Washington State University
School of Electrical Engineering and Computer Science
Fall 2021

CptS 440/540 Artificial Intelligence
Homework 12
Due: December 9, 2021 (11:59pm)

General Instructions: Put your answers to the following problems into a PDF document and upload the document as your submission for Homework 12 for the course CptS 440 Pullman (all sections of CptS 440 and 540 are merged under the CptS 440 Pullman section) on the Canvas system by the above deadline. Note that you may submit multiple times, but we will only grade the most recent entry submitted before the deadline.

1. Given the HMM for the [m] phoneme on slide 40 of the Natural Language lecture, compute the probability of each possible path through the HMM for the sequence of frame features C_1,C_4,C_4,C_7). Show your work.

2. Accompanying this homework on Canvas is the file 'detect.py' which contains Python code to perform object detection on an input image using the pre-trained deep learning network called InceptionResNetV2 (arxiv.org/abs/1602.07261). You will need to install the Python packages 'numpy', 'tensorflow', and 'pillow' for this to work. Choose an image containing a few objects (not the one below), run the 'detect.py' script on the image, show the image and output, and comment on the accuracy of the result (i.e., did it miss some objects in the image, did it detect some objects not in the image). Below is a sample image and the results (objects detected and probabilities).

```
cougar, 0.8759027
pedestal, 0.010987113
obelisk, 0.009561969
lion, 0.0076894453
brass, 0.0028331694
jaguar, 0.00184997
megalith, 0.00096648524
sundial, 0.0006910374
leopard, 0.0006613407
doormat, 0.0006246198
```

3. Find a link to an article on bias in AI that is no more than five years old (e.g., https://www.theguardian.com/technology/2018/oct/10/amazon-hiring-ai-gender-bias-recruiting-engine, no you can't use this one). Provide the link and a brief paragraph describing the ethical issue in your own words.

No CptS 540 only question.