

MEng Innovation by Design

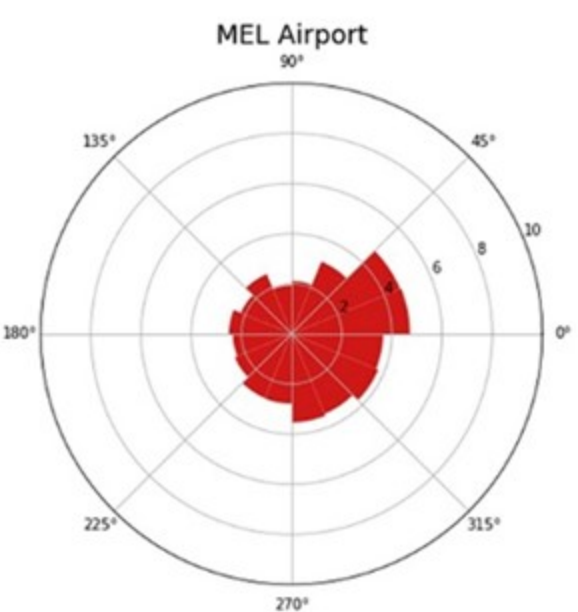
2019/2020 Ideate-Prototype-Realize



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Aviation has historically been one of the most consistently growing industries. With global 5.4% growth year-on-year over the last two decades representing a 15 year doubling period of passenger numbers resulting in many airports being built. However in 2020, aviation was one of the worst hit industries due to the global pandemic, before that seeing resistance due to its contribution to global warming. This has led society to consider wide spread and potentially radical transformation in aviation to maintain its sustainability.

Airports can be disruptive, expensive, and take long to build; and when operating result in land use, exposure to noise and environmental degradation but equally enrich cities, society, culture and economies. The lack of readily available data for airport planning and design can be a problem for governments and decision makers especially in developing economies where many aviation projects are currently being realised. This research project aims to tackle this problem of data discovery and availability for large scale urban infrastructure entities through Machine Learning and advanced GIS Analytics.

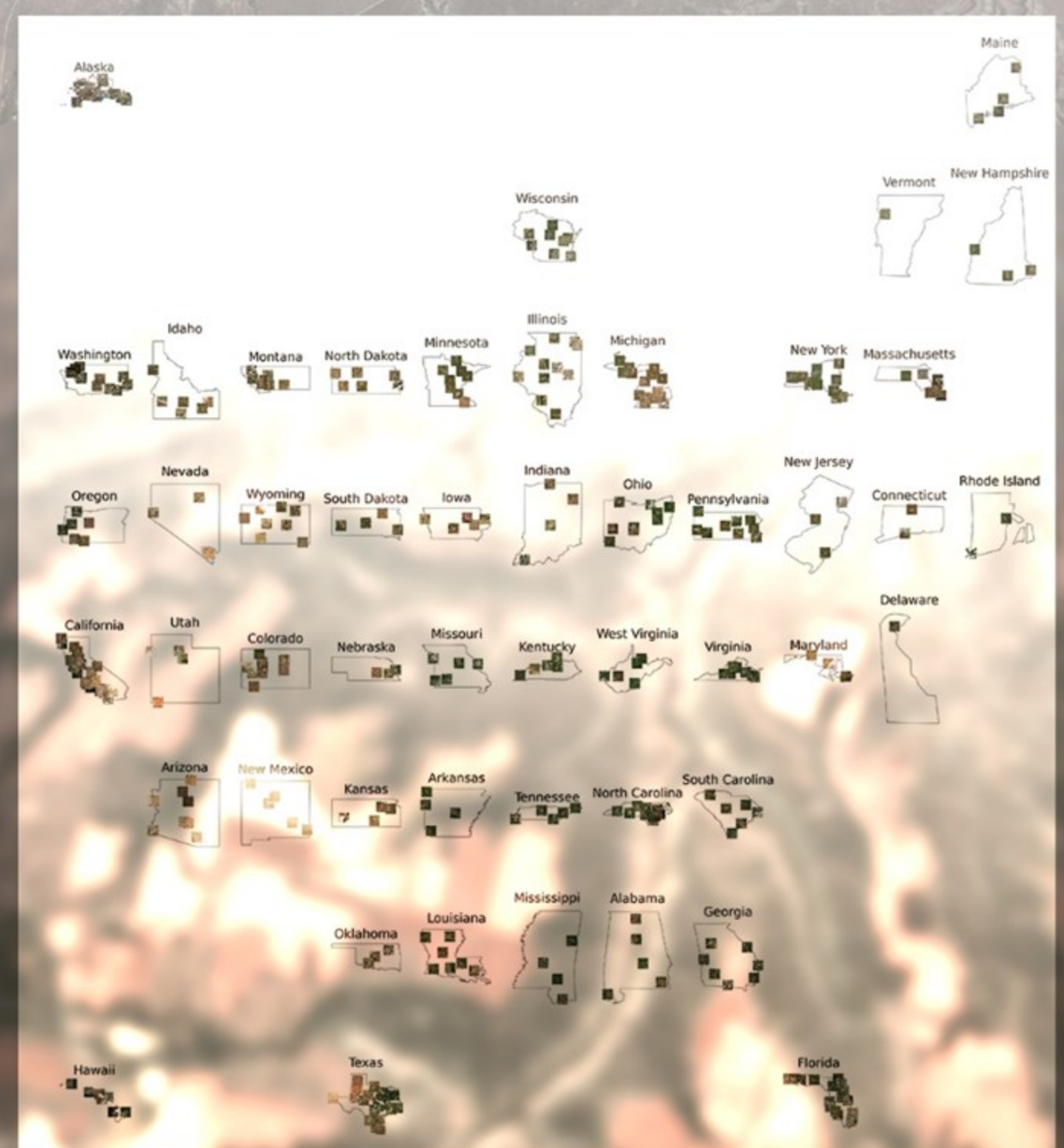
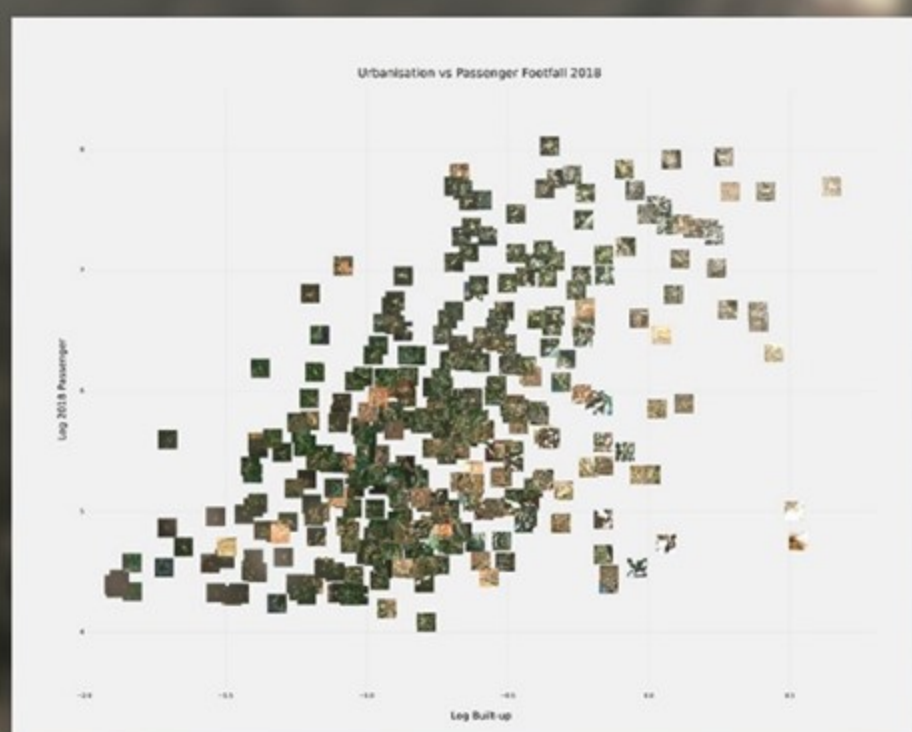


Focusing on aerial image analysis we use open access satellite imagery data on the world's top 1000 airports (based on passenger footfall in 2018), and explore key typology based questions specifically: airport expandability, land encroachment, and interaction between urban zones and airport activity. The approach is a scalable methodology that can be applied to many airport sites: to explore though comparative data, current impact of airports on existing land usage, if airports could expand or contract, and how beneficial or challenging it would be to do so.



A U-Net Architecture was used to train all the 1000 airport images, using 50 cherrypicked sample images which were masked manually to represent the geographical features such as Built-up (red), Arid (yellow), water (Blue) and empty land (Green). The 50 images were strategically chosen to broadly represent the entire dataset in terms of geography, size of the airport, cloud coverage and level of urbanisation surrounding the airport.

Correlation between Passenger footfall and urbanisation of airport showing a trend between the two, indicating the possible scope for expansion of a few strategic airports.



Oslo International Airport visualised across seasons over a year



Lee Kuan Yew Centre for Innovative Cities



Temasek Laboratories

