

Industry Insights: Tim Hillel

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Summary

Lecturer in analytics at UCL also head of faculty at CS. Describe the current research at UCL and Tim's role.

Machine Learning for Cities a Research Perspective

Context (mainly London)

- Air Quality
- Climate Change
- Social and Environmental Issues
- Aging Infrastructure
- Lifestyle Changes - COVID, home working etc.

Technology

- Smart Infrastructure (e.g. smart motorways, smart meters)
- Interconnected Systems (CAV, drone delivery)
- Digital Twins (representations of infrastructure)

How do we feed data into the digital twin? (Tim's research). Human centric modelling lab - Based on behavioural understandings. Investigate counterfactual scenarios - e.g. CAV, last mile. How would that affect e.g. property prices.

Use the counterfactual insights to support data driven strategic planning for energy and transport networks. How will this affect QoL, not just economics?

UCL PEARL research lab in Dagenham - simulate and investigate transport behaviour in controlled environment.

Dynamic Digital Twins Project

- representation of existing infrastructure
- combine with RT monitoring and actuation of infrastructure
- control transport system based on events
- dynamic aspect is using counterfactual scenarios

Arup - defining a meaningful framework for digital twins. Need to move towards full simulation of cities.

- model complex interactions on the whole connected system
- predict impacts of new tech on lifestyles
- understand impacts of smart infrastructure

Dynamic Dimensions

- understand people's behaviours and interactions with infrastructure
- flows of the system - energy, goods, water, waste
- predict physical response of infrastructure

ATI Project DDT-IET

- Develop framework and prototype for simulation - energy and transport
- EV ownership
- Flexible working policies
- Daily scheduling model for an individual
- Agent based simulation to scale up
- Synthetic population to group households

DATGAN

- A generalised adversarial network used to generate synthetic populations
- parameters can be adjusted to reflect the key attributes of a population to more closely simulate real populations.

Daily activity scheduling

- used to provide insight into activities
- scale up to inform synthetic population activity

Joint transport and energy demand modelling

- daily schedules
- activities in and out of home (travel demand)
- in - home activity to understand energy demand

Questions

- Limited use of agent based modelling so far, but will happen
- Census data is used to validate the modelled data but it's limited
- Likely to see mobility as a service rather than car ownership
- Different models for CAV - regulated vs. free market