Supplementary Information
Clutter Removal Techniques for Medical Microwave Imaging

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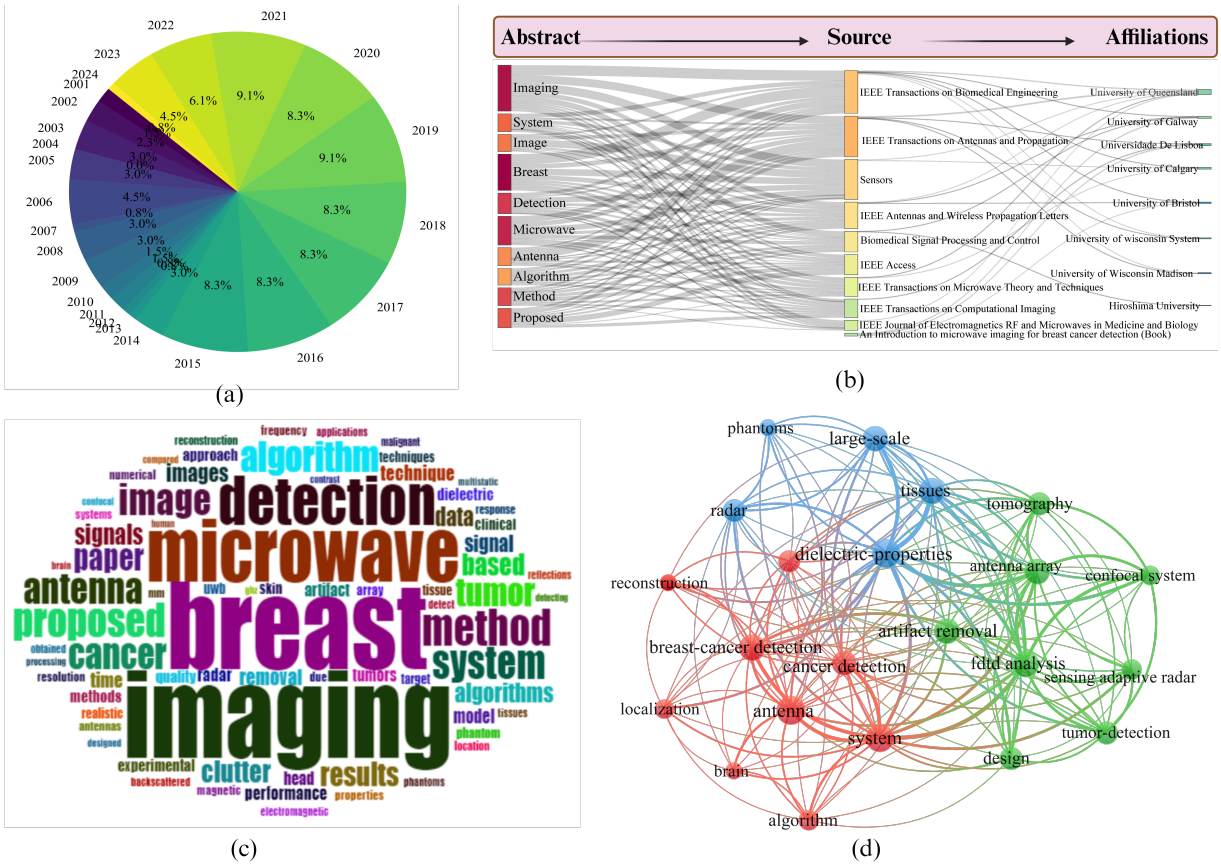
This supplementary document supports the main manuscript entitled "Clutter Removal Techniques for Medical Microwave Imaging," submitted to the *IEEE Journal of Biomedical and Health Informatics*. This supplementary file offers a comprehensive bibliometric analysis of the literature surrounding clutter removal algorithms, particularly within the context of biomedical applications. This analysis is intended to visually demonstrate the research trends, collaborations, and key thematic focuses that have shaped the evolution of this field.



(a) (b) (c) (d)

Figure 1: Bibliometric analysis of the selected studies. (a) percentage of publications per year, (b) three-field plot, (c) word cloud, and (d) Keyword co-occurrence networks.

The bibliometric analysis was conducted using two tools: Biblioshiny [1] and VOSviewer [2]. This analysis serves to highlight the field's vibrancy and depth, emphasizing its crucial role in the advancement

of clutter removal algorithms for biomedical applications. Below, we provide a detailed breakdown of the key figures generated during the analysis, each offering a distinct perspective on the research landscape.

Figure 1(a) presents the annual research activity on clutter removal algorithms since 2015, measured by the number of publications. The data reveal a consistent increase in the volume of research over time, reflecting the growing importance of this field in advancing biomedical technologies.

Figure 1(b) displays a three-field plot visualized through a Sankey diagram [3]. This plot highlights the relationships between abstracts, publication sources (i.e., journals), and author affiliations. In this diagram:

- The height of each box indicates the frequency of observed terms.
- The width of the connecting lines represents the volume of information exchange between categories.

Key findings from this plot include the dominance of terms like "imaging" and "system" in abstracts and their association with major journals such as *IEEE Transactions on Biomedical Engineering* and *IEEE Transactions on Antennas and Propagation*. Moreover, the diagram identifies the University of Queensland and the University of Galway as leading institutions contributing to research in this area.

Figure 1(c) presents a word-cloud analysis, offering insight into the most frequently used terms across the selected research papers. This visualization provides a snapshot of the key concepts that form the core of clutter removal algorithm studies, further emphasizing the thematic areas driving research within the domain.

Figure 1(d) extends the analysis by mapping the keyword co-occurrence network, identifying the interconnectedness of terms across the selected articles. Out of the 171 identified keywords, 21 meet the threshold of appearing at least five times. This network not only highlights the research hotspots but also traces the evolution of key themes and suggests emerging trends in the field.

This supplementary file offers a comprehensive bibliometric analysis of the literature on clutter removal in medical microwave engineering.

References

[1] M. Aria and C. Cuccurullo, "bibliometrix: An R-tool for comprehensive science mapping analysis," *Journal of Informetrics*, vol. 11, no. 4, pp. 959–975, Nov 2017.

[2] N. J. Van Eck and L. Waltman, "VOS: A new method for visualizing similarities between objects," in *Advances in Data Analysis: Proceedings of the 30th Annual Conference of the Gesellschaft für Klassifikation eV, Freie Universität Berlin, March 8–10, 2006*. Springer, 2007, pp. 299–306.

[3] M. Schmidt, "The sankey diagram in energy and material flow management: part ii: methodology and current applications," *Journal of Industrial Ecology*, vol. 12, no. 2, pp. 173–185, 2008.