I. METHODOLOGY

A. Systematic Literature Review (SLR)

Paper Searching: We conducted literature searches in various academic databases and journals using predetermined keywords related to foundation model-based agents. This initial search aimed to gather a broad range of relevant academic publications and scholarly works (300 papers).

Snowballing: To ensure thoroughness, we applied both forward and backward snowballing techniques. Forward snowballing involved examining the citations of initially identified papers, while backward snowballing entailed reviewing references within those papers to identify additional relevant studies (100 papers).

Inclusion & Exclusion Criteria: We established a set of inclusion and exclusion criteria to filter the papers. This step ensured that only studies meeting specific relevance and quality standards were selected for further analysis.

Quality Assessment: The selected papers underwent a rigorous quality assessment process to ensure the robustness and reliability of the included studies. This step was crucial to maintain the integrity of our data extraction (66 studies).

Data Extraction: Finally, we extracted relevant data from the qualifying studies. This phase involved a detailed examination and synthesis of information from 85 studies, which were deemed suitable for our analysis.

B. Extensive Review

Grey Literature Review: Beyond academic publications, we reviewed grey literature to capture the latest trends and applications of foundation model-based agents. This included technical reports, white papers, and other non-peer-reviewed documents (9 studies).

Real-World Application Analysis: To understand practical implementations, we analyzed known real-world applications of foundation model agents. This involved scrutinizing official websites, available documents, and case studies of organizations utilizing these agents (10 studies).

C. Thematic Coding

Our thematic coding process utilized a hybrid approach, combining both deductive and inductive methods to achieve a comprehensive understanding of foundation-model-based agents. This hybrid approach allowed us to systematically categorize the extracted metrics into a structured yet adaptable framework. The predefined criteria provided a clear direction for our analysis, while the emergent sub-criteria offered depth and nuanced insights, resulting in a robust and thorough comprehension of the agents' architecture.

Deductive Coding: We initiated our process with two broad predefined criteria: functional capabilities and non-functional qualities. These criteria guided the initial categorization of the extracted metrics, ensuring a focused and structured analysis.

Emergent Sub-Criteria: As the coding process progressed, sub-themes emerged organically based on patterns, similarities, and differences observed in the data. This inductive method enabled us to capture detailed and context-specific aspects of the metrics, enriching our understanding of their interrelationships and significance.

Refinement and Integration: The emergent sub-criteria were continuously refined and integrated into the overarching predefined themes. This iterative process ensured that our thematic structure accurately reflected the complexities and subtleties of the data, providing a comprehensive framework for analysis.

Internal Validation: To validate our thematic structure, one author conducted the initial coding, followed by a review and feedback process involving six authors. This collaborative validation ensured consensus and accuracy in our categorization.

Upon completing the literature review and thematic coding, our analysis identified twelve key taxonomy branches, systematically categorized under two primary criteria: functional capabilities and non-functional qualities. These branches align with the overarching pillar criteria depicted in our taxonomy framework.

D. Development of the Taxonomy

Combining findings from the literature review, and thematic coding, we developed a taxonomy of architecture options for foundation model-based agents. This taxonomy focused on two main aspects: functional capabilities and non-functional qualities. To guide our taxonomy development, we formulated the following research questions (RQs):

RQ1: What are the **key functional capabilities** of foundation-model-based agents?

- How can we support multi-modality input and access to underlying models in foundation-model-based agents?
- How do foundation-model-based agents integrate external capabilities to enhance their operations?
- How can we design the goal-setting, planning process, action process, reflection, and learning processes, and implement them for agents?

RQ2: What are the **non-functional qualities** that influence the performance and reliability of foundation-model-based agents?

- How does the level of autonomy affect the applications of agents?
- How do different sourcing and control strategies of underlying AI technology impact foundation-model-based agents?
- How to ensure responsible AI practices in developing foundation-model-based agents?

Through this systematic and extensive methodology, we aim to provide clear and structured guidance for the architectural design of foundation model-based agents, thus supporting future research and practical application development in the field.