AMRITA VISHWA VIDYAPEETHAM, AMRITAPURI

B. Tech CSE (ARTIFICIAL INTELLIGENCE)

LITERATURE REVIEW SUBMISSION

1. **Group No: 47**
2. **Guide Name: Geetha Lekshmi V**
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4. **Problem Definition (minimum 5 line):**

Edge-Deployable Multimodal Learning Framework for Predicting Long-Term Disease Risk in Elderly Populations

Problem Statement

Current disease prediction systems for elderly populations are limited by high computational requirements, inadequate adaptability to diverse data modalities, and challenges in deployment within resource-constrained environments such as care homes. There is a pressing need for flexible, efficient predictive models that can integrate heterogeneous health data, ensure robust performance across varied cohorts, and operate effectively on edge devices to democratize access to advanced preventive healthcare.

5. **Literature survey Summary Table (Minimum 15 papers)**

Sl No	Author(s) & Proceedings	Year	Journal/ Impact Factor	Citations	Dataset Used	Methodology/ Approach	Limitations & Future works	Ref patent(if product based project)
1.	Literature survey excel sheet							

6. **Identified Research Gaps:**
   - Existing works focus on self supervised contrastive learning but never on self supervised reinforcement learning which would be better for time series data.
   - Most studies conducted experiments on adding more and more modalities like respiratory signals and brain activity signals to the data to extract complementary information for the embeddings but failed to reduce the load of such huge models to be edge deployable or light weight requirements are needed such as old age homes where resources are limited.
   - Studies have incorporated channel agnostic multi modal frameworks but not arbitrary and heterogeneous modalities, such fusions technologies are still unexplored.

- Many research articles mention health prediction using sleep staging but never a long term health prediction due to high variance in day-to-day life.
- Almost all researches focus on the general population for health mortality predictions but never focus on the elderly where the conditions such as cardiovascular diseases, Parkinson's and Alzheimer's are most prominent.

7. **Novelty / Contribution of the Proposed Work**
    - Design and implementation of a lightweight framework that adaptively selects and fuses multiple heterogeneous data modalities for disease risk assessment, optimizing both accuracy and inference efficiency.
    - Development of a modality selection strategy that enables cost-aware deployment by minimizing unnecessary data acquisition and computational overhead without compromising predictive performance.
    - Comprehensive validation across aggregated, diverse datasets, demonstrating the model's ability to generalize to new cohorts and settings, thereby increasing the clinical robustness and translational potential of the approach.

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