tf.contrib.kernel_methods.RandomFourierFeatureMapper

Class **RandomFourierFeatureMapper**

Defined in `tensorflow/contrib/kernel_methods/python/mappers/random_fourier_features.py`.

Class that implements Random Fourier Feature Mapping (RFFM) in TensorFlow.

The RFFM mapping is used to approximate the Gaussian (RBF) kernel:

```
exp(-||x-y||_2^2 / (2 * sigma^2))
```

The implementation of RFFM is based on the following paper: "Random Features for Large-Scale Kernel Machines" by Ali Rahimi and Ben Recht. (link: https://people.eecs.berkeley.edu/~brecht/papers/07.rah.rec.nips.pdf)

The mapping uses a matrix `Omega \in R^{d x D}` and a bias vector `b \in R^D` where `d` is the input dimension (number of dense input features) and `D` is the output dimension (i.e., dimension of the feature space the input is mapped to). Each entry of `Omega` is sampled i.i.d. from a (scaled) Gaussian distribution and each entry of `b` is sampled independently and uniformly from [0, 2 * pi].

For a single input feature vector x in R^d, its RFFM is defined as:

```
    sqrt(2/D) * cos(x * Omega + b)
```

where `cos` is the element-wise cosine function and `x, b` are represented as row vectors. The aforementioned paper shows that the linear kernel of RFFM-mapped vectors approximates the Gaussian kernel of the initial vectors.

Properties

`input_dim`

`name`

Returns a name for the `RandomFourierFeatureMapper` instance.

If the name provided in the constructor is `None`, then the object's unique id is returned.

Returns:

A name for the `RandomFourierFeatureMapper` instance.

`output_dim`

Methods

`__init__`

```
__init__(
    input_dim,
    output_dim,
    stddev=1.0,
    seed=1,
    name=None
)
```

Constructs a RandomFourierFeatureMapper instance.

Args:

- `input_dim`: The dimension (number of features) of the tensors to be mapped.
- `output_dim`: The output dimension of the mapping.
- `stddev`: The standard deviation of the Gaussian kernel to be approximated. The error of the classifier trained using this approximation is very sensitive to this parameter.
- `seed`: An integer used to initialize the parameters (`Omega` and `b`) of the mapper. For repeatable sequences across different invocations of the mapper object (for instance, to ensure consistent mapping both at training and eval/inference if these happen in different invocations), set this to the same integer.
- `name`: name for the mapper object.

`map`

```
map(input_tensor)
```

Maps each row of input_tensor using random Fourier features.

Args:

- `input_tensor`: a `Tensor` containing input features. It's shape is [batch_size, self._input_dim].

Returns:

A `Tensor` of shape [batch_size, self._output_dim] containing RFFM-mapped features.

Raises:

- `InvalidShapeError`: if the shape of the `input_tensor` is inconsistent with expected input dimension.

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