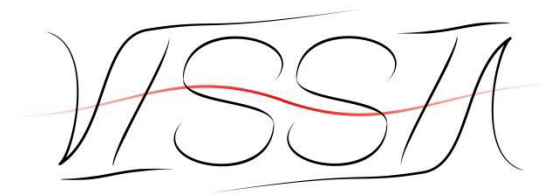
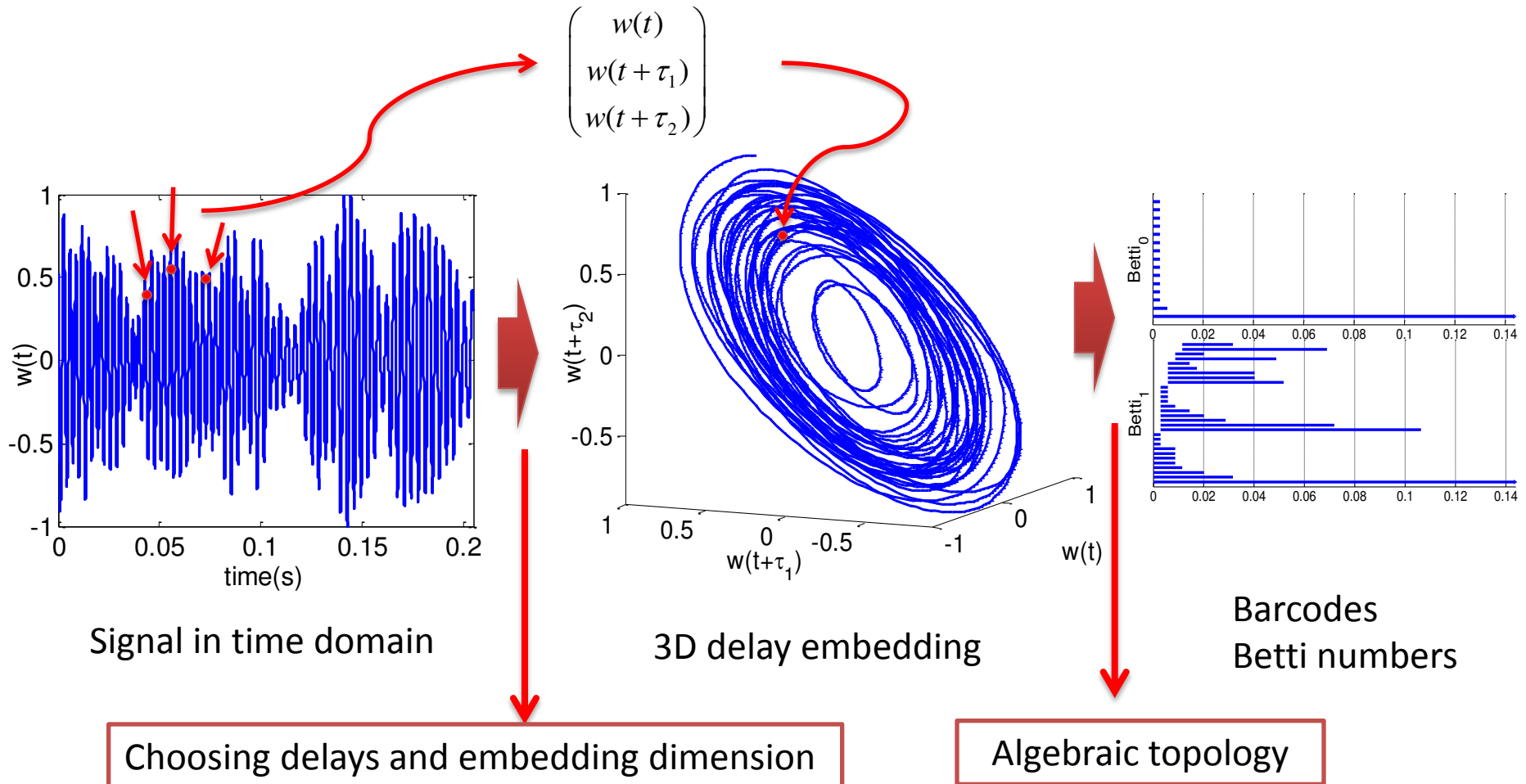


Topological Data Analysis

Examples and ideas!

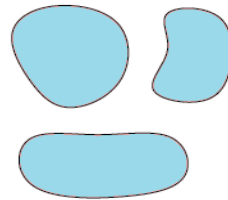


Wheeze Detection!

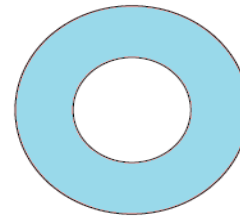


Wheeze detection using delay embeddings of breathing sounds

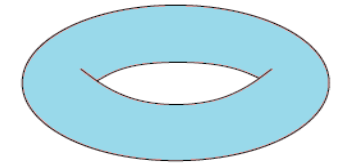
Algebraic topology



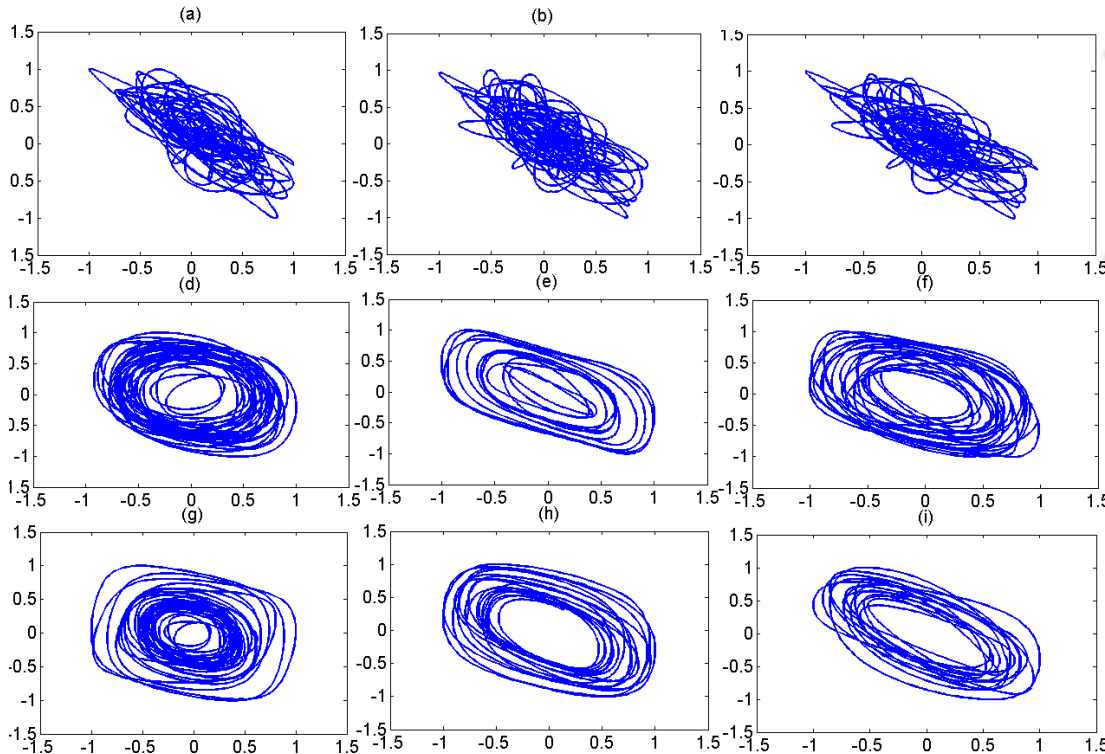
$$\beta_0 = 3$$



$$\beta_0 = 1, \beta_1 = 1$$



$$\beta_0 = 1, \beta_1 = 2, \beta_2 = 1$$



Non-wheeze signals

$$\beta_0 = 1$$

$$\beta_1 = 0$$

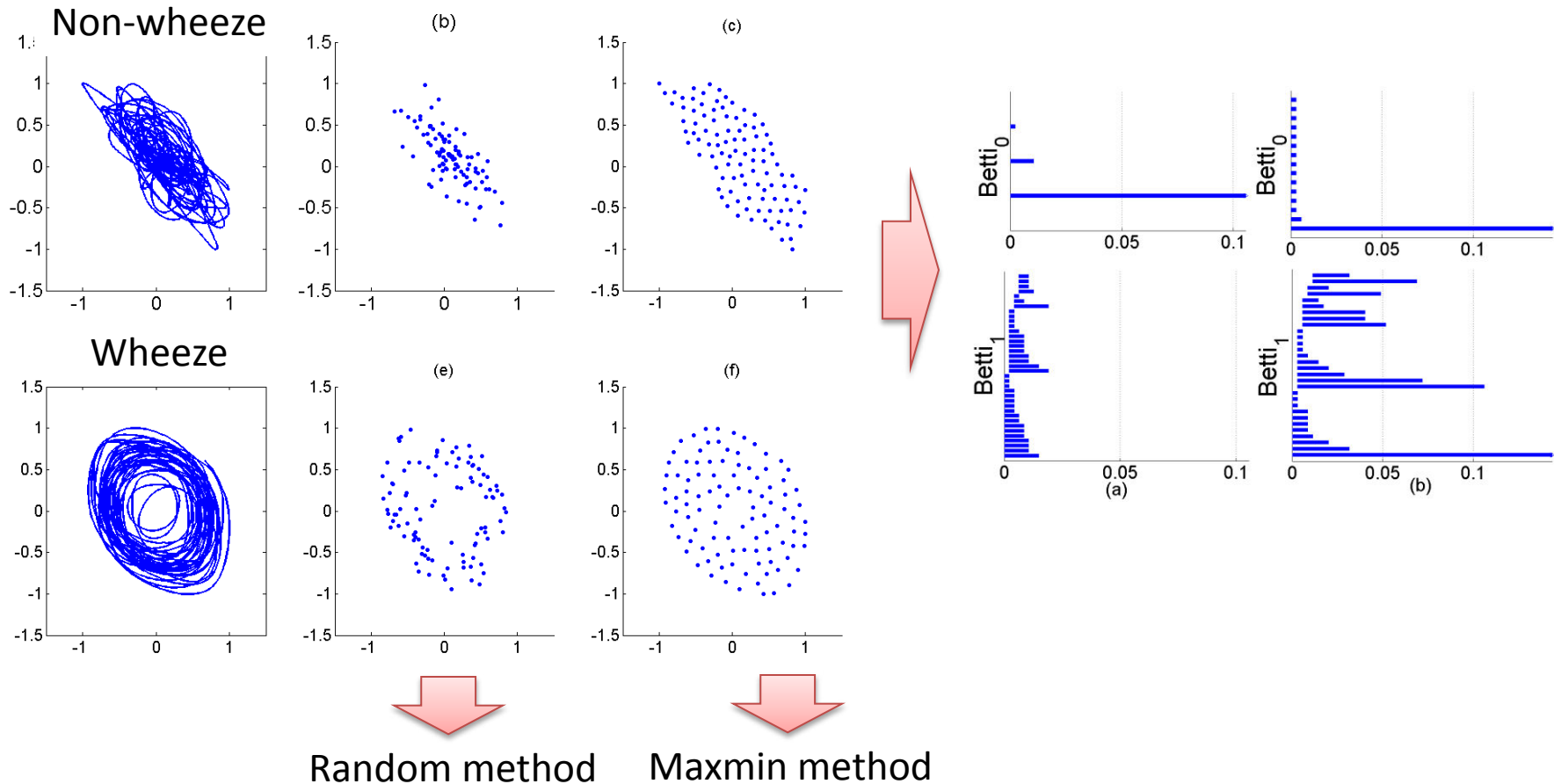
Wheeze signals

$$\beta_0 = 1$$

$$\beta_1 = 1$$

Landmark selection for reducing computational complexity

- A small number of landmarks are selected from all points (8%)



Proximity Measure

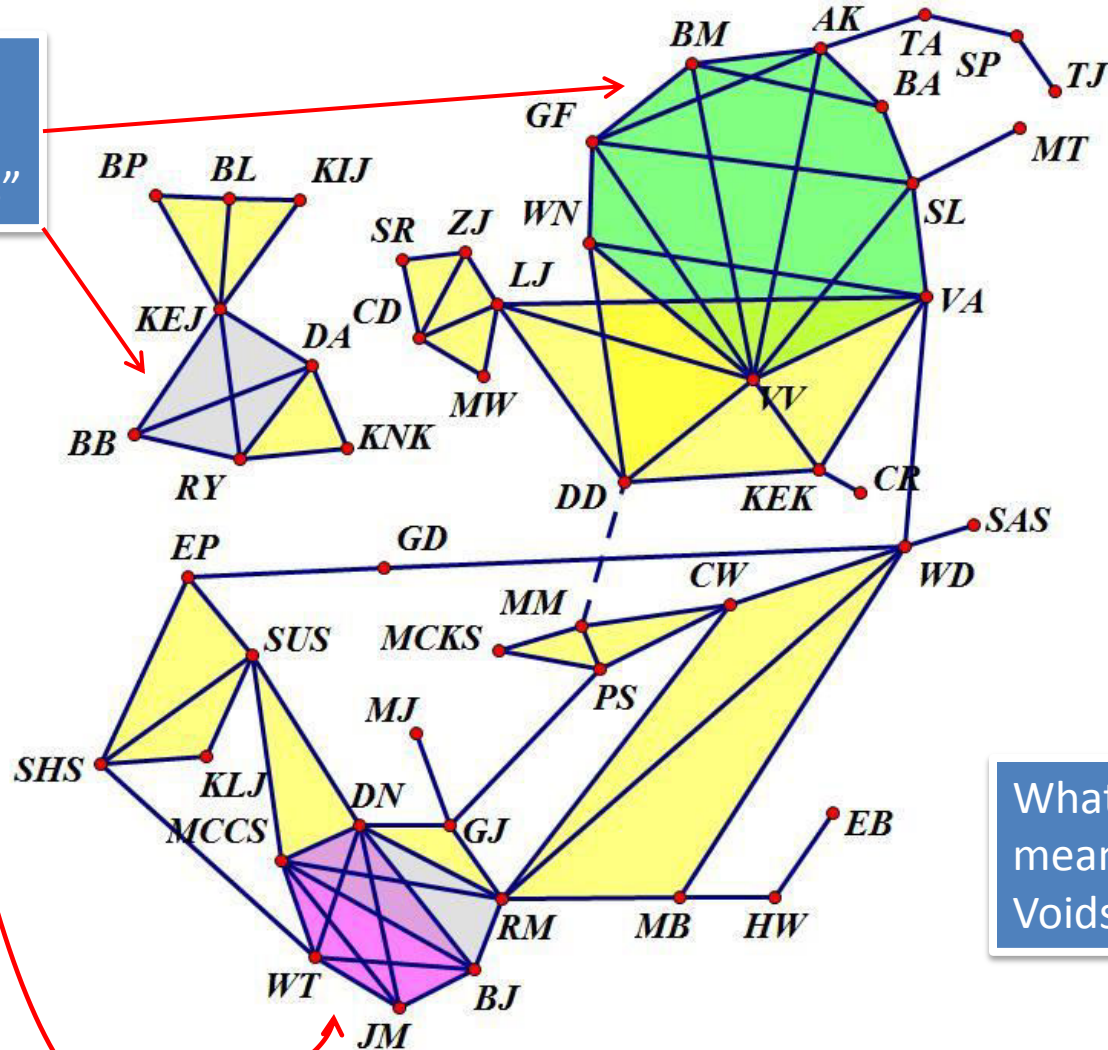
- Given a set of nodes with an attribute vector
- A metric on the space on nodes can be defined as the weighted sum of distances of their attributes:

$$d(A, B) = \sum_{i=1}^n K_i d_i(A, B)$$

- One can then create a simplicial complex representing those nodes and use TDA!

Example of Socio-plex

Clusters Based on "closeness"



What is the meaning of loops?
Voids?

Other Remarks

- In TDA you don't go in with your data and a question. You go in with just your data and look for the questions!
- We really don't know how many applications it has ... we find uses in different unconnected areas
- It is a combination of Mathematics, computer science but ultimately it needs experts on the specific field to analyze the metadata.