# Supplementary Figures

A diagram of a medical research

Description automatically generated with medium confidence

**Supplementary Figure 1.** The basic idea of our approach: The process of converting various medical data types–such as images, signals, and text–into a labeled training dataset, which is subsequently transformed into feature matrices where rows represent labeled samples and columns correspond to extracted features, organized by clarity for model development.

![A diagram of steps and steps

Description automatically generated]()

**Supplementary Figure 2.** Diagram of the basic approach to derive the transition matrix *T* from input matrices *A* and *B*, involving three main steps: visual analytics of the matrices, defining matrix *A*+, and establishing matrix *T*, which serves to interpret DL model outputs in terms of human-expert features.

A diagram of steps and steps

Description automatically generated

**Supplementary Figure 3.** Diagram that outlines the proposed sequential approach to constructing matrix *B* from an initial dataset, through steps including compiling a feature list, defining numerical intervals, selecting techniques to extract features, validating feature selection, and ultimately constructing matrix *B* based on the defined transition matrix from the deep learning model to the feature model.

|  |  |
| --- | --- |
| A red line graph on a white background  Description automatically generated | A red line graph with a white background  Description automatically generated |
| (**a**) | (**b**) |

**Supplementary Figure 4.** This figure presents an ECG signal fragment displaying a triad of cardiac cycles, where (**a**) illustrates a heterogeneous appearance of the R peak, while (**b**) shows a homogeneous expression of the R peak across cycles.

![A diagram of a red and blue component

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**Supplementary Figure 5.** The results of applying PCA to classify data based on the "Absent P peak" feature, showing data points distributed across three principal components for visualization of feature separation.

|  |  |
| --- | --- |
| A stack of colorful plates  Description automatically generated with medium confidence | A close-up of a stack of colorful circles  Description automatically generated |
| (**a**) | (**b**) |

**Supplementary Figure 6.** A 3D visualization of segmented MRI data prepared for classification, with images from the ES phase in (**a**) and the ED phase in (**b**), while preserving MRI signal intensity values across layers for enhanced phase differentiation.