

1. Based on an experiment on a heated plate, temperatures are measured at various points as given in the table below.

y	$x = 0$	$x = 2$	$x = 4$	$x = 6$	$x = 8$
0	100	90	80	70	60
2	85	64.49	53.5	48.15	50
4	70	48.9	38.43	35.03	40
6	55	38.78	30.39	27.07	30
8	40	35	30	25	20

- (a) Estimate the temperature at $(x, y) = (4, 3.2)$ and $(x, y) = (4.3, 2.7)$ using Newton's interpolating polynomial $P_4(x)$. [2]
- (b) Estimate the temperature at $(x, y) = (5, 3.2)$ and $(x, y) = (5.3, 2.7)$ using Lagrange's interpolating polynomial $P_4(x)$. [3]

Facial Detection

Consider the following figure. It performs facial detection using 36 landmarks and the left eye detection using 6 points, as shown in the tables.

- Write a program to perform **cubic spline interpolation**. Using the given eye landmark data (x_i, y_i) , parameterize the points with $t \in [0, 1]$ and construct spline interpolants $x(t)$ and $y(t)$. Reconstruct the eye contour using 300 uniformly spaced values of t . [8]
- Write a program to perform **cubic Hermite interpolation**. Using the given face landmark data (x_i, y_i) , parameterize the points with $t \in [0, 1]$ and construct Hermite interpolants $x(t)$ and $y(t)$. Reconstruct the face contour using 300 uniformly spaced values of t . [8]

t	x	y
0.0000	62.5686	53.7529
0.2000	64.5898	52.3308
0.4000	67.7406	51.9128
0.6000	71.1095	53.7015
0.8000	68.0360	54.4808
1.0000	64.8979	54.5577

Fig. 1: Eye Data

t	x	y
0.0000	76.3269	36.0755
0.0286	82.2208	36.1808
0.0571	87.2102	37.1035
0.0857	91.8336	39.1655
0.1143	94.7677	42.2987
0.1429	96.4614	46.1978
0.1714	97.2195	50.3011
0.2000	97.4811	55.3361
0.2286	97.3197	59.9865
0.2571	97.0977	64.5425
0.2857	96.6009	69.3705
0.3143	95.4954	74.3355
0.3429	93.9233	78.0800
0.3714	92.0927	80.6974
0.4000	89.5228	82.9510
0.4286	87.0789	84.4218
0.4571	84.4254	85.6243
0.4857	81.3203	86.4894
0.5143	77.2480	86.8685
0.5429	73.0681	86.8189
0.5714	69.7278	86.2287
0.6000	66.7797	85.2517
0.6286	64.0402	83.9566
0.6571	60.9892	81.8692
0.6857	58.6065	79.3567
0.7143	56.4717	75.6391
0.7429	54.9361	70.6541
0.7714	54.1983	65.7722
0.8000	53.9169	61.1868
0.8286	53.7913	56.5283
0.8571	54.1947	51.4346
0.8857	55.1709	47.2552
0.9143	57.0959	43.2181
0.9429	60.2624	39.9034
0.9714	65.1283	37.5920
1.0000	70.3008	36.4362

Tab. 1: Face Data