CAP 5636 – Final

Date: Thursday, December 7, 2017 – 4:00 – 7:00pm

Name: ……

Instructions:

- This exam is open book and open notes. Textbooks and notes on tablet devices are acceptable but they must be put into airplane mode. No device with a keyboard is acceptable.
- It is recommended that you use a pencil, such that you can make corrections. Do not use highlighters, and don't use red colored pens.
- Allotted time is 180 minutes.
- Note that the points add up to 100 + 20 bonus points.

Problem 1 (Search - 30 pts)

a) Explain the difference between tree search and graph search. (2 sentences)

b) Give one advantage and one disadvantage of graph search over tree search.

Problem 2 (Classifiers – 30 pts)

a) Explain the difference between model based and not-model based classifiers

b) It is recommended that for machine learning, one separates label data into training data, held out data and test data. Explain the need of held out data.

Problem 3 (Particle Filters - 30 pts)

The particle filter cycle consists of the steps of 1) elapse time, 2) observe and 3) resample. Let us consider that we are using a particle filter to track the location of a robot 3 steps into the future. We choose to not do the resampling step.

a) Give two advantages we might gain by doing this.

1.

2.

b) Give two disadvantages we might incur by doing this.

1.

2.

Problem 4 (Naïve Bayes - 30 pts)

Let us assume that our training data contains the following messages:

```
we have an exam in AI (HAM)
we are going to cinema (HAM)
you should buy this flashlight (SPAM)
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Estimate using both maximum likelihood and Laplace smoothing with k=1. Assume that there are no other words possible except those listed, and assume that the size of the outcomes is the number of words.

P(should | HAM)

P(should | SPAM)

Classify using Naïve Bayes the following email. Estimate the probabilities using Laplace smoothing with k=1

```
should have an flashlight.
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