Explanation-

This code is a Python application for classifying fashion items in a video stream using a Convolutional Neural Network (CNN) trained on the Fashion MNIST dataset. Let's break down the code into sections:

1. \*\*Import Statements\*\*: The code starts with importing necessary libraries and modules such as OpenCV (cv2), NumPy, Tkinter for GUI, Keras for building and training the CNN model, and PIL for image processing.

2. \*\*CustomProgressBar Class\*\*: This class defines a custom progress bar widget using Tkinter's `ttk.Progressbar`. It provides a method `update\_progress` to update the progress bar value.

3. \*\*FashionImageClassifier Class\*\*: This is the main class responsible for the application's GUI and functionality.

- \*\*Initialization\*\*: The class initializes the Tkinter window and sets up the layout with canvas for displaying video frames, buttons for user interaction, labels for displaying predictions and probabilities.

- \*\*Preprocessing Methods\*\*:

- `preprocess\_image`: This method preprocesses the input image before passing it to the model. It resizes the image to 28x28 pixels, converts it to grayscale, and normalizes pixel values.

- \*\*Model Training\*\*:

- `train\_model`: This method loads the Fashion MNIST dataset, preprocesses it, builds and trains a CNN model using Keras. It saves the trained model to a file named `fashion\_mnist\_model.h5`.

- \*\*Image Classification\*\*:

- `classify\_image`: This method takes an input image, preprocesses it, and passes it through the trained CNN model for classification. It updates the GUI with the predicted class label and class probabilities.

- \*\*Video Processing Methods\*\*:

- `load\_video\_and\_process`: This method prompts the user to select a video file, loads the selected video, and starts processing each frame. It also provides options to pause, stop, go to the next frame, and go to the previous frame.

- `pause\_video\_processing`: This method toggles the pause state of video processing.

- `stop\_video\_processing`: This method stops video processing and releases video resources.

- `next\_frame` and `prev\_frame`: These methods allow navigation through video frames.

- \*\*GUI Interaction Methods\*\*:

- `clear\_display`: Clears the canvas and labels.

- `exit\_app`: Closes the application window.

4. \*\*Main Block\*\*:

- It creates an instance of the Tkinter `Tk` class, initializes an instance of `FashionImageClassifier`, and starts the Tkinter event loop.

Overall, this application provides a user-friendly interface for loading a video, processing its frames for fashion item classification, and displaying the results in real-time. It leverages a pre-trained CNN model on the Fashion MNIST dataset for accurate classification.