# Did the bats Lockdown?

CASA have a number of bat monitors in the Queen Elizabeth Olympic Park that have been counting bat calls since 2017. In this research project we are interested in exploring how to visualise changing calls volumes given environmental conditions (climate, events, seasons).

Dataset: available - approx 8 bat monitors (bat counts and probability of bat type), 1 weather station (usual weather parameters), event information (concerts, events etc)

[www.naturesmartcities.com](http://www.naturesmartcities.com)

**CASA contacts: Duncan Wilson**

# Space Usage Activity Monitoring in Bartlett Workshops.

Can Computer Vision help us understand how workshop spaces get used? The project would involve building a prototype camera that implements AI / ML techniques to anonymously track people in Bartlett workshops and visually represent activity trends over time.

Dataset: open source image datasets would be used for training - project would create new datasets through inference on workshop usage.

**CASA contacts: Duncan Wilson**

# Coffee or Tea?

CASA have several IoT energy monitors on appliances in CASA measuring the coffee machine, kettle, water cooler, printers, screens etc. We are interested in analysis of this data from different perspectives: could time series analysis of this data help inform patterns of behaviour or help predict future activity? Could novel forms of visualisation help us see the data from a different perspective?

Dataset: 8x energy monitors capturing power usage every 2 secs since December 2019.

**CASA contacts: Duncan Wilson, Valerio Signorelli**

# Digital Wallpaper and building x-rays

CASA have multiple 3D models of our buildings and infrastructure. We also have a variety of data feeds via an MQTT service. We are interested in how novel forms of visualising real time data in context helps inform user experience.

Dataset: MQTT live feeds, historic data store in InfluxDB, FBX / IFC models of several buildings.

**CASA contacts: Duncan Wilson, Steven Gray, Valerio Signorelli, Oliver Dawkins, Andrew Hudson-Smith**

# Virtual interfaces to data in the city

CASA have developed a walkshop web app called Smart Walks which has a database of geolocated technology in the city. The goal of this project would be to explore how this screen based application could be extended to incorporate novel forms of in-situ interaction and presentation of data in the urban environment.

**CASA contacts: Duncan Wilson, Steven Gray**

# Digital Fabric Design Fictions

CASA are working with the UCL East project team to develop an IoT Strategy to release the large volumes of data generated by modern buildings. Motivated by the technological concept of a smart campus but aware of the socio political risks, we are interested in developing some speculative futures to help frame how future scenarios of this campus of the future could play out. We are keen that the research explores potential futures through physical prototypes, design fictions or works of art.

Dataset: documents on the vision for UCL East / planned programmes / data registers; sample datasets from existing building systems to build proof of concepts

**CASA contacts: Duncan Wilson, Oliver Dawkins, Andrew Hudson-Smith**

# Digital Panoramics

CASA have a triple panel touch screen display, the Mission Room Cine system. The configuration of the screens create a media space which is suggestive of the panoramas of the 18th and 19th century. Previously this system has been used on the 'AEC Production Control Room' project to help construction teams and management better understand and utilise construction project information for collaborative decision-making. In this project we challenge the student to explore new applications for the system, developing new forms of visualisation and/or interaction. We encourage students to propose new applications that stretch the capabilities of the interface.

**CASA contacts: Oliver Dawkins, Valerio Signorelli**

# The Digital Deep Map

Deep Maps are incorporate subjective accounts of people and place that create unique spatial narratives. Deep maps have often emphasised the use of analogue media. This project challenges the student to reimagine the practice and possibilities of deep mapping through digital media. Students are encouraged to develop mapping and visualisation practices that go beyond the traditional 2D map and/or engage alternative sensory modalities.

**CASA contacts: Oliver Dawkins**

# The AR Data Desk;

AR visualisations on a 'desktop' as in actual table top have notable potential for the communication of spatial and city data. We are keen to explore the wider potential and how spatial data can be communicated in meeting type environments.

**CASA contacts: Andrew Hudson-Smith, Valerio Signorelli**

# Image Projection Mapping for room based data visualisation;

Projection mapping in gallery/room spaces has the potential to open up data visualisation in realtime to a lab environment. Looking for students interested in creating data visualisations and using projectors, projecting them onto surfaces and shapes in places and spaces.

**CASA contacts: Andrew Hudson-Smith, Oliver Dawkins, Valerio Signorelli**

# Physical Devices for communicating realtime spatial data;

3D Printing has opened up the ability to communicate realtime data via physical devices - how effective are these devices for communicating realtime visualisation, looking for students to design, build, make and test new and innovative display devices.

**CASA contacts: Andrew Hudson-Smith, Duncan Wilson**

# Game Engines for City Visualisation

Unity, UnReal etc are changing the way digital cities are built and shared, how can such Game Engines be used to communicate not only data feeds but also aspects of place and space.

**CASA contacts: Andrew Hudson-Smith, Oliver Dawkins, Valerio Signorelli**

# Agent Based Simulations in Unity - Populating the City;

Unity allows mass agents to populate 3D cities - how can this be used to portray both pedestrian and transport movement in cities.

**CASA contacts: Andrew Hudson-Smith, Steven Gray**

# Gallery Spaces - Building Virtual Data Spaces for Multiuser Occupation and Collaboration;

Art Galleries for Data Visualisation - Creating an online multi user Gallery for Spatial Data - how can such spaces open up spatial data to wider audiences and enhance the wider understanding of spatial analysis.

**CASA contacts: Andrew Hudson-Smith, Duncan Wilson, Valerio Signorelli**

# Visualising and Sensing Realtime Climate Data;

Good use of climate data can aid behaviour change - looking for students to explore historical and real-time climate data, to either deploy sensors, create visualisations or physical devices.

**CASA contacts: Andrew Hudson-Smith, Duncan Wilson, Valerio Signorelli**

# Holographic Spatial Data;

The Looking Glass Display is arguably the next step in screen technology, how can the addition of depth be used to enhance the understanding of spatial data.

**CASA contacts: Andrew Hudson-Smith, Valerio Signorelli**

# Walkin’ on Moonshine: digital visualisation of night-time environments;

Night-time represents a vibrating and economically valuable aspect of the city environment. Within this context, urban artificial lighting is a core topic that cross various urban issues: it is part of the main entries of the urban energy consumption; it is used to promote urban cultural heritage, and therefore affects the tourist experiences; it is an essential aspect for ensuring urban security and wayfinding. Three aspects that are linked together by the common thread of the spatial perception.

RQ

How the methods used to conduct visibility analyses can be adapted to the night-time environment? How other senses, specifically auditory perception, affect spatial perception? Which form of digital visualisation can be used to represent the nigh-time environment? How VR can be used to represent/explore/test spatial perception in the night-environment

**CASA contacts: Valerio Signorelli**

# Monitoring indoor air quality

The student will be expected to explore indoor air quality empirically by deploying appropriate sensors in an effort to answer some of the following (or others of their own choosing):

How healthy is our indoor environment?

How does it vary through the day?

How is it affected by outdoor air quality?

Will it tell me when I need to get the Hoover out?

**CASA contacts: Martin de Jode**

# Estimating affective state using wearables

Many Wearables include a range of sensors that can in principle be used to track affective state (emotional state, for example whether an individual is stressed or relaxed). This project aims to explore metrics such as EDA and heart rate variability in monitoring emotional state.

Likely to involve ML and may involve some prototyping.

**CASA contacts: Martin de Jode**

# Machine Learning for Carbon Emission Monitoring in Buildings

The Carbon Monoxide gas is tasteless, odourless, and colourless, and therefore it cannot be detected by vision or smell. Carbon monoxide poisoning can cause loss of consciousness, seizures or even death. It is still the most common type of fatal poisoning in the UK, US, and many other countries. Therefore, monitoring CO using sensor devices is essential for CO detection in the construction and built environments. This MSc project includes deploying a carbon emission sensor in a room environment to collect gas emission data and adopting a Machine Learning (ML) tool to monitor and forecast the carbon emissions in the room. The tool can be demonstrated by a smartphone app showing the location and concentration of gas in buildings.

Datasets: The dataset will be collected from a sensor device deployed in department buildings.

**CASA Contacts:**

**Dr Fateme Dinmohammadi, Research Fellow in Real-Time Analytics**

**Prof Duncan Wilson, Professor in Connected Environment**

# Machine learning for estimating energy consumption in buildings

Estimating the energy consumption in buildings is a very important but complex task, as it involves many factors, such as climate, performance of thermal systems, occupancy patterns, etc. Therefore, the classical prediction methods cannot confine the uncertainty at the buildings level due to the many fluctuations in influencing variables. The use of Machine Learning (ML) methods, such as ANN and deep learning, can increase the accuracy of estimations by allowing to include higher levels of abstraction. This MSc project aims to use electric power consumption data collected from individual residential customers for time series prediction of energy consumption in the future. A smartphone app can be designed to demonstrate the results.

**CASA Contacts: Dr Fateme Dinmohammadi, Research Fellow in Real-Time Analytics**