

# Viva Questions for MIDS ANN

Thanks for uploading your `.ipynb` file. I'll now analyze the notebook to identify the 8 practicals—4 related to **MIDS** (Machine Intelligence and Data Science) and 4 related to **ANN** (Artificial Neural Networks). Based on the code and theory involved, I'll generate a set of **viva questions and answers** for each practical.

Let me first read the notebook and extract the contents.

It looks like the notebook doesn't contain any clearly marked **titles or headings** that indicate individual practicals such as "Practical 1", "Experiment 2", etc. Because of this, the system wasn't able to separate the practicals automatically.

To proceed correctly, I need one of the following from you:

1. **Clarification:** Let me know the names or headings of each practical manually (e.g., Practical 1: Data Preprocessing, Practical 2: Linear Regression, etc.), or
2. **Fix:** Re-upload the notebook with proper section headings for each practical (e.g., use markdown cells with titles like `## Practical 1: ANN Basics`).

Would you prefer to share the titles, or reformat the notebook and re-upload it?

Great! The notebook contains 8 code cells, and each one represents a **practical**. Let's proceed to generate **viva questions and answers** for each of these 8 practicals, based on their code and underlying theory.

I'll analyze each practical one by one and provide a **set of 4–6 professional viva questions and answers** per practical.

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## ✓ Practical 1: Activation Functions in ANN

### 🔪 Code Summary:

Implements and plots various activation functions:

- Step
- Sigmoid
- Tanh
- ReLU
- Leaky ReLU

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### ✓ Viva Questions and Answers:

#### Q1. What is the purpose of an activation function in a neural network?

**A1.** Activation functions introduce non-linearity into the neural network, allowing it to learn and represent complex patterns. Without them, the neural network would behave like a linear regression model.

**Q2. How does the sigmoid activation function behave and what is its mathematical formula?**

**A2.** The sigmoid function maps input values between 0 and 1 using the formula:

$$\sigma(x) = \frac{1}{1 + e^{-x}}$$

It's useful for binary classification but suffers from vanishing gradients.

**Q3. What is the difference between ReLU and Leaky ReLU?**

**A3.** ReLU outputs 0 for all negative inputs, which may lead to the "dying ReLU" problem. Leaky ReLU addresses this by allowing a small, non-zero gradient when the input is negative:

$$\text{LeakyReLU}(x) = \max(\alpha x, x), \quad \text{where } \alpha \text{ is a small value like } 0.01$$

**Q4. Why is tanh preferred over sigmoid in some cases?**

**A4.** Tanh outputs values between -1 and 1, making it zero-centered. This can lead to faster convergence compared to sigmoid, which outputs between 0 and 1.

**Q5. In which situations would you use a step function?**

**A5.** Step functions are mainly used in perceptrons and not in modern deep learning due to their non-differentiability, which makes them unsuitable for gradient-based optimization.

Would you like me to continue with the remaining 7 practicals in a similar format?

Perfect. Here's the breakdown:

## ◆ Artificial Neural Networks (ANN) Practicals

### ✓ Practical 2: Feedforward and Backpropagation

#### 🔴 Code Summary:

Implements feedforward neural network and backpropagation using sigmoid activation.

#### ✓ Viva Questions and Answers:

**Q1. What is the purpose of the feedforward step in a neural network?**

**A1.** The feedforward step calculates the output of each neuron layer-by-layer using the current weights and activation functions.

**Q2. What is backpropagation?**

**A2.** Backpropagation is the process of adjusting weights in a neural network by propagating the error backward using gradient descent.

**Q3. How is the derivative of sigmoid used in backpropagation?**

**A3.** The derivative of the sigmoid function is:

$$\sigma'(x) = \sigma(x)(1 - \sigma(x))$$

It's used to compute the gradient during weight updates.

**Q4. What are the two main phases of training in neural networks?**

**A4.** The two main phases are **Feedforward** (prediction) and **Backpropagation** (learning through error

correction).

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## ✓ Practical 3: Adaptive Resonance Theory (ART1)

### ✂ Code Summary:

Implements ART1 neural network using vigilance parameter for pattern recognition.

### ✓ Viva Questions and Answers:

#### Q1. What is Adaptive Resonance Theory (ART)?

**A1.** ART is a type of neural network designed for unsupervised learning that balances plasticity (learning new patterns) and stability (preserving old ones).

#### Q2. What does the vigilance parameter control in ART1?

**A2.** The vigilance parameter determines how strictly new inputs must match existing categories. Higher vigilance = stricter matching.

#### Q3. What type of inputs does ART1 accept?

**A3.** ART1 is specifically designed for binary input patterns.

#### Q4. How does ART1 deal with new categories?

**A4.** If an input doesn't match any existing category based on the vigilance threshold, a new category is created.

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## ✓ Practical 4: Perceptron Algorithm

### ✂ Code Summary:

Implements a perceptron for binary classification using linearly separable data.

### ✓ Viva Questions and Answers:

#### Q1. What is a perceptron?

**A1.** A perceptron is the simplest type of artificial neural network consisting of a single neuron used for binary classification.

#### Q2. What kind of data can a perceptron classify?

**A2.** Perceptrons can only classify linearly separable data.

#### Q3. How does the perceptron learning rule update weights?

**A3.** Weights are updated as:

$$w = w + \eta(y - \hat{y})x$$

Where  $\eta$  is the learning rate,  $y$  is the true label, and  $\hat{y}$  is the predicted label.

#### Q4. Why are perceptrons not used for complex tasks?

**A4.** They can't solve problems that are not linearly separable, such as XOR.

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## ◆ Machine Intelligence & Data Science (MIDS) Practicals

## ✓ Practical 5: Data Preprocessing with StandardScaler

### ✂ Code Summary:

Uses `StandardScaler` to normalize numerical data.

### ✓ Viva Questions and Answers:

#### Q1. Why do we need to scale data?

A1. Scaling ensures all features contribute equally to the model and speeds up convergence in optimization algorithms.

#### Q2. What does `StandardScaler` do?

A2. It standardizes features by removing the mean and scaling to unit variance:

$$z = \frac{x - \mu}{\sigma}$$

#### Q3. What happens if we don't scale data before training?

A3. Features with larger scales may dominate others, leading to poor model performance.

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## ✓ Practical 6: KNN with TF-IDF on Text Data

### ✂ Code Summary:

Applies TF-IDF vectorization and KNN classification for text classification.

### ✓ Viva Questions and Answers:

#### Q1. What does TF-IDF stand for?

A1. Term Frequency–Inverse Document Frequency. It scores words based on how important they are in a document relative to a collection.

#### Q2. What type of classifier is KNN?

A2. KNN is a non-parametric, instance-based, lazy learning classifier.

#### Q3. What is the value of `k` in KNN?

A3. `k` is the number of nearest neighbors considered to classify a test sample. It's typically chosen through experimentation.

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## ✓ Practical 7: Naive Bayes for Text Classification

### ✂ Code Summary:

Uses `CountVectorizer` and `Multinomial Naive Bayes` for classifying text.

### ✓ Viva Questions and Answers:

#### Q1. Why is Naive Bayes called “naive”?

A1. It assumes all features are conditionally independent given the class label, which is a naive assumption but works well in practice.

**Q2. What is MultinomialNB suitable for?**

**A2.** It's suitable for discrete features such as word counts in text classification.

**Q3. Difference between CountVectorizer and TF-IDF?**

**A3.** CountVectorizer counts occurrences; TF-IDF scales them by importance across documents.

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## ✓ Practical 8: Abalone Dataset Regression

### 📌 Code Summary:

Loads the abalone dataset, visualizes it, and performs regression tasks.

### ✓ Viva Questions and Answers:

**Q1. What is the goal of the Abalone dataset analysis?**

**A1.** To predict the age of abalone based on physical measurements.

**Q2. Which kind of ML task does this fall under?**

**A2.** It's a **regression** problem because the target variable (age) is continuous.

**Q3. Why is visualization important in data analysis?**

**A3.** It helps in understanding feature distribution, spotting outliers, and identifying correlations.

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Would you like me to export all this content into a **PDF or Word document** for easy revision or submission?

It seems like I can't do more advanced data analysis right now. Please try again later.

However, I can still provide you with the entire set of professionally written viva questions and answers for all 8 practicals (4 ANN + 4 MIDS) directly here, which you can then copy into a Word document if needed. Would you like me to do that?