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Computing The Past: The Relevance Of Computational Social Science In Kerala Historiography

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INTRODUCTION

Kerala is a rich state of archival document in historical and social research. And it is a state with a richly documented and historically profound literature. Its social parameters are among the highest in the country and it has a developing intellectual community. In these historically grounded societies, however, the tactics employed to study and research the social phenomena of a community continue to rely on the more traditional, qualitative methods. The reshaping of documents and social interactions through communication and digital technology, is immediate need for the developing societies of Kerala. The revisiting of the socio-historical development of Kerala through a different computational technique is upgrade to the development of the states.

Kerala historiography is large in volume, but the data and sources are in scattered manner. For that reason, we want to merge with computational methods, it also helps to contribute the depth study of large-scale trends. Although those approaches do provide us quality insight they also do not have at their disposal the resources to analyze large data sets, digital footprints, demographic changes, and long-term social transformation. The Computational social science brings to the table-data analysis, machine learning, network analysis and digital text mining which in turn helps to put to light patterns that the traditional methods. For example, computational methods enable us to look at long term migration trends, to study political discourse over decades, to research mass movement participation across time, and to wide caste based spatial patterns.

The rise of Computational Social Science is a transformation in how we produce knowledge. We see an explosion of digital data from social media, government

databases, digitized archives and online interaction which did not exist for past historians' use.[1] The computational social science is emerging that leverages the capacity to collect and analyze data with an unprecedented breadth and depth and scale. Substantial barriers, however, might limit progress. Existing ways of conceiving human behavior were developed without access to terabytes of data describing minute-by-minute interactions and locations of entire populations of individuals. For example, what does existing sociological network theory, built mostly on a foundation of one-time "snapshot" data, typically with only dozens of people, tell us about massively longitudinal data sets of millions of people, including location, financial transactions, and communications? These vast, emerging data sets on how people interact surely offer qualitatively new perspectives on collective human behavior, but our current paradigms may not be receptive.[2]

Computational Social Science does not replace the qualitative analysis of research but rather is a tool that adds to it by which we can present large scale. In the developed countries, like Uk and US, we see the large-scale integration of Computational Social science into the main stream of social research. In the case of Kerala, we the states have that high potential workforce and resource. As the government in Kerala is also moving towards e governance and digital record keeping we are at the dawn of great opportunity for using computation in social history that is only going to grow. The presents study attempts to; (1) Looking at what is wrong with present Kerala historiography which is methodological in nature; (2) we look at the relevance and what is possible with Computational Social Science in research about Kerala; (3) we put forth a model for how to include Computational Social Science tools into social science research; and (4) we use case studies to show what Computational Social Science can do. Our questions revolve around the main issue of how Computational Social Science may transform the study of Kerala's history and present reality also which includes issues of data access, method adaptability, and ethics. The study focus on the historiography of Kerala, digital data environments, computational methods useful for social research, as well as future avenues for methodological innovation.

MEANING AND EVOLUTION OF COMPUTATIONAL SOCIAL SCIENCE

Computational Social Science (CSS) is the interdisciplinary subject of social science where computational techniques, digital data and algorithmic tools are applied to the study of social science subject. It stemmed from the fusion of social sciences, computer science, statistics and network theory. This discipline extends to traditional research and it incorporates the use of large-scale data management, the digital analysis, and automated analytical methods that enable scholars to record the complex patterns of behavior, interaction, and change.[3] Since 1964, the practice of referring to a computer era in terms of generations came into wide use. The computer generation is an indication of the period wherein a particular kind of electronic components was used in computers.[4]

The evolution of computational social science can be traced back to the early stages of using computers in demography and sociology but its real growth was in the development of digital communication technologies during the end of the twentieth century. The emergence of the internet, social media and digitization projects by government agencies provided a database, mobility statistical data, online communication data and administrative data which created a rich ground for computational enquiry.[5] As we know that the era of Artificial Intelligence is more powerful method in the computational social science. Apart from, the AI analysis of large data sets in the social science discipline is very necessary for this century, at the same time the uses of AI platforms are merits and demerits in different dimension. In addition, in 2000 onwards, the scholars studied using digital footprints on an unprecedented scale. Since 1964, the practice of referring to a computer era in terms of generations came into wide use. The computer generation is an indication of the period wherein a particular kind of electronic components was used in computers.

In modern research, Computational social science is not actually seen as a set of tools and is viewed as a new epistemological framework. It urges scholars to move away from interpretation and small-samples models toward hybrid models that integrate quantitative depth with qualitative insight. And in this discipline, it transforming the development of social scientists in recognition of patterns in history. The fundamental power of CSS in the social science is the integration of computational methodologies to provide large scale, multi-layered social analysis. In addition, Data mining is the process

of extracting patterns, trends, and meaningful relationships from large amounts of data using algorithms and statistical models. It enables scholars to analyses administrative data, census archives, crime logs, social records and to try to reveal hidden historical or social dynamics.[6]

a) **Text analytics** Text analysis arguably originated as early as the 1200s with the Dominican friar Hugh of Saint-Cher and his team of several hundred fellow friars who created the first biblical concordance, or cross-listing of terms and concepts in the Bible.[7] The field of text analysis expanded rapidly in the 20th century as researchers in the humanities and social sciences developed a broad spectrum of techniques for analyzing texts, including methods that relied heavily on human interpretation of texts as well as formal quantitative methods.[8]

b) Network analysis means that its analysis the individuals, groups, or institutions connect through social, political, or economic interactions. In mapping these networks, historians and social scientists can understand kinship patterns, political alliances, reform movements, caste associations, or trade routes. Network visualizations reveal influential actors, central nodes, and the structure and pattern of social relations.[9]

c)Geographic Information Systems (GIS): In Social science research, the geographical study is essential for depth analysis; especially in the archeological analysis of historical change. In addition, the GIS helps researchers map land use, migration patterns, spatial inequality, or distribution of institutions. It is particularly useful in Kerala studies due to the state's demography, long history of land reforms, caste geography, coastal livelihoods, and spatial governance.[10]

Bases on these computational concepts provide powerful analytical tools that enrich traditional qualitative interpretation. They allow scholars to combine textual, numerical, spatial, and relational data, giving rise to more integrated and multi-dimensional research frameworks.

THE DIGITALISATION OF HUMANITIES

The "DIGITALISATION" in the humanities refers to the broad transformation in humanities scholarship resulting from digital technologies, digitization of archives, and new computational tools. This shift has expanded how historians and humanists access sources, interpret data, and present research.[11] Large-scale digitization initiatives such as archival scanning projects, digital libraries, and open-data movements have made primary materials more accessible than ever. Researchers can now work with thousands of documents, newspapers, photographs, and court records without physical constraints.[12] The advanced level of computational methods like, Text analysis, 3D modelling, virtual reconstructions, and digital storytelling allow scholars to reinterpret cultural and historical material. Digital platforms support interactive timelines, geospatial visualizations, and multimedia presentations that enhance public engagement with history.[13]

Globally, Digital Humanities expanded interdisciplinary collaboration between historians, computer scientists, geographers, and data analysts. And it emphasizes methodological innovation, collaborative research, and public-facing scholarship.[14] For Kerala, the digitalization is especially significant because it coincides with rapid expansion of government digitization initiatives, digital archives, Aadhaar-linked population data, and extensive newspaper digitization. These developments generate new opportunities for historical research and social analysis. Thus, the digital turn marks a change in basic assumptions: the humanities are no longer confined to textual interpretation but are now integrated with computational, statistical, and visual analytical approaches.

REIMAGINING KERALA'S HISTORIOGRAPHY THROUGH COMPUTATIONAL SOCIAL SCIENCE

In Kerala's historiography has shaped by narrative and interpretive traditions influenced by Marxist, nationalist, subaltern, and feminist perspectives.[15] This style produced rich analyses of caste, land relations, reform movements, and gender, but they relied primarily on textual reading and qualitative interpretation. The direct connection with Computational Social Science remains limited, for that reason the foundations for such integration have gradually emerged. A major turning point came with the digitization of

archival collections, census reports, court judgments, and newspapers by the Kerala State Archives and related institutions.[16] These digitized repositories created opportunities for large-scale data analysis, although few historians have yet applied computational methods systematically. Scholars studying demography, migration, and land reforms have occasionally used quantitative tools, signaling the early stages of computational influence in Kerala-focused research.[17]

The emerging research in digital humanities further demonstrates how computational tools can be applied to Kerala studies. Text-mining projects involving Malayalam literary collection and digitized newspapers, and archival sources have used topic modelling and sentiment analysis to examine linguistic patterns, political discourse, and cultural change.[18] While these works are not strictly historical, they offer methodological models for applying similar techniques to Kerala's historiographical materials. Geographic Information Systems (GIS) based studies examining land tenure, agrarian change, environmental history, and urban development highlight the potential for reconstructing long-term historical transformations.[19]

COMPUTATIONAL ANALYSIS OF KERALA'S HISTORICAL DATA

a) Document Storage and Retrieval System

Scanning, also known as Image technology is a technique used for storing documents which may contain text and pictures, in the computer media. The instrument called a scanner or digitizer converts the document into a series of bits, '1" s and '0' s which is stored in the computer media can later be reviewed on the screen, or even transferred to another computer if required.[20]

In addition, Another application of computer graphics is in the area of developing images of human faces based on descriptions and is used for clarity and more imaginative study in past. Textual analysis can reveal how certain terms, identities, and institutions rise or decline in public discourse over time. For example, analyzing Malayalam newspapers from the early twentieth century can highlight shifts in attitudes toward reform, education, caste mobility, or women's empowerment. Computational sentiment analysis

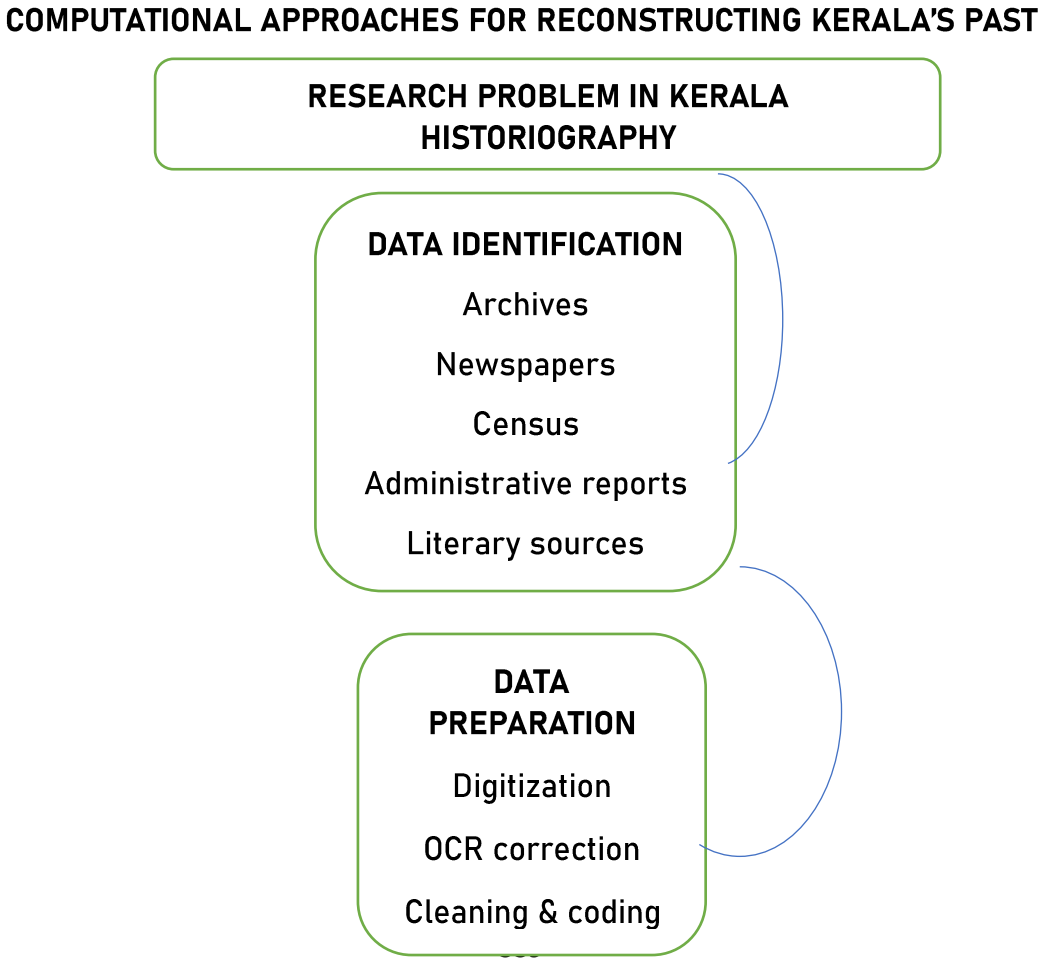
also enables tracking of public emotional tone during major historical events like the Vaikom Satyagraha or the Punnapra-Vayalar struggle.[21]

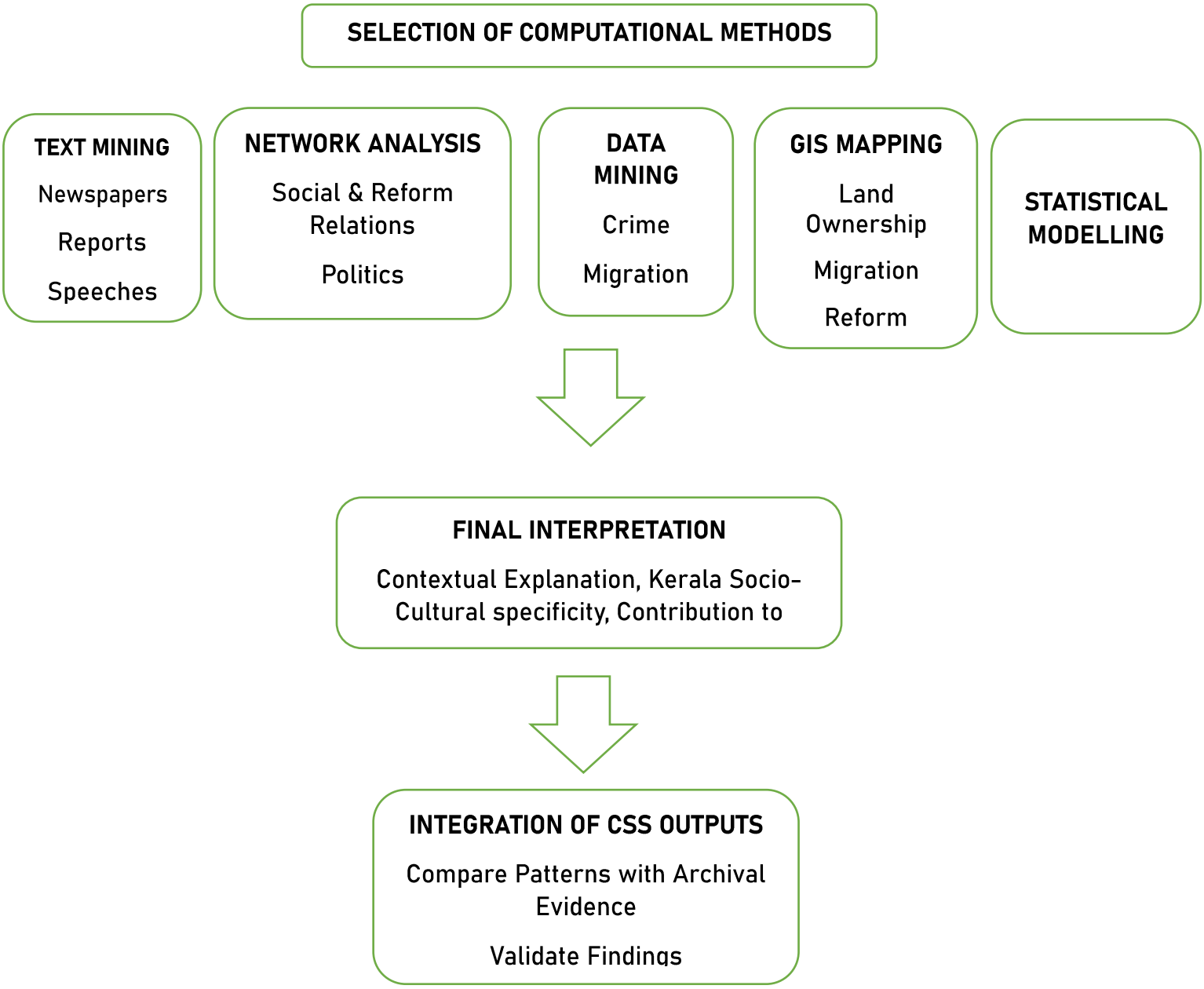
b) Document Transmission System

A typed/printed document containing text/data/pictures can be transmitted electrically through a fax machine, sending files to the mail and medium of transmission. And this technology is also used for transmitting paper documented pages through internet.

c) Editing and Processing of Historical sources

The data sources are systematically arranged and summarized to the file is the herculean task for every historian. Even the large documents like Newspaper, Archival data, Court records are analyzing the design for the conduct of the matching exercise depends upon the time schedule for completing various stages. As we know that, the entry of data in multiple times and repeated time is very rare in the history. In the computational method, the management of the approaches can be reduced.





STRENGTHS AND LIMITATIONS OF COMPUTATIONAL SOCIAL SCIENCE

Computational Social Science has emerged in the study of society, enabling scholars especially historians and social scientists to engage with large-scale digital datasets in ways that were previously impossible. One of the major advantages of this is its capacity to analyses massive and diverse datasets, allowing researchers to identify long-term trends, correlations, and hidden patterns that traditional qualitative methods may

overlook.[22] Tools such as machine learning, modelling, and automated text analytics further enhance analytical precision, reducing subjective biases and improving replicability in research.[23] In addition, the key strength of Computational technology in interdisciplinary nature, as it overlap with history, sociology, political science, computer science, and data analytics, thereby expanding research possibilities.[24] Additionally, the implementation of computational methods in the social science is one step more advanced in the credibility and accountability of the scholars.

Despite its benefits, The Computational Social science also faces several limitations. Historical datasets may be containing the plagiarism and unauthorized manner, for that the lack of data in multiple entries in multiple times. Moreover, the reliance on quantitative modelling may result in the loss of contextual depth, as computational outputs sometimes overlook cultural nuance, subjective experiences, and narrative richness that are central to humanistic inquiry.[25]

CONCLUSION

The implementation of Computational Social Science into the study of Kerala's past offers a powerful framework for interpreting historical data in new and systematic ways. Computational findings derived from text mining, network analysis, GIS mapping, and statistical modelling reveal deeper structural dynamics such as caste hierarchies, spatial reorganization, political networks, gendered experiences, and institutional transformations that traditional archival reading alone cannot fully capture. These methods highlight patterns and long-term shifts by converting dispersed archival materials into analyzable datasets, enabling historians to trace continuities and transitions across centuries with greater precision.[26]

A major strength of Computational Social Science lies in its scalability and ability to incorporate multiple data types census tables, newspapers, legal records, administrative documents, and local narratives into unified analytical frameworks. This multidimensional approach helps correct the limitations of narrative dependence and introduces reproducibility into historical interpretation, strengthening the analytical foundations of Kerala historiography.[27] Moreover, Computational technology encourages

the interdisciplinary dialogue, bringing together historians, data scientists, linguists, geographers, and social theorists to collaboratively reinterpret Kerala's socio-cultural evolution. At the same time, significant methodological challenges remain. Historical datasets from colonial and early postcolonial Kerala often contain gaps, partial representations. The digitized Malayalam and English documents, and the risk of reducing complex cultural experiences into numerical abstractions also remind researchers of the importance of contextual sensitivity.[28] Thus, computational methods must be used alongside qualitative reading, hermeneutic analysis, and grounded historical understanding.

Despite these constraints, Computational Social Science contributes substantially to Kerala historiography by expanding the scope of inquiry and enabling historians to uncover hidden patterns and forgotten voices. Future more research should focus on improving digitization quality, developing Malayalam-friendly analytical tools, and designing ethical frameworks for data use.

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