



# SILLS MODULES

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The Bartlett School of Architecture UCL

B-Pro MArch Urban Design | RC15 | Pervasive Urbanism

STUDENT NUMBER: 24145324



## Design of Cat Whiskers Wearable Device

### Reference & Inspiration

Inspired by the concept of 'Umwelt' in von Uexküll's thesis, in the broader context of Posthumanism, I hoped that human beings could also make use of the animal's perspective and senses to experience the world and the environment.

Based on multiple comparisons, 'cat whiskers', a sensory system missing in humans but unique and important to animals, caught my attention. Unlike human beings' moustaches or other hairs, cat whiskers play an important role in emotional expression and environmental perception.

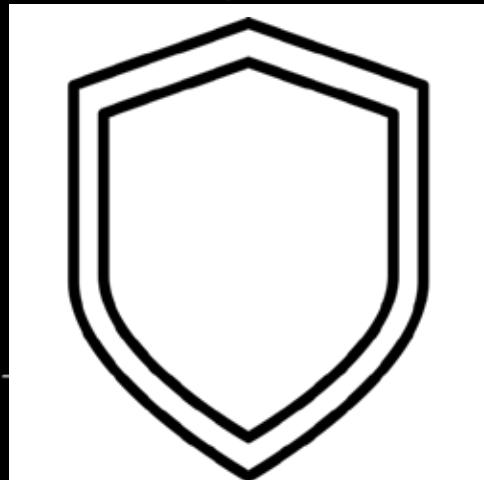
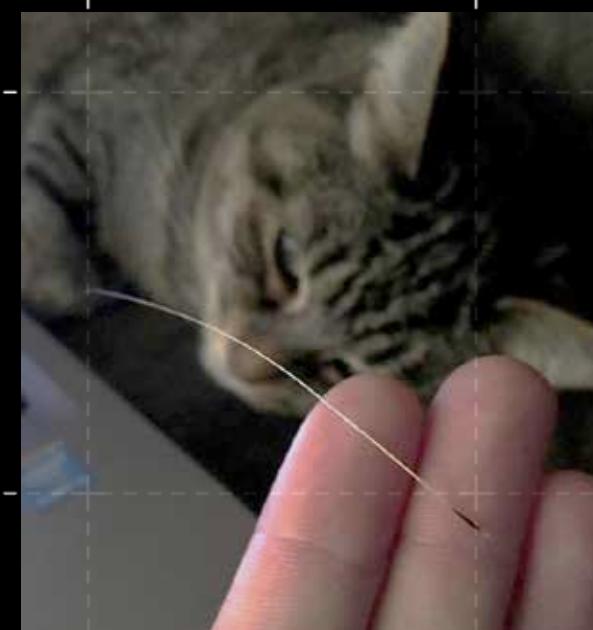
Therefore, I chose to design a sensor based on the basic functions of cat whiskers, using the basic shape of a cat's whiskers as a reference vehicle carrier to be the receptors of the sensor device.

In addition, the effects of the number of sensors required, cost, and the location of the receptors and feedback devices on the sensitivity felt by the human senses were also taken into account in the comparative selection of carriers for DEVICE design in conjunction with the morphology of the cat's whiskers.

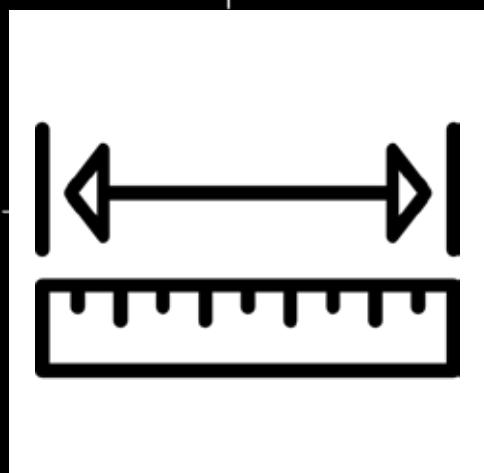
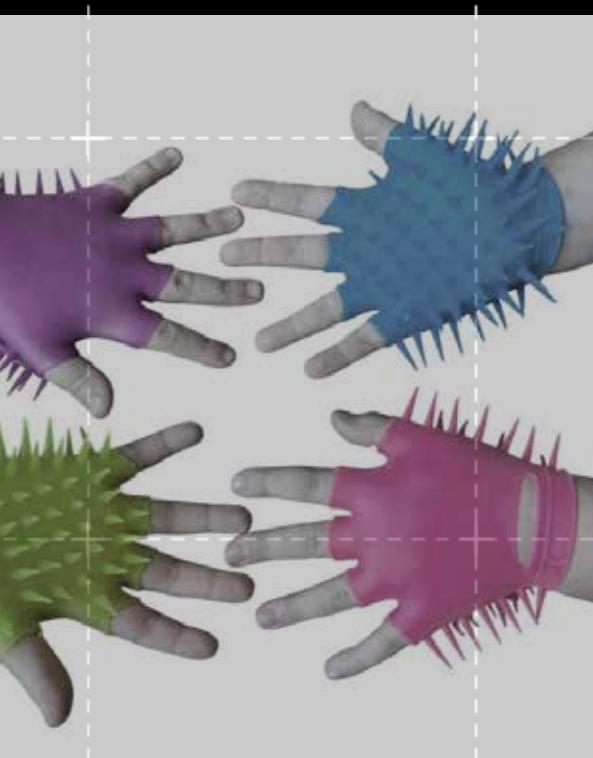
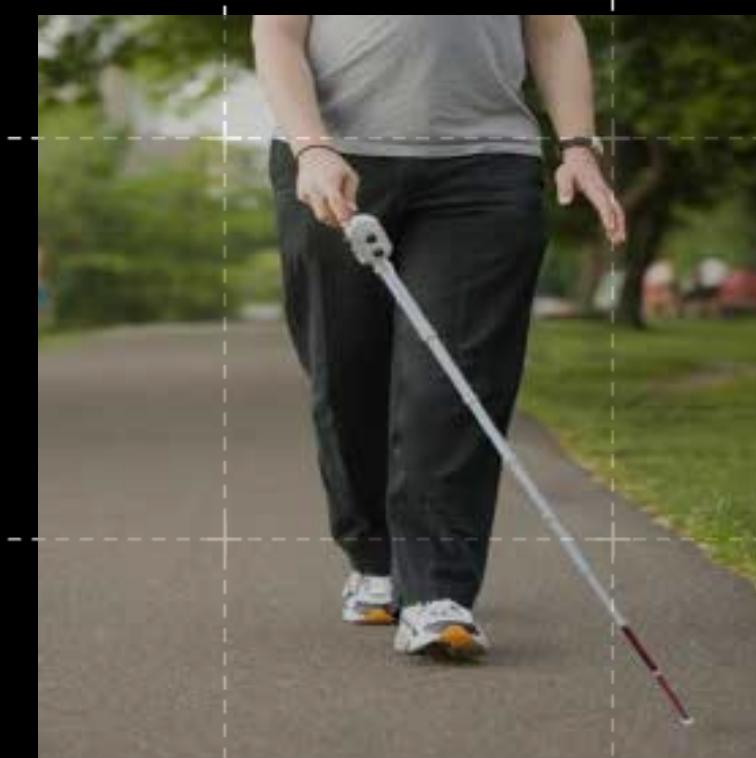
#### Function of Cat Whiskers



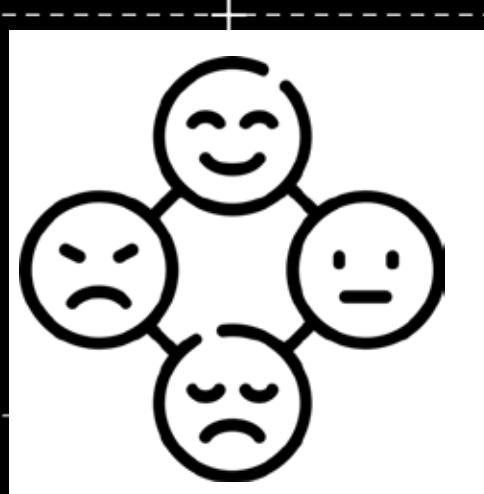
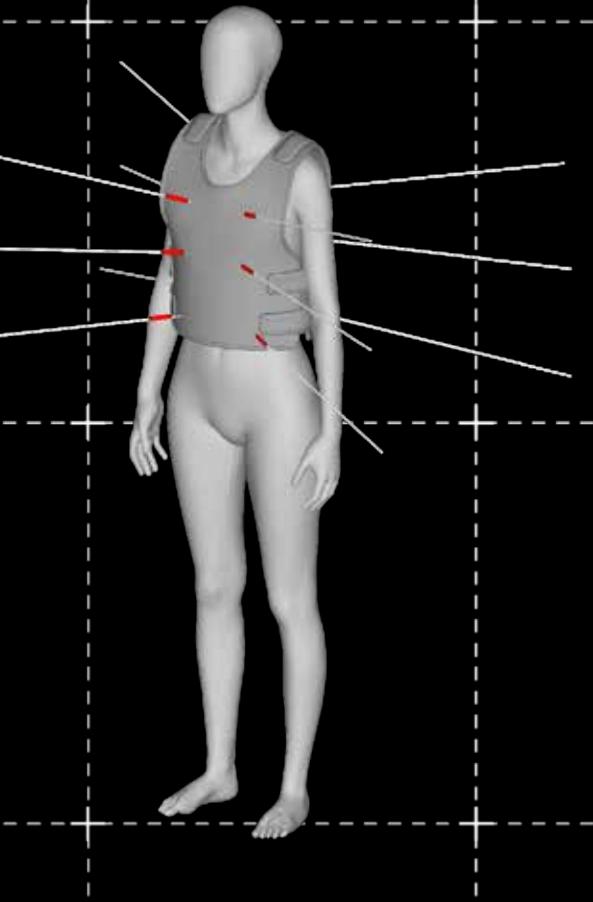
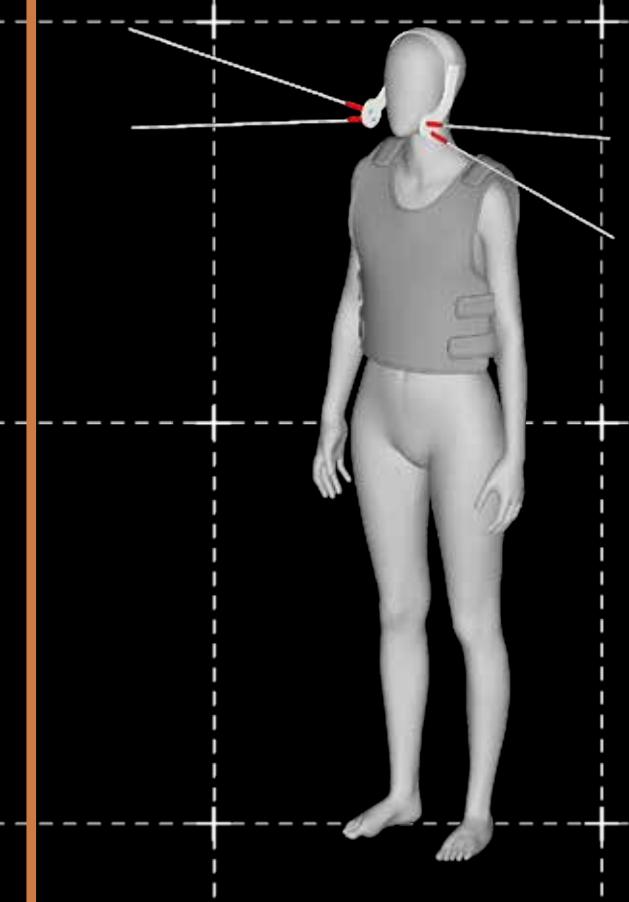
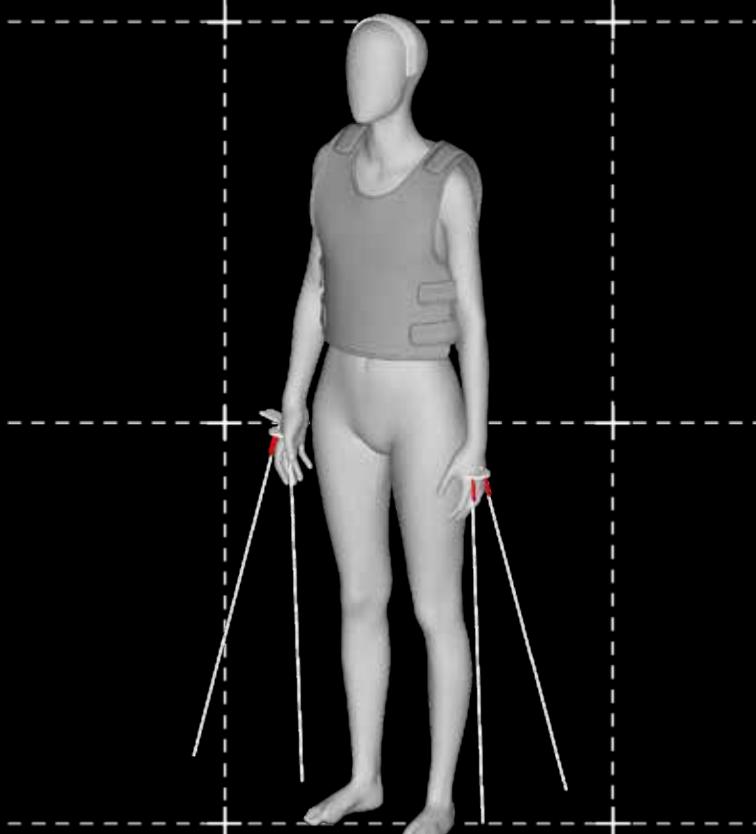
#### Perceive the environment



#### Protective reaction



#### Measure the space



#### Emotional communication

## Design of Cat Whiskers Wearable Device

### Sensor Assembly and Principle of the device operation

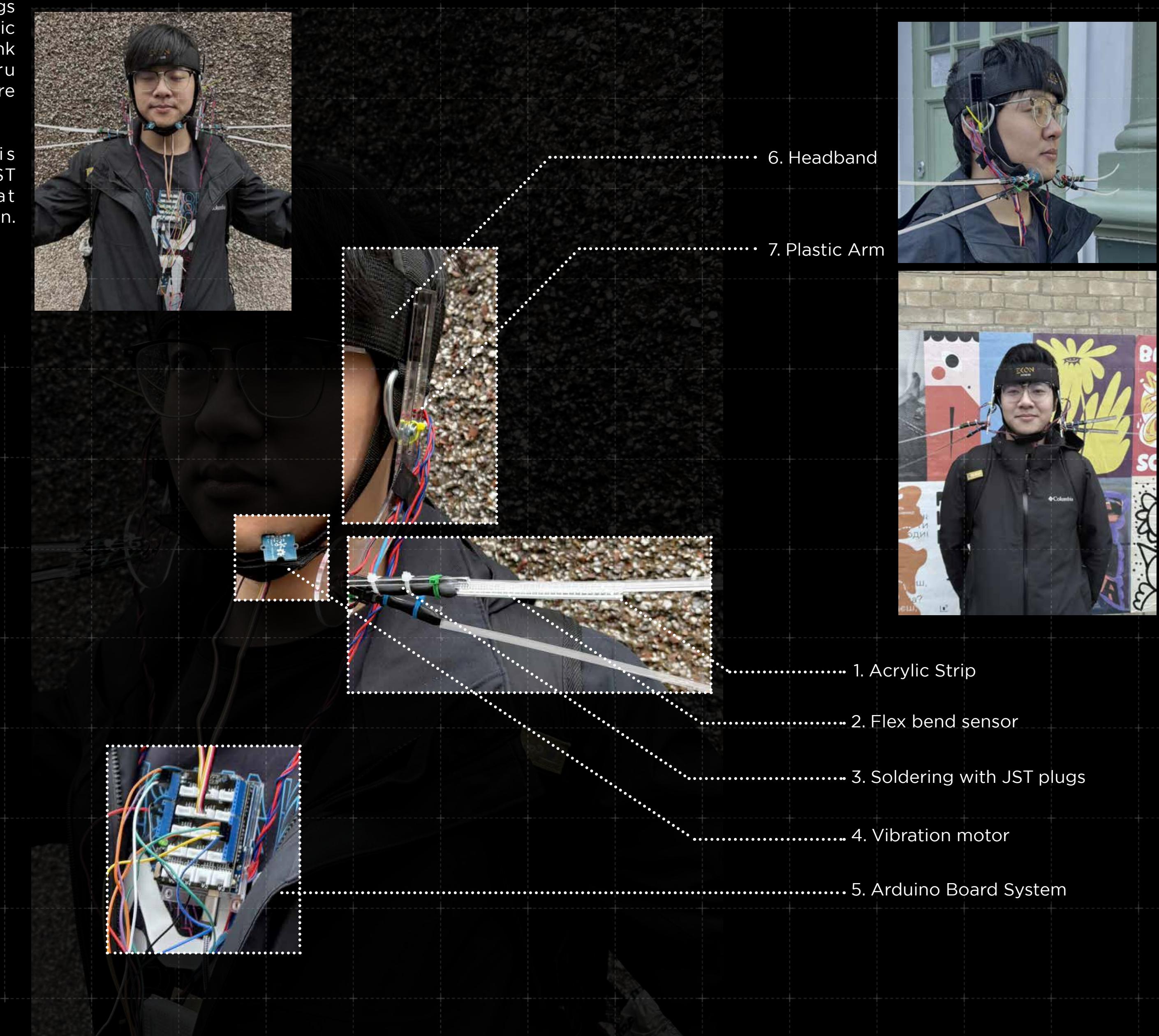
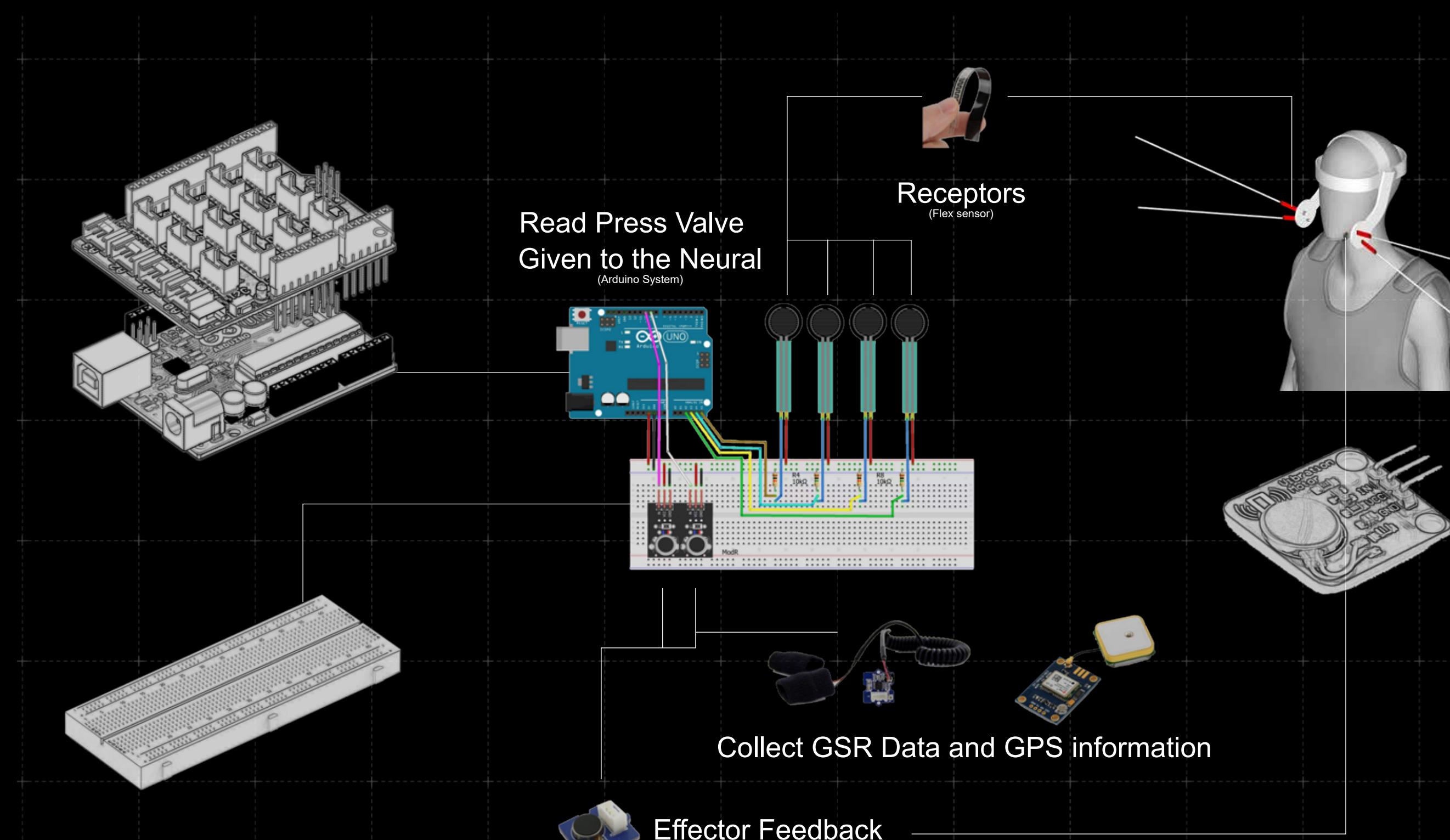
Two sets of flexible sensor whisker devices (acrylic strips + bending sensors, 4 in total, 2 on each side) held in place by a headband and whiskers arm receive haptic information (bending, flexing, etc.) from objects in the user's immediate environment. The initial voltage/resistance information received

by each sensor is then converted into bending angle information. This bending angle information is then converted into a proportional output that is sent to the appropriate vibration motor in the user's neck.

The whisker sensor device is flexible enough to mimic a real beard, but stiff enough to always return to a straight, unbent position. A thin-film pressure sensor/bending sensor was eventually

used. JST plugs were soldered to the legs of the sensors, then thin strips of acrylic were adhered to the sensors, heat-shrink was applied, and a protective Sugru coating was moulded around the entire base of the whisker unit.

Each whisker bending sensor is connected to the BreadBoard via JST and then to an Arduino UNO that performs the conversion/transformation.



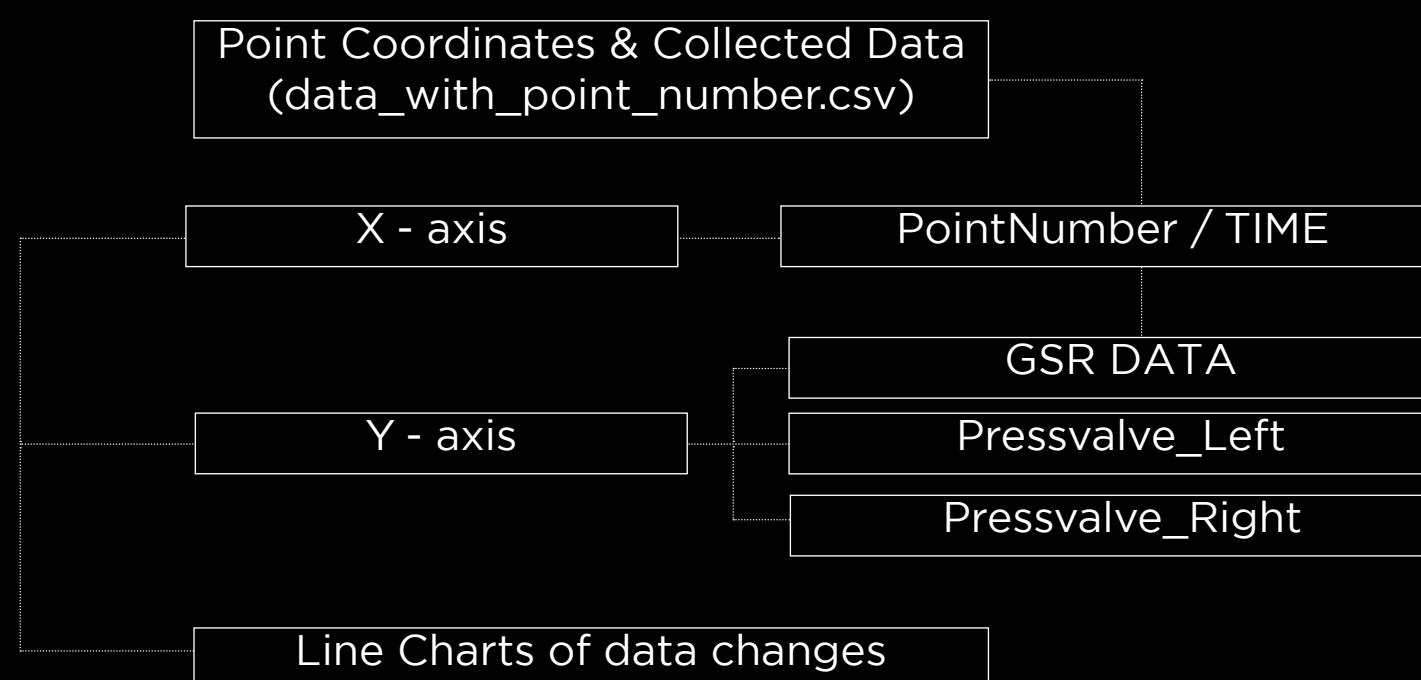
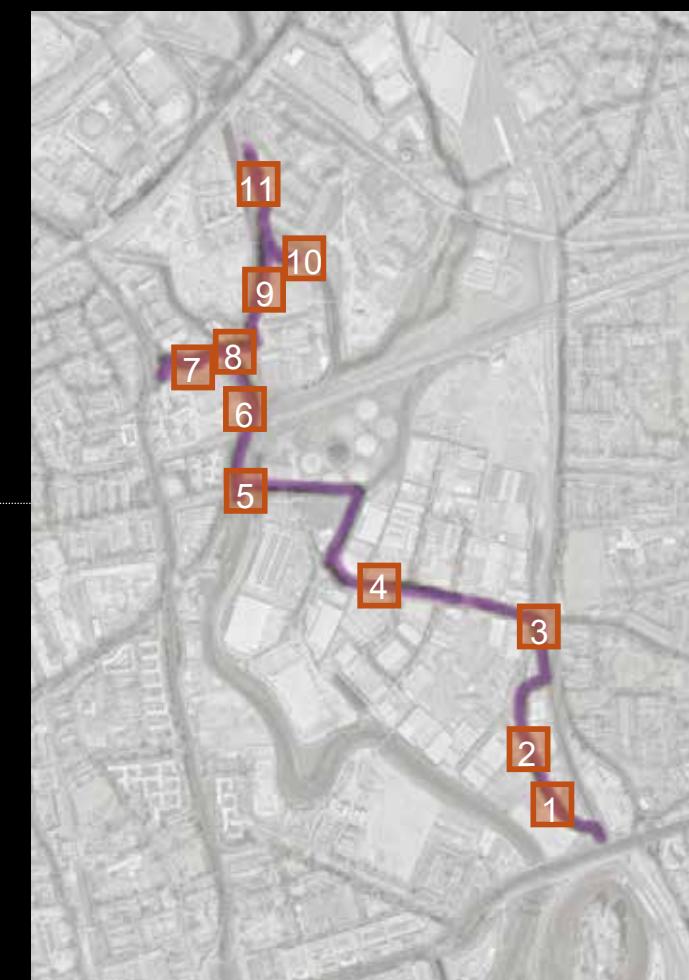
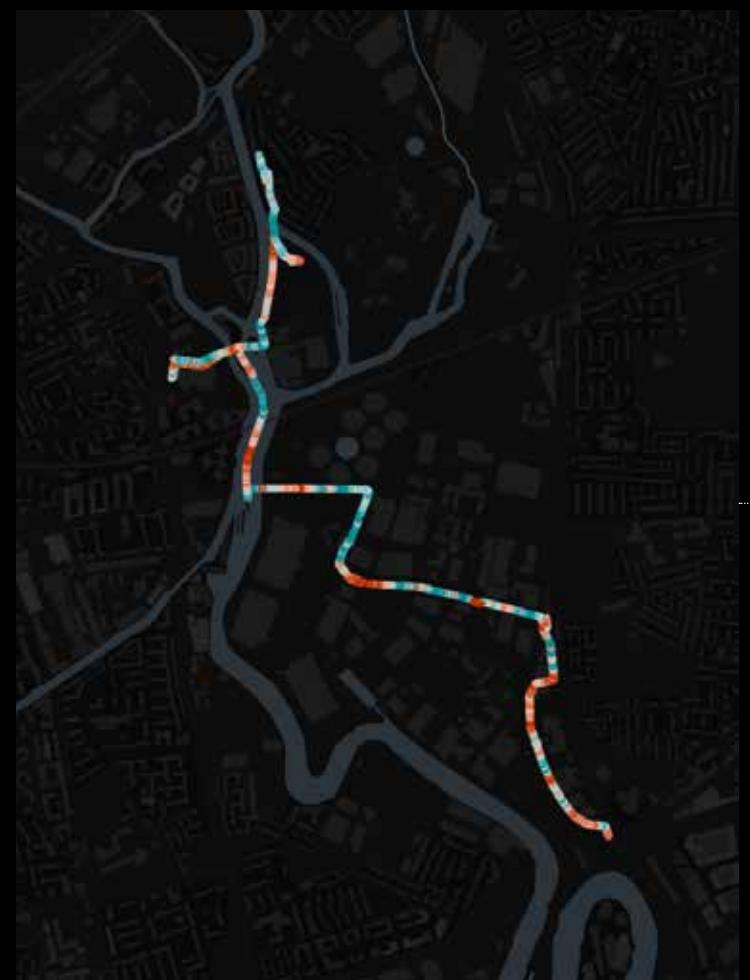
Left: Workflow of the device

Right: Model Details

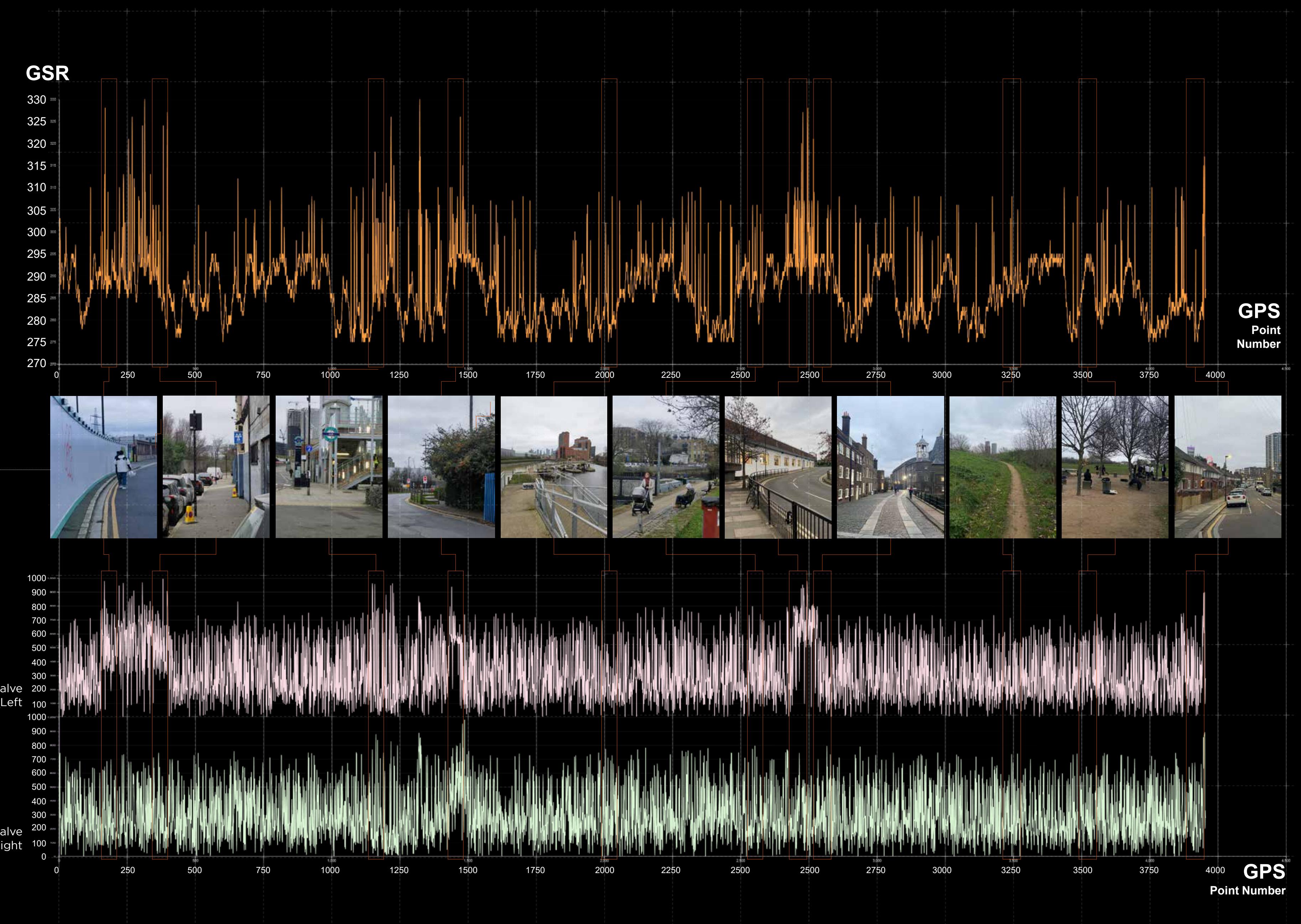
## SITE DATA COLLECTION & VISUALISATION

### Data results displaying by line chart

By wearing the wearable device for a field walking tour of the site, sensor detection data, such as data from the gsr and left and right side bend sensors, can be acquired. In addition, data such as the wearer's walking speed and time during the field trip can also be acquired.



When the above collected data are combined with the gps position information and sensing data for 3D visualisation of graphs (e.g. axonometric mapping diagrams), it is possible to show more clearly than in a flat surface, the touch response (pressvalve data from bend sensors) and the emotional impact on the person (gsr data) corresponding to the different field positions.



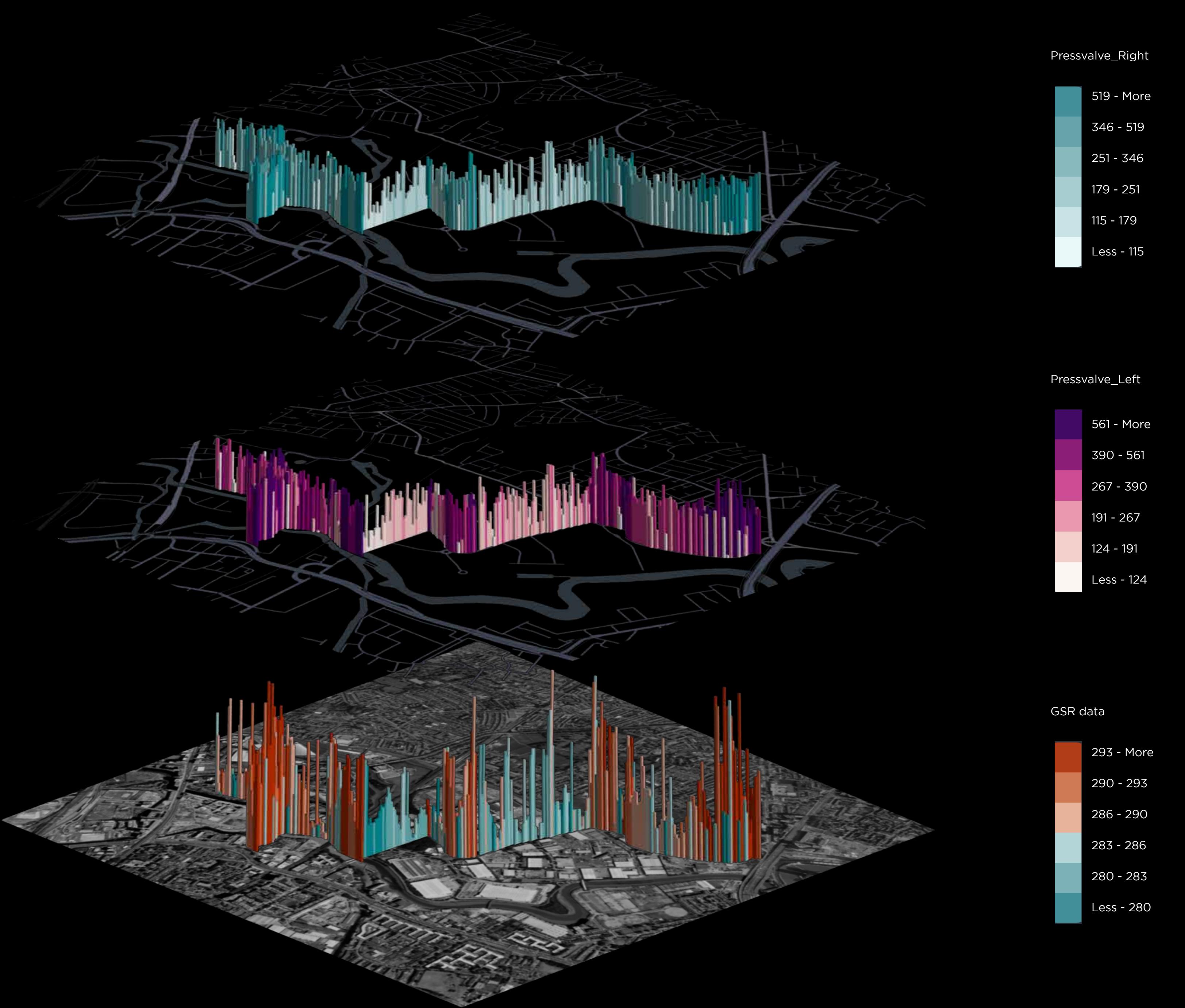
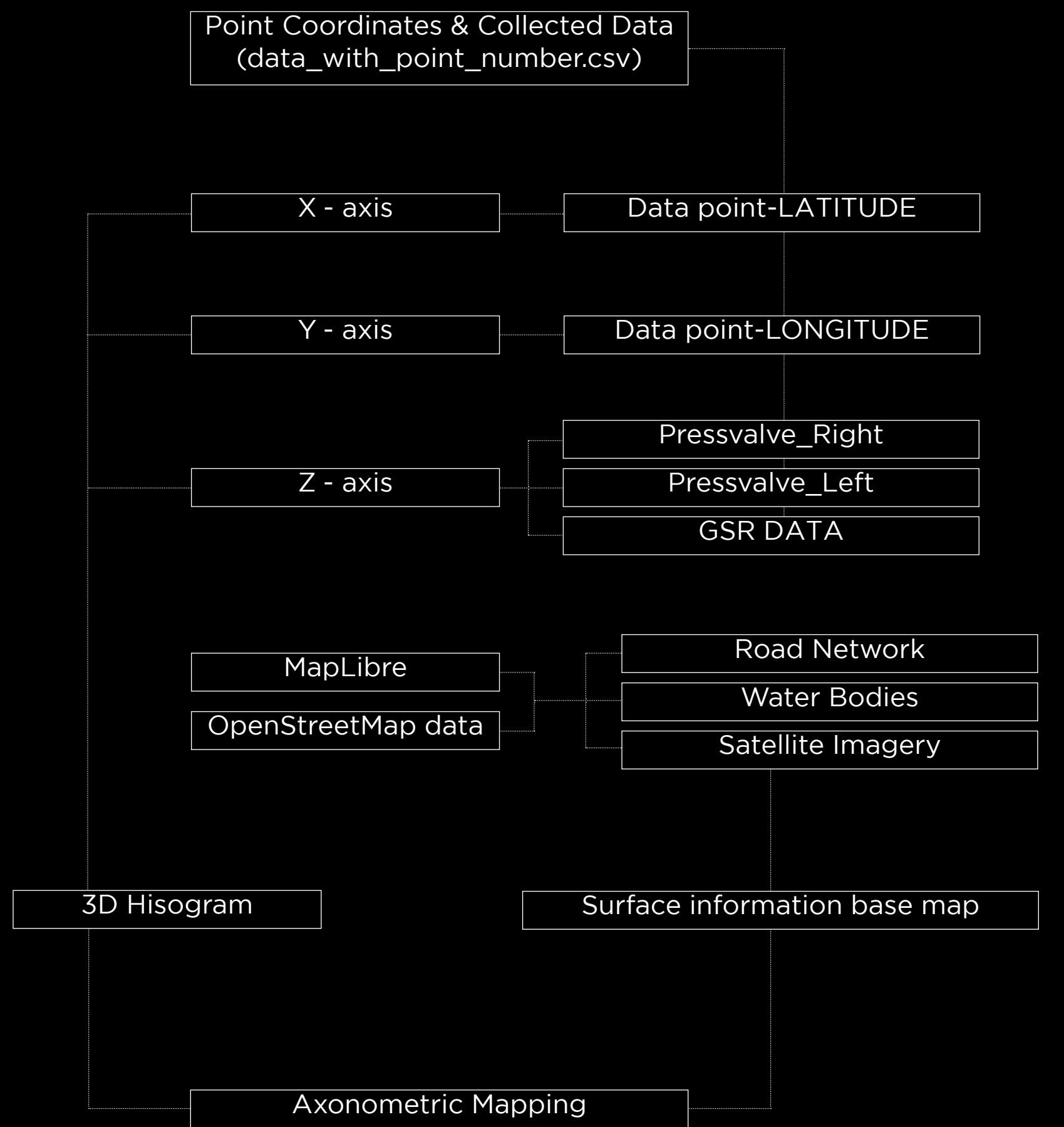
Right: Onsite data collection line charts

## SITE DATA COLLECTION & VISUALISATION

### Data results displaying by mapping diagrams

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Right: GSR and bend sensor data mapping

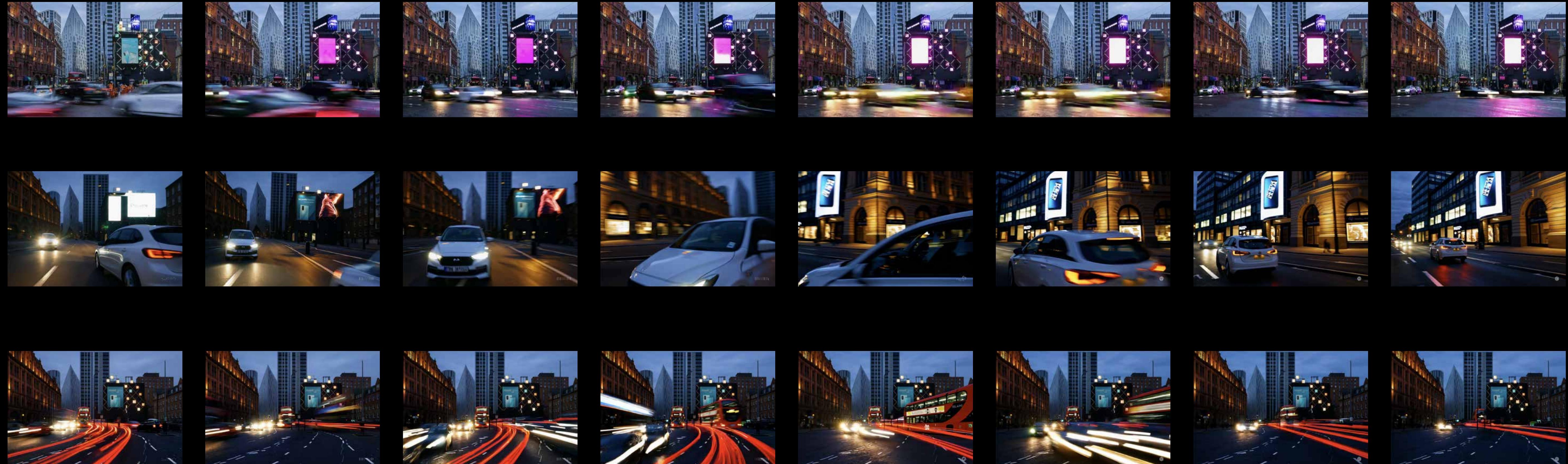
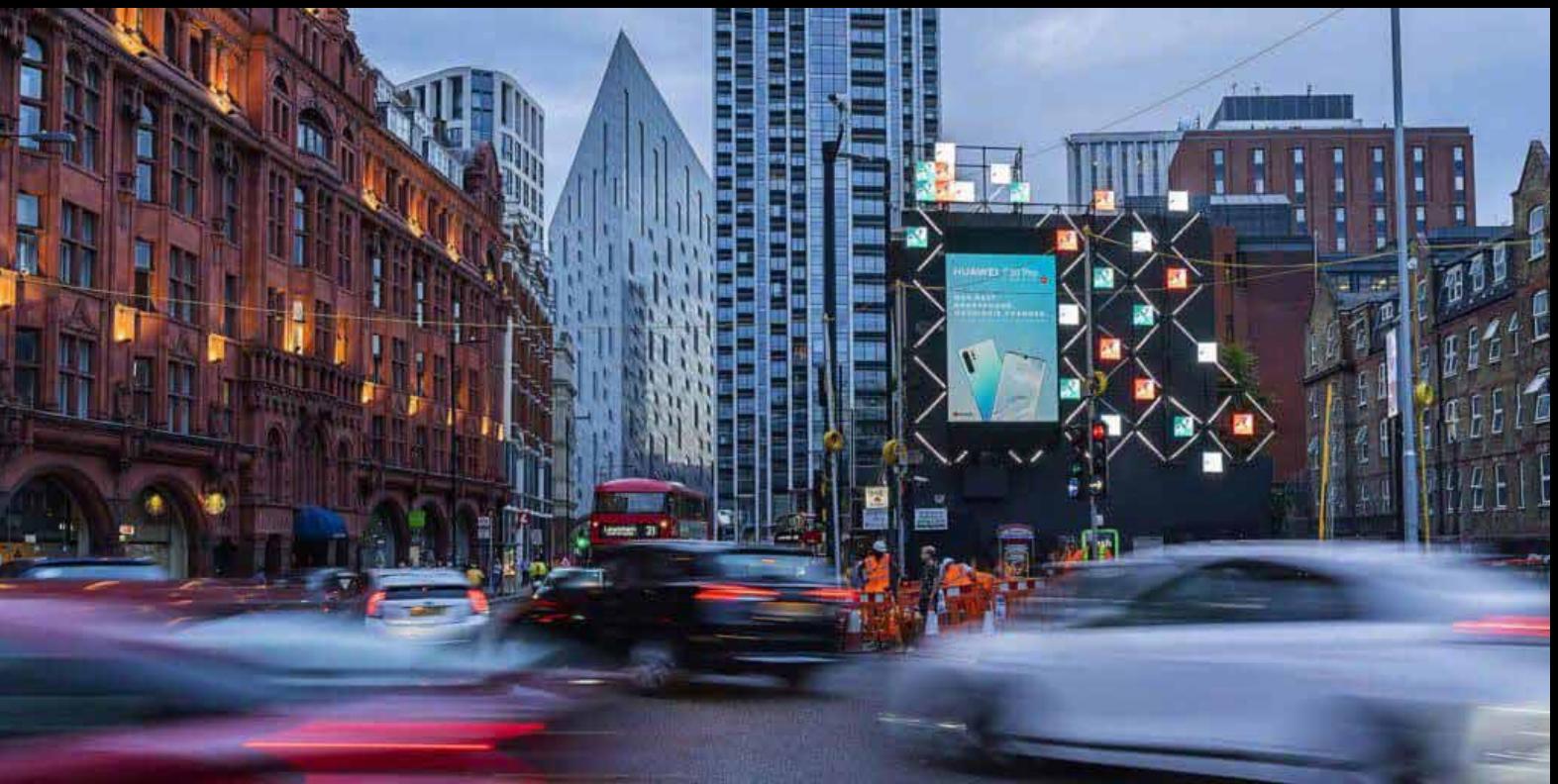
## AI VIDEO PROCESSING & POINT CLOUD GENERATION

### Attempts to generate AI videos from images only

An attempt was made to generate a dynamic video from just one separate picture. Without in-depth and complex command giving, attempts were made for three scenarios.

1. objective description of the content of the original picture;
2. specifying part of the picture to generate movement and commanding the picture camera to follow;
3. keeping the picture camera position fixed and specifying part of the picture to generate movement.

*The Original Photo  
A501 road, Old Street, London*



*Bottom: 3 different videos by AI based on same photo*

## AI VIDEO PROCESSING & POINT CLOUD GENERATION

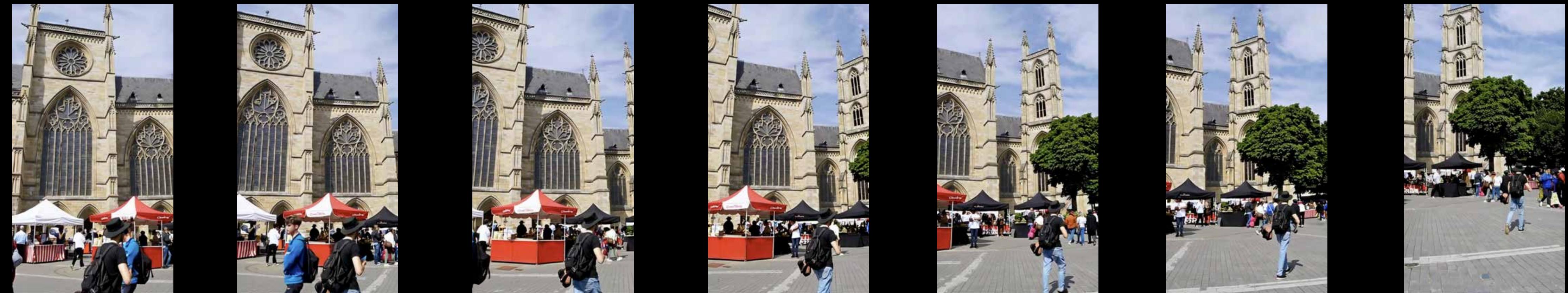
### Attempts to generate AI videos from mobile phone camera video

An attempt was made to generate a dynamic video from a video recorded by mobile phone

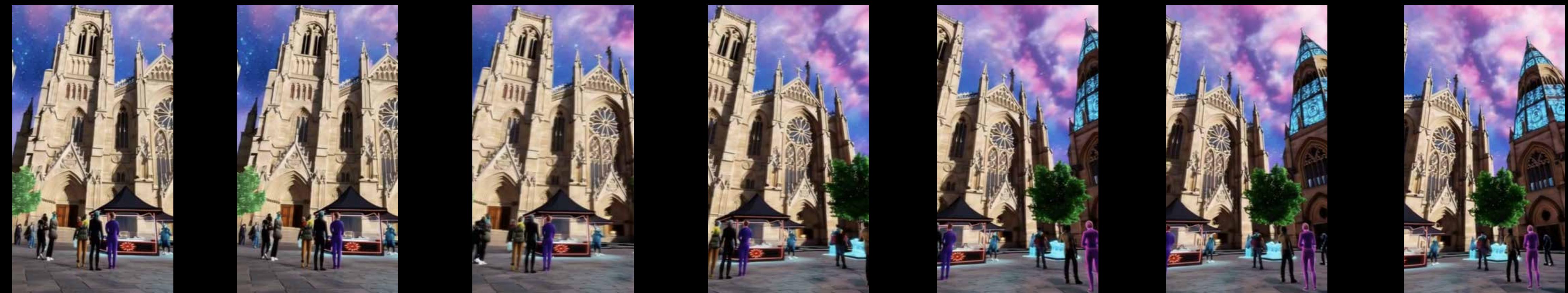
*The Original Video  
Torrington Square, London*



1



2

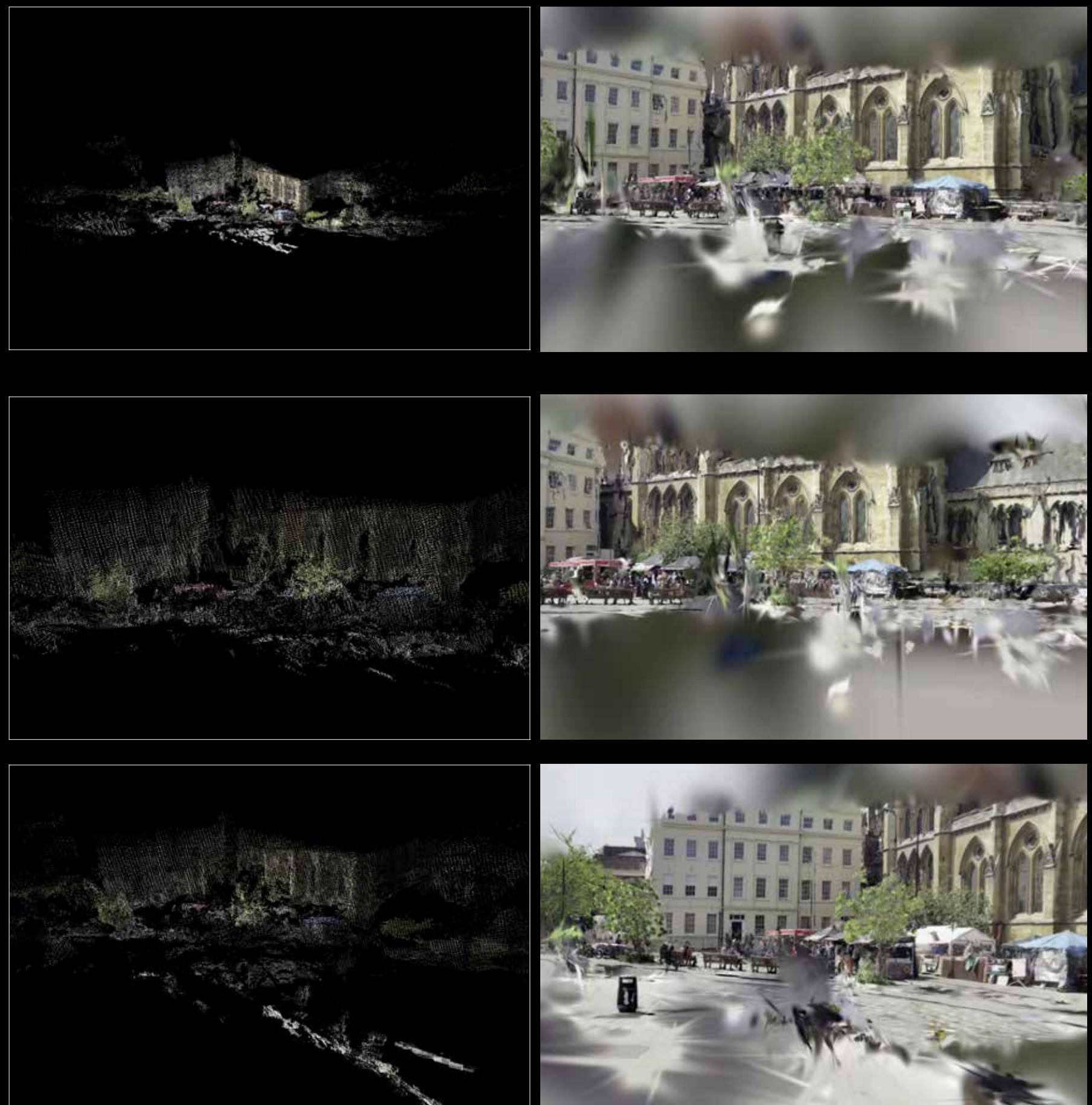
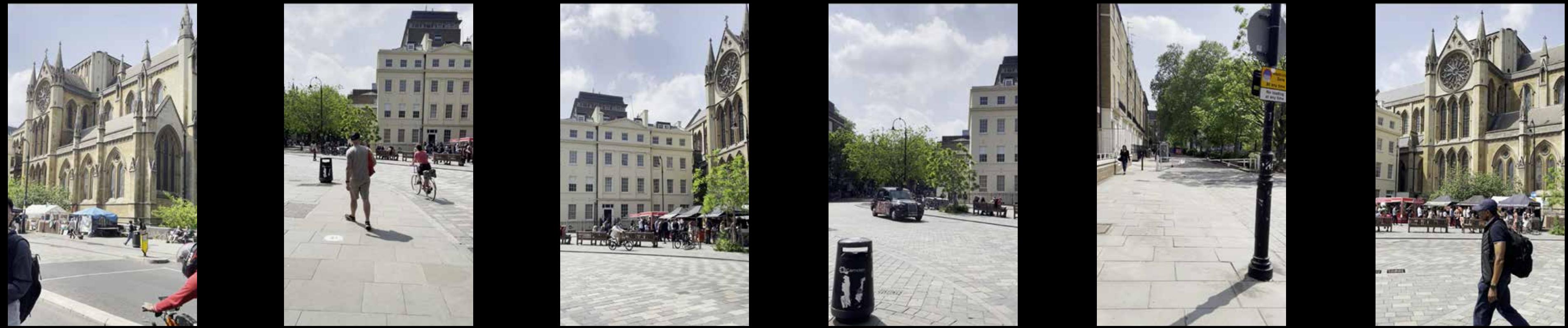


*Bottom: 2 different videos by AI based on video*

### AI VIDEO PROCESSING & POINT CLOUD GENERATION

**Point Cloud Generation by LUMA  
AI based on a video recorded by  
mobile phone**

*The Original Video  
Torrington Square, London*



*Bottom: Point Cloud by Luma AI based on video*

## EXPLORATION OF OTHER METHOD TO GENERATE POINT CLOUDS

### Model reconstruction of networked VR images (during the RC15 design course, term2)

Using the use of a variety of tools, interior photos or VR screenshots of second-hand or new boats from open web platforms can be used for the re-modelling of VR models.

In *MESHROOM*, a point cloud point matrix

can be automatically generated based on the photo screenshots from multiple angles, and the colourful point cloud view, as well as the black-and-white point cloud depth of field, allows for a more intuitive feel of the interior space in terms of colour, scale, and other spatial elements.

Through the *PT GUI*, pictures can be stitched together to generate a 360-degree panoramic rendering of the indoor space, which provides a very

intuitive and clear understanding of the space as a whole.

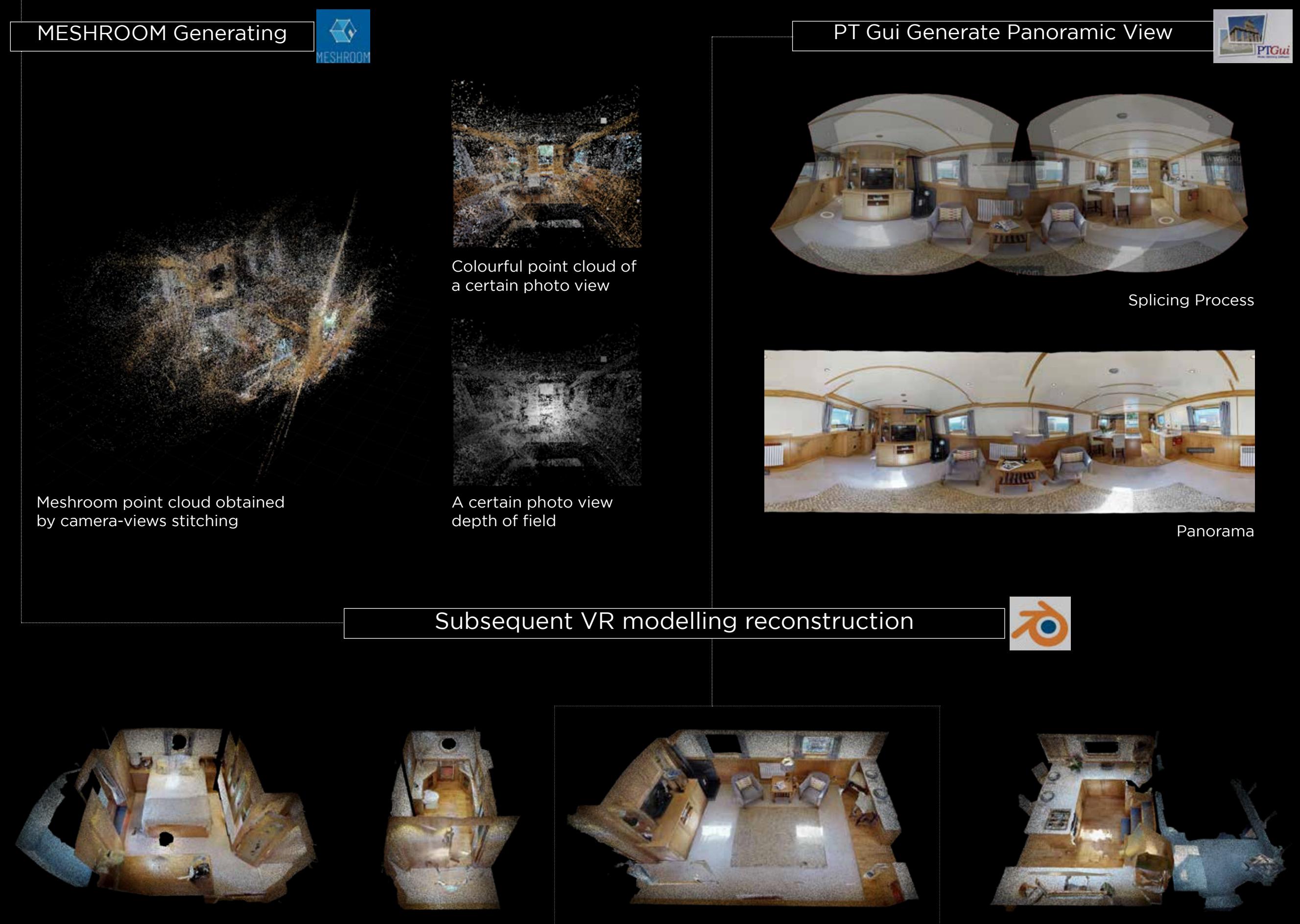
With the co-operation of panorama and point cloud, the subsequent model building will be smoother.



Multi-angle Boathouse Interior Pictures and Screenshots  
(<https://newandusedboat.co.uk/virtual-tours/>)



Left: Narrow boat & Wide beam boat indoor models



Right: Workflow steps for reconstruction of network VR models

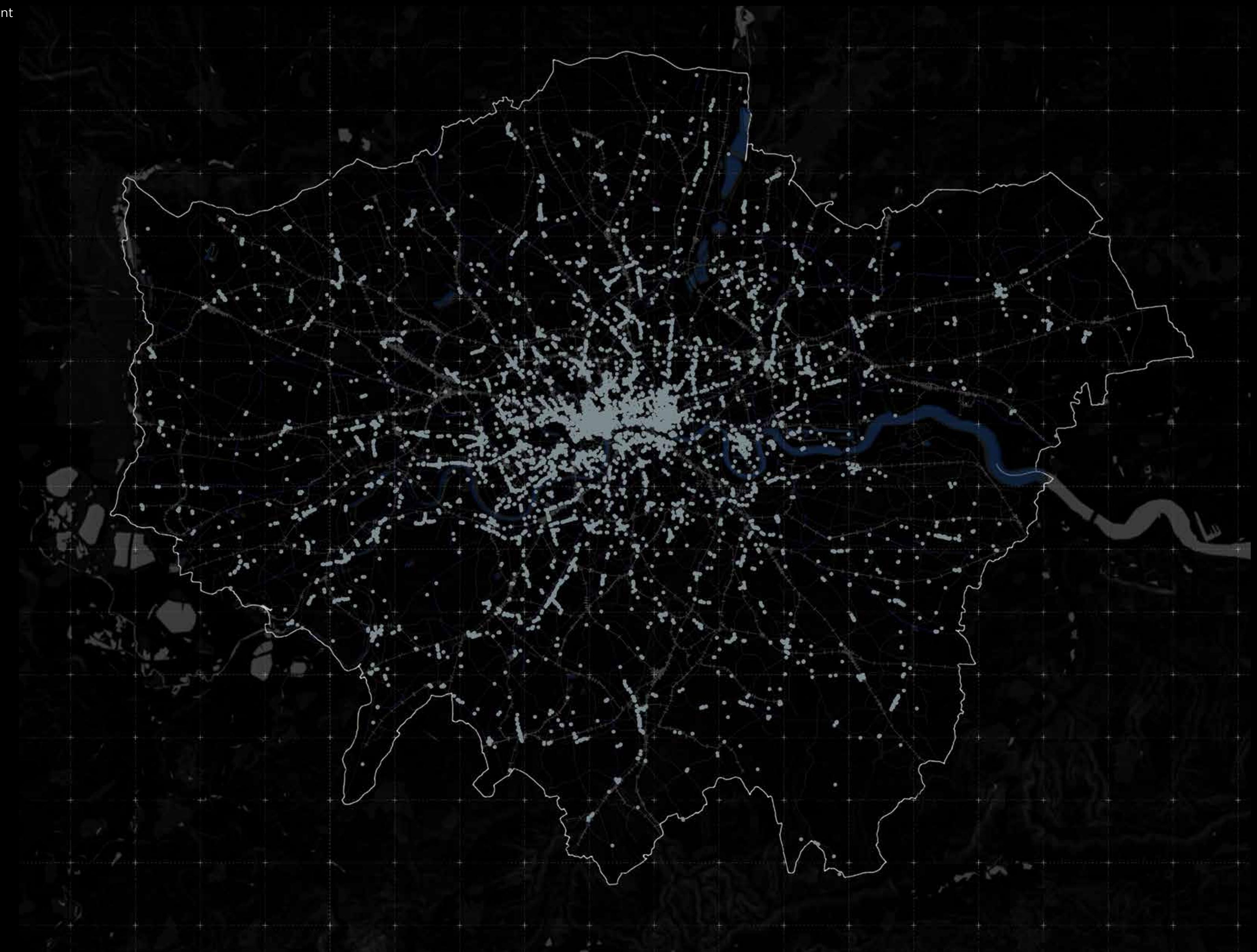
### Geo Location Getting

London Restaurant

OpenStreetMap

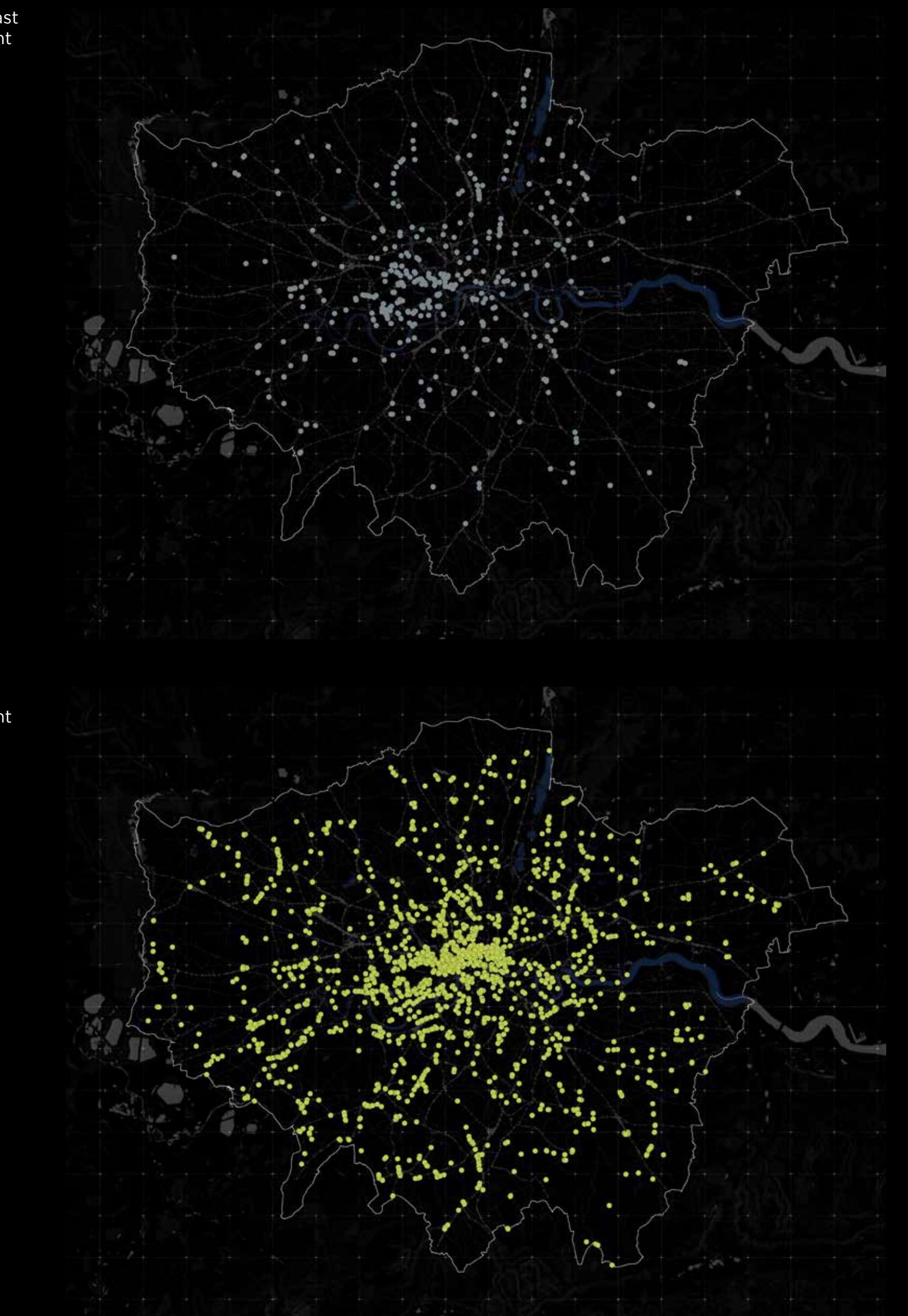
extracted via Overpass turbo  
(GeoJSON)

QGIS



Middle East  
Restaurant

Asian  
Restaurant

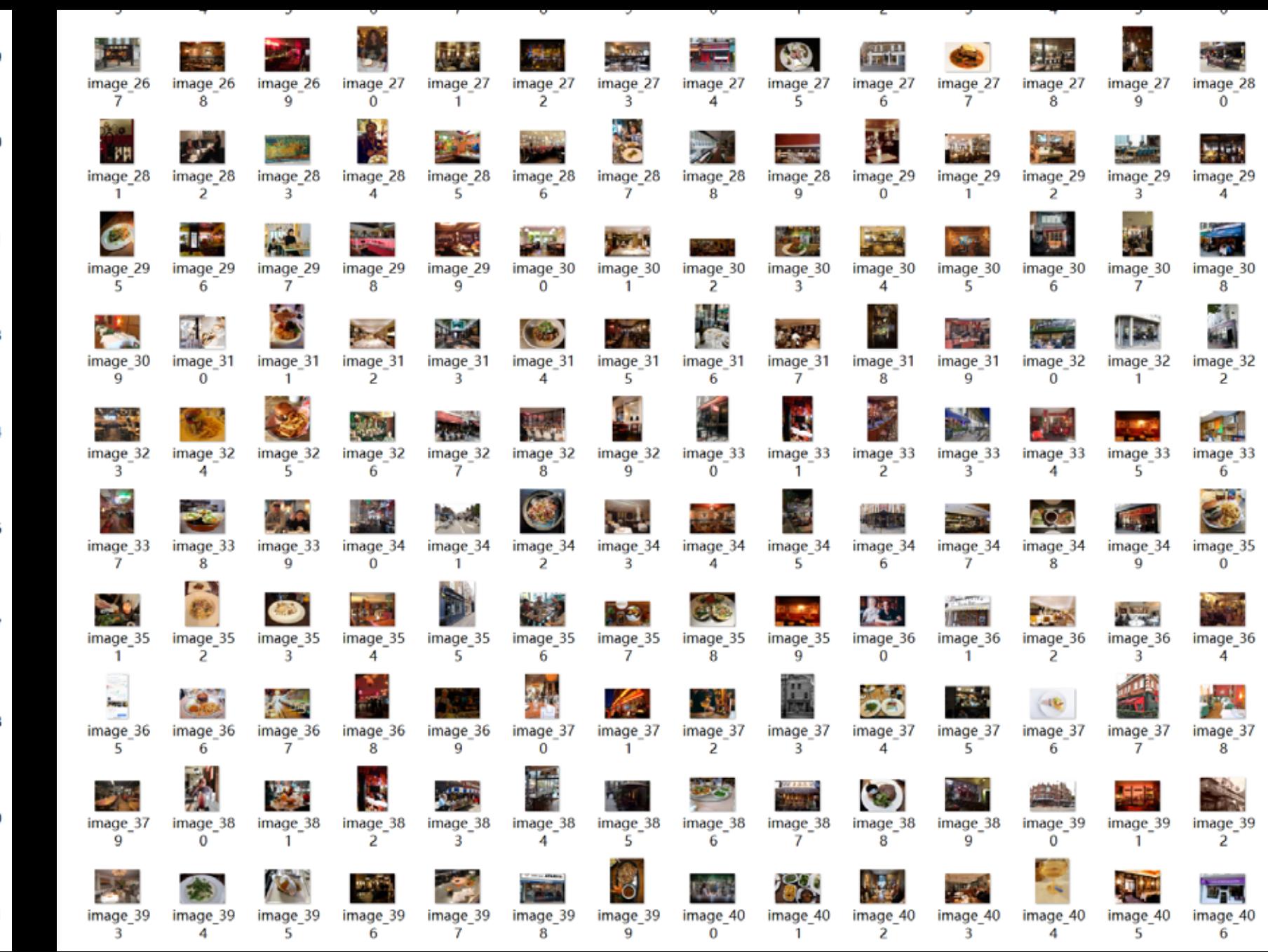
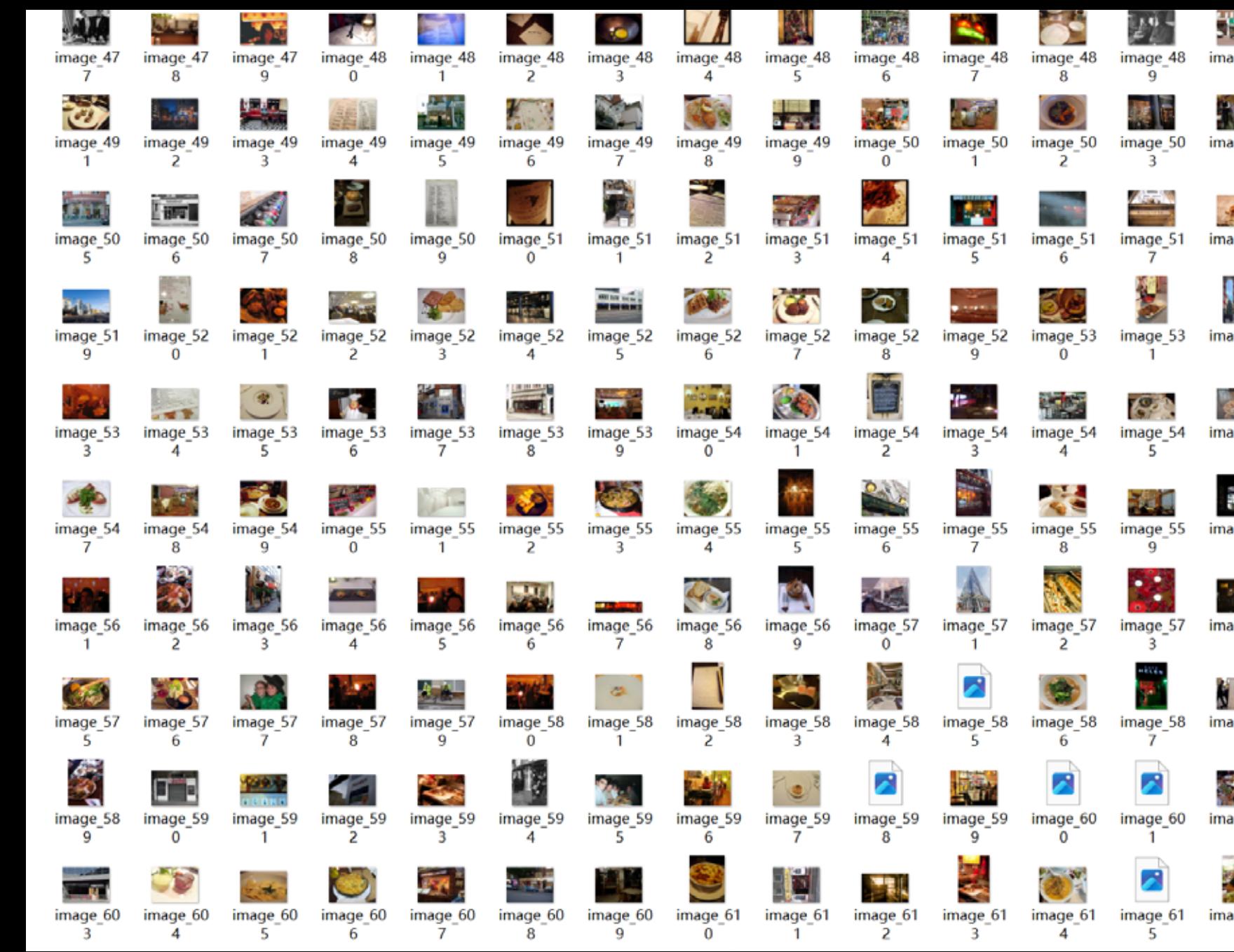
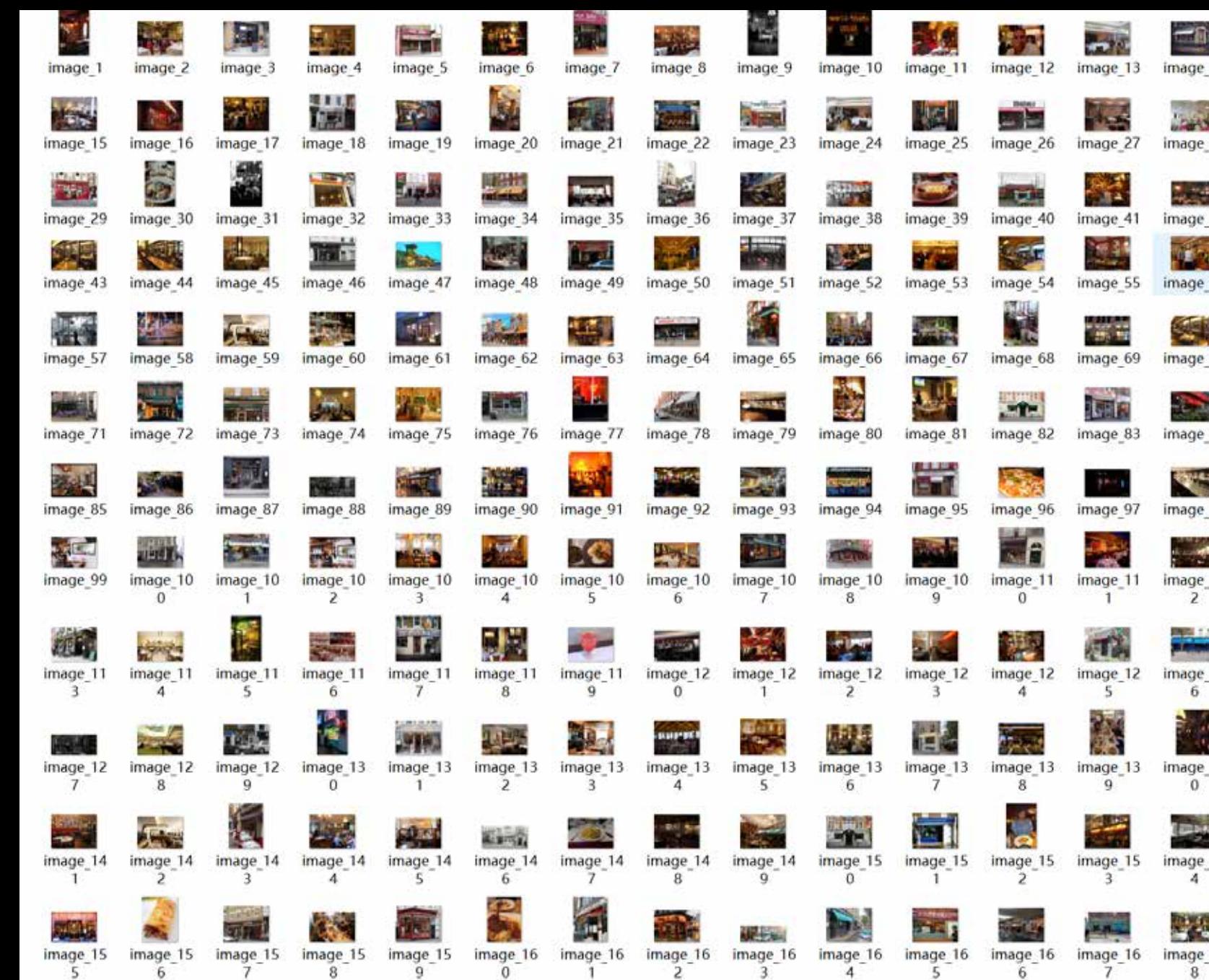


## FLICKR PHOTO GETTING

Middle East  
Restaurant

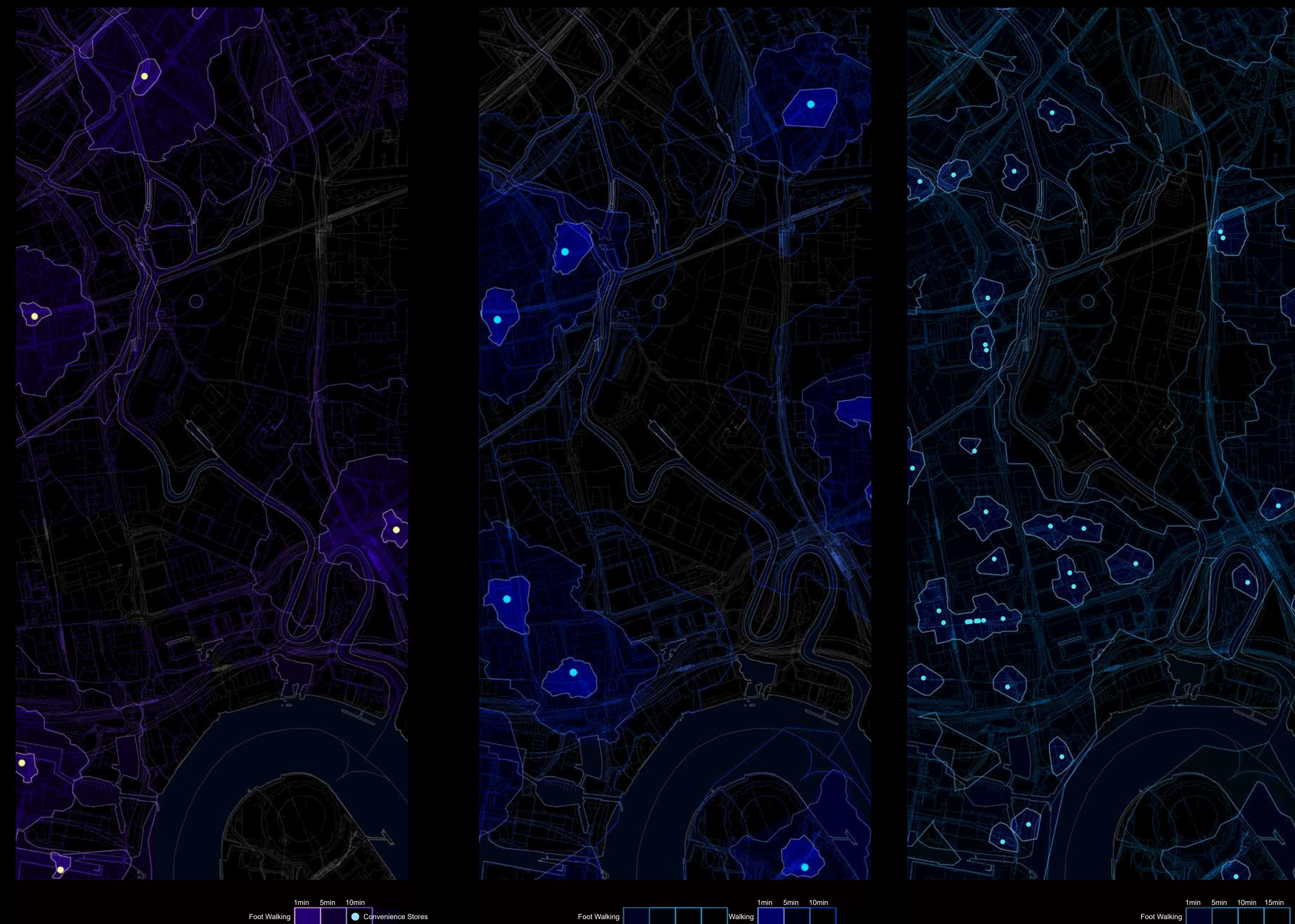
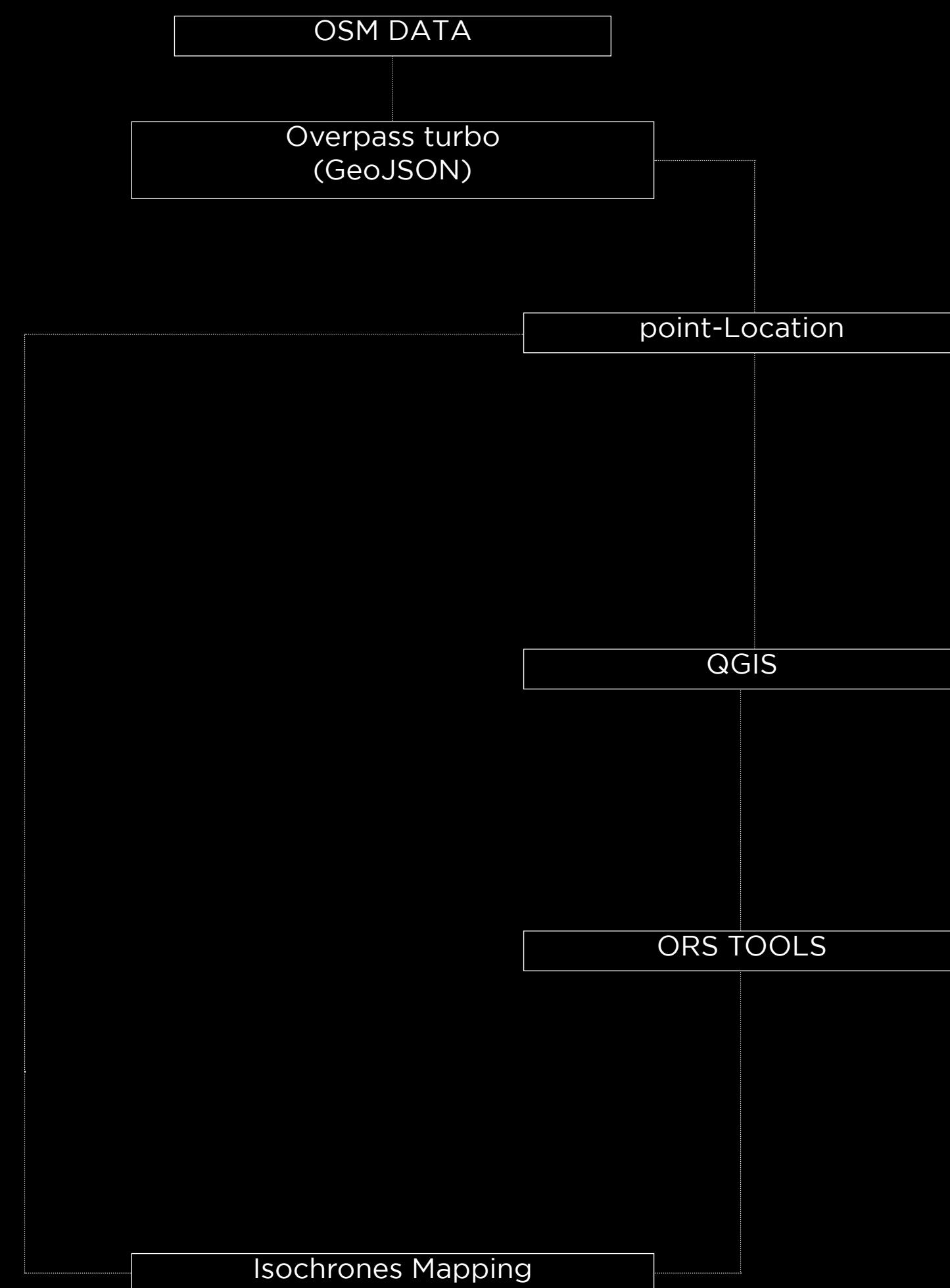


Asian  
Restaurant



Left: Service Accessibility of Hardware & Building Materials Stores  
Right: Moorings type and location in site

### Isochrones



## Isochrones

