The term pap-smear refers to samples of human cells stained by the so-called Papanicolaou method. The purpose of the Papanicolaou method is to diagnose pre-cancerous cell changes before they progress to invasive carcinoma. In this paper a metaheuristic algorithm is proposed in order to classify the cells. Two databases are used, constructed in different times by expert MDs, consisting of 917 and 500 images of pap smear cells, respectively. Each cell is described by 20 numerical features, and the cells fall into 7 classes but a minimal requirement is to separate normal from abnormal cells, which is a 2 class problem. For finding the best possible performing feature subset selection problem, an effective genetic algorithm scheme is proposed. This algorithmic scheme is combined with a number of nearest neighbor based classifiers. Results show that classification accuracy generally outperforms other previously applied intelligent approaches.