

Task 1

b)

Task 1b was a filtering operation. Computing $P(X_t|e_{1:t})$, for $t = 1, \dots, 6$.

The output was

	P(Fish)	P(No Fish)
X0	0.5	0.5
X1	0.82089552	0.17910448
X2	0.90197069	0.09802931
X3	0.48518523	0.51481477
X4	0.81645924	0.18354076
X5	0.43134895	0.56865105
X6	0.79970863	0.20029137

This is a filtering operation which calculate the probability of being in one state at each step given the evidence that leads up to that step.

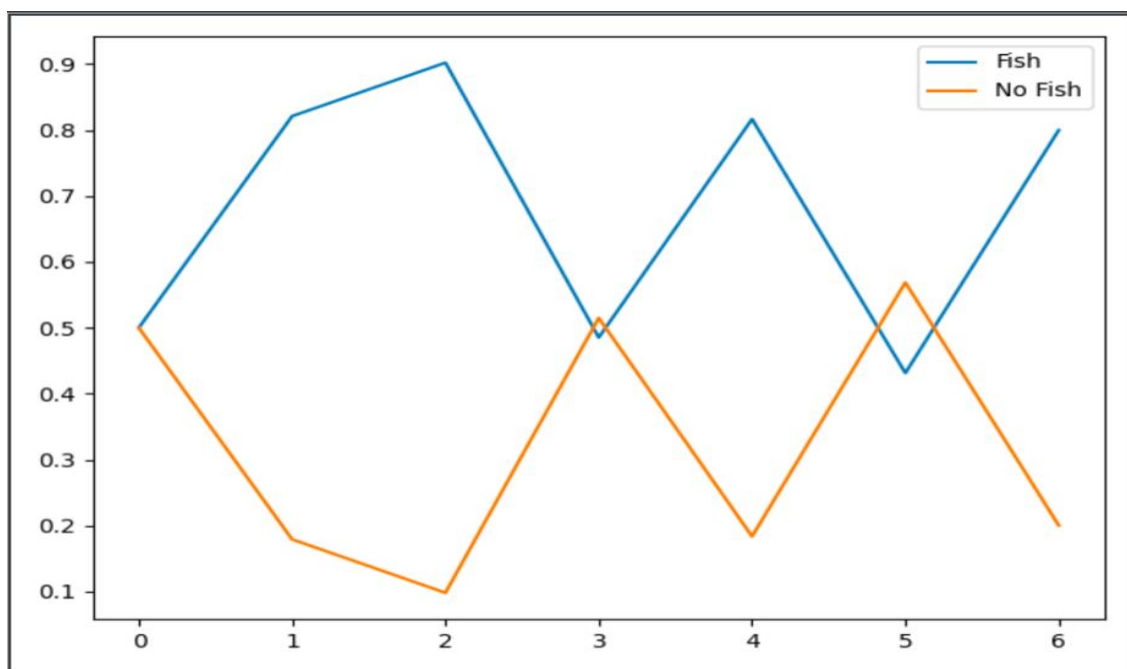


Figure 1: Graph representation of task 1b

c)

Task 1c was a prediction operation.

$P(X_t|e_{1:6})$, for $t = 7, \dots, 30$.

	P(Fish)	P(No Fish)
X06	[0.64992716	0.35007284]
X07	[0.62496358	0.37503642]
X08	[0.61248179	0.38751821]
X09	[0.60624089	0.39375911]
X10	[0.60312045	0.39687955]
X11	[0.60156022	0.39843978]
X12	[0.60078011	0.39921989]
X13	[0.60039006	0.39960994]
X14	[0.60019503	0.39980497]
X15	[0.60009751	0.39990249]
X16	[0.60004876	0.39995124]
X17	[0.60002438	0.39997562]
X18	[0.60001219	0.39998781]
X19	[0.60000609	0.39999391]
X20	[0.60000305	0.39999695]
X21	[0.60000152	0.39999848]
X22	[0.60000076	0.39999924]
X23	[0.60000038	0.39999962]
X24	[0.60000019	0.39999981]
X25	[0.6000001	0.3999999]
X26	[0.60000005	0.39999995]
X27	[0.60000002	0.39999998]
X28	[0.60000001	0.39999999]
X29	[0.60000001	0.39999999]
X30	[0.6	0.4]

This is a prediction operation. Based on the evidence given to the current date, the operation calculates the probabilities for future events. The probability converges towards 60% chance of fish in a nearby lake.

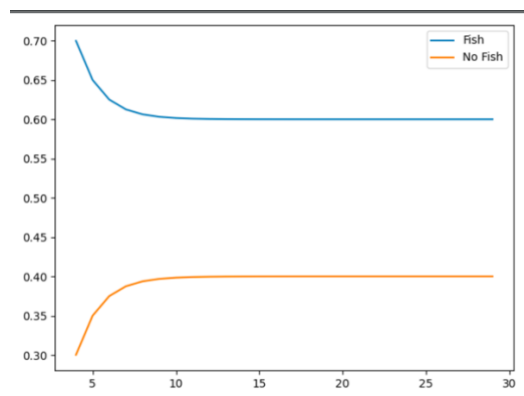


Figure 2: Graph representation of task 1c

d)

Task 1d was a smoothing operation.

$P(X_t|e_{1:6})$, for $t = 0, \dots, 5$.

	P(Fish)	P(No Fish)
X0	0.66485218	0.33514782
X1	0.87640731	0.12359269
X2	0.86578657	0.13421343
X3	0.59792735	0.40207265
X4	0.76663731	0.23336269
X5	0.57082582	0.42917418

A smoothing is a process of computing the distribution of earlier states given the evidence up to present. This is achieved by computing the likelihood of the evidence.

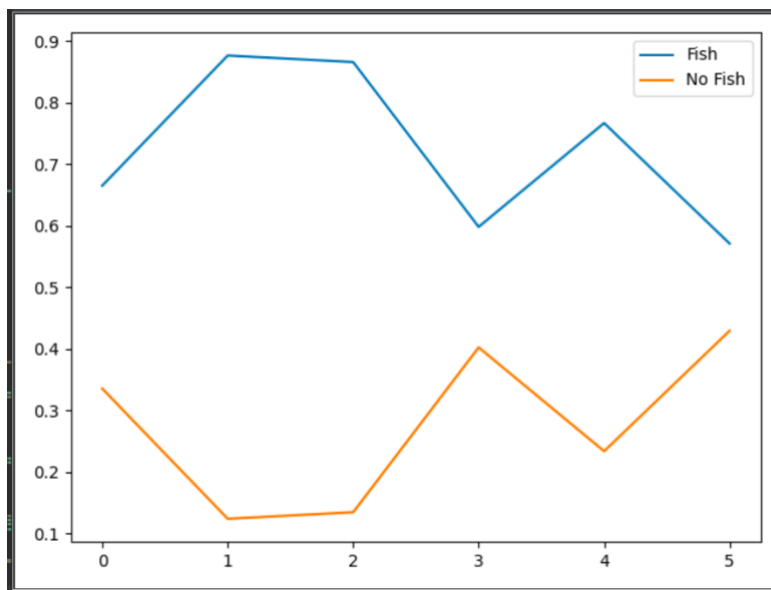


Figure 3: Graph representation of task 1d

Eirik Olav Aa – Assignment 2

e)

Task 1e was finding most likely path

$\arg \max_{x_1, \dots, x_{t-1}} P(x_1, \dots, x_{t-1}, X_t | e_{1:t}), \text{ for } t = 1, \dots, 6.$

Probability of fish/no fish		Parents
P(Fish)	P(No Fish)	
X1	[0.82089552 0.17910448]	[0. 0.]
X2	[0.49253731 0.03283582]	[0. 0.]
X3	[0.09850746 0.07880597]	[0. 0.]
X4	[0.05910448 0.01103284]	[0. 1.]
X5	[0.0118209 0.00945672]	[0. 0.]
X6	[0.00709254 0.00132394]	[0. 1.]

By observing the results, the most likely path ends in X6 in Fish. The parent of this node is Fish, and parent of this is Fish... All the parents are in the left column because every previous selected node has 0 as parent.

The most likely path is therefore:

Fish – Fish – Fish – Fish – Fish – Fish

The probability of this is 0.709%.