

# Hidden Stories: Topic Modeling in Hydrology Literature

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## Key Points:

- Topic Modeling is a form of unsupervised machine learning for Natural Language Processing (NLP)
- Topic Modeling can provide a high-level overview of topics and trends in hydrology literature
- This is a first step toward building a tool to help researchers navigate and synthesize a growing body of literature

## Keywords:

- Hydrology Literature
- Science Communication
- Machine Learning
- Unsupervised Learning
- Natural Language Processing
- Topic Modeling

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**Abstract**

Hydrologic research generates large volumes of peer-reviewed literature across a number of evolving sub-topics. It's becoming increasingly difficult for scientists and practitioners to synthesize this full body of literature. This study explores topic modeling with Latent Dirichlet Allocation (LDA) as a form of unsupervised learning applied to 42,154 article-abstracts from six high-impact (Impact Factor > 0.9) journals (Water Resources Research *WRR*, Hydrology and Earth System Sciences *HESS*, Journal of Hydrology *JH*, Hydrological Processes *HP*, Hydrological Sciences Journal *HSJ*, Journal of Hydrometeorology *JHM*) to provide a high-level contextual analyses of hydrologic science literature since 1991. We used a hybrid quantitative/qualitative approach to label a number of broad topics in this body of literature, and used these labeled topics to analyze topic trends, inter-topic relationships, and journal diversity. As an example of what we can learn from this type of analysis, results showed that data-driven research topics are gaining in popularity while some subsurface related topics lose popularity within our journal set and time period. While no journal in our sample was completely homogeneous, *JHM* and *WRR* exhibited the most notable preferences for certain topics over others. The methods and outcomes of this paper are potentially beneficial to scientists and researchers who aim to gain a contextual understanding of the existing state of hydrologic science literature. In the long term, we see topic modeling as a tool to help increase the efficiency of literature reviews, science communication, and science-informed policy and decision making.