1. **Architecture of the ANN Model:**

Overview of our original data file:

Load the datafile in with read\_csv function, then hit data.info() in Jupyter notebook for more information.

The Dataset ATS- 1.CSV file consists of 10 columns, including categorical and numerical data.

Categorical columns include: gender, Dependents, Phone Services, Multiple Lines, Internet Service, Contract, Churn (target variable later, we will first leave it aside, as this was primarily not in the original dataset)

Numerical columns include: Senior Citizen, Tenure, Monthly Charge

Data Preprocessing:

Encoding Categorical Variables: Use one-hot encoding or label encoding to convert categorical variables into numerical form.

Normalization: Scale numerical columns to a standard range using Standardization, like 0 to 1.

**2. Weighting factors:**

Gender: 2 categories (Male, Female) with one encoded column, which is binary.

Dependents: 2 categories (Yes, No) with one encoded column, which is binary.

Phone Service: 2 categories (Yes, No) with one encoded column, which is binary.

Multiple Lines: 3 categories (Yes, No, No phone service,) with 2 encoded columns.

Internet Service: 3 categories (DSL, Fiber optic, No) with 2 encoded columns.

Contract: 3 categories (Month-to-month, One year, Two year) with 2 encoded columns.

**3. Input Layer:**

Here The Input Shape should be the number of encoded features below, which is 10.

**4. Output Layer:**

For binary classification, use one single neuron with a sigmoid function, whereas a single neuron in the output layer is sufficient to generate probability,

Neurons: 1 (for binary classification of churn)

Activation Function: Recommend Sigmoid (probability between 0 and 1)

**5. Hidden Layers with Neurons:**

Layer 1/ First Layer:

Neurons: 64 (in general cases)

In order to prevent Overfitting, dropout should be 15-20%

Layer 2/ Second Layer:

Neurons: 32, but normally half of the size of hidden layer 1 / previous hidden layer.

**6. Numerical Features and Number of Neurons:**

Senior Citizen, tenure, Monthly Charges all have one numerical column each respectively.

Summing up the encoded and numerical columns up 1\* 3+ 2 \*3 + 1 \*2 = 12 features.

Thus, the Number of Neurons should equal to the number of features after encoding and scaling, which is 12.

For the number of neurons, random seed is not needed here for sequence modelling.

**7. Model Compilation and Short Summary:**

Accuracy: 70 percent for this model.

Loss Function: Binary Cross entropy (since the target is binary)

Metrics: Accuracy, Precision, Recall, F1-score

Batch Size: 32 recommended

Epochs: 50 recommended with early stopping based on validation loss

In conclusion, this defined architecture of ANN model should be improved by using methods like cross-validation and hyperparameter adjusting to optimize predictive performance for customer churn prediction, as providing more useful insights for businesses to reduce their customers.