**Proposal for Bachelor's Thesis**

**Analysis of the research field of additive manufacturing with cementitious materials through bibliometric analyses and graph-based databases**

**Supervisor**

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**Motivation**

In the last decade, the use of additive manufacturing methods with cement-bound materials has also found application in the construction industry. This is reflected in the strongly increasing number of scientific literature.

Additive manufacturing is generally referred to as an automated manufacturing process in which material is deposited layer by layer to create three-dimensional structures derived from a computer model. Additive manufacturing has become an integral part of modern product development and process technology and is used primarily in the aerospace and automotive industries and in many medical manufacturing processes. The fast and cheap production method due to automated manufacturing processes is the reason for the rapid global industrial development and expansion. The application of additive manufacturing offers optimisation possibilities in terms of quantity with the help of cycle time optimisation as well as quality through optimisation of the manufacturing processes and function integration, which effectively utilises the material used, also in combination with other materials. In the last decade, interest in additive manufacturing with cementitious materials has also increased significantly in the construction industry. With regard to the application in the construction industry, new scientific and legal-normative questions arise that need to be identified, abstracted and discussed.

**Objective**

The aim of the work is to clean up and evaluate a literature database using scientific methods of bibliometric analysis on the example of additive manufacturing with cementitious materials. Through the analysis of the social network, clusters (e.g. reinforcement strategies) of the research area are to be quantified, and their origins and development over time are to be shown. Suitable metrics are to be evaluated and analysed for this purpose.

**Work Plan**

Familiarisation with the open-source graph-based database management system "neo4j".

Familiarisation with the basics of bibliometric analyses and evaluation of suitable metrics for the use case.

Entering, completing and cleaning the data set and converting it into a graph-based database management system.

Evaluation of the data set and visualisation of the results according to the selected metrics, such as development of research branches over time, the participation of researchers in them and the emergence of new research branches.

Preparation of a text version and handout with explanation of the scientific methodology and interpretation of the results, including concrete examples from the research field of additive manufacturing.

• Thesis can both be done in English or German

**Previous knowledge**

- basic operation of a computer (desirable)

- motivation

**References**

[1] R. Todeschini and A. Baccini, *Handbook of Bibliometric Indices*. Hoboken: Wiley-VCH, 2016.

[2] A. Andrés, *Measuring academic research*. Oxford: Chandos Publishing, 2009.

[3] M. Needham and A. Hodler, *Graph algorithms*. Sebastopol: O'Reilly, 2019.