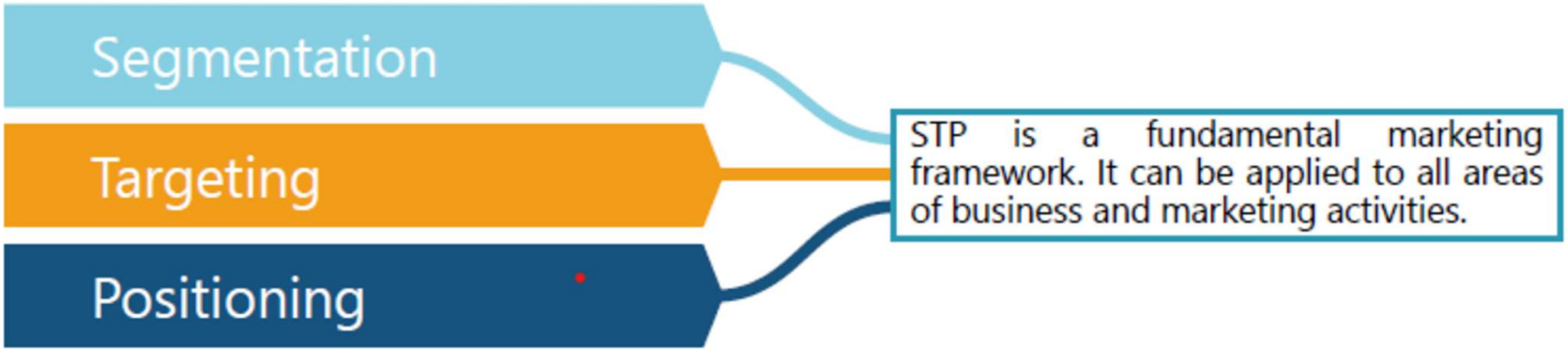
SASI KISHORE VARMA

JANUARY 10, 2025

Customer Analytics

Marketing Modeling

The STP Framework



B2C

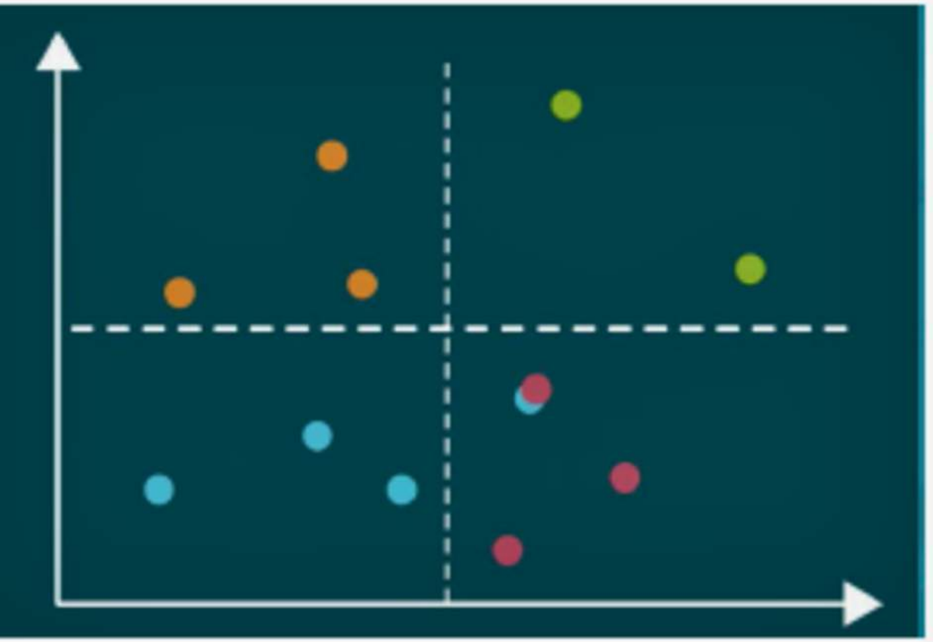
(business-to-customer)

The clients of our business are individuals rather than organizations.

The advantage of a B2C model in terms of data science is that we have much more data points.

The STP Framework

Segmentation



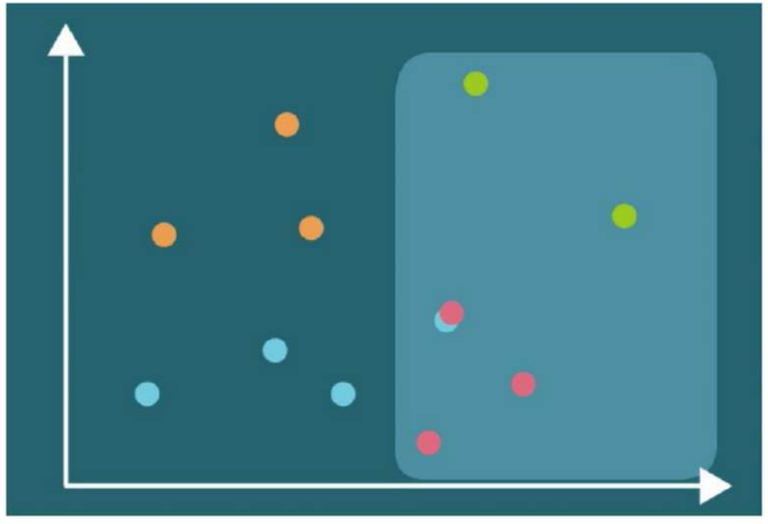
- The process of dividing a population of customers into groups that share similar characteristics.

- Observations within the same group would have comparable purchasing behavior.

- Observations within the same group would respond similarly to different marketing activities.

The STP Framework

Targeting



The process of evaluating potential profits from each segment and deciding which segments to focus on.

Selecting ways to promote your products. You can ***target*** one segment on TV and another online.

Examining customers' perception. *(Involves psychology and usually budget constraints).*

The STP Framework

Positioning

What product characteristics do the customers from a certain segment need?

Marketing Mix

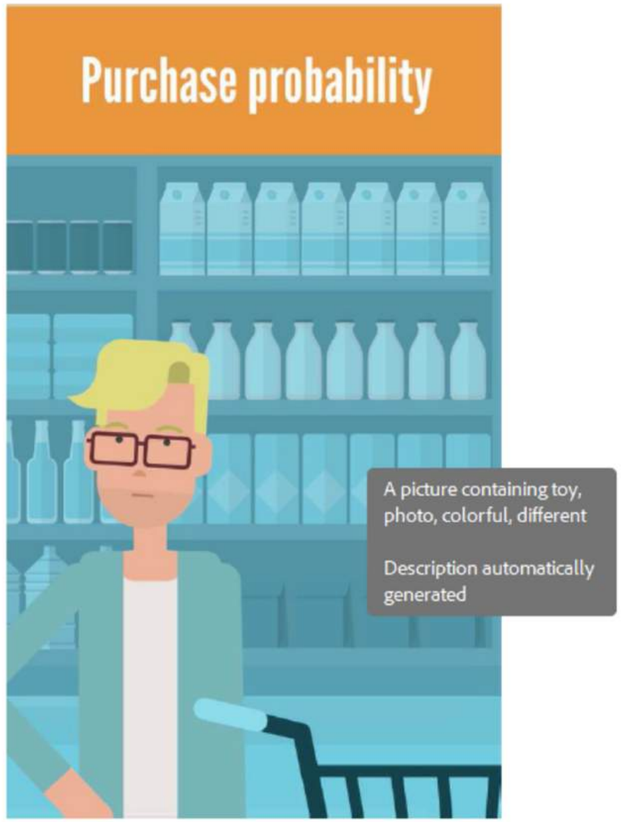
Shows how a product should be **presented** to the customers and through what **channel**.

In fact, this process is so important, that it has a framework of its own called: **Marketing Mix**.

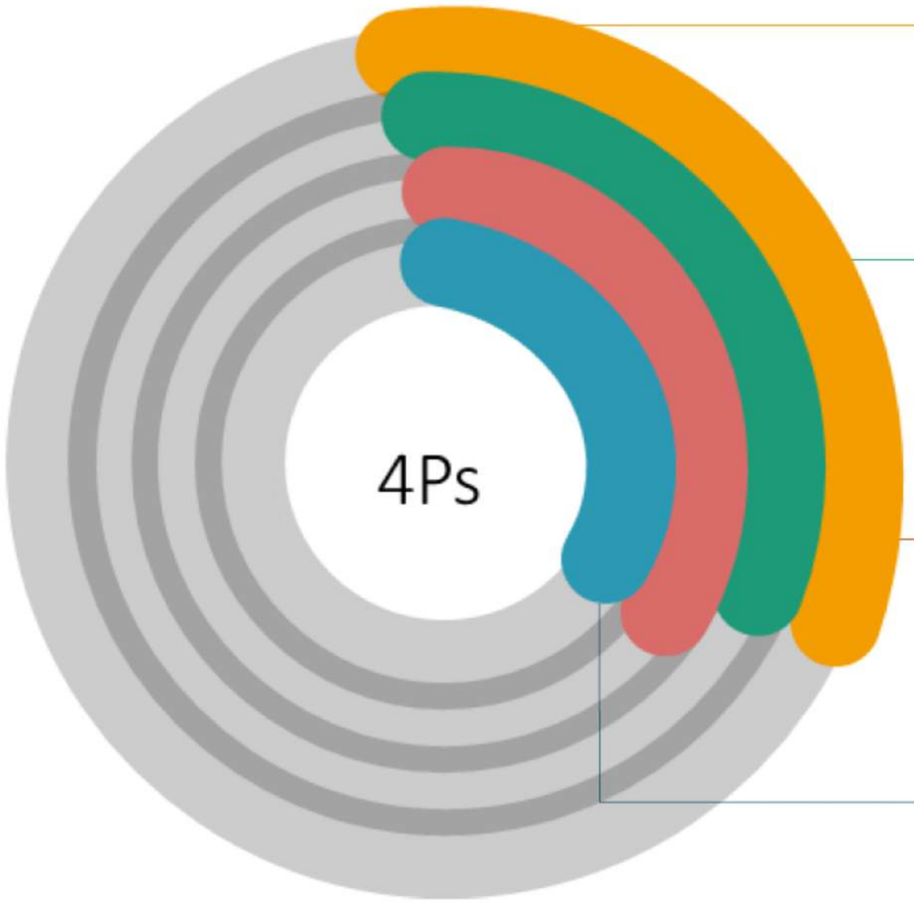
← BACK TO AGENDA PAGE

Marketing Mix

Develop the *best* product or service and offer it at the *right price* through the *right channels*.



Marketing Mix



Product
Product features;
Branding; Packaging

Price
Product cost;
Long term price changes

Promotion
Price reduction,
display and feature

Place
Distribution:
intensive, selective, exclusive

Price Elasticity

Price elasticity measures how a variable of interest changes when the price changes.

Price Elasticity

$$E = \frac{\frac{\Delta Y}{Y}}{\frac{\Delta P}{P}}$$

Y: economic variable of interest
P: price

Supply and Demand

*The cheaper the product
the higher the demand

$$Revenue_i = P_i * Q_i$$

Q: quantity
P: price

Own Price Elasticity

Price elasticity with respect to the same product

Cross Price Elasticity

Price elasticity with respect to another product

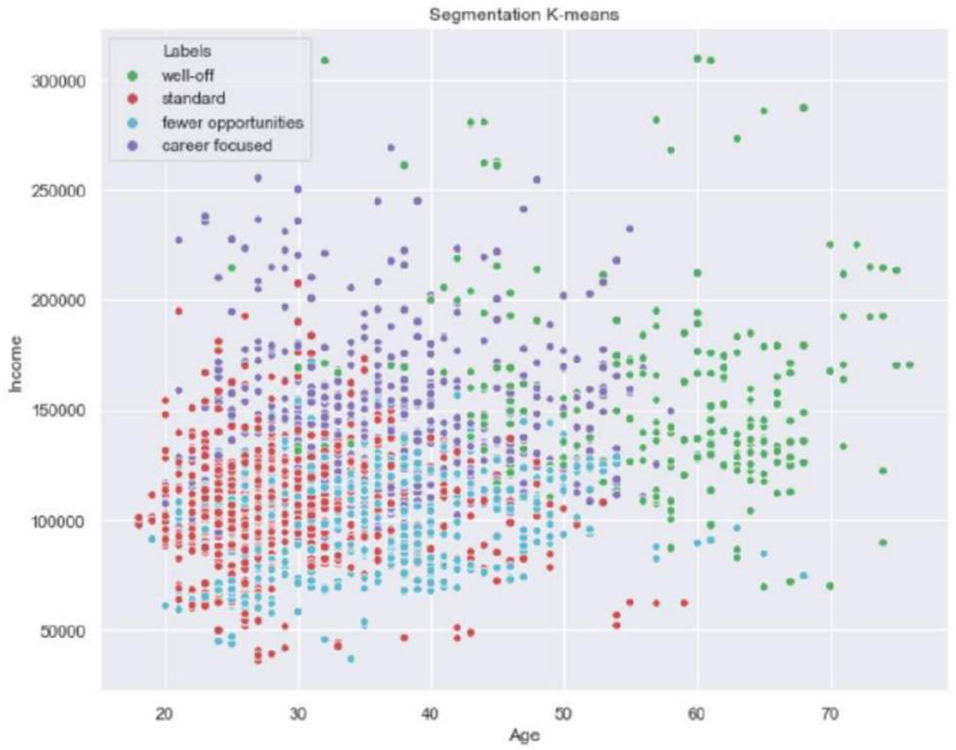
K-means Clustering

01 Choose the number of clusters

02 Specify cluster seeds

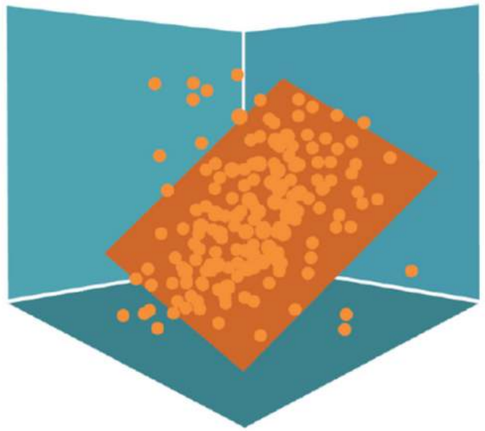
03 Calculate the centroid (geometrical center)

04 Repeat until the centroids stop changing



Principal Components Analysis - PCA

The goal of PCA is to find the best possible subspace which explain most of the variance.
Most commonly it is used to reduce the dimensionality (number of features) of a problem.



3D Plane

Dimensionality reduction technique

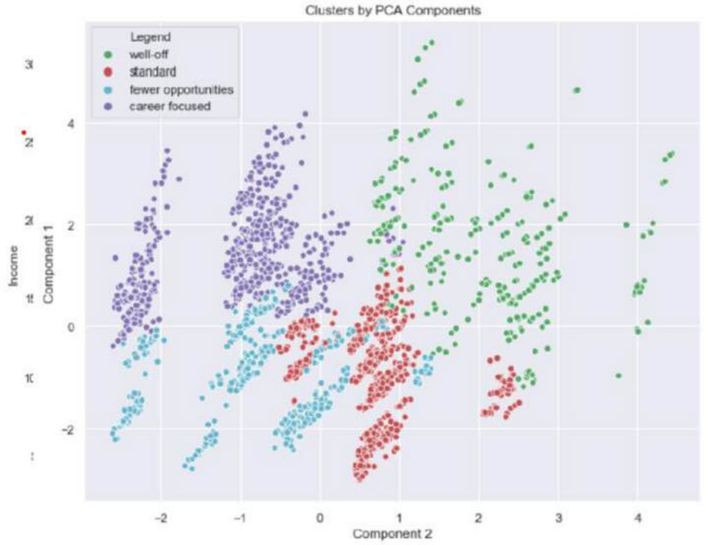
2D Plane

K-means with PCA

01 Reduce Dimensionality with PCA

02 Perform K-means with PCA scores as features

03 Visualize and interpret clusters

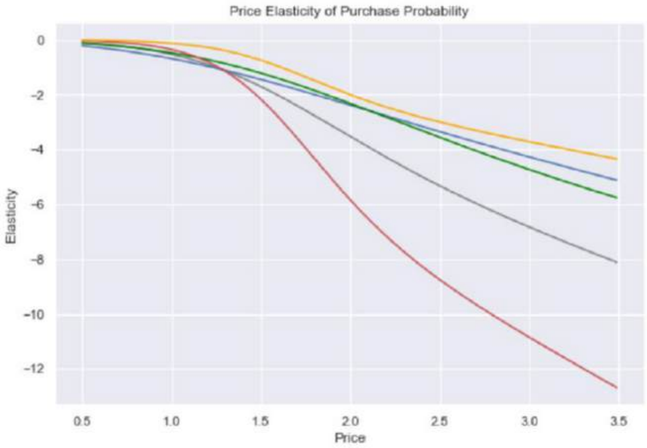


Price Elasticity of Purchase Probability

Quantifies the change in probability of purchase of a product with a given change in its price

Own-price elasticity of purchase probability

$$E = beta * price * (1 - Pr(purchase))$$

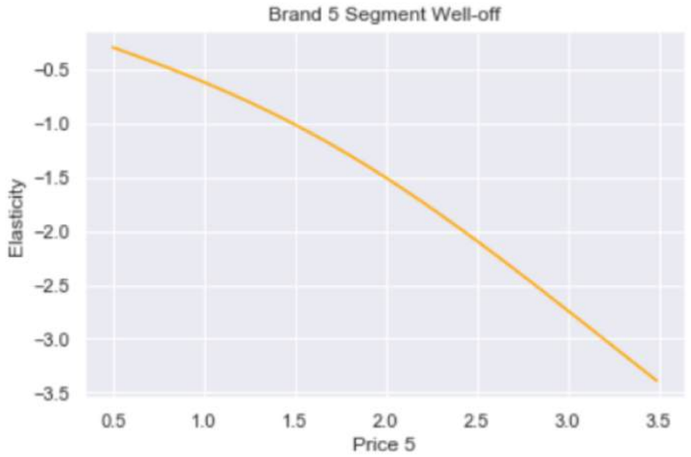


Price Elasticity of Brand Choice Probability

Quantifies the change in probability of purchase of a product with a given change in a **competitor brand's** price

Cross-price elasticity of brand choice

$$E = -beta(own\ price) * price(cross\ brand) * Pr(cross\ brand)$$



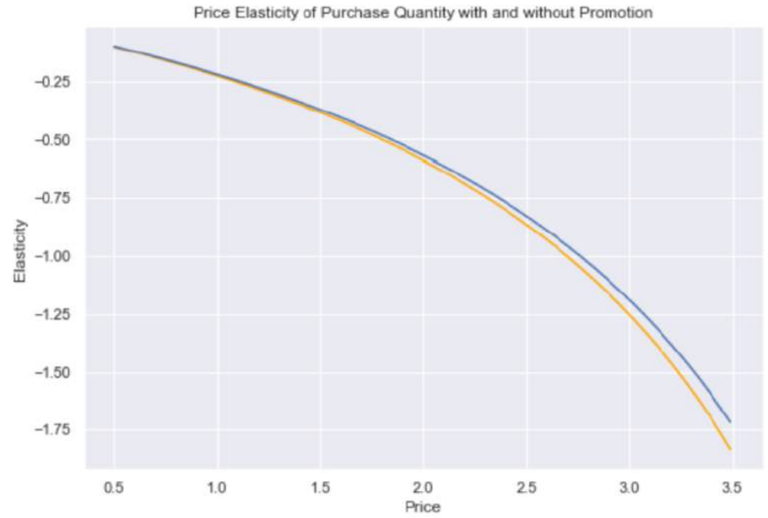
Price Elasticity of Purchase Quantity

Quantifies the change in purchase quantity of a product with a given change in its price

Price elasticity of purchase quantity

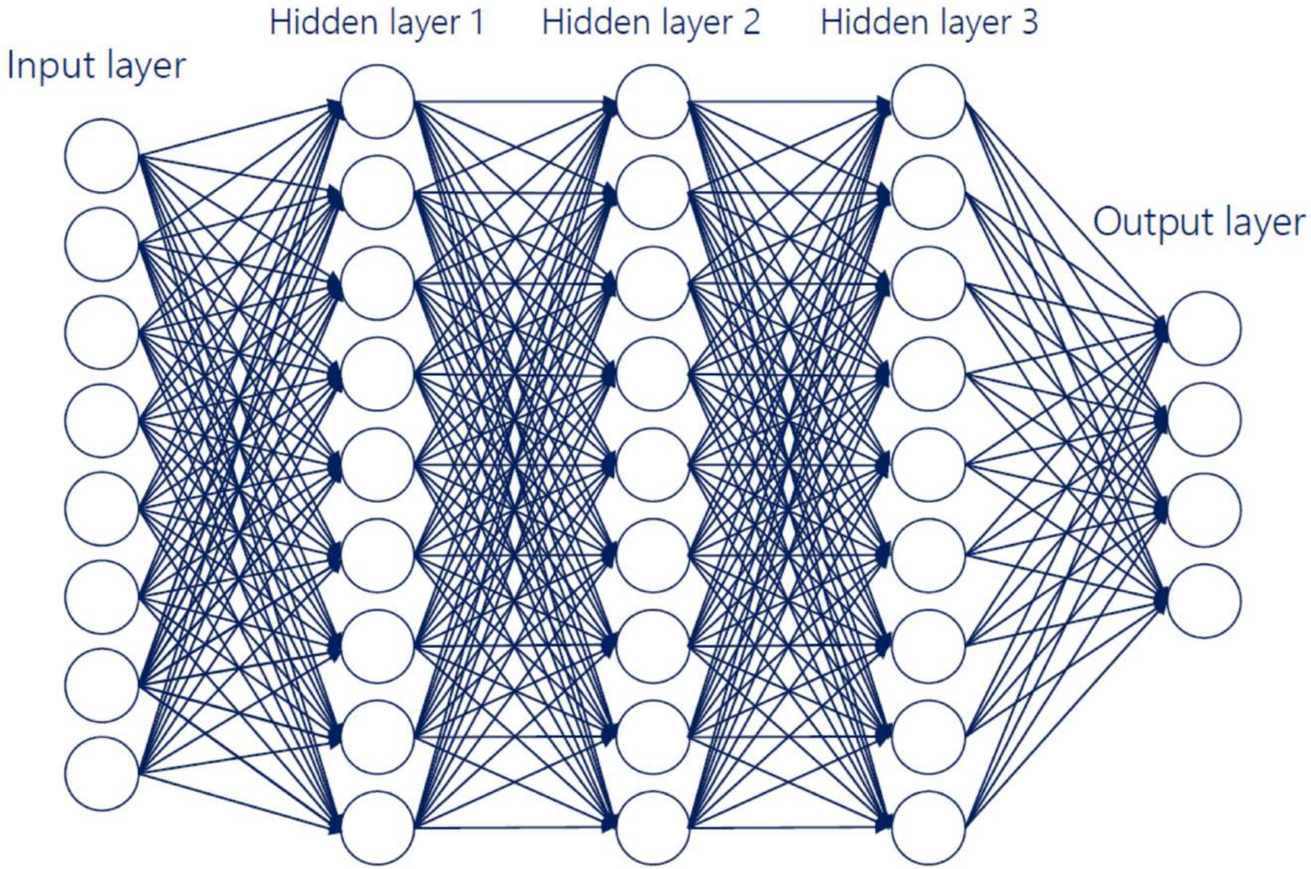
**Closest to price elasticity of demand*

$$E = beta * \frac{Price}{Quantity(purchase)}$$



A Deep Neural Network

This is a deep neural network (deep net) with 5 layers.



How to read this diagram:

A layer

A unit (a neuron)

Arrows represent mathematical transformations

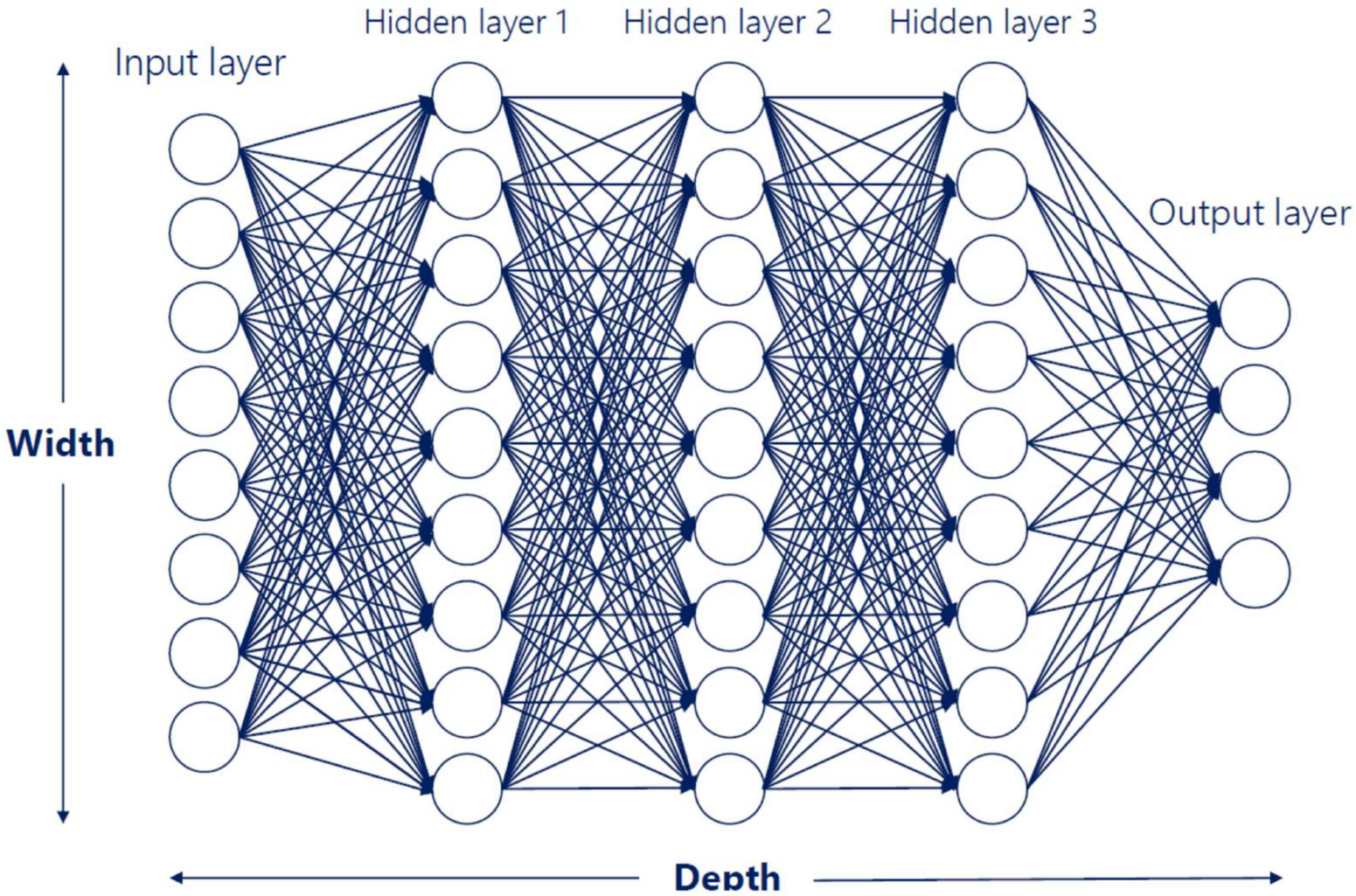
A Deep Neural Network

The **width** of a layer is the number of units in that layer.

The **width** of the net is the number of units of the biggest layer.

The **depth** of the net is equal to the number of layers or the number of hidden layers. The term has different definitions. More often than not, we are interested in the number of hidden layers (as there are always input and output layers).

The width and the depth of the net are called **hyperparameters.** They are values we manually chose when creating the net.

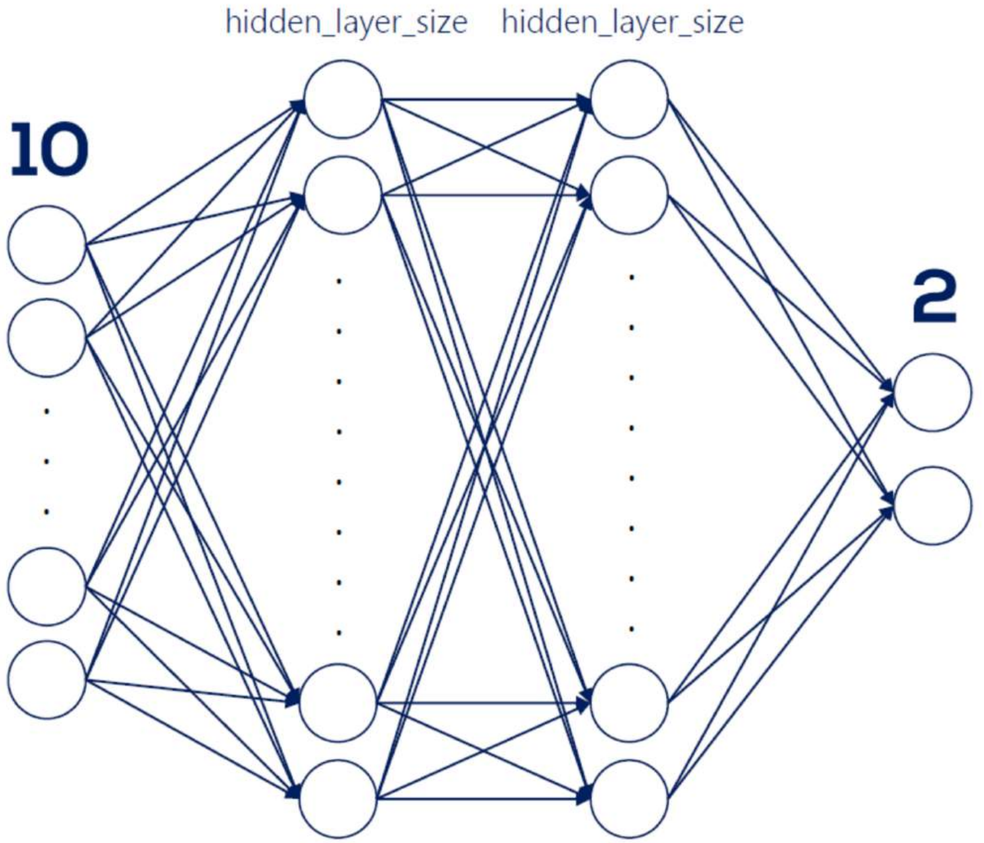


The Business Case Deep Neural Net

Our neural network has 10 features; therefore the input layer size is 10.

The hidden layer size is a hyperparameter. We can adjust it during the learning process. In the lectures we start from 50 nodes, but its size could be any integer number.

The output layer contains the two possibilities for the targets (0 and 1), therefore it has a size of 2.



How to approach similar problems?

1. Preprocess the data
    a. Balance the dataset
    b. Create train, validation and test sets
    c. Save the data in a tensor-friendly format
2. Train the model
    a. Outline the model (create or envision a diagram like the one on the right)
    b. Create the actual network and choose appropriate starting hyperparameters
    c. Optimize the model by fiddling with the hyperparameters
    d. Test the model
3. Save the model and deploy it where needed