Leibniz Institute for Ecological Urban and Regional Development (IOER) in Dresden is offering a **Master Thesis** at the research area „Research Area Spatial Information and Modelling" with IOER-Research Data Centre.

**Topic**: **Quantification of Urban Public Parking Space**

Many cities in the world are committed to implementing evidence-based radical climate actions – A recent investigation reported that already 296 cities published their net-zero targets including mobility transition issues like car-free cities, autonomous mobility and so on. Several conceptual frameworks have already been proposed within the scope of land use-mobility-energy and environmental integration for achieving net-zero carbon city outcomes. One of the challenges for implementing such frameworks in adopting evidence-based data-driven approaches is hardly achieved due to the availability of qualified datasets to identify the potential hot spot of interventions.

The sustainability transition of cities is a complex process, where the mobility sector is reshaping many dynamic factors including technological, social and ecological issues. Rethinking parking spaces is gaining attention to address the several problems related to sustainable urban development. For example, in recent years, some German cities have applied an intervention tool - Minimum Parking Requirement (MPR) to reduce car ownership, promoting sustainable transport practices, and thereby free-up parking space can support in achieving the climate goals as well as other basic needs like housing, green area, e-mobility infrastructure. The major problem is often – how to quantify available parking space (static) considering the complexity of urban structure, configures, networks and space. This study will also showcase how an integration method of artificial intelligence could support the generation of quantitative analysis of urban parking space to support future city planning. The study only addresses the physical dimensions, but the social perception and economic aspects will be left for future research scope.

**Possible Work packages:**
- Conducting a literature survey on urban parking space quantification using Open Data
- To develop a workflow to harvest multi-source information (Parking feed, OpenStreetMap, Orthophoto, Video Surveillance etc)
- Extract parking space (start simple – grow comprehensive) information (E.g., Computer Vision Tools)
- Develop a generative adversarial model (GAN) to generate future parking space data and an LSTM-based model for predictive analysis
- Conduct validation and sensitivity test

**Possible Output:**
- State of the art in urban parking space quantification
- Potential adoption of an open data-driven automated workflow for urban areas
- Prototype toolbox for extraction, harmonization and visualisation of urban parking space
- A demo case study on the city of Dresden

**Literature:**
- Guo, Z. (2013). Residential Street Parking and Car Ownership. Journal of the American Planning Association, 79(1), 32–48. DOI: https://doi.org/10.1080/01944363.2013.790100
- Schuster, T., & Volz, R. (2019). Predicting Parking Demand with Open Data. In: I. O. Pappas et al. (Eds), Digital Transformation for a Sustainable Society in the 21st Century (pp.218–229). Cham: Springer International Publishing. DOI: https://doi.org/10.1007/978-3-030-29374-1_18.
- Szell, M., (2018) Crowdsourced Quantification and Visualization of Urban Mobility Space Inequality, DOI: https://doi.org/10.17645/up.v3i1.1209
- Yu Z., Urban Computing: Concepts, Methodologies, and Applications. ACM Trans. Intell. Syst, DOI: https://doi.org/10.1145/2629592
- Rajabioun T. (2015), On-Street and Off-Street Parking Availability Prediction Using Multivariate Spatiotemporal Models," in IEEE Transactions on Intelligent Transportation Systems, DOI: https://doi.org/10.1109/TITS.2015.2428705

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