DSC-22 Analysis of Automatic Identification System (AIS) data to understand shipping and ports

2018-04-12

The off-course project explores the operation, use and relationships between ports in the UK at a macro level and the behaviour and operational characteristics of ships at a micro level. Specifically, we explored ship travelling behaviours, traffic at ports and related factors, port capacity utilisation, national and international port relationships and inbound ship delays.

## Team members

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## The need

The maritime freight industry is of critical importance to the economic output of the UK, with almost half a billion tonnes of freight being handled by UK ports in 2016. The Freight Transportation Association estimate that delays on both side of the Channel cost the UK logistics industry £750,000 a day. As the demands upon shipping freight are likely to increase in the future, a more in-depth understanding of the UK maritime shipping industry becomes increasingly more important.

This project explores the operation, use and relationships between ports in the UK at a macro level and the behaviour and operational characteristics of ships at a micro level, specifically:

* national and international relationships
* traffic at ports and related factors
* inbound delays
* capacity utilisation

Two sources of data are utilized:

* [Automatic Identification System (AIS)](https://en.wikipedia.org/wiki/Automatic_identification_system). AIS data records the position, speed, heading, bearing and rate of turn for each ship, at frequent time intervals throughout its voyage
* [Consolidated European Reporting System (CERS)](https://www.gov.uk/government/publications/the-cers-workbook). CERS data is collected at a higher level and records details such as destination port and expected time of arrival for the voyage of each ship

## Impact

The main outputs of this project are: • processing pipeline of big data containing location of ships and reports containing itinerary information • port statistics based on several criteria • port relationships between UK and international ports • classification of ship travelling behaviour • prediction models for delayed arrivals of freight ships

## Data science

• Development of Scala functions to decode, sort, filter and extract AIS messages. • Visualisations of port statistics and network analysis. • Unsupervised machine learning algorithms to classify the ships’ moving behaviour. • Supervised machine learning algorithms to predict if a freight ship is going to arrive delayed.

## Stakeholders

* Maritime and Coastguard Agency (MCA)
* Department for International Trade (DIT)

## Code and outputs

• [Report](https://datasciencecampus.ons.gov.uk/analysing-port-and-shipping-operations-using-big-data/)on main website • [GitHub public repository](https://github.com/datasciencecampus/off-course)

## Related and existing work

* [ESSNET WP4](https://webgate.ec.europa.eu/fpfis/mwikis/essnetbigdata/index.php/Main_Page)

## Delivery

* [x] **September 2017** Project started
* [x] **June 2018** Project finished

## Further information

Please contact [datasciencecampus@ons.gov.uk](mailto:datasciencecampus.ons.gov.uk) for more information.

## Updates

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Chris Bonham and Sonia Williams produced a [report](https://datasciencecampus.ons.gov.uk/analysing-port-and-shipping-operations-using-big-data/) detailing the process and outcome of this project in June 2018.