Vector_Kmean

Total Clusters: 9

Cluster Details:
1. Cluster 0 (Green Hydrogen and Renewable Energy Policies)
   - Number of Papers: 22
   - Key Topics: Green hydrogen production, economic impacts of renewable energy, environmental policies, hydrogen as an energy carrier, energy crisis management, green bond markets, carbon neutrality strategies.

2. Cluster 1 (Solar Energy Innovations and Applications)
   - Number of Papers: 10
   - Key Topics: Solar energy applications, photovoltaic technologies, solar power in energy grids, optimization of solar energy systems, impact of solar energy on national grids.

3. Cluster 2 (Battery Technology and Management)
   - Number of Papers: 4
   - Key Topics: Battery management systems, early prediction of battery degradation, fiber optic sensing technologies, false data detection in batteries.

4. Cluster 3 (Smart Energy Systems and Microgrids)
   - Number of Papers: 11
   - Key Topics: Smart grid technologies, microgrid optimization, wind power modeling, stochastic energy management, renewable energy scheduling, integration of renewable energy sources.

5. Cluster 4 (Biomedical Applications)
   - Number of Papers: 1
   - Key Topics: Biomedical applications of smart materials, self-healing hydrogels for burn wound healing.

6. Cluster 5 (Advanced Grid and Battery Systems)
   - Number of Papers: 8
   - Key Topics: Grid-scale battery systems, model predictive control in energy systems, battery dispatch and optimization, challenges in renewable-heavy power systems.

7. Cluster 6 (Advanced Materials and Electrochemistry)
   - Number of Papers: 17
   - Key Topics: Advanced materials for energy applications, electrochemical synthesis, photocatalytic systems, sodium-ion batteries, electrocatalysts for hydrogen evolution, metal-air batteries.
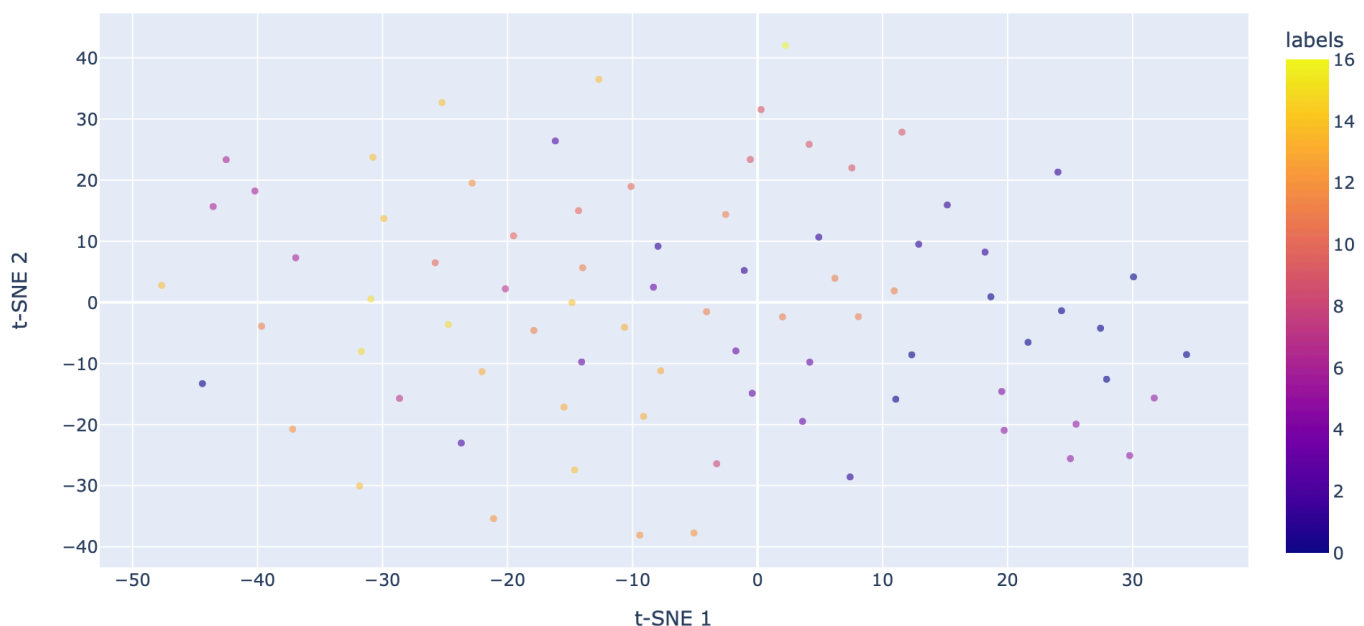
Vector_Hierarchical

Total Number of Clusters: 9

Cluster Overview:
1. Cluster 0 (Mainstream Renewable Energy and Grid Technologies)
   - Number of Papers: 54
   - Key Topics: Green hydrogen, battery management, renewable energy integration, smart grid technologies, solar and wind energy, energy storage, carbon pricing.

2. Cluster 1 (Advanced Battery Management and Security)
   - Number of Papers: 3
   - Key Topics: Battery management systems, state-of-charge balancing, false data injection detection in battery systems.

3. Cluster 2 (Advanced Materials and Electrochemistry)
   - Number of Papers: 14
   - Key Topics: Sodium-ion batteries, photocatalysis, electrochemical reduction, nanostructured electrocatalysts.

4. Cluster 3 (Nanoscale Electrochemistry Innovations)
   - Number of Papers: 2
   - Key Topics: Mass transport in electrocatalysis, nanoscale materials for water splitting.

5. Cluster 4 (Advanced Control Systems)
   - Number of Papers: 1
   - Key Topics: Model predictive control, nine-phase open-end winding PMSMs.

6. Cluster 5 (Biomedical Applications of Green Synthesis)
   - Number of Papers: 1
   - Key Topics: Smart release hydrogels, infection treatment.

7. Cluster 6 (Environmental and Renewable Energy Strategies)
   - Number of Papers: 2
   - Key Topics: Green synthesized metal nanoparticles, wastewater treatment using advanced materials.

8. Cluster 7 (Innovative Fault Diagnosis Techniques)
   - Number of Papers: 1
   - Key Topics: Semi-supervised learning for fault diagnosis in wind turbines.

9. Cluster 8 (Catalyst Development and Optimization)
   - Number of Papers: 1
   - Key Topics: Rational design and optimization of catalysts.

wordE_Kmean

Total Clusters: 11

Cluster Details:

1. Cluster 0: Renewable Energy and Environmental Technology
   - Number of Papers: 10
   - Key Topics: Solar photovoltaic, hydrogen production, water desalination, renewable energy technologies, green ammonia.

2. Cluster 1: Wind Energy and Market Impacts
   - Number of Papers: 5
   - Key Topics: Wind power modeling, energy market impacts, power grid optimization, energy planning strategies.

3. Cluster 2: Advanced Battery Technology
   - Number of Papers: 4
   - Key Topics: Battery materials, rechargeable batteries, energy storage solutions, sodium-ion technologies.

4. Cluster 3: Grid-Scale Energy Storage and Management
   - Number of Papers: 10
   - Key Topics: Grid-scale battery management, virtual synchronous generator, battery degradation, fire hazards, power system operations.

5. Cluster 4: Green Energy Policies and Economics
   - Number of Papers: 11
   - Key Topics: Green hydrogen economics, environmental innovation, carbon pricing, economic impacts of green energy, sustainable development.

6. Cluster 5: Hydrogen Energy Systems
   - Number of Papers: 10
   - Key Topics: Hydrogen production, low-carbon technologies, green ammonia applications, energy crisis management, renewable hydrogen.

7. Cluster 6: Nano-Materials and Electrochemistry
   - Number of Papers: 7
   - Key Topics: Electrochemical reduction, nano-materials for energy, photocatalytic systems, metal-air batteries, electrochemical synthesis.

8. Cluster 7: Renewable Energy Optimization
   - Number of Papers: 11
   - Key Topics: Microgrid management, renewable energy integration, photovoltaic systems design, optimal grid flexibility, renewable energy assessments.

9. Cluster 8: Advanced Control Systems
   - Number of Papers: 1
   - Key Topics: Advanced motor control, virtual vector synthesis, phase control systems.

10. Cluster 9: Biomedical and Environmental Applications
    - Number of Papers: 3
    - Key Topics: Biomedical applications, environmental catalysis, materials science.

11. Cluster 10: Data Analytics and Predictive Models in Energy
    - Number of Papers: 4
    - Key Topics: Machine learning in energy, data-driven models for energy optimization, predictive analytics in renewable energy.

wordE_Hierarchical

Total Clusters: 11

 Cluster Details:

1. Cluster 0: Energy Storage and Grid Optimization
   - Number of Papers: 20
   - Key Topics: Battery management, grid-scale energy storage, solar PV systems, energy optimization algorithms, renewable energy integration.

2. Cluster 1: Renewable Energy Policies and Innovations
   - Number of Papers: 9
   - Key Topics: Green bond markets, environmental innovation, renewable energy investments, solar energy applications and analysis, climate policy.

3. Cluster 2: Advanced Sensing and Battery Management
   - Number of Papers: 2
   - Key Topics: Fiber optic sensing technologies, false data injection detection in battery systems.

4. Cluster 3: Hydrogen Energy Systems
   - Number of Papers: 17
   - Key Topics: Green hydrogen production, hydrogen utilization in transportation, renewable hydrogen technologies, environmental impact of hydrogen technologies.

5. Cluster 4: Renewable Energy Forecasting and Management
   - Number of Papers: 6
   - Key Topics: Wind power modeling, energy demand response, machine learning applications in energy, forecasting energy market trends.

6. Cluster 5: Biomedical Applications
   - Number of Papers: 1
   - Key Topics: Biomedical use of tobramycin, self-healing materials.

7. Cluster 6: Advanced Battery Materials
   - Number of Papers: 4
   - Key Topics: Sodium-ion batteries, rechargeable batteries, advanced materials for long-cycle energy storage.

8. Cluster 7: Advanced Control Systems
   - Number of Papers: 1
   - Key Topics: Advanced motor control systems, virtual vector synthesis for PMSMs.

9. Cluster 8: Advanced Materials and Chemical Processes
   - Number of Papers: 6
   - Key Topics: Green synthesis of metal nanoparticles, catalysis, electrochemical applications, synthesis strategies.

10. Cluster 9: Photocatalytic Applications
    - Number of Papers: 1
    - Key Topics: Photocatalytic nitrogen fixation.

11. Cluster 10: Solar and Wind Energy Market Impact
    - Number of Papers: 1
    - Key Topics: Impact of solar and wind energy on electricity prices, market dynamics.

wordE_DBSCAN

Total Clusters: 7 (including noise or -1 cluster)

Cluster Details:

1. Cluster -1: Noise or Unclustered Data
   - Number of Papers: 27
   - Key Topics: This cluster includes a diverse set of topics that were not grouped into other specific clusters by the DBSCAN algorithm.

2. Cluster 0: Renewable Energy and Grid Management
   - Number of Papers: 50
   - Key Topics: Green hydrogen production, renewable energy integration, battery energy storage systems, energy grid flexibility, solar and wind energy optimization, electrochemical energy systems.

3. Cluster 1: Smart Energy Systems and Machine Learning
   - Number of Papers: 3
   - Key Topics: Machine learning applications in energy systems, smart grid technologies, predictive maintenance.

4. Cluster 2: Solar Energy Technologies
   - Number of Papers: 2
   - Key Topics: Solar photovoltaic technologies, solar thermal systems, desalination technologies using solar energy.

5. Cluster 3: Advanced Battery Materials
   - Number of Papers: 4
   - Key Topics: Sodium-ion batteries, advancements in battery materials, long-cycle energy storage solutions.

6. Cluster 4: Electrocatalysis and Materials Science
   - Number of Papers: 2
   - Key Topics: Electrocatalysis, materials science, advancements in nanostructured materials for energy applications.