**Tutorial 3f – Combine Core Transform in Apache Beam:**

**Combine:**

* [Combine](https://github.com/apache/beam/blob/master/sdks/python/apache_beam/transforms/core.py) is a Beam transform for combining collections of elements or values in your data.
* Combine has variants that work on entire PCollections, and some that combine the values for each key in PCollections of key/value pairs.
* When you apply a Combine transform, you must provide the function that contains the logic for combining the elements or values.
* The combining function should be commutative and associative.
* The Beam SDK also provides some pre-built combine functions for common numeric combination operations such as sum, min, and max.
* complex combination operations might require you to create a subclass of CombineFn that has an accumulation type distinct from the input/output type.

**Advanced combinations using CombineFn:**

* A general combining operation consists of four operations. When you create a subclass of CombineFn, you must provide four operations by overriding the corresponding methods:
  + **Create Accumulator -** creates a new “local” accumulator
  + **Add Input -** adds an input element to an accumulator, returning the accumulator value.
  + **Merge Accumulators -** merges several accumulators into a single accumulator; this is how data in multiple accumulators is combined before the final calculation.
  + **Extract Output -** performs the final computation.

**Three types of Aggregator function is supported by beam. They are.**

**CombineGlobally:**

* Combines all elements in a collection.

**CombinePerKey:**

* Combines all elements for each key in a collection.

**CombineValues:**

* Combines an iterable of values in a keyed collection of elements.

**Resources:**

* <https://beam.apache.org/documentation/programming-guide/#combine>
  + <https://beam.apache.org/documentation/transforms/python/aggregation/combineglobally/>
  + <https://beam.apache.org/documentation/transforms/python/aggregation/combineperkey/>
  + <https://beam.apache.org/documentation/transforms/python/aggregation/combinevalues/>