**Nine Algorithms Assignment (Part One)**

**Part One [10 points]**

Read Chapter One: “Introduction” and answer the following Questions

* 1. How Does the Author Define Algorithms [1 point]

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| The author defines an algorithm as a precise recipe that specifies the exact sequence of steps required to solve a problem. When following an algorithm, the steps should feel mechanical, absolutely precise and require no human intuition or guesswork. The algorithm must also always work, no matter what the input. |

* 1. How does this definition compare to the definition that we discussed in class? Which definition do you prefer? Why? (Explain Briefly). [1 point]

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| This compares to the definition we discussed in class because the steps must not be ambiguous and they must be effective, as in it must be able to clearly accomplish what we wish to do as fast as possible. Personally, I would like a combination of each definition because I can relate the “recipe” MacCormick mentioned to cooking but his definition leaves out the ending. Algorithms should do what we want over a period of time and halt. I also relate to the description of the “mechanical-feel” and how algorithms should not require intuition. Both definitions could be refined and combined to make one great definition. |

* 1. What are the criteria that the author uses to identify a “great algorithm”? [1 point]

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| The criteria the author uses to identify a “great algorithm” is that the algorithms must be used by ordinary computer users everyday, they should address concrete, real-world problems, they must relate to the theory of computer science and finally they must present the “Aha!” moment that makes the algorithm truly special in MacCormick’s eyes. |

**Select one algorithm (chapter) from Chapters Two to Chapter Ten for your reading.**

* 1. List the name and number of the chapter that you have selected here: [0.5 points]

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| Chapter 6 - Pattern Recognition: Learning from Experience |

* 1. Briefly describe why did you pick this algorithm? [1 point]

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| I chose this algorithm because I found the subject to be very interesting, especially because it will be utilized in our lifetime more and more. MacCormick also described chapter 6 as exceptional. Beginning in the 21st Century, pattern recognition was not used in everyday computing, but the importance of pattern recognition is rapidly increasing. This is true because mobile devices and technology are becoming staples to our society. This also brings up the philosophical question: Are computers truly “intelligent”. As of now humans have a clear advantage over computers in the field of pattern recognition, but could that change in the future? It is an interesting and profound topic to explore. I am currently in the 3D Lab group with Dr. Herve and I believe I will be seeing more of this topic especially this semester with the work he wants me to complete. We will be working with Kinect and underwater pattern recognition. |

* 1. What does the algorithm do? What problem does it solve? [1.5 points]

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| Pattern recognition attempts to solve classification issues that a computer has with new data. The algorithm breaks down processed data into sensible chunks called samples, and each sample belongs to a fixed set of possible classes. The computer’s task is to process new data samples that have never been seen before and classify each sample into one of the possible classes. Essentially the computer “learns” from the samples but this process is not perfect. |

* 1. In one paragraph (10-15 lines), describe how the algorithm works. [2 points]

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| The algorithm pattern recognition is broken into two phases: the training phase where the computer learns about the classes based on some labeled training data and the classification phase where the computer classifies new, unlabeled data samples. First, the computer is given a large amount of labeled data samples that have already been classified. Then, the computer uses various analytical tricks to extract characteristics of each class. Finally, the computer can guess its class by choosing the one whose characteristics are most similar to the unlabeled sample. MacCormick also brings up three different classification “tricks”, including the nearest neighbor, the decision tree, and neural networks. The nearest neighbor trick involves geographic distance between two points to work out which ones are closest. In turn, the closest known data sample to the unknown data sample in question is then labeled with that corresponding label. A better classification would be the “K-nearest-neighbors” where K is a small number, which is more accurate because it takes into account the majority of differing neighbors close to the unknown sample. The decision tree trick is basically a pre-planned guessing game similar to “twenty questions” where there is a huge possibility of first questions. The computer decides which question will yield the best possible information and formulate more “yes or no” questions until the set of examples become “pure” and an output is reached. Neural networks seem far more complex and involve thresholds. Anything above or below the threshold can be classified in a certain way by the computer and can help identify or classify the new, unlabeled data. |

* 1. Why is this algorithm important? How does it “change the future”? [2 points]

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| This algorithm is especially important because we will see its prevalence more and more in the near future as pattern recognition is applied and studied. In comparison to the 1990’s, it was a travel agent’s job to select a low-cost itinerary, but now, we have computers that perform this task better than humans. Jobs will be lost but they will also be created for those with a background in technology, computer science, and theory, which are very important today. We certainly do not want to abuse this intelligence especially with computers but as a society, we definitely can use this algorithm to better and personalize our lifestyle. Nearest-neighbor, decision trees and neural networks can be applied to an immense range of practical problems too including correcting fat-fingered text entry, toll bridges and license plates and with advertisements. These are the fundamental building blocks of pattern recognition systems, which we can definitely expect to see more of in our lifetime. This algorithm will change the future because computers will soon be able to recognize almost as well as humans. |