

Toward a Readily Available Maritime Route Suggestion and Prediction System Using Historic “Roads of the Sea”

Cowan Killian¹, Bernardini Alesandra¹, Mercedes Alexander¹, Troupiotis-Kapeliaris Alexandros-Nikolaos², Zissis Dimitris², Kastrisios Christos³, Schmidt Val³

¹ University of New Hampshire, Department of Computer Science, Durham, NH, USA

² Department of Product and Systems Design Engineering, University of the Aegean, Syros, Greece

³ Center for Coastal and Ocean Mapping/UNH-NOAA Joint Hydrographic Center, University of New Hampshire, Durham, NH, USA

Alexander.Mercedes@unh.edu

Unlike land routing, sea navigation takes place in “free-space”, not constrained to strict road networks. To ensure safety of passage, mariners tend to use commonly traveled routes. Nautical and routing charts provide information regarding dangers to navigation and shipping routes and distances between major ports, however they are often outdated or not complete, while the routes can only be considered as recommendations.

When ships are to stray from previously followed and recommended routes, there lies a higher risk of grounding, and in areas of high traffic, an increased risk of collision, potentially causing disruption of goods and services, loss of life, and environmental pollution. A system that could provide safe and efficient routes unique to specific ship characteristics and predict routes of nearby vessels would greatly alleviate those risks. Mapping the most frequently traveled sea routes using historical AIS data and predicting ship trajectories is a rising research topic, mostly with the aim to identify irregular behavior of vessels.

However, we lack a readily available system aboard ships for use by mariners and autonomous systems. In this work we utilize sample “Roads of the Sea”, derived using unsupervised learning techniques capable of identifying the spatiotemporal dynamics of historic ship routes, to build a prototype route suggestion and route prediction system (Figure). This system pulls data from a remote database hosted on a remote cloud platform, suggests optimal routes between ports, and predicts probable trajectories of nearby vessels based on current movement and location. An additional front-end application provides access to the system’s services, letting users view routes and request route predictions and suggestions for specific vessel types. Though connected, these components are designed to be loosely coupled, allowing for changes to and improvements on the utilized graph while permitting the system to provide services to other applications as an API.

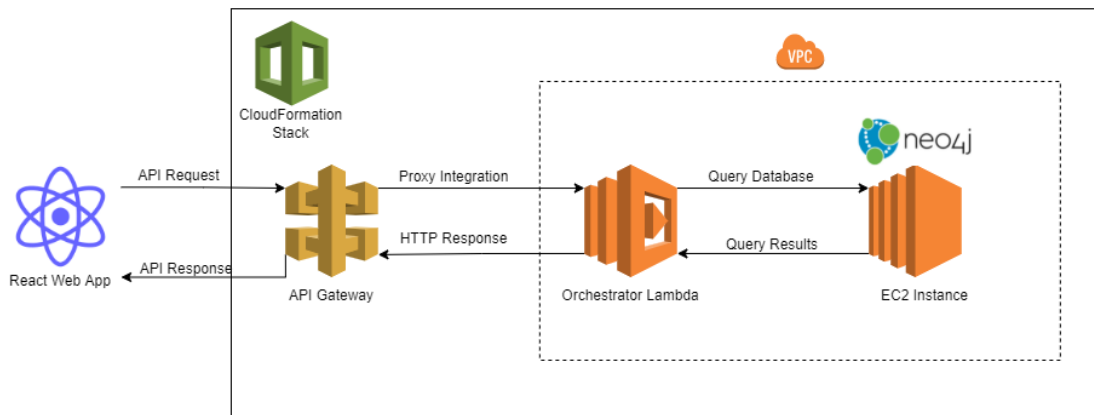


Figure: Route Suggestion and Prediction System Overview