# DTE-2502: Neural Networks

## Module03: Computational graph

Basic definitions

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## 1. Computational graph

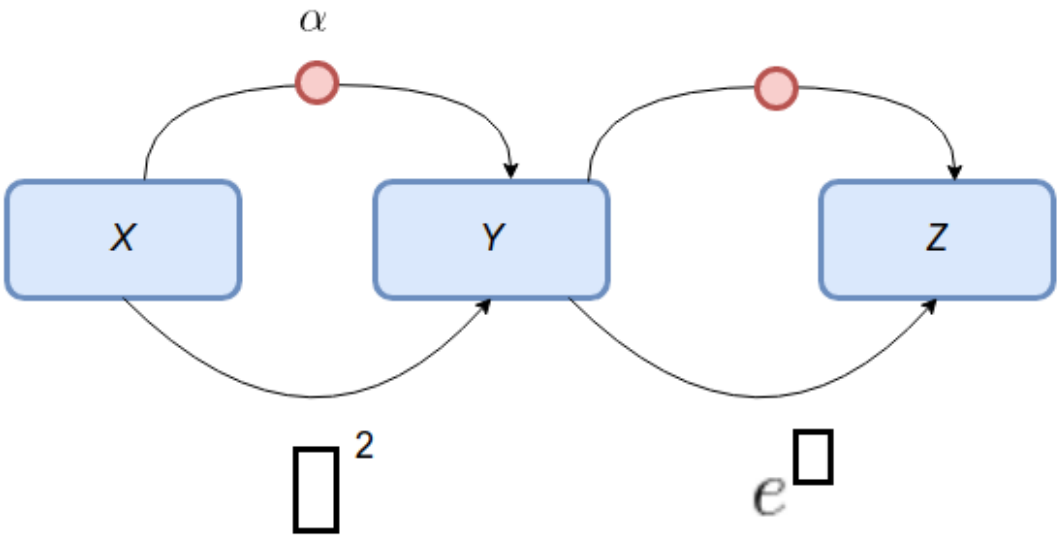


**Figure 1:** Example of gradient flow in a computational graph

In the shown computational graph we have two path multiplied by scalars and two paths having functional transformations. We have $Y = \alpha X + X^2$ and $Z = 1.Y + e^Y$ (as the scalar is not specified it is taken as 1) Forward gradients ($\frac{\partial}{\partial X}$):

- $\frac{\partial X}{\partial X} = 1$
- $\frac{\partial Y}{\partial X} = 1 + 2X$
- $\frac{\partial Z}{\partial X} = \frac{\partial Z}{\partial Y} . \frac{\partial Y}{\partial X} = (1 + e^Y)(1 + 2X)$

Reverse gradients ($\frac{\partial Z}{\partial}$):

- $\frac{\partial Z}{\partial Z} = 1$
- $\frac{\partial Z}{\partial Y} = (1 + e^Y)$
- $\frac{\partial Z}{\partial X} = \frac{\partial Z}{\partial Y} . \frac{\partial Y}{\partial X} = (1 + e^Y)(1 + 2X)$