INSTITUTE of TECHNOLOGY CARLOW
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AN IDEAL WORLD
MODELLING ROUTES FOR IRELAND'S PUBLIC TRANSPORT NETWORK

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1. Abstract

A variety of projections from the Irish government indicate that major improvements to the transport infrastructure of Ireland will occur over the next twenty years. Analyses into what this may look like have been concluded, and the results of same are not promising. As such, the present research seeks to identify the gaps in the Irish public transport network through machine learning and graphical mapping over time in order to rectify the proposed and current network in Ireland. This will be achieved by determining, through extensive data analysis of billions of data points on the human traffic behaviour in Ireland in order to determine where people move in Ireland. Models of this data shall thus be analysed through a machine learning algorithm which will determine an ideal scenario for a public transport network and coupled with the current situation in order to identify key infrastructure differences. This information can thus be used to plan a more appropriate vision for Ireland's public transport network which could be of great benefit to the future planning of the country.

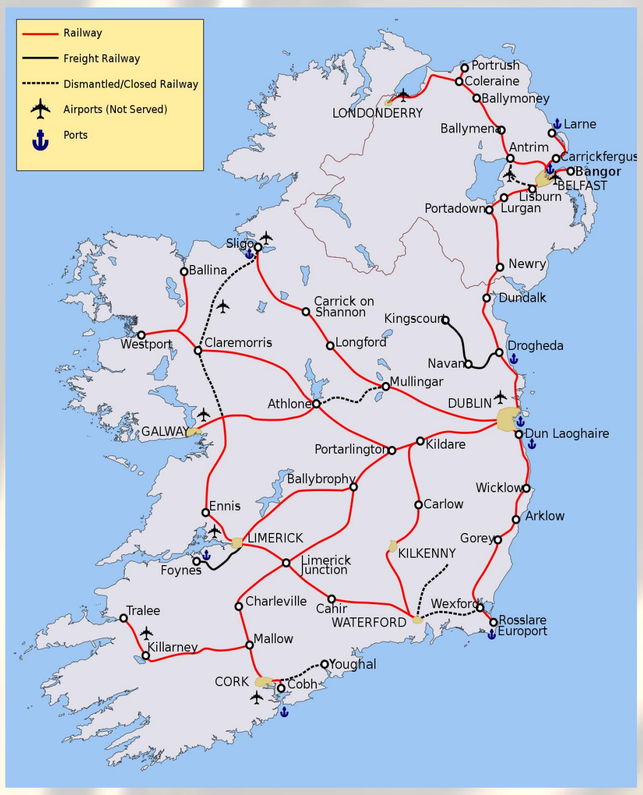

Fig 1. Map of Ireland's current railways

2. Research Objectives

The primary research question for this dissertation is the following:

"Using traffic flow data from cars and public transport, how can a public transport network be optimised to reflect the actual traffic patterns of its users?"

In order to determine this information, the following five research objectives will be investigated throughout the duration of the dissertation:

1. Identify, using specific case studies (i.e., dataset for South County Dublin), the pertinent factors and features involved in traffic flow in Ireland.
2. Create, from the information gathered in Objective 1, a reasonable public transport system (busses, trains and trams) irrespective to the system already put in place.
3. Correlate the above with the public transport system already established, and with the plans in place for the future, to establish in what ways the ideal system from Objective 2 relates to the reality.
4. Visualise the resulting public transport network(s).
5. Generalise the above process in order to develop an algorithm which, when given similar or appropriate data, will be capable of determining the suitability of the current network to the ideal at any given time.

3. Literature Review

Dissatisfaction with Ireland's current public transport network was highlighted by Hynes et al. (2018) in a comprehensive mixed-methods study in which they surveyed 363 individuals in Galway City and its suburbs on their experiences with public transport and discovered a vastly lower satisfaction rate in comparison to a similar study done in the UK. An older study by John McDonagh (2006) further explored this dissatisfaction through the lens of social exclusion, relating the "lack of coherence" in transport policy leading to a direct impact on the mobilisation of the Irish rural population. This disdain for the current system was the impetus to undertake this project.

Furthermore, outside of the social sphere, the utility of public transport is much discussed. Malone and Hynes (2020), with large references to the above Hynes et al. (2018) paper, further demonstrated the need for reliable and available public transport in Ireland during the COVID-19 pandemic. It analysed too the multitude of commitments made by the Government of Ireland to invest and further improve the transport network, though stops at the point of envisioning these projections outside of the financial sphere. Such a projection is produced by Páraic Carroll (2019), who took the Government's most recent Project Ireland 2040, a combination of the National Planning Framework and National Development Plan and analysed in what ways their projected transport infrastructure may impact the traffic and transport patterns of the Irish people. Considering all bus, rail and car transport models, he discovers that the Government's future initiatives will have a "negligible impact" on thoroughfare capacity and entail little to no improvements in congestion in the Dublin region. Considering that most innovations to the transport network situate themselves within the Dublin region according to Project Ireland 2040, such as new Luas lines and the proposed Metro, it would suggest that the situation elsewhere in Ireland would be comparable to these findings.

4. Data

The following list identifies the primary sources, all from Government data sources:

- **National Household Travel 2017 (2018)**: contains survey information on travel habits of 5,906 households over 62,307 trips in Ireland
- **Railway passenger transport statistics – quarterly and annual data (2020)**: a European Union analysis of rail transport containing valuable statistical information on Irish rail usage
- **National Transport Authority Bus & Rail Statistics (2019)**: all relevant statistics on bus and rail usage in Ireland
- **Census of Ireland (2016)**: for use with population statistics
- **Transport for Ireland (2021):** for use in modelling the transport network in Ireland
- **National Road Traffic Counts (2012-2016):** contains over 6.5 billion transport data points on Irish roads
- **Traffic Flow Data Jan to June 2021**: a specialised dataset on road traffic flow in South County Dublin

It is expected as the project develops over the coming months that alternative and additional datasets will be utilised for comparative and analytical purposes, such as the upcoming Census 2022.

5. Technologies

6. References

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