**Proposed Methodology**

**This workflow outlines a secure system for cardiovascular disease (CVD) detection using Deep learning. It prioritizes data privacy and utilizes medical expertise throughout the process.**

1. **Sender:**

* **Data Selection:**
  + Cardiac Images: Utilize a well-curated dataset from a reputable source focusing on CVD diagnosis, like the one referenced in "<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6992607/>". These datasets often include images from various modalities (Echocardiogram, CCTA, etc.) for diverse CVD types.
  + Historical Data: Include relevant data points from EHRs, such as demographics (age, gender), medical history (family history of CVD, smoking, diabetes, hypertension, cholesterol), lifestyle factors (BMI, physical activity), medications, and lab results (blood sugar, cholesterol levels). Consider "<https://www.kaggle.com/datasets/sulianova/cardiovascular-disease-dataset>" as a starting point, ensuring compliance with data privacy regulations.
* **Data Encryption:**Implement a robust encryption method to encrypt patient data before transmission. This safeguards sensitive information from unauthorized access and implement access control mechanism to grant access to different users.

1. **Data Transmission via blockchain**

* Utilize blockchain technology for secure and tamper-proof data transmission. Blockchain offers a distributed ledger system that ensures data integrity and prevents unauthorized modification.

1. **Disease Detection phase**

* Data is decrypted via hybrid decryption algorithm. Then, its pre-processed and features are extracted. Using the extracted features, the deep learning model is trained.

**Data Preprocessing**

* **Image Preprocessing:**
  + Resize images using Bilinear Interpolation.
  + Apply Gaussian Smoothing for noise reduction.
* **Historical Data Preprocessing:**
  + Clean data to address inconsistencies or errors.
  + Handle missing values using techniques like mean/median imputation or model-based methods. Flag missing values for which imputation is not appropriate.
  + Apply z-score scaling for standardization.

**Feature Extraction**

* **Cardiac Image Feature Extraction:**
  + Utilize pre-trained models like VGG-19 for feature extraction.
  + Extract Haralick texture features and compute shape-based features.
* **Historical Data Feature Extraction:**
  + Compute statistical features (mean, median, standard deviation, kurtosis) and consider additional features like medication use or lab results.

**Feature Fusion**

* Combine features from different modalities using weighted averaging. Assign weights based on feature importance determined through domain knowledge or feature selection techniques.

**Optimal Feature Selection**

* Utilize a hybrid optimization model to select the most informative features for CVD detection.

**CVD Detection**

* Develop an architecture for CVD detection and Train on a large, high-quality CVD dataset.

Incorporate feedback from medical experts on the model's performance and effectiveness in real-world scenarios.