How “digitalization” will change the energy and power industry in the next five years

A SCIENTOMETRICS TREND RESEARCH SHOW-CASE

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Stop Searching. Start Knowing. Get Insights.

I. Findings – ClusterMap Summary

KEY THEMES IMPACTING THE POWER INDUSTRY

Key "digitalization" themes impacting the power industry

1. **Smart Buildings**: The new partners for intelligent energy networks and efficient energy supply.

The first important cluster detected is centered around Smart Buildings, with overlapping scientometric clusters like "Buildings," "Smart Buildings," "Smart Home Energy Management," "Buildings and Cities," and "Energy Harvesting." Through the use of an automated technical infrastructure and physical and digital connections to local energy networks, they offer the possibility of buffering excess electricity from fluctuating renewable sources in thermal and electrical storage units. Buildings become an integral part of an intelligent energy network because they can produce, store, and consume energy. Used properly, smart buildings could become flexible partners for energy producers.

2. **Electric Vehicles (EVs): Will become the next normal. Energy on the move.**

Scientometrics reveals clusters such as "Electric Vehicle," "Vehicle Power," "Induction Motors," "Vehicle to Grid," and "Internet of Things." It looks like the 2020s will be the decade of the electric car. As EVs reach mass scale, plug-in cars challenge the local power grid, for example, overloads while charging at peak times and EVs providing power back to the grid. If managed properly, they could also be a boon for utilities seeking to sell more electricity. However, as early as 2023, EVs could displace the daily oil demand of 2 million barrels. In addition, the power industry needs to manage the exponential rise in energy use that will come with the widespread adoption of EVs and mass EV charging.

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Key "digitalization" themes impacting the power industry

3. **Smart Markets: Replacing human traders with decentralized, automatic negotiation algorithms between devices.**

The detected theme "Smart Markets" contains clusters like "Real-time Systems," "Real-time control," "Operation Schemes," "Energy Nodes," "Electricity/Energy Price," "Dynamic Pricing," "Optimal Scheduling," "Prediction Algorithm," and "Forecasting Models." The Smart Market is an area outside the grid in which energy volumes, or services derived from them, are traded among market participants on the basis of grid availability. Taking into account the digital development in the EV and Smart Building clusters, future players in this market are operated by intelligent devices, not humans.

4. **Neighborhood Area Network (NAN), the WLAN for Utilities: NAN is becoming mainstream for the utility last mile.**

New protocol standards are coming into play, with clusters showing up around "ZigBee Networks," "Transmission Network," "Energy Appliances," "Industrial Network," "IEC 61850," "Communication Networks," and "Wireless Communication." All are focusing IoT wireless mesh networks (for example, JupiterMesh) with flexible data rates that enable neighborhood and field-area communications for utilities and municipalities deploying intelligent grid solutions. NAN is the utility last mile that connects devices outside the home, such as smart meters, distribution automation devices, and data aggregators directly with utility companies.

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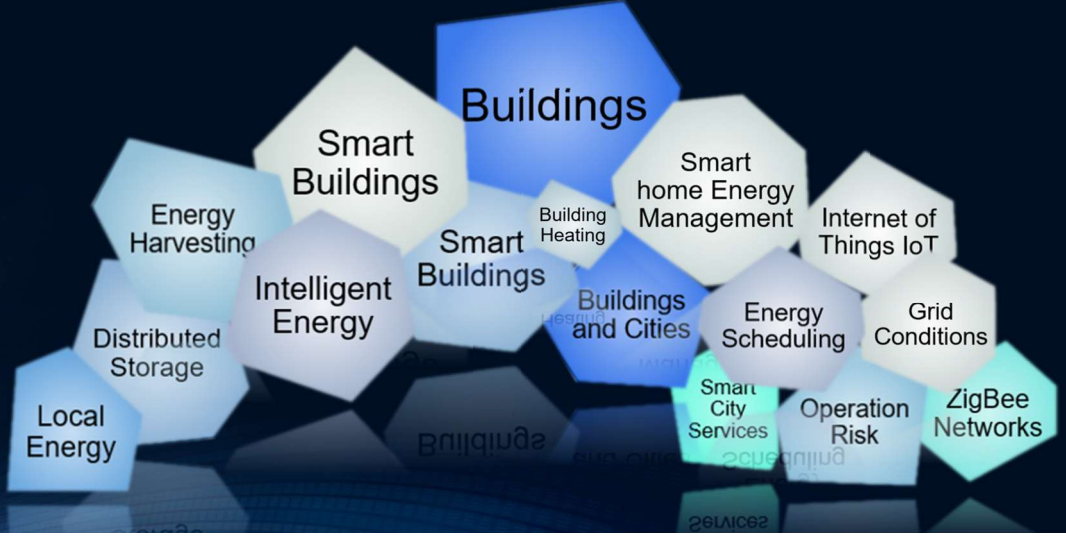
Interconnection Cluster Pyramid

Deep Dive
Example Extract

Smart Buildings

The new partners for intelligent energy networks and efficient energy supply.



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II. Approach

SCIENTOMETRICS

Noggle uses a digital approach, combining latest technologies in one solution

Scientometrics

… is the study of measuring and analyzing science, technology, and innovation. Major research issues include the measurement of tangible impacts, reference sets of articles to investigate the effect of journals and institutes, mapping scientific fields, and producing indicators for use in policy and management contexts.

Bibliometrics

… is statistical analysis of written publications, such as books or articles. Bibliometric methods are frequently used in the field of library and information science. For instance, bibliometrics is used to provide quantitative analysis of academic literature.

Text Clustering

… is defined as an automatic, nonsupervised grouping of similar documents into clearly labeled hierarchical clusters. Text clustering utilizes near real-time, fully automatic, nonsupervised machine learning in order to obtain a concise summary of the subjects discussed in a set of documents.

Use-Case: Scientometrics Research Setting

Search Topics

- energy industry
- power industry
- Energy Ecosystem
- Electricity Network
- Digital Transformation Power Industry
- Smart Grid
- Smart Power
- Energy Grid
- Power Plant

Search Space

- Worldwide Patent Database (90m documents)
- IEEE (4.2m documents)
- TED Talks (3000 presentations)

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Used search space of 100 million documents

4.5m docs

The world's largest technical professional organization for the advancement of technology

"IEEE and its members inspire a global community to innovate for a better tomorrow through its more than 420,000 members in over 160 countries, and its highly cited publications, conferences, technology standards, and professional and educational activities. IEEE is the trusted "voice" for engineering, computing, and technology information around the globe."

90m docs

European Patent Office

"EPO contains data on more than 90 million patent documents from around the world."

0.3m docs

TED, a clearinghouse of free knowledge from the world's most inspired thinkers

"TED is a global community, welcoming people from every discipline and culture who seek a deeper understanding of the world. TED believes passionately in the power of ideas to change attitudes, lives and, ultimately, the world.—and a community of curious souls to engage with ideas and each other at TED events around the world."

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What are Noggle Knowledge Maps?

Noggle is creating a visual interface to scientific knowledge that can be used to dramatically improve the discoverability of important trends, themes and similar topics.

An Scientometric Knowledge Map visualization presents a topical overview for the search subjects by using AI-guided machine learning looking for similar patterns. The Noggle clustering algorithm scans internal relations and linguistic patterns among all the documents according to how similar they are to the initial search request. This tool can unearth new groups or cross-document relationships, which might guide users to new, interesting areas that build upon their initial search request.

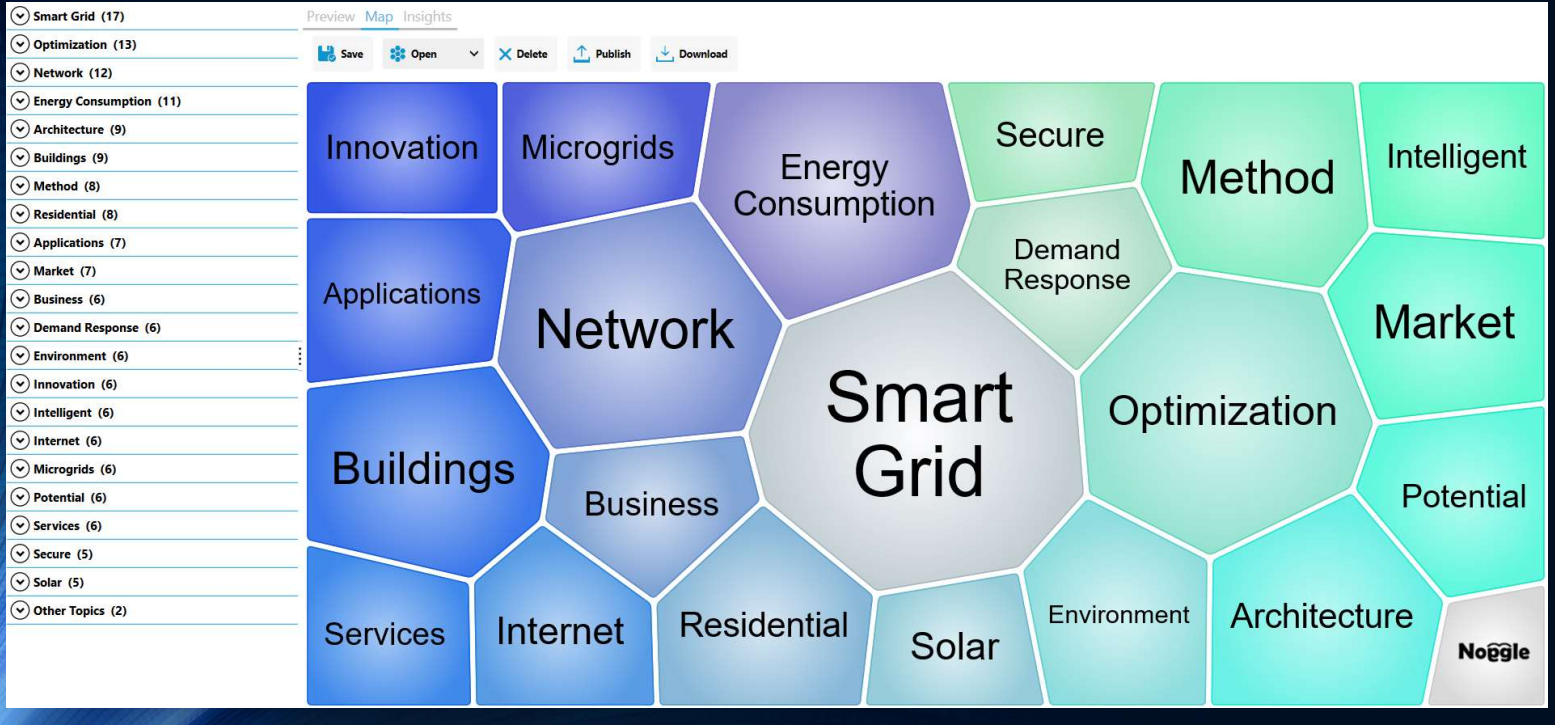
A knowledge map is basically a clustered picture that orders grouped information around a central subjects. Starting with the most common groups in the center.

These maps are one of Noggles ways to capture millions of documents and bring similar content cluster to life in visual form. Beyond just scanning research listings, though, these maps can help you become more creative, remember more, and solve problems more effectively.

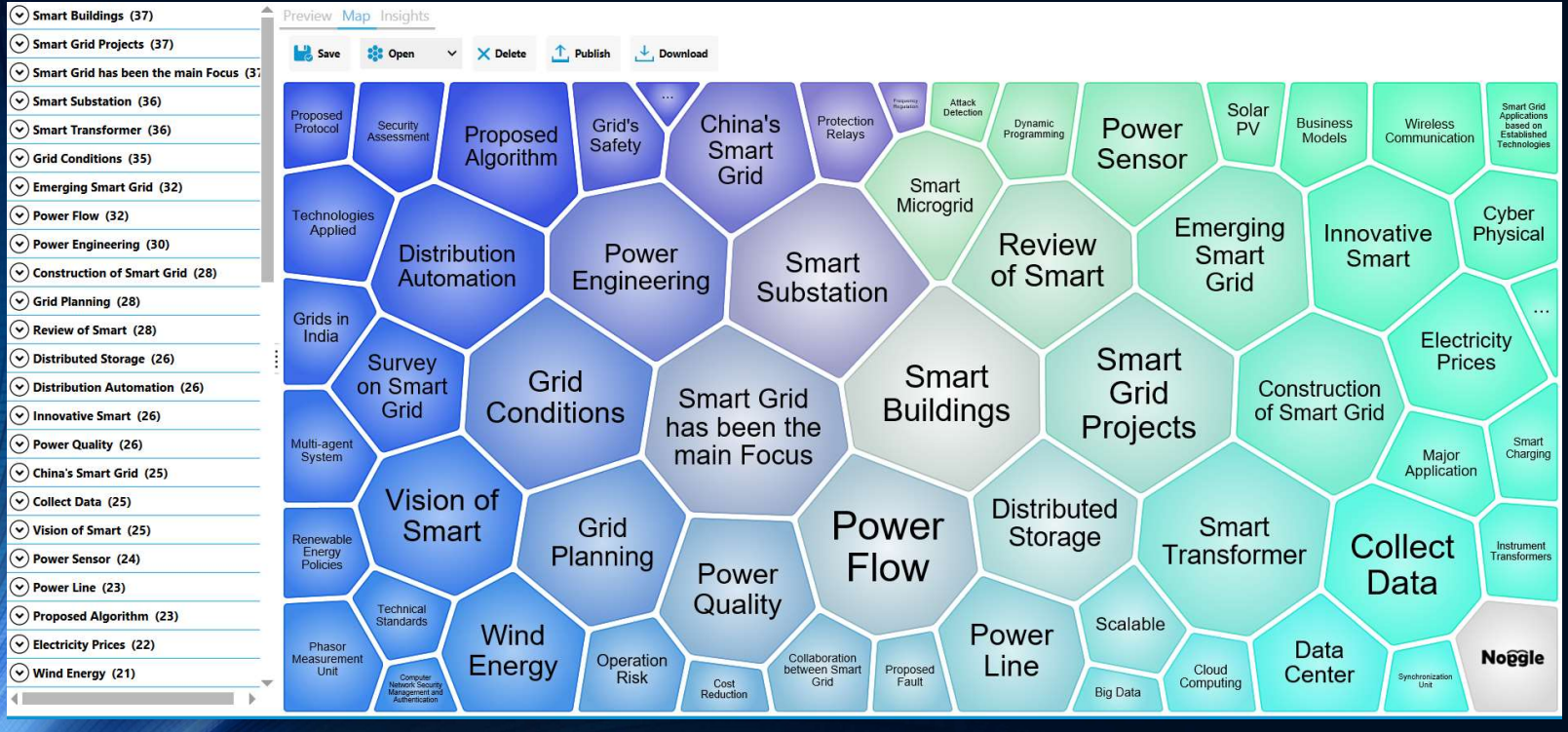
III. Scientometric Cluster Maps

SEARCHING IEEE, PATENTS AND TED TALKS ON GIVEN SUBJECTS,
APPLYING TEXT CLUSTERING AND BUILDING VISUAL TREND MAPS

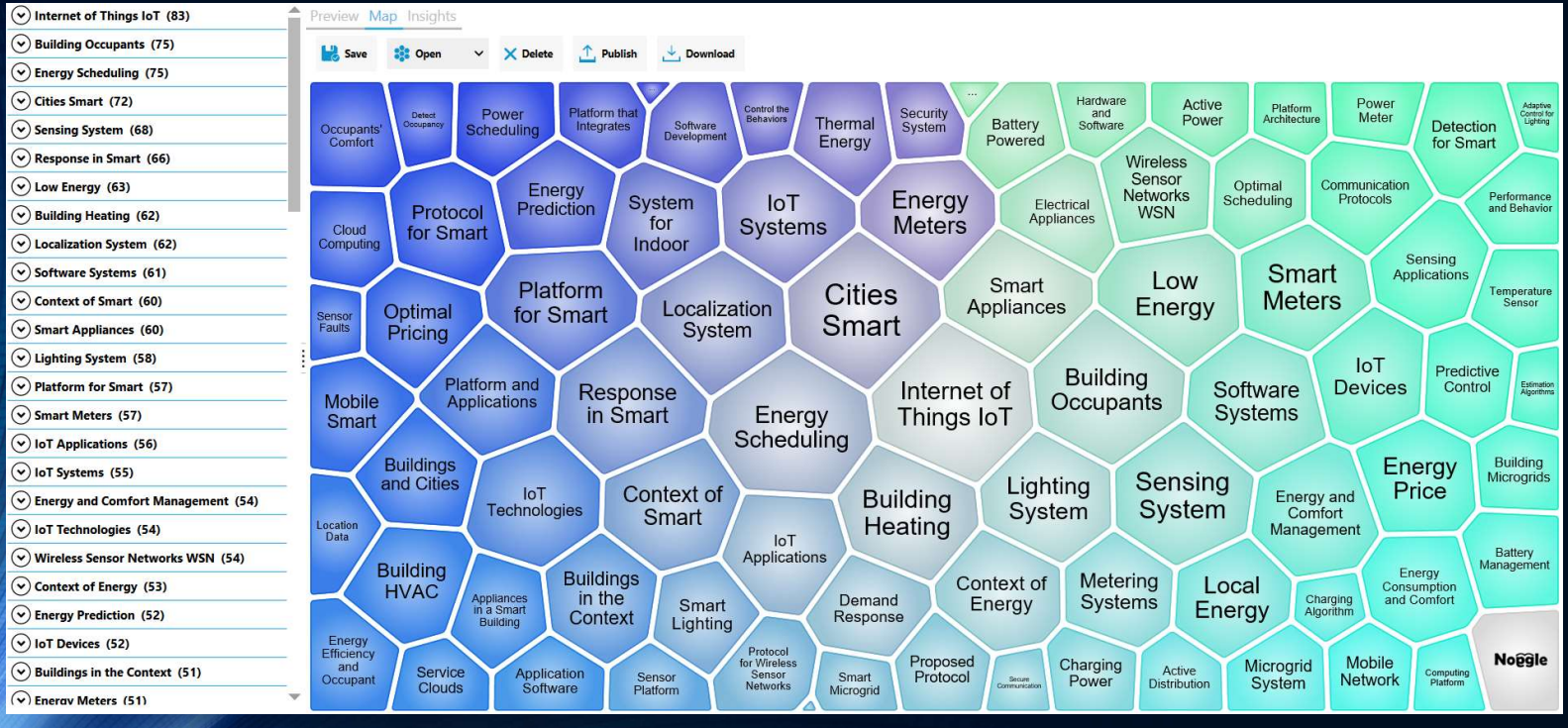
("Energy Ecosystem" AND "smart")



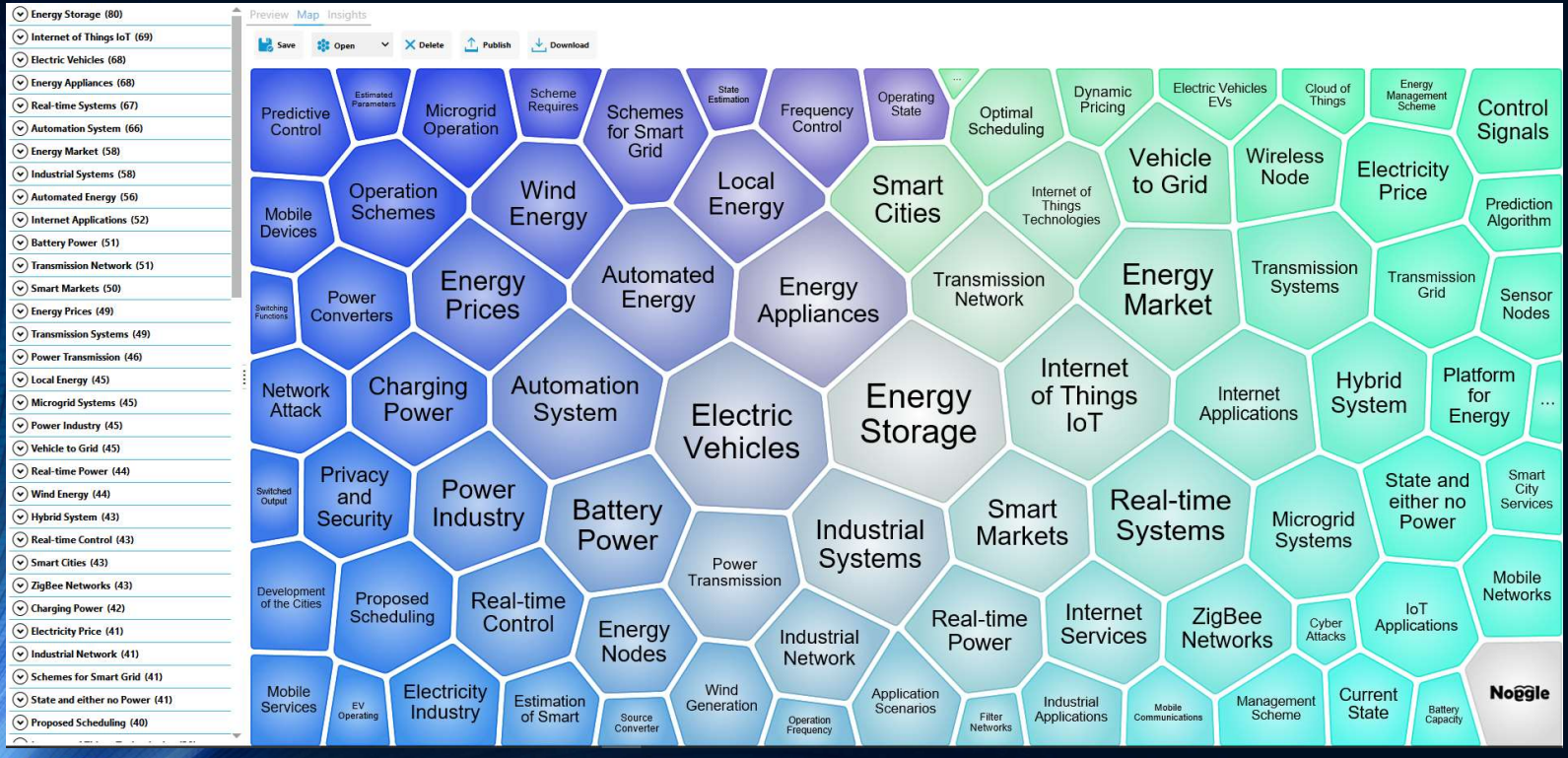
("power industry" AND "digital" AND "SMART POWER" AND "SMART GRID")



("smart building" AND "power")



Digital AND "Smart Energy"



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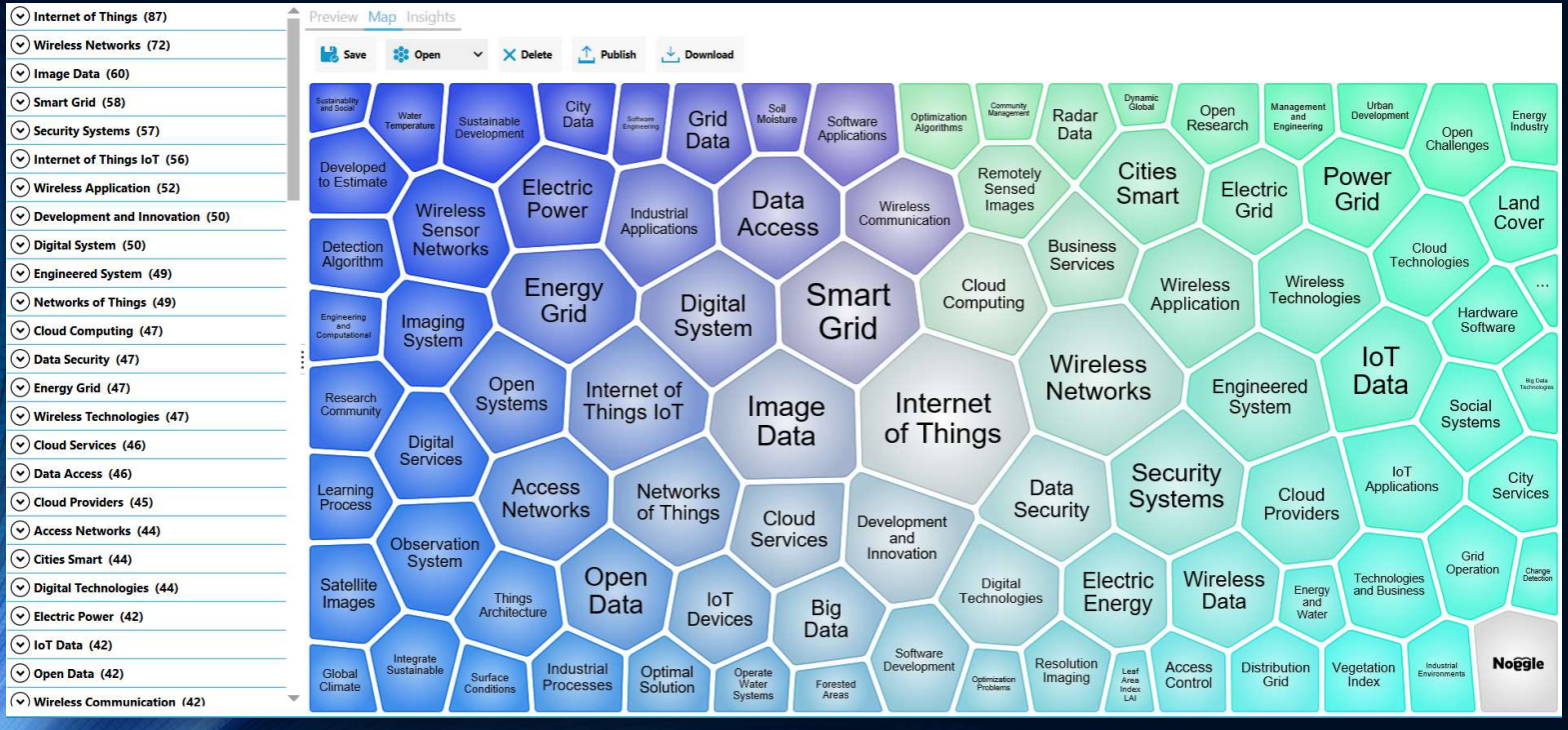
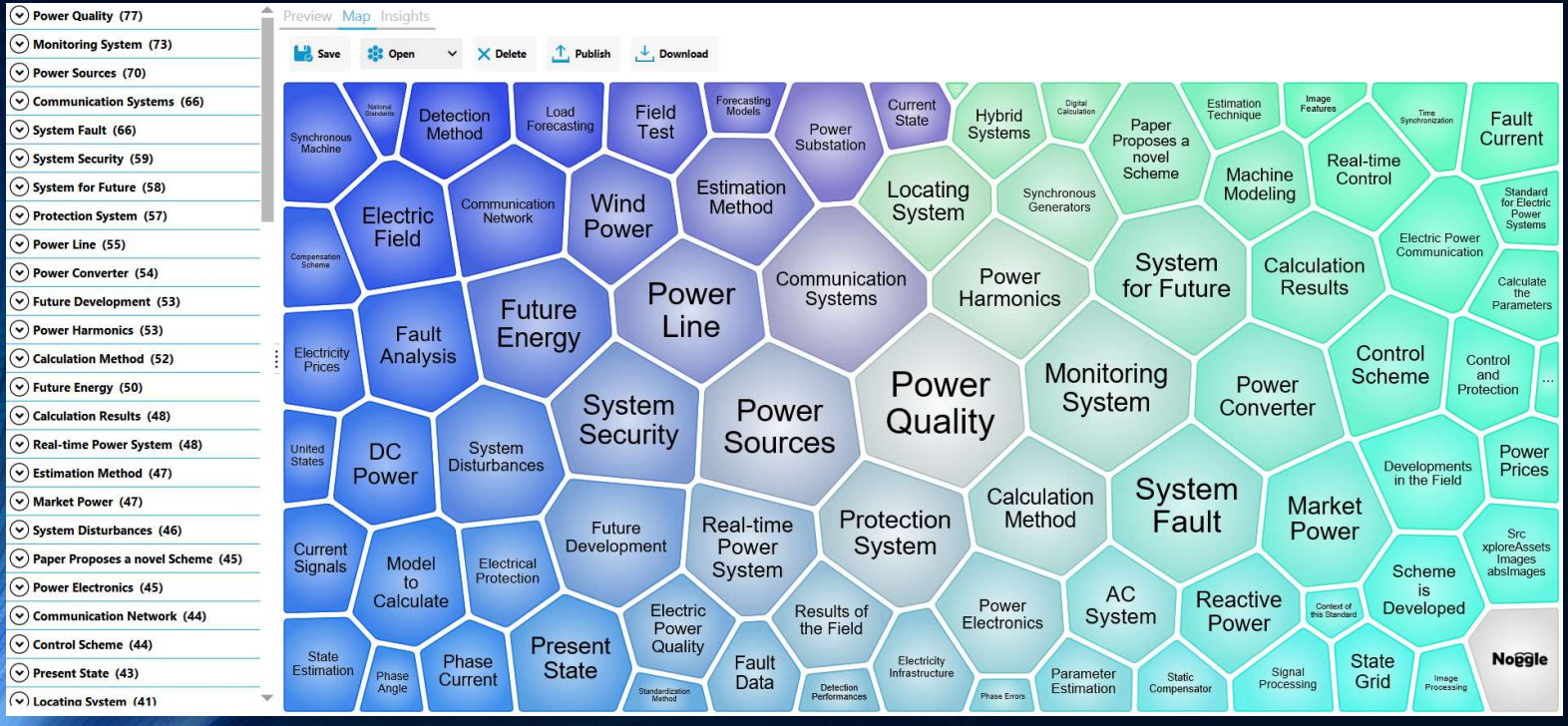
(Energy Ecosystem and digital AND future)



Source: Noggle Scientometrics cluster map based on 4.2m IEEE article universum

("power industry" AND "digital" AND "transformation")



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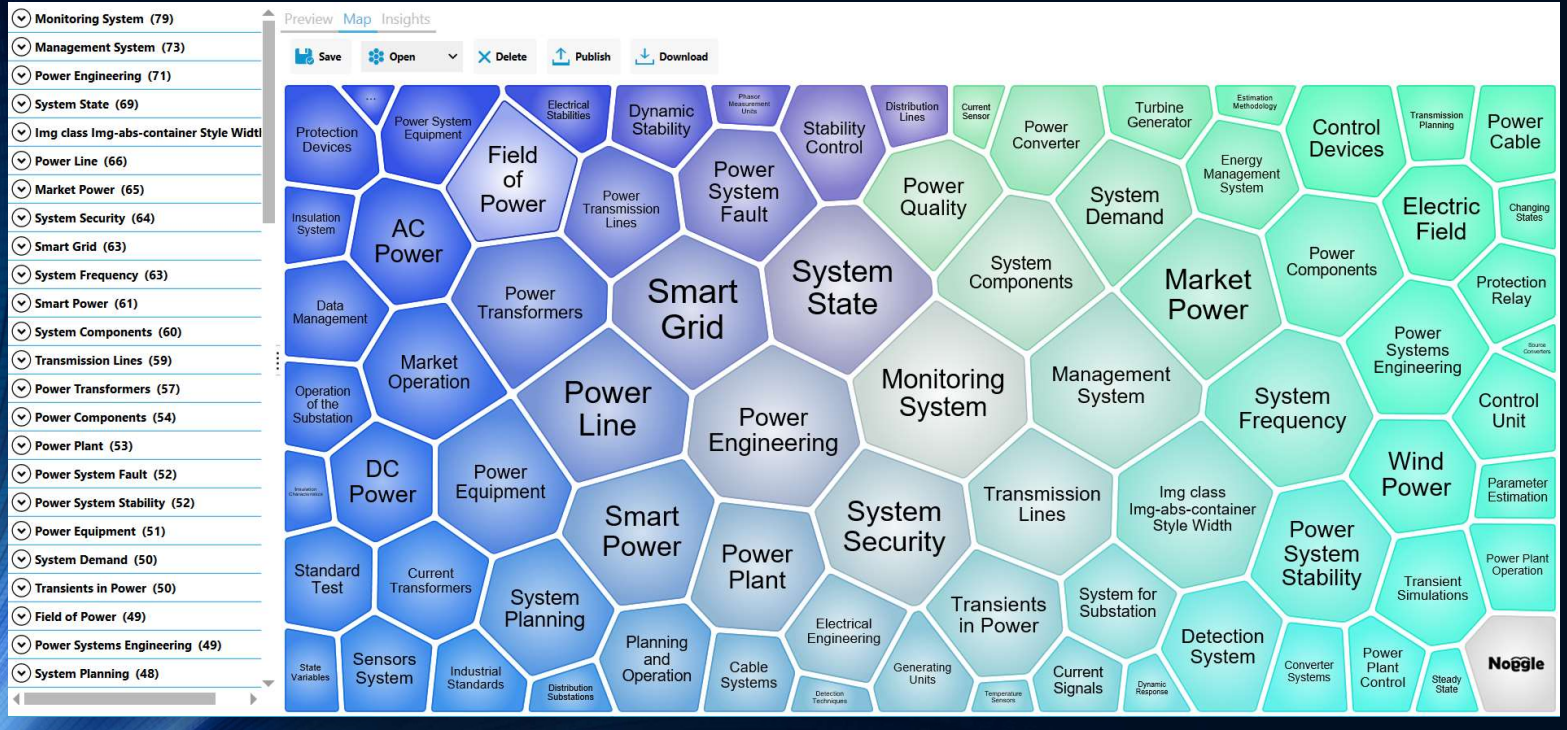
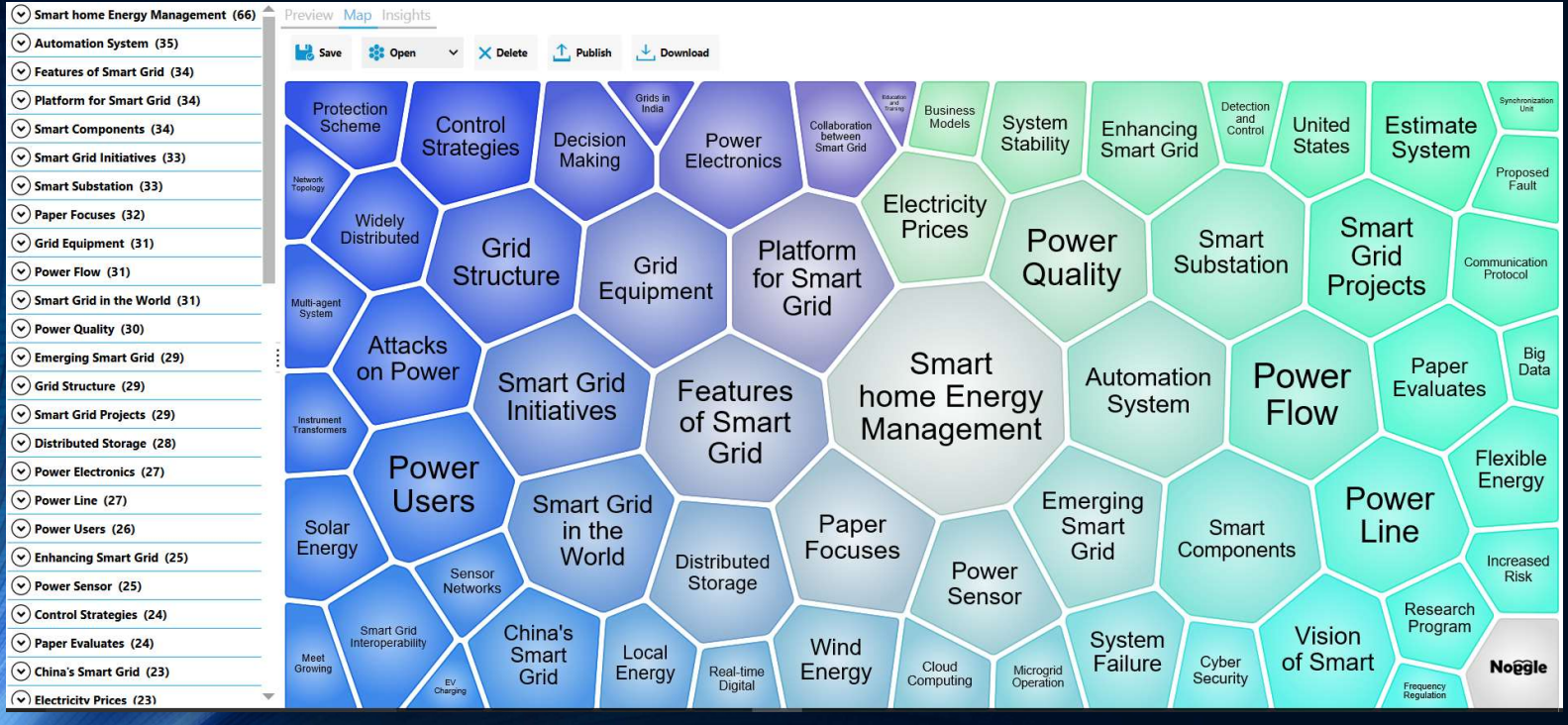
IEEE High-Level cluster search: ("power industry" AND "digital")



IEEE Cluster Search: ("power industry" AND "digital" AND "SMART POWER")



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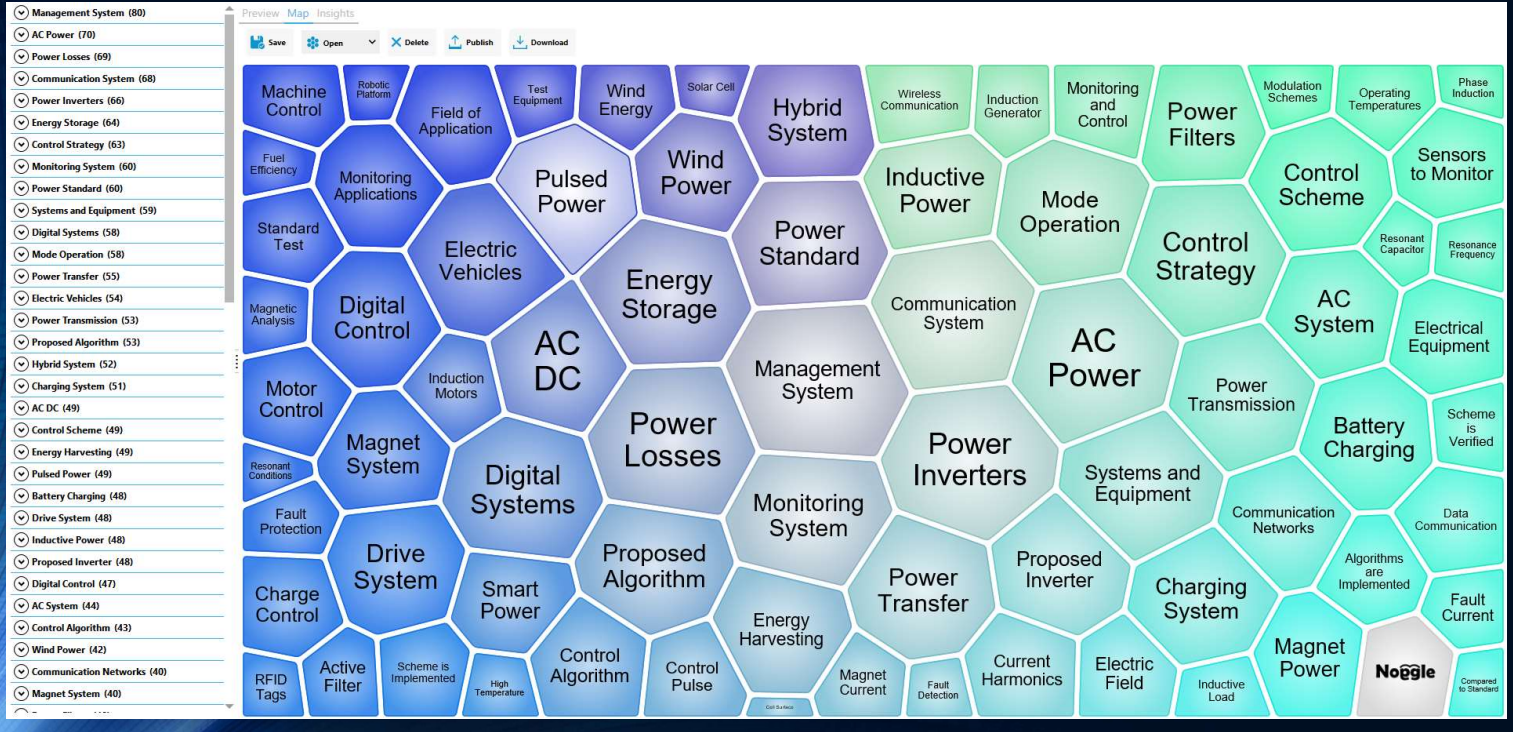
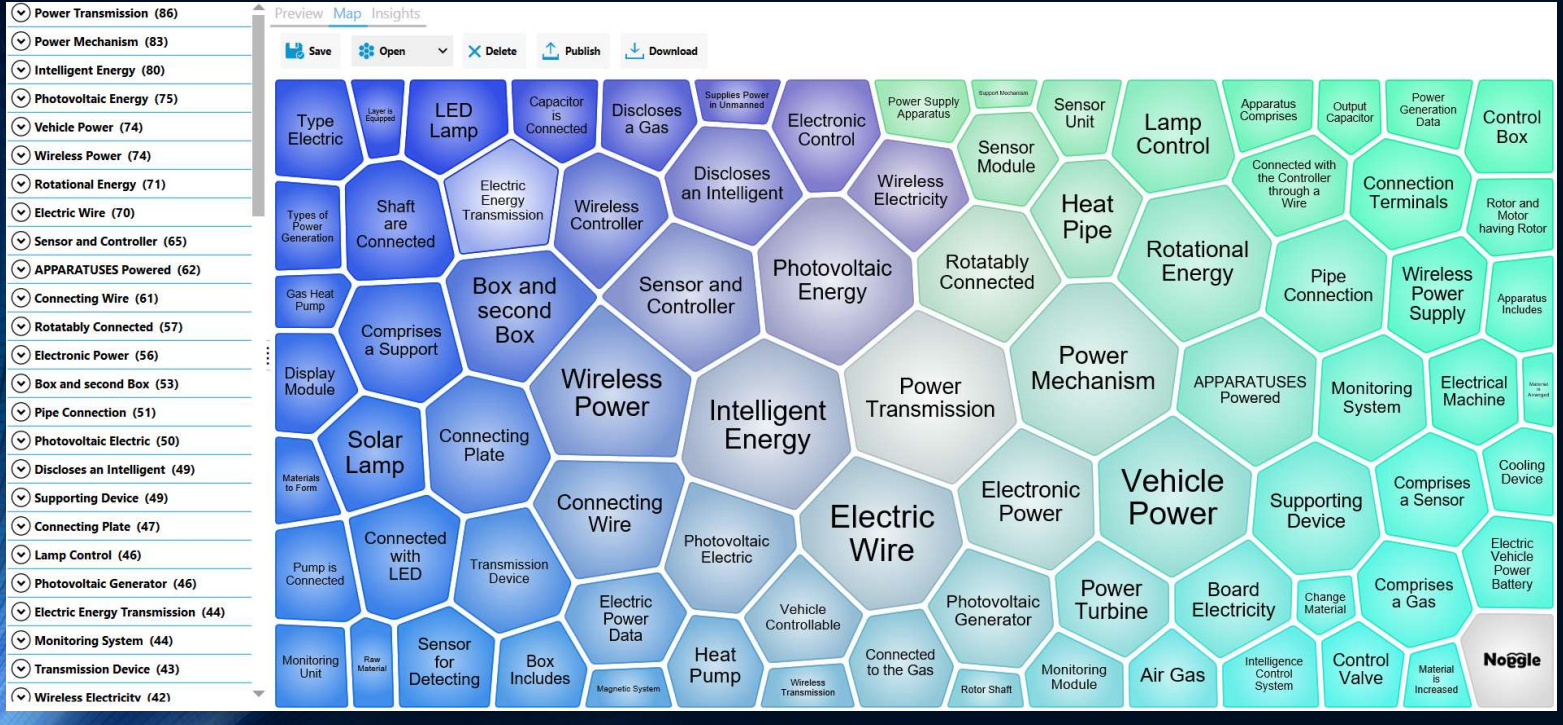
IEEE :("power industry" AND "digital" AND "SMART POWER" AND "SMART GRID" AND "FUTURE")

"Power Source" AND "energy" and "digital"



energy and power AND technology



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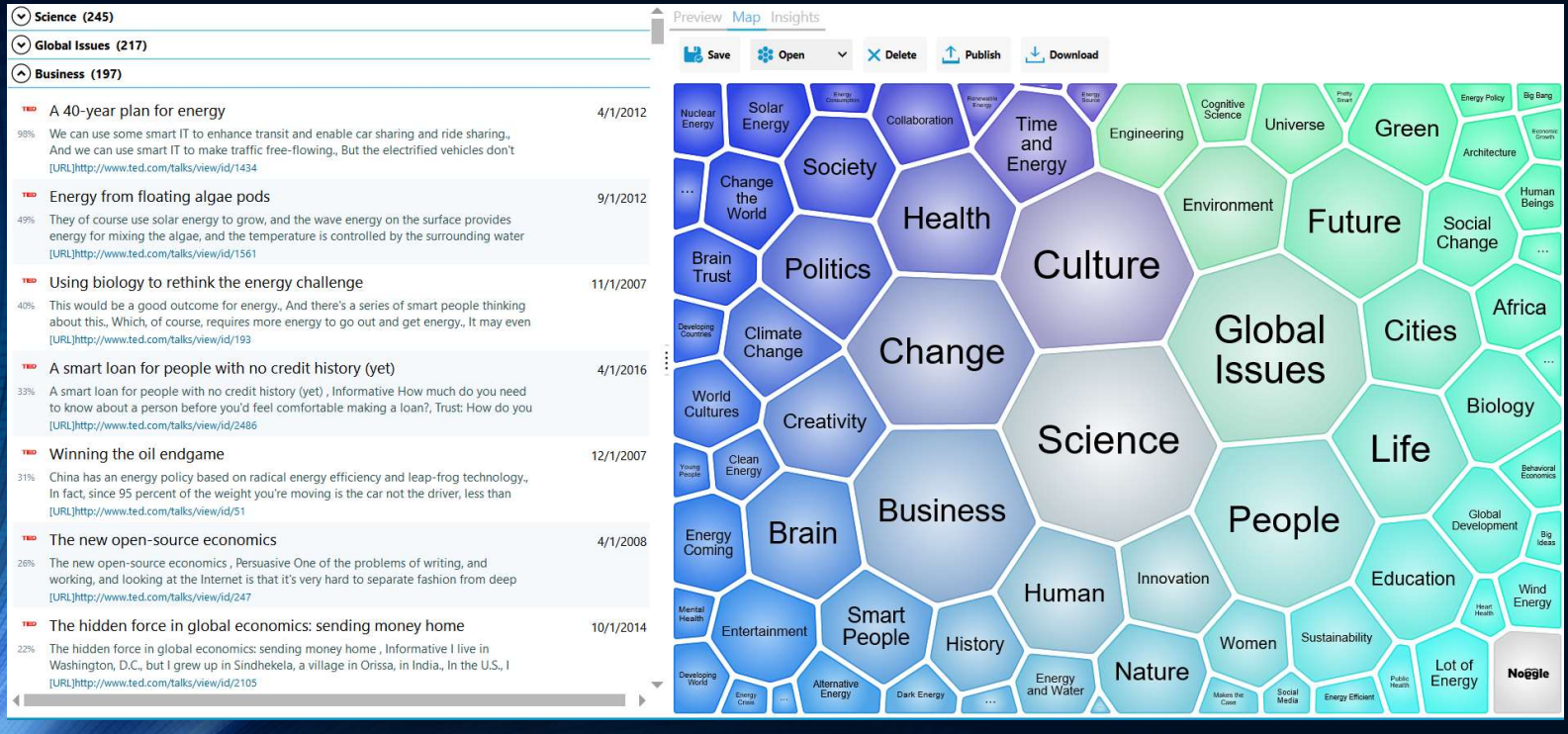
energy grid smart economics



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Want more?
Interested in deep-cluster results?

Download your Noggle application to get started.
Or get in contact with a Noggle Scientometrics Expert.

Lars von Thienen

Noggle AG
Hamburg, Germany
www.noggle.online

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