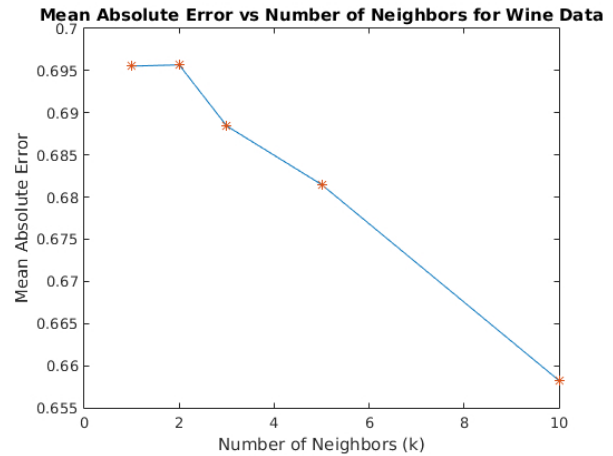
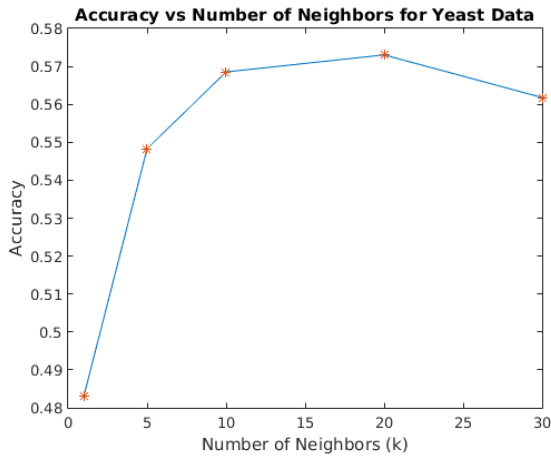


Part 1

See included code.

Part 2



Confusion Matrix for $k = 1$

	CYT	NUC	MIT	ME3	ME2	ME1	EXC	VAC	POX	ERL
CYT	69	39	21	4	1	0	1	2	1	0
NUC	46	57	13	6	0	0	0	1	0	0
MIT	26	12	34	2	3	0	2	0	2	0
ME3	3	9	2	32	1	0	0	0	0	0
ME2	3	0	2	3	6	1	2	0	1	0
ME1	0	0	1	0	3	6	3	0	1	0
EXC	0	0	1	0	1	3	5	0	0	0
VAC	3	0	1	0	0	1	0	1	0	0
POX	1	1	1	0	0	0	0	0	5	0
ERL	0	0	0	0	0	0	0	0	0	0

Confusion Matrix for $k = 30$

	CYT	NUC	MIT	ME3	ME2	ME1	EXC	VAC	POX	ERL
CYT	89	36	11	1	0	1	0	0	0	0
NUC	48	59	13	3	0	0	0	0	0	0
MIT	25	5	45	1	1	3	1	0	0	0
ME3	3	2	2	40	0	0	0	0	0	0
ME2	4	2	3	3	3	3	0	0	0	0
ME1	0	0	1	0	1	9	3	0	0	0
EXC	0	0	1	0	0	4	5	0	0	0
VAC	2	3	1	0	0	0	0	0	0	0
POX	6	0	2	0	0	0	0	0	0	0
ERL	0	0	0	0	0	0	0	0	0	0

It is easy to see that with using $k = 30$, there are less misclassified instances overall. This is not surprising given the graph above. It seems that most of the gains in accuracy were found in the better classification of instances with the CYT label, which is one of the more common labels in this data set. In fact, some other labels saw worse classification, such as NUC and MIT, but the gains in CYT compensated for it. Another interesting aspect of this data is that no testing instances had the ERL label and no instance was classified as such.

Part 3

operation	dist at this step	best dist	best node	queue
init	N/A	∞	N/A	$(f, 0)$
pop f	7.071	7.071	f	$(h, 0), (c, 1)$
pop h	7.071	7.071	f	$(i, 0), (c, 1), (g, 5)$
pop i	3	3	i	$(c, 1), (j, 3), (g, 5)$
pop c	2	2	c	$(b, 0), (e, 0), (j, 3), (g, 5)$
pop b	4.472	2	c	$(e, 0), (j, 3), (a, 4), (g, 5)$
pop e	7.810	2	c	$(d, 0), (j, 3), (a, 4), (g, 5)$
pop d	5.385	2	c	$(j, 3), (a, 4), (g, 5)$
pop j	Return c			