tf.contrib.distributions.GammaWithSoftplusConcentrationRate

Contents

Class GammaWithSoftplusConcentrationRate

Properties

  allow_nan_stats

  batch_shape

Class `GammaWithSoftplusConcentrationRate`

Inherits From: `Gamma`

Defined in `tensorflow/python/ops/distributions/gamma.py`.

`Gamma` with softplus of `concentration` and `rate`.

Properties

`allow_nan_stats`

Python `bool` describing behavior when a stat is undefined.

Stats return +/- infinity when it makes sense. E.g., the variance of a Cauchy distribution is infinity. However, sometimes the statistic is undefined, e.g., if a distribution's pdf does not achieve a maximum within the support of the distribution, the mode is undefined. If the mean is undefined, then by definition the variance is undefined. E.g. the mean for Student's T for df = 1 is undefined (no clear way to say it is either + or - infinity), so the variance = E[(X - mean)**2] is also undefined.

Returns:

- `allow_nan_stats`: Python `bool`.

`batch_shape`

Shape of a single sample from a single event index as a `TensorShape`.

May be partially defined or unknown.

The batch dimensions are indexes into independent, non-identical parameterizations of this distribution.

Returns:

- `batch_shape`: `TensorShape`, possibly unknown.

`concentration`

Concentration parameter.

dtype

The `DType` of `Tensor`s handled by this `Distribution`.

event_shape

Shape of a single sample from a single batch as a `TensorShape`.

May be partially defined or unknown.

Returns:

- `event_shape`: `TensorShape`, possibly unknown.

name

Name prepended to all ops created by this `Distribution`.

parameters

Dictionary of parameters used to instantiate this `Distribution`.

rate

Rate parameter.

reparameterization_type

Describes how samples from the distribution are reparameterized.

Currently this is one of the static instances `distributions.FULLY_REPARAMETERIZED` or `distributions.NOT_REPARAMETERIZED`.

Returns:

An instance of `ReparameterizationType`.

validate_args

Python `bool` indicating possibly expensive checks are enabled.

Methods

__init__

```
__init__(
    concentration,
    rate,
    validate_args=False,
    allow_nan_stats=True,
    name='GammaWithSoftplusConcentrationRate'
)
```

batch_shape_tensor

```
batch_shape_tensor(name='batch_shape_tensor')
```

Shape of a single sample from a single event index as a 1-D `Tensor`.

The batch dimensions are indexes into independent, non-identical parameterizations of this distribution.

Args:

- `name` : name to give to the op

Returns:

- `batch_shape` : `Tensor` .

cdf

```
cdf(
    value,
    name='cdf'
)
```

Cumulative distribution function.

Given random variable `X` , the cumulative distribution function `cdf` is:

```
cdf(x) := P[X <= x]
```

Args:

- `value` : `float` or `double` `Tensor` .
- `name` : The name to give this op.

Returns:

- `cdf` : a `Tensor` of shape `sample_shape(x) + self.batch_shape` with values of type `self.dtype` .

copy

```
copy(**override_parameters_kwargs)
```

Creates a deep copy of the distribution.

Args:

- `**override_parameters_kwargs` : String/value dictionary of initialization arguments to override with new values.

Returns:

- `distribution` : A new instance of `type(self)` initialized from the union of self.parameters and override_parameters_kwargs, i.e., `dict(self.parameters, **override_parameters_kwargs)` .

covariance

```
covariance(name='covariance')
```

Covariance.

Covariance is (possibly) defined only for non-scalar-event distributions.

For example, for a length- `k` , vector-valued distribution, it is calculated as,

```
Cov[i, j] = Covariance(X_i, X_j) = E[(X_i - E[X_i]) (X_j - E[X_j])]
```

where `Cov` is a (batch of) `k x k` matrix, `0 <= (i, j) < k` , and `E` denotes expectation.

Alternatively, for non-vector, multivariate distributions (e.g., matrix-valued, Wishart), `Covariance` shall return a (batch of) matrices under some vectorization of the events, i.e.,

```
Cov[i, j] = Covariance(Vec(X)_i, Vec(X)_j) = [as above]
```

where `Cov` is a (batch of) `k' x k'` matrices, `0 <= (i, j) < k' = reduce_prod(event_shape)` , and `Vec` is some function mapping indices of this distribution's event dimensions to indices of a length- `k'` vector.

Args:

- `name` : The name to give this op.

Returns:

- `covariance` : Floating-point `Tensor` with shape `[B1, ..., Bn, k', k']` where the first `n` dimensions are batch coordinates and `k' = reduce_prod(self.event_shape)` .

entropy

```
entropy(name='entropy')
```

Shannon entropy in nats.

event_shape_tensor

```
event_shape_tensor(name='event_shape_tensor')
```

Shape of a single sample from a single batch as a 1-D int32 `Tensor` .

Args:

- `name` : name to give to the op

Returns:

- `event_shape` : `Tensor` .

is_scalar_batch

```
is_scalar_batch(name='is_scalar_batch')
```

Indicates that `batch_shape == []` .

Args:

- `name` : The name to give this op.

Returns:

- `is_scalar_batch` : `bool` scalar `Tensor` .

is_scalar_event

```
is_scalar_event(name='is_scalar_event')
```

Indicates that `event_shape == []` .

Args:

- `name` : The name to give this op.

Returns:

- `is_scalar_event` : `bool` scalar `Tensor` .

log_cdf

```
log_cdf(
    value,
    name='log_cdf'
)
```

Log cumulative distribution function.

Given random variable `X` , the cumulative distribution function `cdf` is:

```
log_cdf(x) := Log[ P[X <= x] ]
```

Often, a numerical approximation can be used for `log_cdf(x)` that yields a more accurate answer than simply taking the

logarithm of the `cdf` when `x << -1`.

Args:

- `value`: **float** or **double** **Tensor**.
- `name`: The name to give this op.

Returns:

- `logcdf`: a **Tensor** of shape `sample_shape(x) + self.batch_shape` with values of type `self.dtype`.

log_prob

```
log_prob(
    value,
    name='log_prob'
)
```

Log probability density/mass function.

Args:

- `value`: **float** or **double** **Tensor**.
- `name`: The name to give this op.

Returns:

- `log_prob`: a **Tensor** of shape `sample_shape(x) + self.batch_shape` with values of type `self.dtype`.

log_survival_function

```
log_survival_function(
    value,
    name='log_survival_function'
)
```

Log survival function.

Given random variable `X`, the survival function is defined:

```
log_survival_function(x) = Log[ P[X > x] ]
                         = Log[ 1 - P[X <= x] ]
                         = Log[ 1 - cdf(x) ]
```

Typically, different numerical approximations can be used for the log survival function, which are more accurate than `1 - cdf(x)` when `x >> 1`.

Args:

- `value`: **float** or **double** **Tensor**.
- `name`: The name to give this op.

Returns:

`Tensor` of shape `sample_shape(x) + self.batch_shape` with values of type `self.dtype` .

mean

```
mean(name='mean')
```

Mean.

mode

```
mode(name='mode')
```

Mode.

Additional documentation from `Gamma` :

The mode of a gamma distribution is `(shape - 1) / rate` when `shape > 1` , and `NaN` otherwise. If `self.allow_nan_stats` is `False` , an exception will be raised rather than returning `NaN` .

param_shapes

```
param_shapes(
    cls,
    sample_shape,
    name='DistributionParamShapes'
)
```

Shapes of parameters given the desired shape of a call to `sample()` .

This is a class method that describes what key/value arguments are required to instantiate the given `Distribution` so that a particular shape is returned for that instance's call to `sample()` .

Subclasses should override class method `_param_shapes` .

Args:

- `sample_shape` : `Tensor` or python list/tuple. Desired shape of a call to `sample()` .
- `name` : name to prepend ops with.

Returns:

`dict` of parameter name to `Tensor` shapes.

param_static_shapes

```
param_static_shapes(
    cls,
    sample_shape
)
```

param_shapes with static (i.e. `TensorShape`) shapes.

This is a class method that describes what key/value arguments are required to instantiate the given `Distribution` so that a particular shape is returned for that instance's call to `sample()`. Assumes that the sample's shape is known statically.

Subclasses should override class method `_param_shapes` to return constant-valued tensors when constant values are fed.

Args:

- `sample_shape`: `TensorShape` or python list/tuple. Desired shape of a call to `sample()`.

Returns:

`dict` of parameter name to `TensorShape`.

Raises:

- `ValueError`: if `sample_shape` is a `TensorShape` and is not fully defined.

prob

```
prob(
    value,
    name='prob'
)
```

Probability density/mass function.

Args:

- `value`: `float` or `double` `Tensor`.
- `name`: The name to give this op.

Returns:

- `prob`: a `Tensor` of shape `sample_shape(x) + self.batch_shape` with values of type `self.dtype`.

quantile

```
quantile(
    value,
    name='quantile'
)
```

Quantile function. Aka "inverse cdf" or "percent point function".

Given random variable `X` and `p in [0, 1]`, the `quantile` is:

```
quantile(p) := x such that P[X <= x] == p
```

Args:

- `value`: `float` or `double` `Tensor`.

- `name` : The name to give this op.

Returns:

- `quantile` : a `Tensor` of shape `sample_shape(x) + self.batch_shape` with values of type `self.dtype` .

sample

```
sample(
    sample_shape=(),
    seed=None,
    name='sample'
)
```

Generate samples of the specified shape.

Note that a call to `sample()` without arguments will generate a single sample.

Args:

- `sample_shape` : 0D or 1D `int32` `Tensor` . Shape of the generated samples.
- `seed` : Python integer seed for RNG
- `name` : name to give to the op.

Returns:

- `samples` : a `Tensor` with prepended dimensions `sample_shape` .

stddev

```
stddev(name='stddev')
```

Standard deviation.

Standard deviation is defined as,

```
stddev = E[(X - E[X])**2]**0.5
```

where `X` is the random variable associated with this distribution, `E` denotes expectation, and `stddev.shape = batch_shape + event_shape` .

Args:

- `name` : The name to give this op.

Returns:

- `stddev` : Floating-point `Tensor` with shape identical to `batch_shape + event_shape` , i.e., the same shape as `self.mean()` .

survival_function

```
survival_function(
    value,
    name='survival_function'
)
```

Survival function.

Given random variable `X`, the survival function is defined:

```
survival_function(x) = P[X > x]
                     = 1 - P[X <= x]
                     = 1 - cdf(x).
```

Args:

- `value`: **float** or **double** **Tensor**.
- `name`: The name to give this op.

Returns:

Tensor of shape **sample_shape(x) + self.batch_shape** with values of type **self.dtype**.

variance

```
variance(name='variance')
```

Variance.

Variance is defined as,

```
Var = E[(X - E[X])**2]
```

where `X` is the random variable associated with this distribution, `E` denotes expectation, and **Var.shape = batch_shape + event_shape**.

Args:

- `name`: The name to give this op.

Returns:

- `variance`: Floating-point **Tensor** with shape identical to **batch_shape + event_shape**, i.e., the same shape as **self.mean()**.

Stay Connected

Blog