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5. Bayesian Information Criterion

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Project due Apr 26, 2023 08:59 -03 Completed

So far we have simply set the number of mixture components K but this is also a parameter estimate from data. How does the log-likelihood of the data vary as a function of K as optimal solutions?

To compensate, we need a selection criterion that penalizes the number of parameters. Bayesian information criterion (BIC) is a criterion for model selection. It captures the trade-off between the log-likelihood of the data, and the number of parameters that the model uses. The BIC of a

$$\text{BIC}(M) = l - \frac{1}{2}p \log n$$

where l is the log-likelihood of the data under the current model (highest log-likelihood after adjusting the parameters in the model), p is the number of free parameters, and n is the number of data points. This score rewards a larger log-likelihood, but penalizes the number of parameters used. In a situation where we wish to select models, we want a model with the the highest BIC.

Implementing the Bayesian Information Criterion

0.0/1.0 point (graded)

Fill in the missing Bayesian Information Criterion (BIC) calculation (`bic` function) in `code`

Available Functions: You have access to the NumPy python library as `np`, to the `GaussianMixture` class, and to typing annotation `typing.Tuple` as `Tuple`.

```

1 def bic(X: np.ndarray, mixture: GaussianMixture,
2         log_likelihood: float) -> float:
3     """Computes the Bayesian Information Criterion for a
4     mixture of gaussians
5
6     Args:
7         X: (n, d) array holding the data
8         mixture: a mixture of spherical gaussian
9         log_likelihood: the log-likelihood of the data
10
11     Returns:
12         float: the BIC for this mixture
13     """
14     n, d = X.shape
15     k = mixture.mu.shape[0]
```

Press ESC then TAB or click outside of the code editor to exit

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