



THE CDRC AND MOVEMENT STRATEGIES



10 May 2021

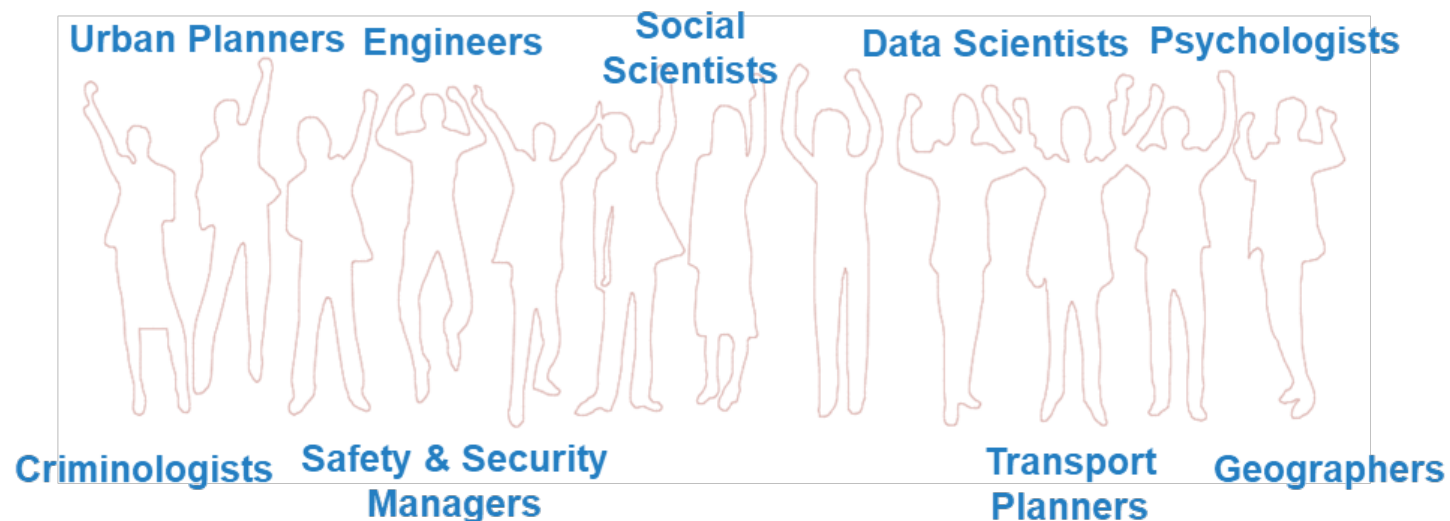
WHO WE ARE

Founded in **London** in 2005, with most staff working from our London office

35+ team members with varying backgrounds and specialisms

World leader in **people movement and crowd dynamics** consultancy.

Specialist in **movement analytics** with a focus on cellular, Wi-Fi, GPS, Spend, Computer Vision, AIS (Shipping) and new data sources



LEADING THE SCIENCE AND ART OF MOVEMENT FOR 15+ YEARS

2005

movement
consulting



World leader in people movement and crowd dynamics consultancy.

Helping to Design, Deliver and Operate venues, buildings, spaces and events around the world

2014

movement
analytics

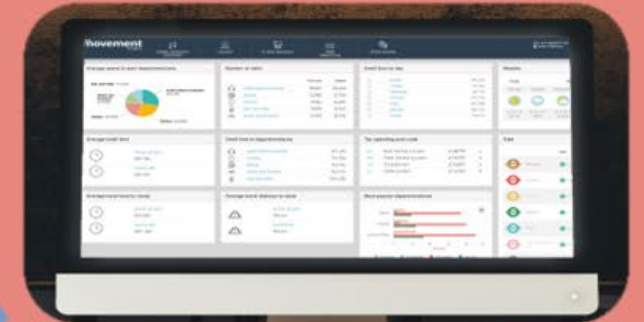


Specialist in movement analytics with focus on cellular, Wi-Fi and new data sources.

Transport, retail, cities

2019

movement
insights



Data Scientists blending large data-sets to derive insights and visualise via data dashboards

A large and growing pipeline - cities, retail, property, transport

CDRC RESEARCH

WHERE WE WORK



Sports + Events: Trusted advisors on crowd safety and dynamics for the highest profile venues in the world



Transport: Better people movement planning that facilitates safer, more comfortable journeys and releases space for commercial opportunities



Cultural: Sympathetic, tailored solutions that enhance visitor experience and comfort for unique venues



Healthcare: Creating smarter healthcare facilities that flow better for diverse users



Education: Enhancing learning space, in-class time and safety in universities, schools and libraries



Safety, Security + Evacuation: Leading experts in crowd safety and security providing guidance that influences planning, design, construction and operation for crowded places worldwide



Buildings + Spaces: Combining science with expert understanding of people movement to create places that leave a lasting, positive impact on the people that use them

TRUSTED BY SOME OF THE BIGGEST COMPANIES IN THE WORLD



Historic
Royal Palaces



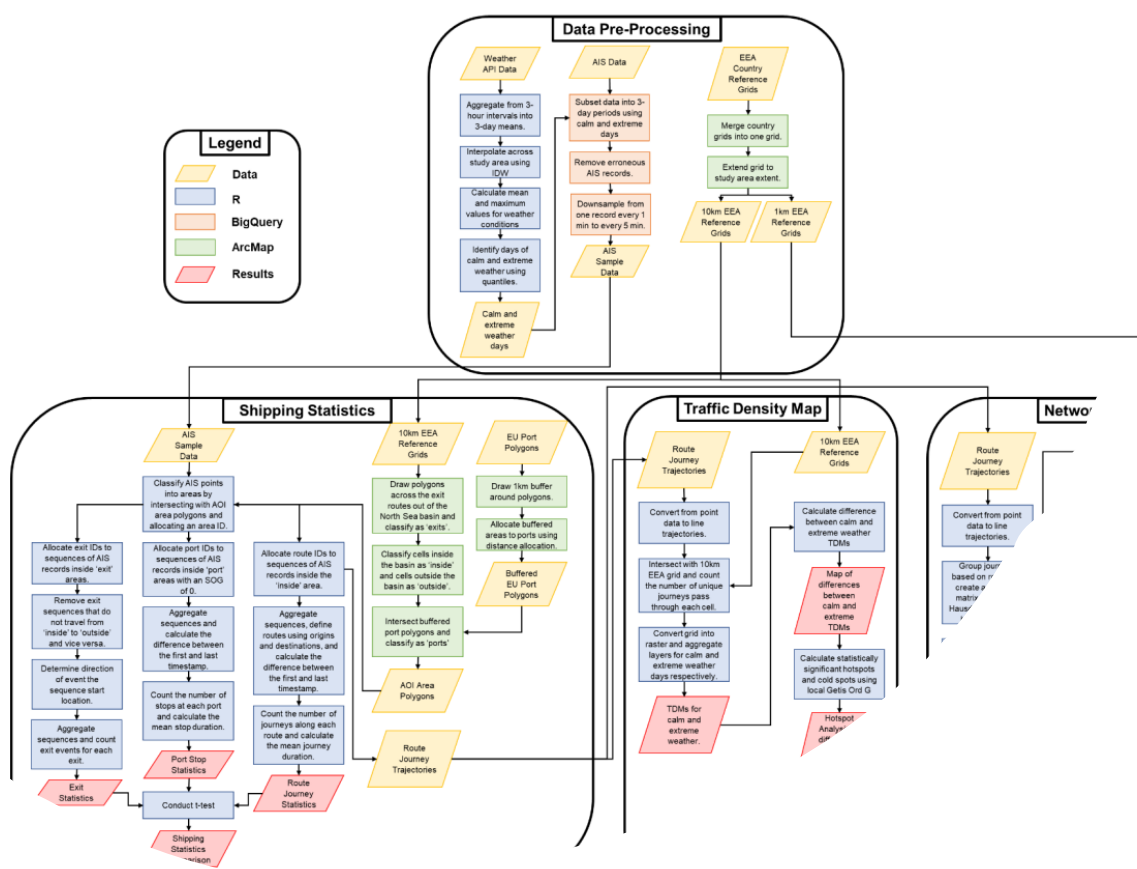
CDRC MASTERS DISSERTATION SCHEME

- Participated in the competition since 2015
- **Prizes in 5 out of 6 years – 1st and 2nd prize last year**
- 3+ former students are now full time employees
- Excellent feedback on **student support** and mentoring:
 - Training
 - Mentoring
 - Proof Reading
 - Ongoing Support from 10,000+ people in our wider team globally



EXAMPLES PREVIOUS YEARS TOPICS

- An Assessment of the Impact of Weather Upon Shipping Patterns using AIS Data and Weather APIs
- Understanding and Predicting Consumer Behaviour in Music Festivals with Machine Learning
- Retail Centre Footfall: Planning and Forecasting Using Time Series Modelling
- Combining footfall from mobile network data and event listings to predict consumer behaviour patterns
- Stadia and Sporting Events in London, Use of GPS Data to analyse Spectator Behaviour



CDRC SCHEME EXPERIENCE | CHRISTIAN TONGE

THE PROJECT

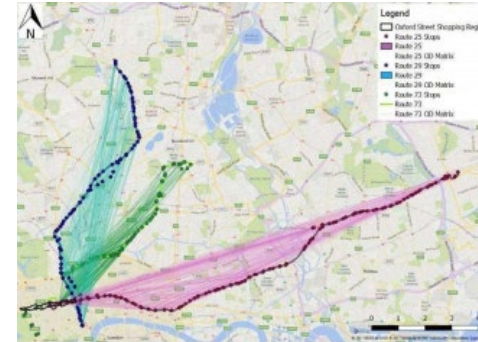
An exploration of mobile data: towards proximity based passenger sensing on public transport

THE DATA

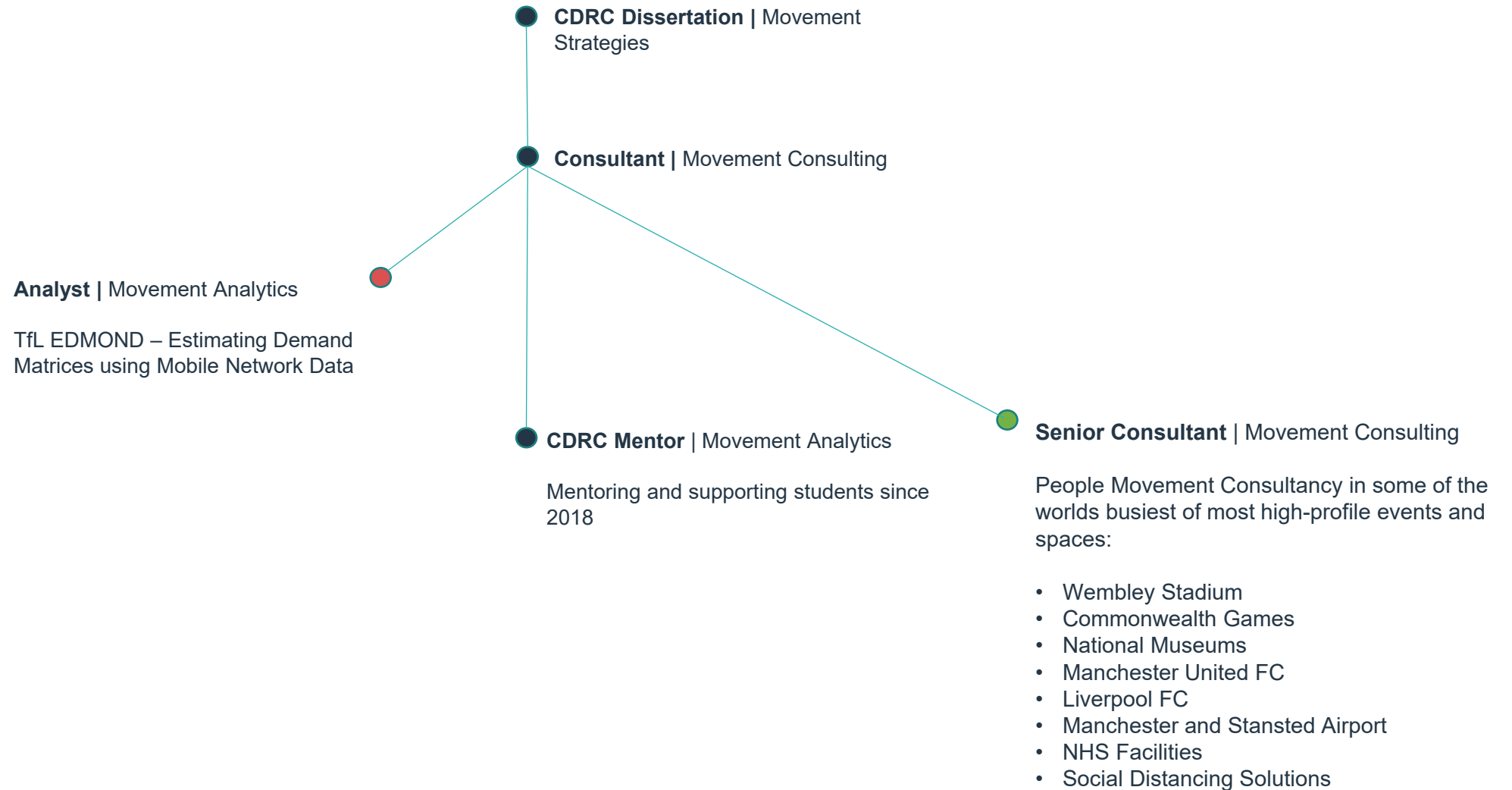
- TfL Bus API
- GPS Data

VALUE ADDED

- Methodology for processing raw GPS data
- Inferred public transport and last mile activity



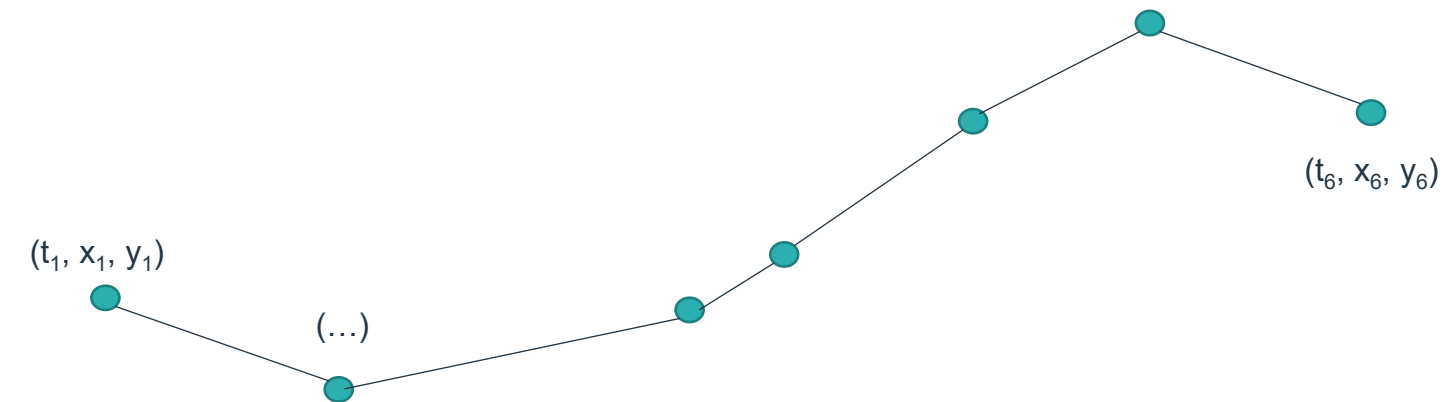
CAREER PATH AFTER CDRC



CDRC SCHEME EXPERIENCE | CRISTOBAL MONTT

THE PROJECT

Understanding the impact of network disruption on mode, route and travel time using GPS data



THE PROJECT

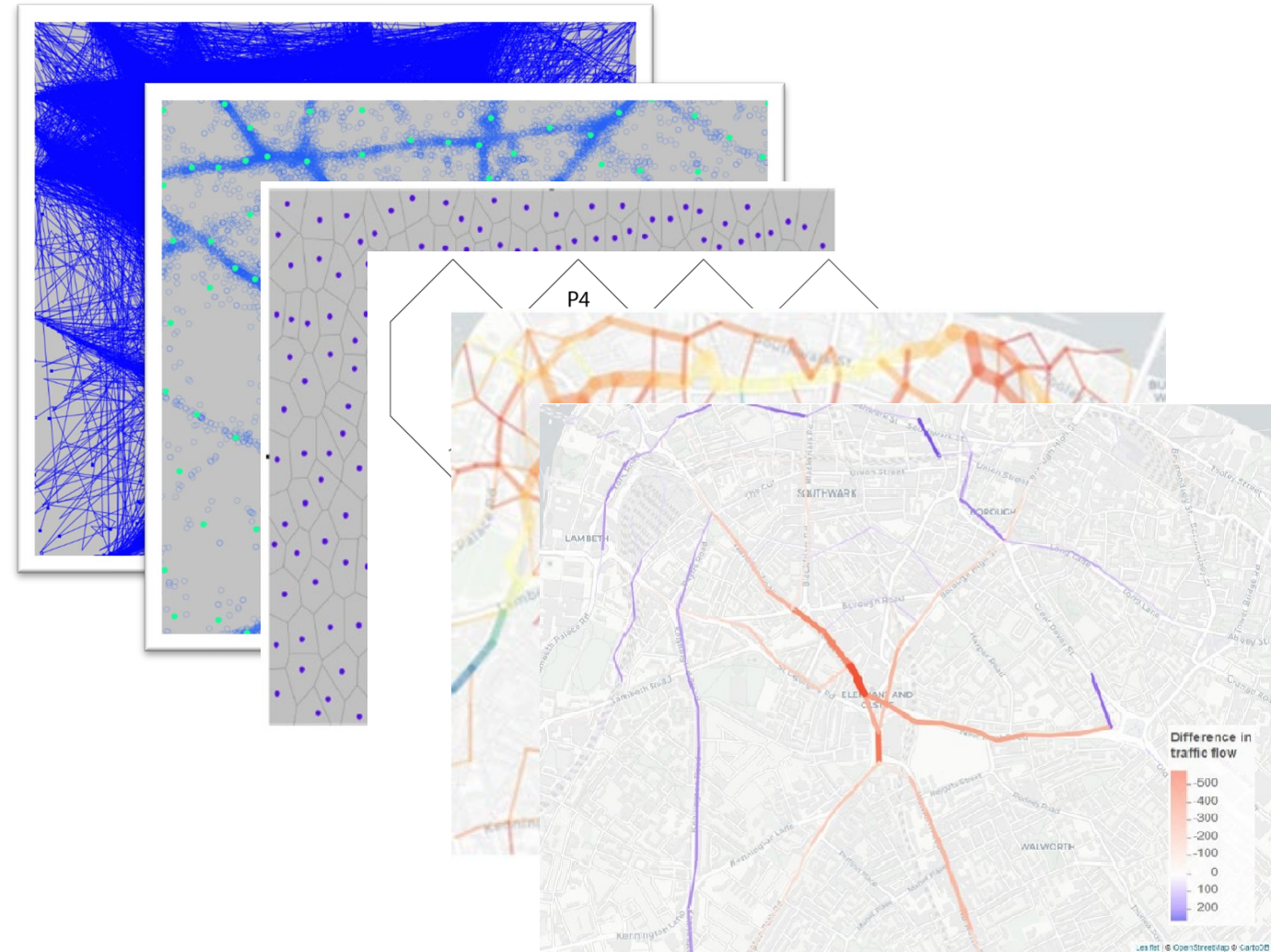
IEEE TRANSACTIONS ON VISUALIZATION AND COMPUTER GRAPHICS, VOL. 16, NO. X, XXX/XXX 2010

Spatial Generalization and Aggregation of Massive Movement Data

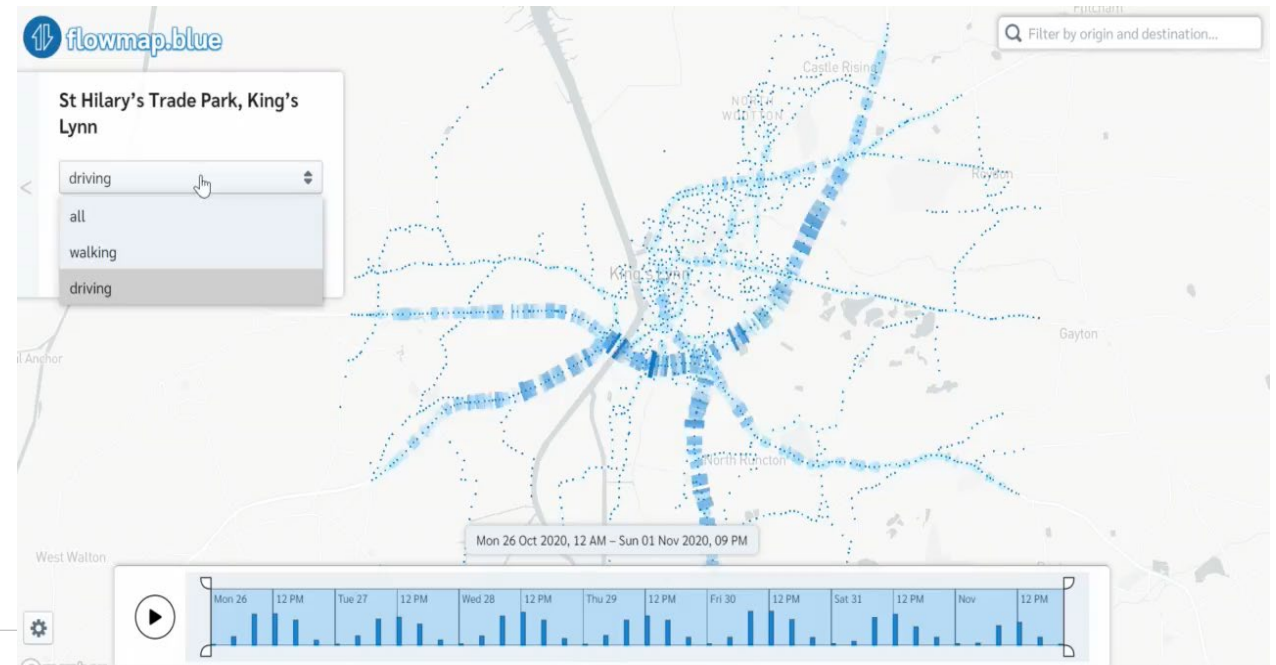
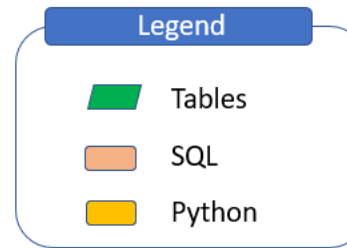
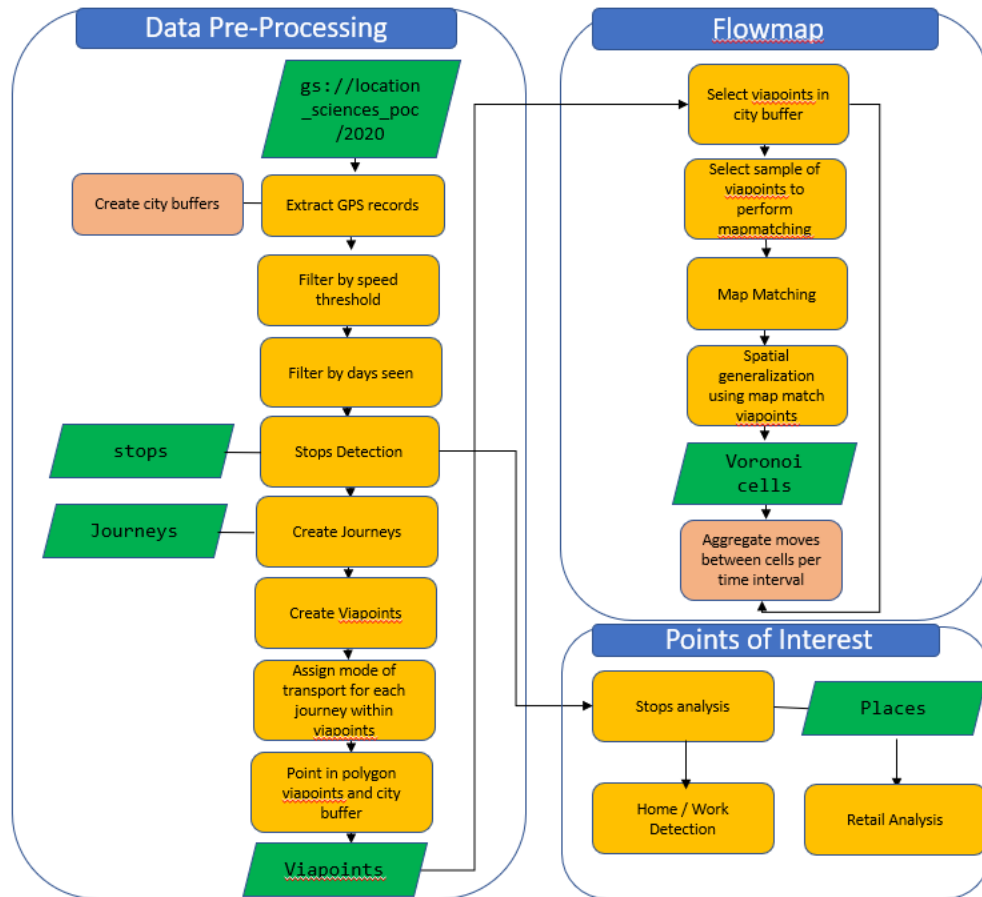
Natalia Andrienko and Gennady Andrienko

Abstract—Movement data (trajectories of moving agents) are hard to visualize: numerous intersections and overlapping between trajectories make the display heavily cluttered and illegible. It is necessary to use appropriate data abstraction methods. We suggest a method for spatial generalization and aggregation of movement data, which transforms trajectories into aggregate flows between areas. It is assumed that no predefined areas are given. We have devised a special method for partitioning the underlying territory into appropriate areas. The method is based on extracting significant points from the trajectories. The resulting abstraction conveys essential characteristics of the movement. The degree of abstraction can be controlled through the parameters of the method. We introduce local and global numeric measures of the quality of the generalization, and suggest an approach to improve the quality in selected parts of the territory where this is deemed necessary. The suggested method can be used in interactive visual exploration of movement data and for creating legible flow maps for presentation purposes.

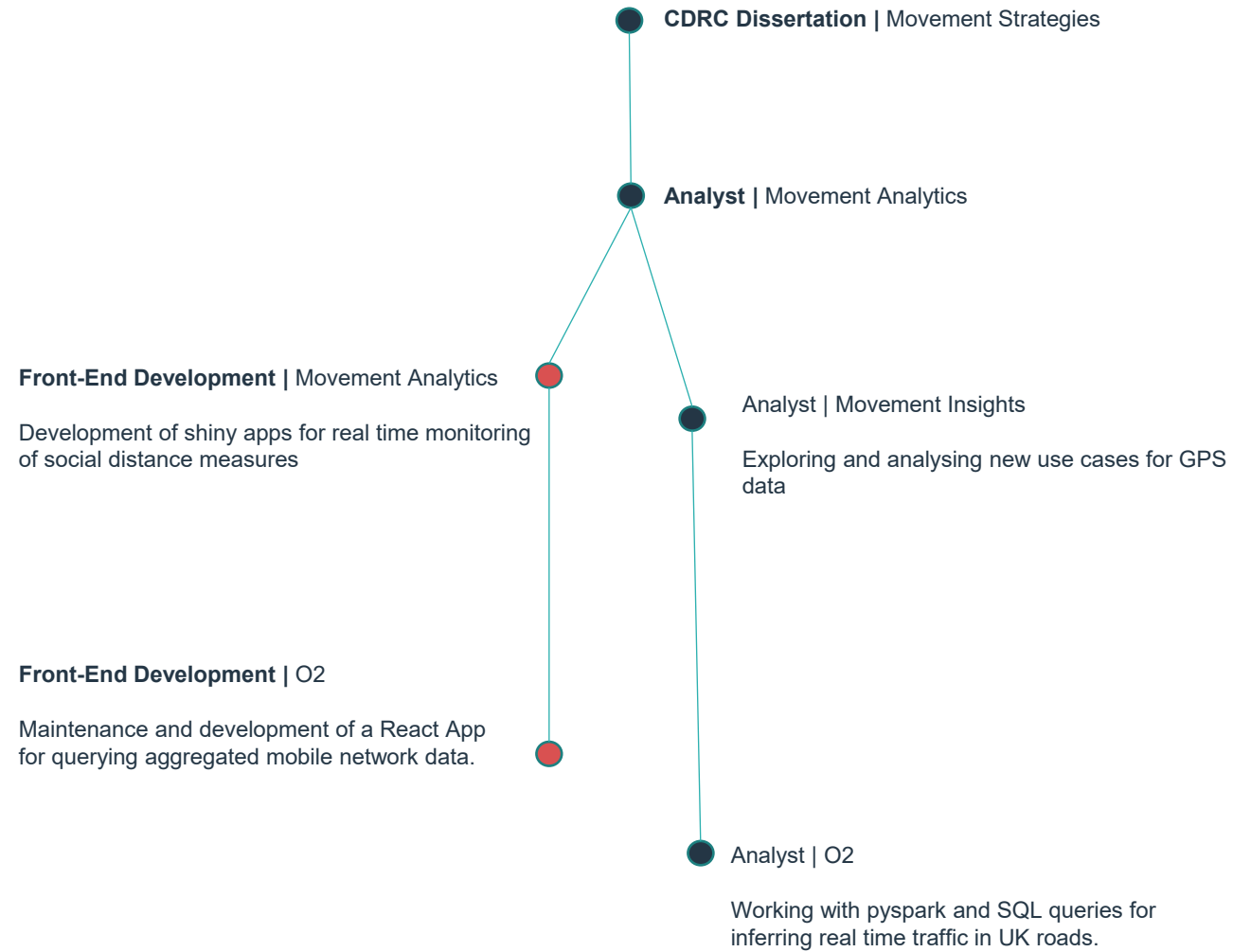
Index Terms—Movement, generalization, aggregation, information visualization, geovisualization, visual analytics.



VALUE ADDED TO THE BUSINESS



CAREER PATH AFTER CDRC



USING COMPUTER VISION ALGORITHMS TO AUTOMATICALLY DETECT PERSONS WITH REDUCED MOBILITY

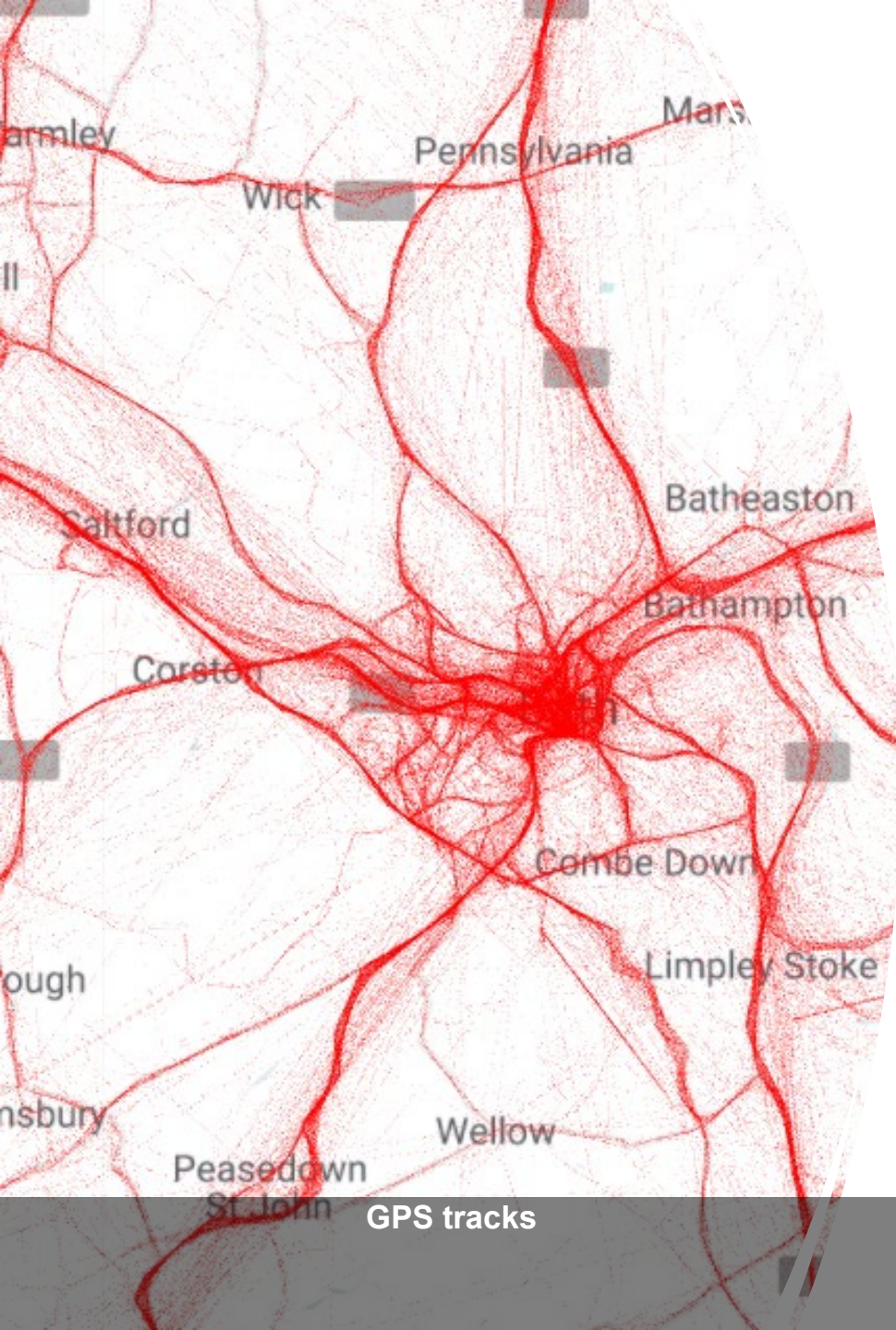
- Topic: Studying video feeds captured on CCTV or other cameras throughout our clients' locations has become an important source of data in many diverse projects. With the rise of concerns around data privacy and the spread of use cases and projects, it has become crucial to automate video analysis, to extract data from it in a faster, more secure and less resource-intensive way. Applying computer vision algorithms, the aim of this project is to develop a tailored solution that can be applied to a variety of situations and understand when a person with reduced mobility is seen by the camera in real-time for the purpose of improving accessibility and inclusion. Future applications of this algorithm will vary across all sectors (stadia, airports, cultural places, retail ...) and will be used to inform venue managers on the use of their spaces by PRM and/or specific categories of people, including families with prams, people with luggage, etc.

- Data: Historic video footage will be made available to develop and train models and algorithms. A live feed from a camera located in one of our locations can also be supplied to work on taking the solution to the next step and develop a real-time solution.

- Potential Techniques: **Computer Vision, Deep Learning**



YOLO with OpenCV to detect people and baggage, 2018



INFERRING MODE OF TRANSPORT FROM GPS DATA

- Topic: A crucial element for transport planning is knowing the modal split of commuters. In recent years, the widespread of GPS-enabled devices (i.e., smartphones) has resulted in abundant collective travel behaviour data that can be used to infer mode of transportation. The aim of this project is to predict mode of transportation (car, bus, walk, bike and train) based on unlabeled GPS data.
- Data: Raw GPS data (derived from various smart phones apps) will be provided. For each event produced by a unique device id, the time at which the event was recorded as well as the geographical coordinates and horizontal accuracy of the record are present. Additional data sources can be used, such as OSM road or rail network to improve the accuracy of the model.
- Potential Techniques: **Unsupervised, semi-supervised ML, spatial data science.**



movement strategies

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