Chapter 2
A Comprehensive Bibliometric Analysis of Soft Robotics Research: Trends, Impact, and Future Directions

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ABSTRACT

This report presents a comprehensive bibliometric analysis of the soft robotics research landscape, drawing upon a Scopus-derived dataset. The study meticulously examines publication trends, identifies influential documents, leading authors, prominent institutions, key publication outlets, and the global distribution of research efforts. Findings reveal a field characterised by exponential growth in scientific production, particularly since 2013, driven by advancements in materials science, novel fabrication techniques like 3D/4D printing, and bio-inspired design principles. The analysis highlights the significant contributions of pioneering researchers and institutions, predominantly from the USA, with a notable recent surge in output

DOI: 10.4018/979-8-3373-4652-6.ch002

from Asian countries. While the field demonstrates a robust intellectual framework and diverse applications in human-robot interaction and biomedicine, challenges about long-term durability, standardised characterisation, energy autonomy, and complex control strategies persist.

INTRODUCTION

Soft robotics is quite dynamic and involves many experts from many professions. It differs from rigid robotics. Use of flexible, compliant materials to create robots that can safely operate with people and adapt to unstructured environments is its main strength. This method mimics biological systems' complicated movements and adaptability, such as an octopus arm's precision movement or an earthworm's effortless movement. Soft robots are flexible and safe, making them a transformative tool for personalised healthcare, assistive devices, manufacturing, and environmental exploration.

A rigorous bibliometric examination is necessary to understand the dynamics, structure, and intellectual development of this burgeoning scientific field. These studies meticulously map a research topic's intellectual landscape, identifying key trends, contributions, and new fields. This report uses carefully selected Scopus data to provide a detailed bibliometric overview of soft robotics research. The purpose is to examine publishing trends and identify the most influential papers, authors, organisations, and nations. This study also seeks important topics and potential research directions. This will give academics and stakeholders a solid foundation in this new field.

METHODOLOGY

For this bibliometric analysis, Scopus, a renowned peer-reviewed literature abstract and citation database, was used. Keywords related to “soft robotics” were used to cover the domain. In Scopus soft robotics top 100 paper.csv and BiblioshinyReport-2025-07-08_jogen.xlsx, the raw data was provided. For uniformity and completeness, robotics.xlsx - Sheet.csv was used to cross-reference paper abstracts and citation counts.

The following bibliometric indicators were used:

- **Publication Volume:** Measured by the total number of articles published per year and by different entities such as authors, affiliations, countries, and publication sources.