

Test Preview**TestSummary.txt: 1/1****Jin Ha - jsh114:c4**

```
1: Test Preview: Summary for jsh114 of c4
2: -----
3:
4:   Public Tests:
5:     Marks for coding exercises:: 12 / 12
6:
7: Git Repo: git@gitlab.doc.ic.ac.uk:lab1819_autumn/496-bayesian-regression_jsh114.git
8: Commit ID: 0c676
```

```
1: # -*- coding: utf-8 -*-
2:
3: """
4: Use this file for your answers.
5:
6: This file should be in the root of the repository
7: (do not move it or change the file name)
8:
9: """
10:
11: import numpy as np
12:
13: def lml(alpha, beta, Phi, Y):
14:     """
15:     4 marks
16:
17:     :param alpha: float
18:     :param beta: float
19:     :param Phi: array of shape (N, M)
20:     :param Y: array of shape (N, 1)
21:     :return: the log marginal likelihood, a scalar
22:     """
23:
24:     N, M = Phi.shape
25:     bI = beta * np.eye(N)
26:
27:     term = alpha*Phi.dot(Phi.T) + bI
28:     term_1 = -0.5 * N * np.log(2*np.pi)
29:     term_2 = -0.5 * np.log(np.linalg.det(term))
30:     term_3 = -0.5 * Y.T.dot(np.linalg.inv(term)).dot(Y)
31:
32:     return np.asscalar(term_1 + term_2 + term_3)
33:
34: def grad_lml(alpha, beta, Phi, Y):
35:     """
36:     8 marks (4 for each component)
37:
38:     :param alpha: float
39:     :param beta: float
40:     :param Phi: array of shape (N, M)
41:     :param Y: array of shape (N, 1)
42:     :return: array of shape (2,). The components of this array are the gradients
43:     (d_lml_d_alpha, d_lml_d_beta), the gradients of lml with respect to alpha and
44:     beta respectively.
45:     """
46:
47:     N, M = Phi.shape
48:     bI = beta * np.eye(N)
49:     f = alpha*Phi.dot(Phi.T) + bI
50:     detF = np.linalg.det(f)
51:     invF = np.linalg.inv(f)
52:
53:     dF_da = Phi.dot(Phi.T)
54:     dF_db = np.eye(N)
55:
56:     dlml_da = np.asscalar(
57:         float((-0.5*detF*np.trace(invF.dot(dF_da)))/detF +
58:             -0.5*Y.T.dot(-invF.dot(dF_da)).dot(invF)).dot(Y)
59:     )
60:
61:     dlml_db = np.asscalar(
62:         float((-0.5*detF*np.trace(invF.dot(dF_db)))/detF +
63:             -0.5*Y.T.dot(-invF.dot(dF_db)).dot(invF)).dot(Y)
64:     )
65:
66:     return np.array([dlml_da, dlml_db])
```

Test Preview

testResults.txt: 1/1

Jin Ha - jsh114:c4

```
1: ----- Test Output -----
2:
3:
4: ----- Test Errors -----
5: ..
6: -----
7: Ran 2 tests in 0.001s
8:
9: OK
```