

## Detecting Port Maritime Communities in Spain with Complex Network Analysis

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**Abstract :** In recent years, researchers have shown an interest in modelling maritime traffic as a complex network. In this paper, we propose a bipartite weighted network to model maritime traffic and detect port maritime communities. The bipartite weighted network considers two different types of nodes. The first one represents Spanish ports, while the second one represents the countries with which there is major import/export activity. The flow among both types of nodes is modeled by weighting the volume of product transported. To illustrate the model, the data is segmented by each type of traffic. This will allow fine tuning and the creation of communities for each type of traffic and therefore finding similar ports for a specific type of traffic, which will provide decision-makers with tools to search for alliances or identify their competitors. The traffic with the greatest impact on the Spanish gross domestic product is selected, and the evolution of the communities formed by the most important ports and their differences between 2019 and 2009 will be analyzed. Finally, the set of communities formed by the ports of the Spanish port system will be inspected to determine global similarities between them, analyzing the sum of the membership of the different ports in communities formed for each type of traffic in particular.

**Keywords :** bipartite networks, competition, infomap, maritime traffic, port communities

**Conference Title :** ICIMT 2021 : International Conference on International Maritime Transport

**Conference Location :** Madrid, Spain

**Conference Dates :** March 25-26, 2021