# Investigations into Cardiology: Categorizing Heart Rhythms using Machine Learning

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The purpose of this experiment was to create and test a computer model to accurately and automatically classify cardiac arrhythmias. Such a model, in the absence of trained cardiac professionals, would alert patients of the presence of life threatening arrhythmias. Care could be initiated more rapidly as a result and lives could be saved. Input data on 452 patient encounters, each with 279 attributes, was downloaded from UCI-MLR database and was used to train and test the model responsible for classifying each instance into 1 of 16 arrhythmia categories. This novel model was based on a genetic algorithm that self-selected input attributes according to the processes of evolution. As a measure of “fitness” for an individual attribute set, an artificial neural network (ANN) based on the processes of the brain was constructed and trained to test the highest possible classification accuracy based on such an attribute set. After 62 generations, the genetic algorithm terminated with the extraction of an attribute set that corresponded with 98.89% classification accuracy. The model was, on average, 97.84% confident in the classifications it correctly made (indicating certainty) and only 33.19% confident in the classifications it incorrectly made (indicating uncertainty). A chi-squared test with 15 degrees of freedom was performed on the data. A p-value of 0.9833 was obtained, indicating that the classifications the model made were very representative of the correct classifications. For extended research, the model can be localized and trained on unique patient populations such as pediatrics or geriatrics.

**Awards Won:**
Fourth Award of $500