

Course: Machine Learning  
Course no. CAP6610  
Instructor: LiMin Fu

## Homework # 1

1. Use the version space algorithm to learn a concept in the poker domain. Each instance and concept is represented as a feature vector “(rank, suit),” e.g., (4, heart). The initial version space has the  $G$  boundary =  $\{(x, y)\}$  and the  $S$  boundary = nil, where  $x$  and  $y$  are variables. The following instances are presented in sequence:

Classification (Label)	Pattern
positive	(6, spade)
positive	(8, spade)
negative	(J, diamond)
positive	(K, club)

Assume the generalization and specialization rules as follows:

Two specific even numbers are generalized into even numbers.  
Two specific odd numbers are generalized into odd numbers.  
Even ranks and odd ranks are generalized into all ranks.  
Spades and clubs are generalized into blacks.  
Hearts and diamonds are generalized into reds.  
Blacks and reds are generalized into all suits.  
All ranks are specialized into even ranks or odd ranks.  
All suits are specialized into blacks or reds.  
Blacks are specialized into spades or clubs.  
Reds are specialized into hearts or diamonds.

- (a) Update the version space incrementally.
- (b) What is the concept learned?