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SOFTWARE ENGINEERING OF CONTROL AND MEASURING DEVICE ELEMENTS USING AI

To represent data in the neural network of the control and measuring device, tensors of 2-5 ranks are used, the understanding of which allows us to perform calculations in the future. A tensor is a data container that is almost always assigned to numbers [1, p. 5].

1) A Matrix (Rank 2 Tensor) or a two-dimensional tensor is an array of vectors. The Matrix has two axes (often called rows and columns). The Matrix can be represented as a rectangular table with numbers. In the example of the NumPy library Matrix:

```
>>> x = np.array([[6, 79, 3, 35, 1],  
[7, 80, 4, 36, 2],  
[8, 81, 5, 37, 3]])  
>>> x.ndim  
2
```

Elements on the first axis are called rows, and on the second – columns. In the example $[7, 80, 4, 36, 2]$ — this is the second row of the Matrix X, and $[79, 80, 81]$ is its second column.

2) tensors of the 3rd and highest ranks. If we complete such matrices into a new array, we get a three-dimensional tensor, which can be represented as a numeric Cube. As an example of a three-dimensional tensor in NumPy:

```
>>> x = np.array([[[6, 79, 3, 35, 1],  
[7, 80, 4, 36, 2],  
[8, 81, 5, 37, 3]],  
[[6, 79, 3, 35, 1],  
[7, 80, 4, 36, 2],  
[8, 81, 5, 37, 3]],  
[[6, 79, 3, 35, 1],  
[7, 80, 4, 36, 2],  
[8, 81, 5, 37, 3]]])  
>>> x.ndim  
3
```

Combining a three-dimensional tensor into an array can create a four-dimensional tensor, and so on.

References

1. Pattanayak S. (2017). Pro Deep Learning with TensorFlow. - Apress-412 P.