



LUND  
UNIVERSITY

# Digital Tools in the Circular Economy: A Scientometric Analysis Using AI and Direct Citation Clustering

---

VINICIUS MURARO – LUND UNIVERSITY, SWEDEN  
ALYSSON MAZONI – UNIVERSITY OF CAMPINAS, BRAZIL



# Circular Economy & Digitalization

- Circular Economy (CE) aims to minimize waste and maximize resource efficiency. (Blomsma & Brennan, 2017)
- Digitalization as a driver for circularity (Pathan et al., 2023):
  - IoT
  - Blockchain
  - AI

What are the relevant subtopics in the intersection of CE and digitalization?



Source: European Parliament Research Service



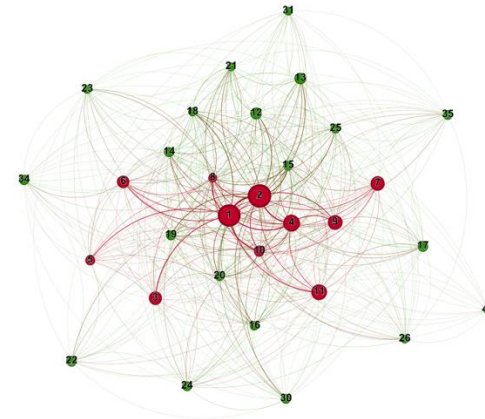
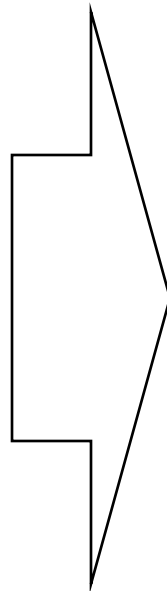
LUND  
UNIVERSITY

# Methodology



Papers related to CE and digitalization (1983 docs.) + references/citing papers **filtered by topic (CE)** (~31k docs.)

**Data Collection**



Direct citation clustering based Leiden Algorithm to group publications van Eck and Waltman (2024).

**Clustering**

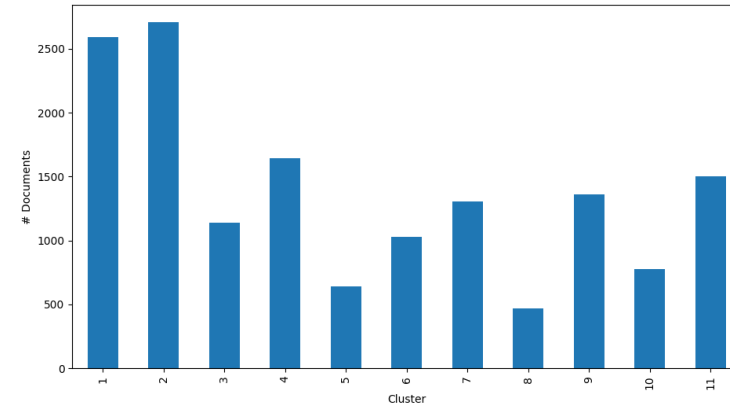
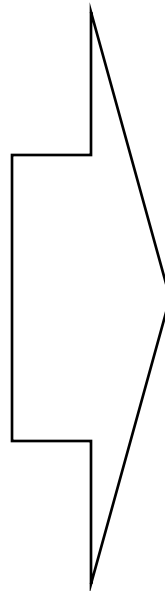


# Methodology



GPT-4 used to generate cluster names based on papers titles, improving understanding of research themes

**AI-Assisted Labeling**



Bibliometric analysis of clusters: mean publication year, title wordcloud, citations, prominent papers.

**Clusters Characterization**



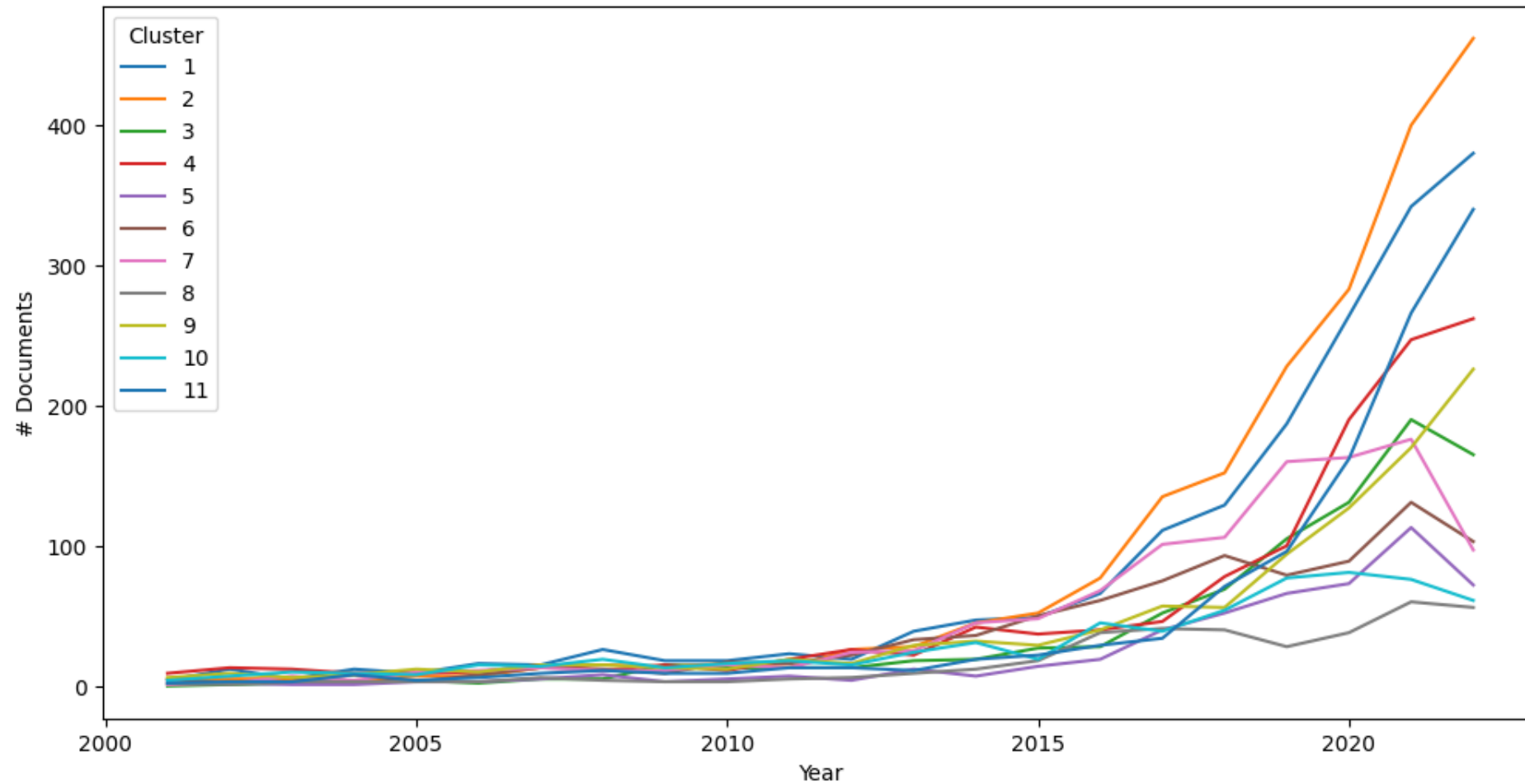
# Results:

## Clusters characterization

cluster	themes	avg_year	works	primary_count	citations	avg citations
1	Digitalization Driving Circular Economy Across Diverse Sectors	2019,2	2594	157	602852	232,4
2	Industry 4.0 Transforming Circular Supply Chains and Manufacturing	2019,5	2709	95	280171	103,4
3	Digital Technologies Enabling Circularity in Construction and Built Environment	2019,4	1137	55	138375	121,7
4	Integration of Industry 4.0, Lean, and Circular Economy in Manufacturing	2018,1	1646	40	664583	403,8
5	AI-Powered Innovations for Circular Economy and Resource Efficiency	2018,7	641	34	78756	122,9
6	Smart Remanufacturing and Product Lifecycle Extension with Industry 4.0	2017,8	1026	32	125074	121,9
7	Digitalization of Food Supply Chains and Agroindustry for Circularity	2017,7	1302	29	245915	188,9
8	Digital Twins and Smart Systems for Circular Economy in Manufacturing	2017,8	466	29	55888	119,9
9	Procurement 4.0 and Supply Chain Resilience for Circular Economy	2018,2	1359	28	463526	341,1
10	Circular Economy Adoption in SMEs and Emerging Markets	2015,5	775	28	165042	213,0
11	Blockchain and Digital Tools for Post-COVID-19 Circular Supply Chains	2019,8	1504	26	202090	134,4



# Results: Clusters publication dynamic



# Results

- Research interest in digitalization and circular economy gains traction after 2015
- Identification of subtopics as sectorial application such as cluster 3 (construction sector) and cluster 7 (food sector)
- Topics like “Industry 4.0” and “Supply Chain” feature prominently, indicating potential for integration between these fields.
- Intersection between topics is still an issue



**LUND**  
UNIVERSITY

vinicius.muraro@design.lth.se