Deep Learning
The Introduction

Internal course
Medical Physics

Artificial intelligence: definitions

◈ **Artificial Intelligence:** A field of computer science that aims to make computers achieve human-style intelligence. There are many approaches to reaching this goal, including machine learning and deep learning

  ◇ **Machine Learning:** A set of related techniques in which computers are trained to perform a particular task rather than by explicitly programming them.

  ◇ **Neural Network:** A construct in Machine Learning inspired by the network of neurons (nerve cells) in the biological brain. Neural networks are a fundamental part of deep learning, and will be covered in this course.

  ◇ **Deep Learning:** A subfield of machine learning that uses multi-layered neural networks. Often, "machine learning" and "deep learning" are used interchangeably.

Video lessons

- [What is a neural netowks – 1](#) (19'13'')
- [Gradient descent, how neural netowks learn – 2](#) (21'01'')
- [What is backpropagation – 3](#) (13'54'')
- [Backpropagation calculus – 4](#) (10'17'')

Recap: the terminology

◈ **Feature**: The input(s) to our model

◈ **Labels**: The output of the model

◈ **Layer:** A collection of nodes connected together within a neural network.

◈ **Model:** The representation of your neural network

◈ **Dense and Fully Connected (FC):** Each node in one layer is connected to each node in the previous layer.

◈ **Weights and biases:** The internal variables of model

◈ **Loss:** The discrepancy between the desired output and the actual output

◈ **MSE:** Mean squared error, a type of loss function that counts a small number of large discrepancies as worse than a large number of small ones.

◈ **Gradient Descent:** An algorithm that changes the internal variables a bit at a time to gradually reduce the loss function.

◈ **Optimizer:** A specific implementation of the gradient descent algorithm. (There are many algorithms for this. In this course we will only use the "Adam" Optimizer, which stands for ADAptive with Momentum. It is considered the best-practice optimizer.)

◈ **Learning rate:** The "step size" for loss improvement during gradient descent.

◈ **Batch:** The set of examples used during training of the neural network

◈ **Epoch:** A full pass over the entire training dataset

◈ Forward pass: The computation of output values from input

◈ Backward pass (backpropagation): The calculation of internal variable adjustments according to the optimizer algorithm, starting from the output layer and working back through each layer to the input.

Tensorflow

◈ TensorFlow provides **tutorials**, **examples**, and other resources to speed up model building and create scalable ML solutions

◈ Playground → Let's taste a Neural Network experience

◈ KERAS is an open source deep learning framework

K Keras