Supervised machine learning is a type of machine learning where the algorithm learns from labeled data, which means each input data point is associated with a corresponding target or output label. The goal is for the algorithm to learn a mapping from the input to the output based on the given labeled examples.

Here’s a simple example to illustrate supervised machine learning:

**Example: Email Spam Classification**

**Problem:** You want to classify emails as either spam or non-spam (ham) based on the content of the email.

**Dataset:** You have a dataset of emails where each email is labeled as spam or ham.

**Features:**

* **Textual features:** Words or phrases in the email.
* **Structural features:** Length of the email, presence of attachments, etc.

**Target:**

* **Label:** Whether the email is spam (1) or ham (0).

**Steps:**

1. **Data Collection:** Gather a dataset of emails labeled as spam or ham.
2. **Data Preprocessing:** Convert the text data into a numerical format that machine learning algorithms can process (e.g., using techniques like Bag-of-Words, TF-IDF, etc.). Split the dataset into training and testing sets.
3. **Model Selection:** Choose a supervised learning algorithm suitable for classification tasks, such as:
   * Logistic Regression
   * Naive Bayes
   * Support Vector Machines (SVM)
   * Decision Trees
   * Neural Networks (e.g., for more complex patterns)
4. **Training:** Train the selected model on the training data. During training, the model learns the relationship between the input features (email content) and the target labels (spam or ham).
5. **Evaluation:** Evaluate the trained model on the test dataset to assess its performance. Common evaluation metrics for classification tasks include accuracy, precision, recall, and F1-score.
6. **Prediction:** Once the model is trained and evaluated, it can be used to predict whether new, unseen emails are spam or ham based on their content.

**Example Workflow:**

* You preprocess the text data to extract features like word frequencies or presence of certain keywords.
* You choose a classification algorithm like Naive Bayes.
* You train the Naive Bayes model on the labeled email dataset.
* After training, you evaluate the model’s performance using metrics like accuracy and confusion matrix.
* Finally, you deploy the trained model to classify new incoming emails as spam or ham.

This example demonstrates how supervised learning is used to solve a classification problem by learning from labeled data to make predictions on new, unseen data.