

Homework 3: Chapter 12

Do Exercise 12.12 of the textbook.

Exercise 12. Implement a custom layer that performs Layer Normalization (we will use this type of layer in Chapter 15):

- a. The `build()` method should define two trainable weights α and β , both of shape `input_shape[-1:]` and data type `tf.float32`. α should be initialized with 1s, and β with 0s.
- b. The `call()` method should compute the mean μ and standard deviation σ of each instance's features. For this, you can use `tf.nn.moments(inputs, axes=-1, keepdims=True)`, which returns the mean μ and the variance σ^2 of all instances (compute the square root of the variance to get the standard deviation). Then the function should compute and return

$$\alpha \odot \frac{X - \mu}{\sigma + \varepsilon} + \beta,$$

where \odot represents itemwise multiplication (*) and ε is a smoothing term (small constant to avoid division by zero, e.g., 0.001).

- c. Ensure that your custom layer produces the same (or very nearly the same) output as the `keras.layers.LayerNormalization` layer.

Report what you find. Don't forget attach your code with you report. **Deadline:** [Nov

31, 2025]