tf.contrib.metrics.streaming_covariance

```
streaming_covariance(
    predictions,
    labels,
    weights=None,
    metrics_collections=None,
    updates_collections=None,
    name=None
)
```

Defined in `tensorflow/contrib/metrics/python/ops/metric_ops.py`.

See the guide: Metrics (contrib) > Metric `Ops`

Computes the unbiased sample covariance between `predictions` and `labels`.

The `streaming_covariance` function creates four local variables, `comoment`, `mean_prediction`, `mean_label`, and `count`, which are used to compute the sample covariance between predictions and labels across multiple batches of data. The covariance is ultimately returned as an idempotent operation that simply divides `comoment` by `count` - 1. We use `count` - 1 in order to get an unbiased estimate.

The algorithm used for this online computation is described in https://en.wikipedia.org/wiki/Algorithms_for_calculating_variance. Specifically, the formula used to combine two sample comoments is `C_AB = C_A + C_B + (E[x_A] - E[x_B]) * (E[y_A] - E[y_B]) * n_A * n_B / n_AB` The comoment for a single batch of data is simply `sum((x - E[x]) * (y - E[y]))`, optionally weighted.

If `weights` is not None, then it is used to compute weighted comoments, means, and count. NOTE: these weights are treated as "frequency weights", as opposed to "reliability weights". See discussion of the difference on https://wikipedia.org/wiki/Weighted_arithmetic_mean#Weighted_sample_variance

To facilitate the computation of covariance across multiple batches of data, the function creates an `update_op` operation, which updates underlying variables and returns the updated covariance.

Args:

- `predictions`: A `Tensor` of arbitrary size.
- `labels`: A `Tensor` of the same size as `predictions`.
- `weights`: Optional `Tensor` indicating the frequency with which an example is sampled. Rank must be 0, or the same rank as `labels`, and must be broadcastable to `labels` (i.e., all dimensions must be either `1`, or the same as the corresponding `labels` dimension).
- `metrics_collections`: An optional list of collections that the metric value variable should be added to.
- `updates_collections`: An optional list of collections that the metric update ops should be added to.
- `name`: An optional variable_scope name.

Returns:

- `covariance`: A `Tensor` representing the current unbiased sample covariance, `comoment` / (`count` - 1).
- `update_op`: An operation that updates the local variables appropriately.

Raises:

- `ValueError`: If labels and predictions are of different sizes or if either **`metrics_collections`** or **`updates_collections`** are not a list or tuple.

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