

Using machine learning to uncover hidden topics of fisheries models

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Abstract

Fishery science output has increased drastically over the last years, partly driven by the need to provide information for fisheries management. In particular, insights on alternative management scenarios and future management objectives are most frequently provided through fisheries modeling tools. Such models are in high demand as the understanding of fisheries is shifting toward a socio-ecological complex adaptive system (SECAS) perspective. This novel understanding adds not only complexity but also new challenges to the field of fisheries models.

It is, therefore, important to assess the developments and the state of the fisheries modeling field, in order to evaluate its maturity to incorporate multiple economic, social and ecological objectives, as well as to identify unexplored research gaps and underrepresented research topics. This might lead to more research on the underrepresented topics and stimulate funding bodies to reset their focus to cover the identified gaps.

This interdisciplinary study applies an unsupervised machine-learning algorithm (i.e. Latent Dirichlet Allocation) to uncover fisheries modeling topics and their underlying sub-topics to identify historical and current research interests. We analyze over 22,200 full-text scientific publications from 13 top-tier fisheries journals published in the period 1990-2016 to assess how far socio-ecological complex adaptive systems have been addressed and what management objectives e.g. social, ecological and economic, have been included. Additionally, we assess what particular species, areas, and methods occur within the uncovered topics, allowing us to identify specific priorities in research focus and methods. We furthermore report on past and current 'hot' and 'cold' fisheries modeling topics.

Keywords: latent Dirichlet allocation, LDA, machine learning, topic modeling, fisheries models, trends and gaps, socio-ecological systems, modeling SECAS, multi-sectoral management objectives

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