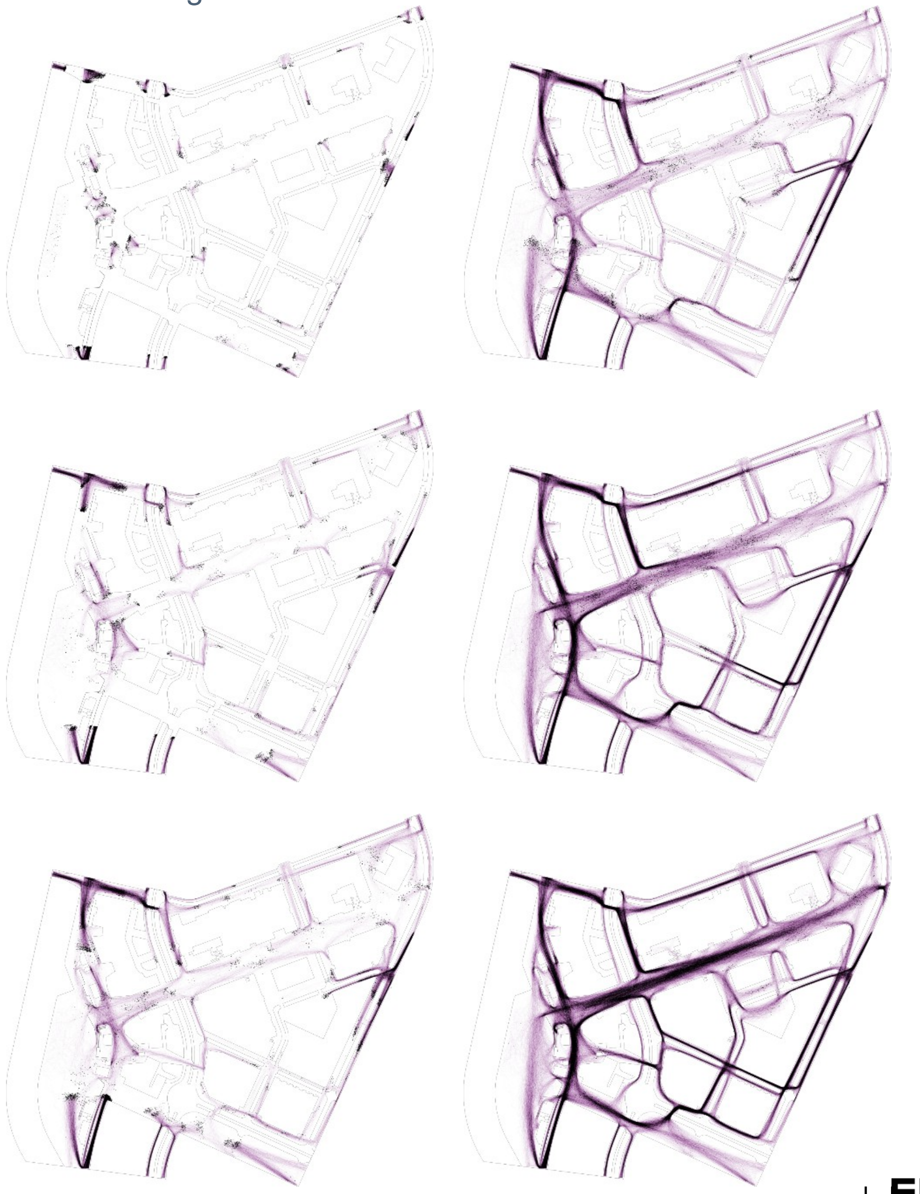
Simulation of pedestrian flows across a walkable area based on predefined origins, destinations, and population assumptions.

BRIDGE

MALL

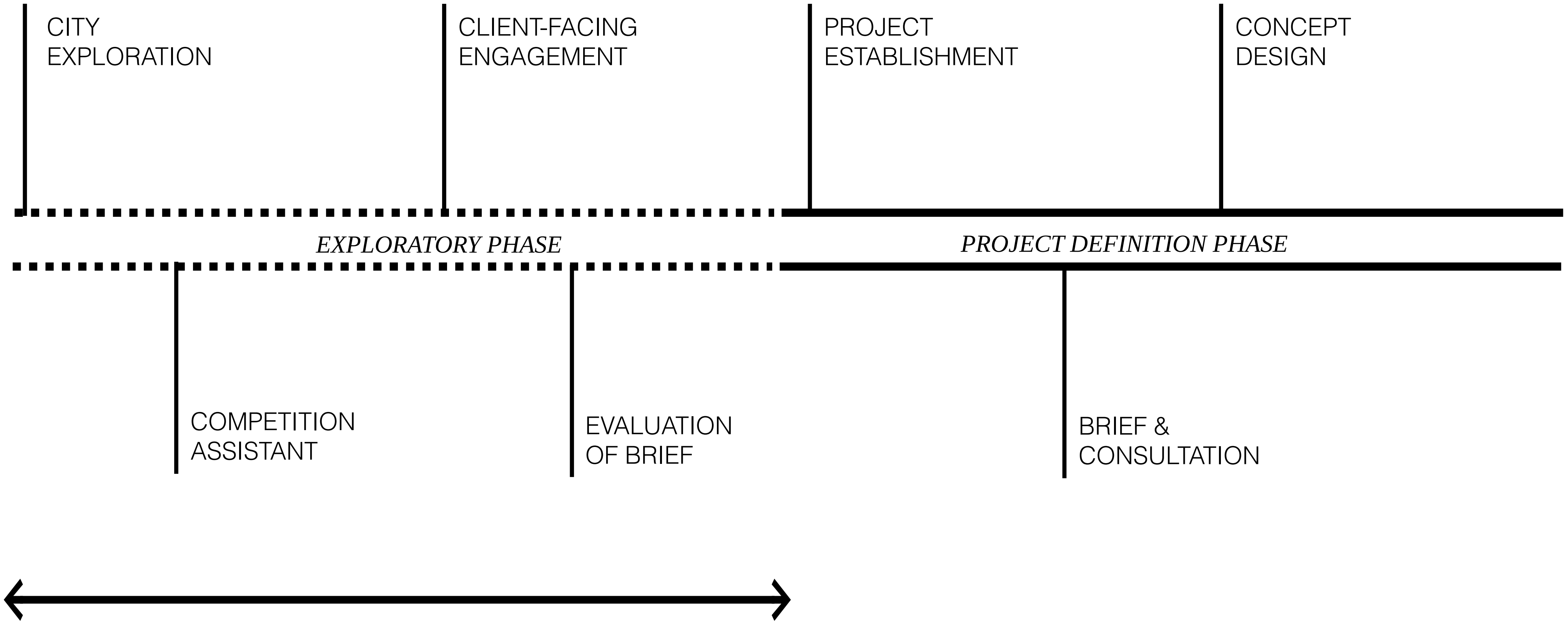
BRIDGE

Flow Progression



AI-POWERED PERCEPTUAL MAPPING

Deeper understanding of your context, share insights with clients, enhance how we respond to briefs, and question our assumptions



AI-POWERED PERCEPTUAL MAPPING

1. Explore visual perception of streets as a key element of urban form.

2. Develop scalable methods for street-level perceptual assessment.

3. Apply open-source computer vision to street-view imagery (SVI).

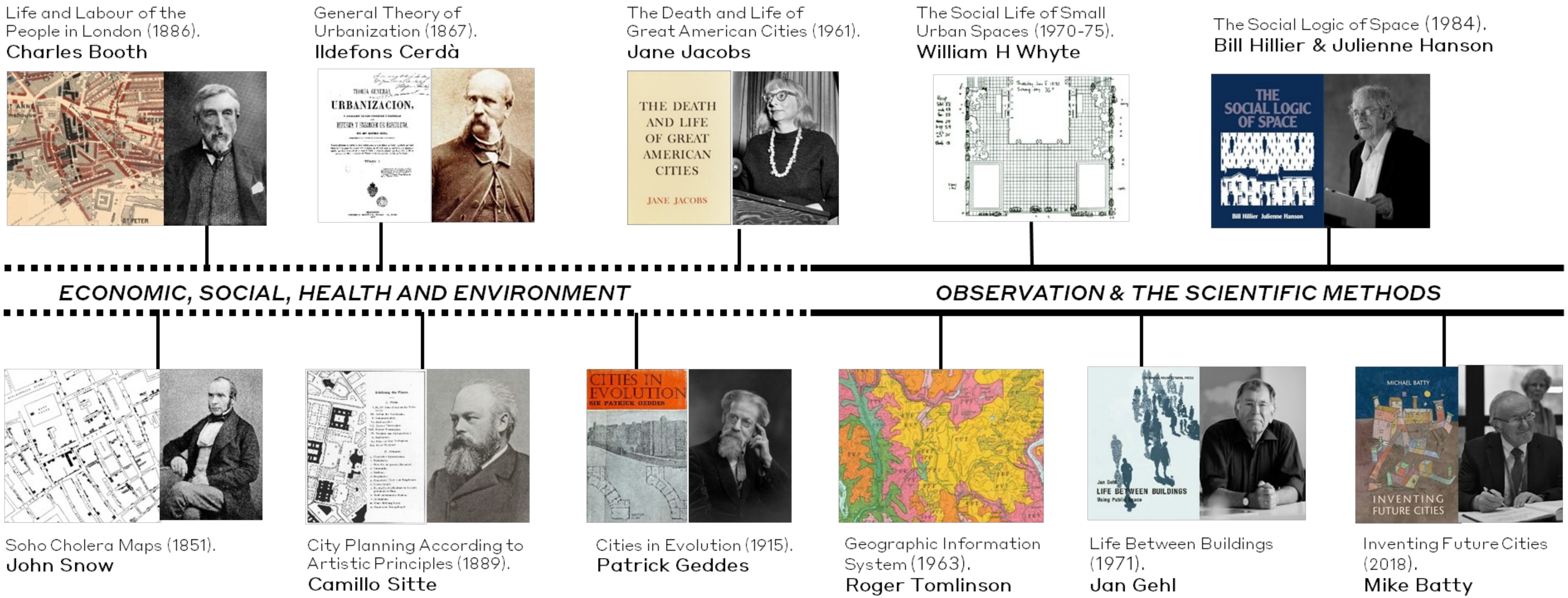
Street scene from field survey in Southhampton Row, London

How can semantic segmentation models be applied to street-view imagery to develop scalable, data-driven methods for evaluating the **perceptual qualities** of urban form?

Work of **Dr Nicolas Palominos**

● **PERCEPTUAL QUALITIES**

Theoretical foundations in Urban Design Addressing **Perceptual Qualities**



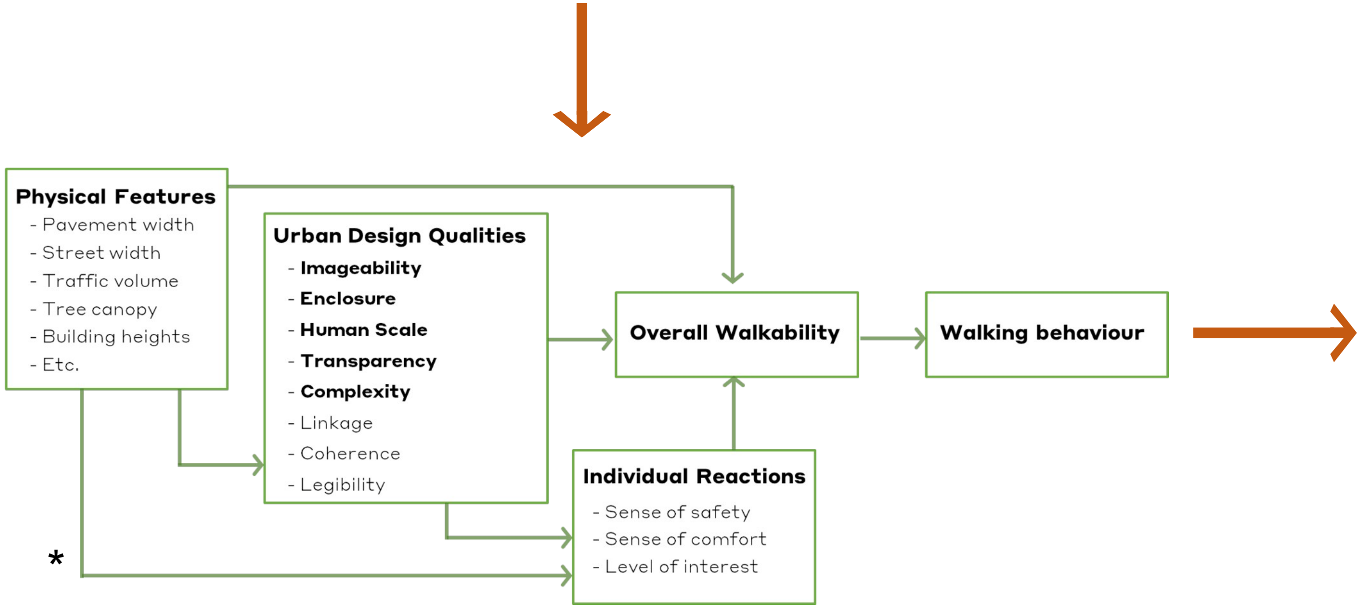
- *1889: City Planning According to Artistic Principles,* Camillo Sitte
- *1909: Town Planning in Practice,* Raymond Unwin
- *1960: The Image of the City,* Kevin Lynch
- *1961: The Concise Townscape,* Gordon Cullen
- *1961: The Death and Life of Great American Cities,* Jane Jacobs
- *1977: A Pattern Language: Towns, Buildings, Construction,* Christopher Alexander, Sara Ishikawa, and Murray Silverstein

ERA

- *1984: Fundam*
- *1986: Finding*

Leveraging on Theoretical Foundations

Lynch, Alexander, Jacobs, and others: Defined key perceptual qualities like enclosure, human scale, and imageability as core to urban form and experience.



Perceptual Quality	Definition	Key Segmentation Classes	Formula Concept	Formula
Imageability	Memorability and distinctiveness of a place through physical features and human activity.	person, rider, vegetation, building	Weighted sum of memorable features	0.4*(person + rider) + 0.3*vegetation + 0.3*building
Enclosure	Degree to which a street feels spatially enclosed by vertical elements.	building, vegetation, wall, fence, sky	Ratio of vertical elements to sky	(building + vegetation + wall + fence) / (building + vegetation + wall + fence + sky + 1e-6)
Human Scale	Presence of human-level details and proportions matching pedestrian perspective.	person, rider, pole, traffic sign, traffic light	Sum of small-scale elements normalized	(person + rider + pole + traffic_sign + traffic_light) / (1 - sky + 1e-6)
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Complexity	Visual richness from variety of elements, forms, and activity in the scene.	person, rider, bicycle, motorcycle, traffic sign, pole, car, vegetation	Entropy (distribution of elements)	Shannon entropy([class proportions])

Work of **Dr Nicolas Palominos**

* From 2013: Ewing, R; Clemente, O. *Measuring Urban Design: Metrics for Livable Places*

Assessing Urban Form through Street-View Imagery.

From site photo survey — To advanced place analysis

Step 1:
Semantic Segmentation

Step 2:
K-means Clustering

AOI in Barnet, Brent and Camden, London

(1) Hamstead G S, residential, Barnet

image
Route

(2) Staples Corner, industrial, Brent

(3) Bloomsbury, mixed-use, Camden

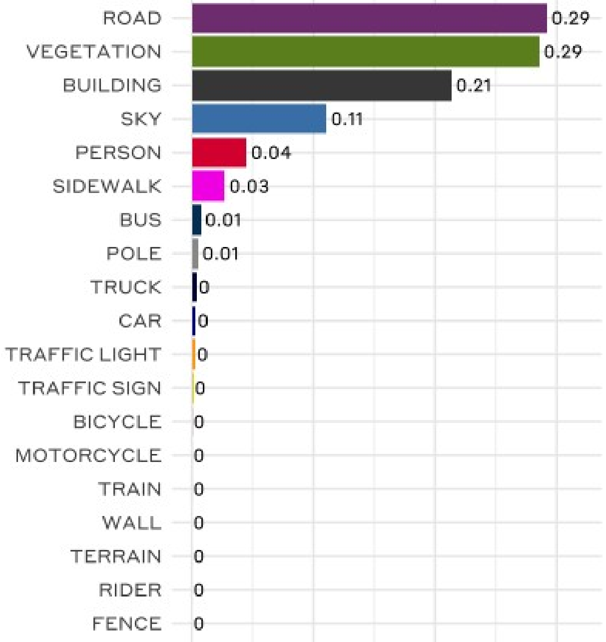
SEMANTIC SEGMENTATION

Sorting pixels into meaningful categories for perceptual analysis.

METHODOLOGY	**Computer Vision**
TRAINING MODEL	**TensorFlow (DeepLabv3+, TFLite, trained on Cityscapes)**
INPUT	**Images**
GOAL	**Turn raw pixels into labeled elements**

Street scene from Bloomsbury

Segmented image with color coded labels



Labels distribution

image	road	sidewalk	building	wall	fence	pole	traffic light	traffic sign	vegetation	terrain	sky	person	rider	car	truck	bus	train	motorcycle	bicycle
IMG_3483.JPG	0.29199	0.02719	0.21380	0.00000	0.00000	0.00541	0.00297	0.00113	0.28564	0.00000	0.11136	0.04497	0.00000	0.00355	0.00431	0.00744	0.00004	0.00004	0.00016

Segmentation metrics by image

From pixels to Ingredients: Semantic Segmentation Results.

RStudio: Notebook Output

A tibble: 156 × 20

image <chr>	road <dbl>	sidewalk <dbl>	building <dbl>	wall <dbl>	fence <dbl>	pole <dbl>	traffic light <dbl>	traffic sign <dbl>	vegetation <dbl>	terrain <dbl>	sky <dbl>	person <dbl>
IMG_3509.JPG	0.167928521	0.070657028002	0.27660247	0.0000000000000	0.010477009814	0.00089093797	0.0000000000000	0.0013445265259	0.39938619762	0.000000000000	0.0000300793060	0.00777522380
IMG_3521.JPG	0.255950536	0.134643277884	0.47512109	0.0000000000000	0.006826710719	0.00387672430	0.0000324782691	0.0002214427438	0.03647254258	0.000000000000	0.0784309600576	0.00513857887
IMG_3535.JPG	0.293558526	0.001117732249	0.20584376	0.0000108876016	0.000000000000	0.00163904538	0.0000592359340	0.0006838890070	0.24038550967	0.000000000000	0.0813612011645	0.02425222476
IMG_3496.JPG	0.284334328	0.053438193854	0.21781957	0.0000164236702	0.009131376075	0.00215537604	0.0000011072137	0.0002694220049	0.25390237475	0.000000000000	0.0727491083239	0.04008464280
IMG_3483.JPG	0.291991080	0.027185233903	0.21380426	0.0000000000000	0.000000000000	0.00541039984	0.0029689935870	0.0011280662439	0.28564139414	0.000000000000	0.1113591269841	0.04497243776
IMG_3497.JPG	0.358234570	0.073313787320	0.16949209	0.0003245981552	0.018215880102	0.00208506797	0.0000769513535	0.0000142092427	0.25057150681	0.000046318441	0.0680286871693	0.00597784687
IMG_3534.JPG	0.260156841	0.123582212833	0.29673512	0.0027645281203	0.000002029892	0.00432200875	0.0000184535620	0.0010095943759	0.23024804540	0.000029894770	0.0218276112528	0.01636757133
IMG_3520.JPG	0.263337496	0.071161917458	0.41265892	0.0002299313823	0.064590419501	0.00313562925	0.0000446576200	0.0001699573058	0.01440300513	0.000000000000	0.0942120771920	0.01628526845
IMG_3508.JPG	0.002854397	0.234412645266	0.56160094	0.0000000000000	0.000000000000	0.00110979722	0.0000000000000	0.0019322724750	0.11305316397	0.000000000000	0.0502833728978	0.03243047436
IMG_3522.JPG	0.242403591	0.016570006909	0.56892535	0.0004844060020	0.003859931559	0.00028400032	0.0000000000000	0.0001127512637	0.11056433207	0.000000000000	0.0540386727608	0.00048938846
IMG_3495.JPG	0.294236141	0.025777227123	0.29859026	0.0184923144605	0.001295809122	0.00272872821	0.0000000000000	0.0007440476190	0.25058977584	0.000000000000	0.0670165092947	0.00540634005
IMG_3494.JPG	0.246912904	0.082110046710	0.16964341	0.0001323120394	0.022368669690	0.04266998683	0.0000000000000	0.0389770600080	0.28801120057	0.000560065606	0.0235063317862	0.03286284132
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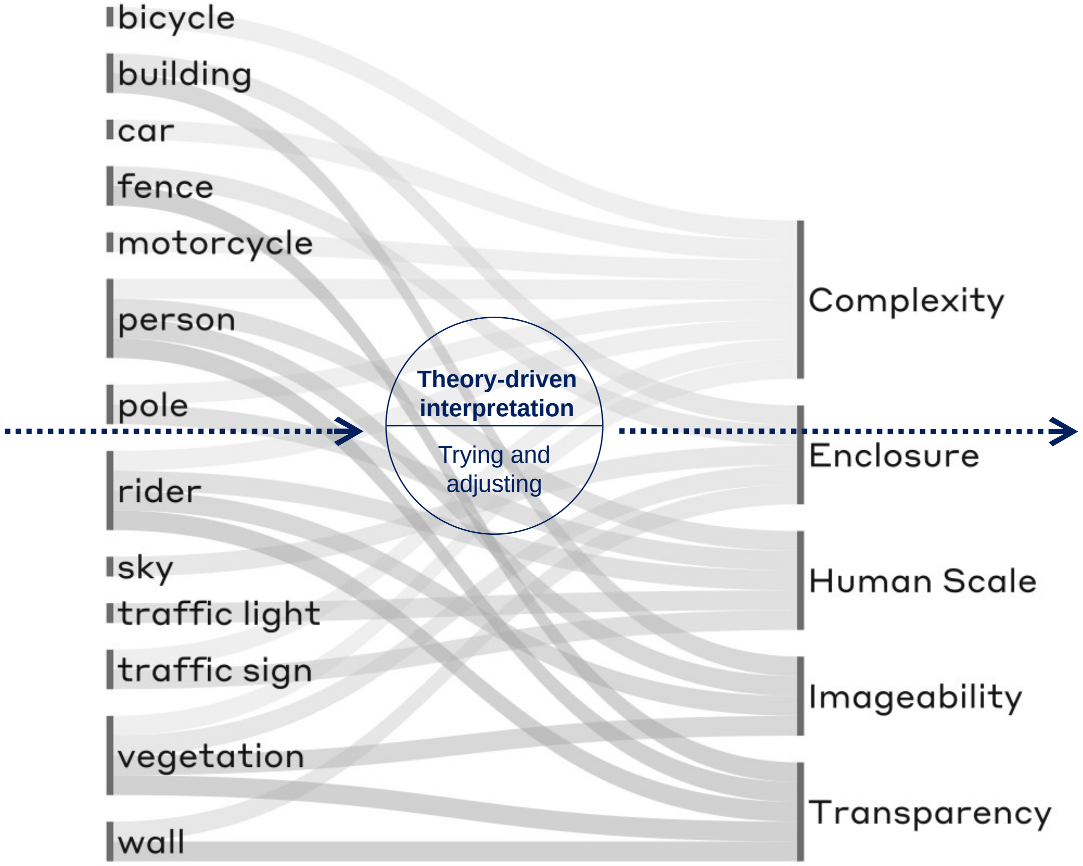
1–14 of 156 rows | 1–13 of 20 columns

Previous 1 2 3 4 5 6 ... 12 Next

Translating segmentation labels into metrics that reflect how streets feel and function.

Recipe 1:
Sorting Ingredients



LABEL
TensorFlow

PERCEPTUAL QUALITIES

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PERCEPTUAL QUALITIES

Imageability	Enclosure	Human_scale	Transparency	**Complexity**
0.47722	0.73904	0.31766	0.01106	0.74643

Low Complexity

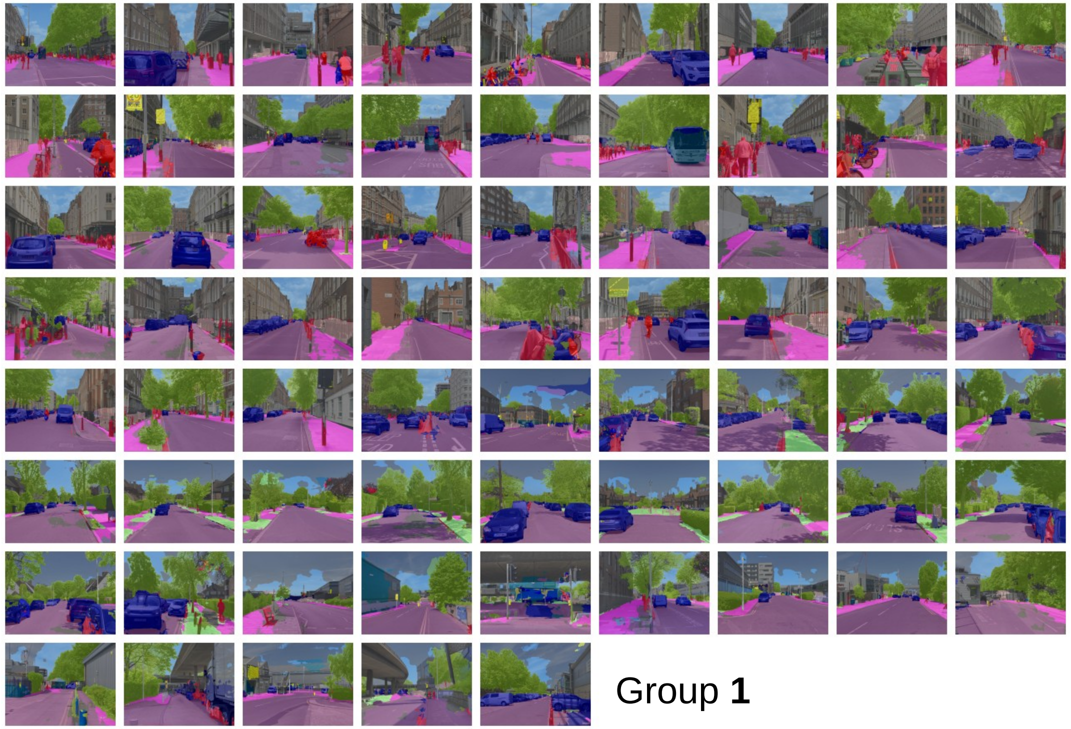
High Complexity

Each image has a different mix

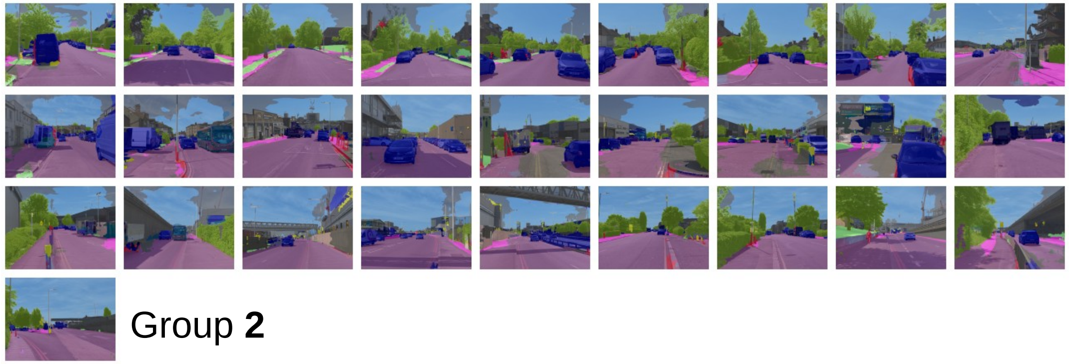
STATISTICAL CLUSTERING

Grouping similar flavour mixes. Finding patterns in prepared ingredients to reveal urban typologies.

Approach	**Machine Learning**
Stat Method	***K-means algorithm**
Input	**Perceptual quality metrics derived from segmentation**
Outcome	**Cluster street-views into perceptual types**



Group **1**



Group **2**

Group **3**

K-means algorithm, an unsupervised machine learning algorithm designed to partition unlabeled data into **K distinct, non-overlapping clusters based on similarity*

STATISTICAL CLUSTERING

From labels to Urban Types: Clustering Results

	Imageability					Enclosure					Human scale					Transparency					Complexity				
Cluster	mean	median	min	max	sd	mean	median	min	max	sd	mean	median	min	max	sd	mean	median	min	max	sd	mean	median	min	max	sd
1	0.48	0.47	0.25	0.91	0.09	0.87	0.88	0.71	1.00	0.08	0.20	0.15	0.01	1.00	0.20	0.02	0.01	0	0.17	0.04	0.73	0.72	0.58	1.00	0.09
2	0.24	0.25	0.00	0.39	0.10	0.46	0.54	0.00	0.67	0.19	0.11	0.10	0.01	0.22	0.06	0.01	0.00	0	0.16	0.04	0.72	0.72	0.59	0.99	0.08
3	0.66	0.63	0.48	1.00	0.13	0.97	1.00	0.57	1.00	0.06	0.07	0.04	0.00	0.30	0.07	0.02	0.00	0	1.00	0.13	0.48	0.51	0.00	0.69	0.14

Statistical summary of Groups by Perceptual Quality

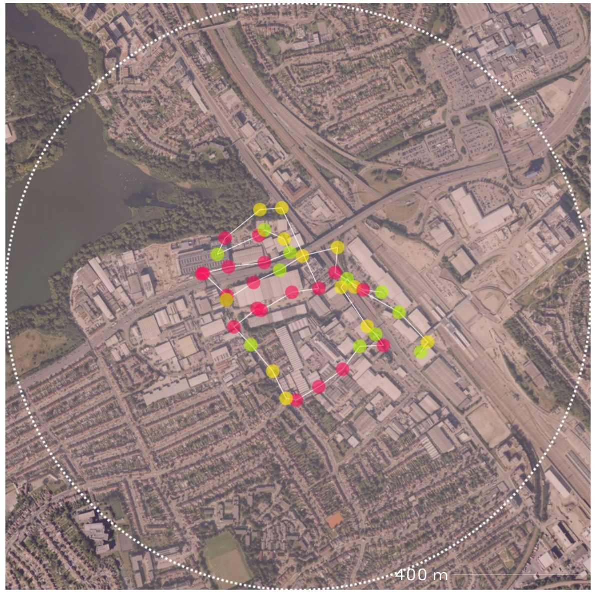
Vaues (0-1 norm.) Low High

Hamstead G S, residential, Barnet
Largely highly imageable and enclosed with low human scale and simpler scenes, complemented by some enclosed and complex areas and a few open, varied segments.

60% 13% 27%

Group **3**

Staples Corner, industrial, Brent
Primarily open and varied with low imageability but still complex, mixed with enclosed and complex areas and some highly imageable, enclosed simpler spots



26% 47% 28%

Group **2**

Bloomsbury, mixed-use, Camden
Mostly enclosed and complex with strong human scale, with some highly imageable and enclosed simpler pockets.

25% 75%

Group **1**

Blending AI's precision with human creativity for better urban environments.

From site photo survey → To advanced place analysis

Urban Design & Planning

- Which streets score highest on enclosure or human scale?
- Where should greening be prioritized?

Real Estate & Development

- How does street character affect value?
- Which areas show the most visual diversity?

Mobility & Accessibility

- Which streets feel most walkable?
- How do visual qualities correlate with pedestrian comfort and safety?

Policy & Place-Making

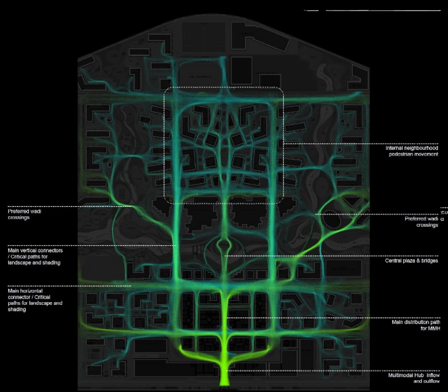
- How can perceptual analysis guide planning?
- Which typologies align with placemaking goals?

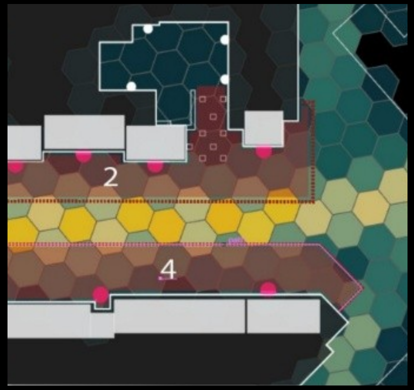
Data → AI prep → Theory seasoning → Insights served

● WORKING IN THE AGE OF AI

THE HUMAN EXPERIENCE → ARTIFICIAL INTELLIGENCE → ANALYTICAL EXPERIENCE → DESIGN INTELLIGENCE

- making choices shaped by experience, memory, inspirations and relationships



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Soupe de Poissons
10F
calamar Frits 9F
RESTAURANT

Thank you

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