

Artificial Intelligence, Machine Learning, and Evidence Based Research.

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Grabbing the Head of the Snake: The Role for Python in Systematic Literature Reviews.

Climate Change has increased the frequency and intensity of natural hazards. The 2023 IPCC report emphasizes that governance settings and policies need to be based on the best available science and evidence, backed by rigorous and transparent processes. A way for researchers to achieve this is through Artificial Intelligence and Machine Learning.

Literature reviews

Climate change enhanced natural hazards, pandemics, and war all impact energy and water infrastructures. To design governance frameworks, that increase the resilience and sustainability of energy and water systems to these systemic risks, requires first establishing a firm evidence base. Therefore, this research project is conducting twin systematic literature reviews into how governance settings can enhance the resilience and sustainability of energy and water infrastructures.

Automating literature review stages

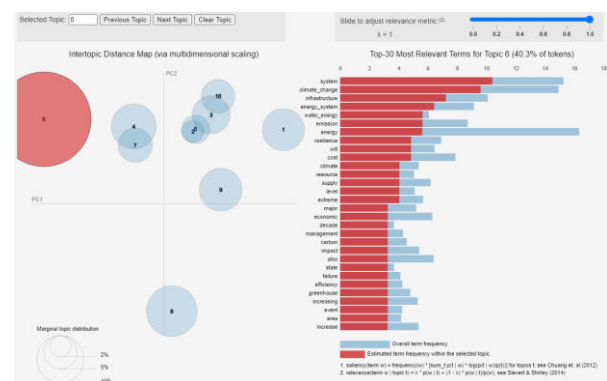
- AI is transforming how research is conducted across a wide range of disciplines. An area where AI is playing a transformational role is in the conduct of literature reviews, in particular systematic ones.

Data synthesis

- Using computer languages such as Python for data synthesis allows for the automatic, and repeatable, identification of key themes surrounding issues such as the policy problems that energy and water infrastructures face.
- Large themes such as climate change, disruptions to energy and water systems, and other policy problems are automatically identified, and their interactions with one another can be observed.

Natural Language Programming

- Natural Language Programming straddles the spaces of computational linguistics, Artificial Intelligence, and computer science, and covers the manipulation and computer understanding of human language (Millstein, 2020).
- Topic Modelling based on Natural Language Programming is a way for researchers to transparently, and with a high level of repeatability, uncover and code themes in data sets from reviews.



The above image is a visualisation of themes and their interactions. Interactions between themes such as climate-change, water and energy, and infrastructures are all visualised using LDA Topic Modelling.

Topic Modelling

- A statistical form of Natural Language Programming, Topic Modelling utilises algorithms to summarize large quantities of texts, into a range of topics (Leeson et al., 2019). As systematic literature reviews can produce huge volumes of data, Topic Modelling using Latent Dirichlet Allocation is a way for researchers to speed up this process.

Latent Dirichlet Allocation

- The central thrust of the model is that texts are signified as random mixtures over latent topics, where each topic is distinguished by a distribution over words (Blei et al., 2003).
- This means that each text is a collection of topics or themes, such as climate change and disruptions from hazards (natural and human), and that the existence of each word can be assigned to one of the texts topics or themes. This in turn allows for deeper analysis.



Further information

For additional information scan the QR code or contact:
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