

Neural Network Final Exam: Coin Drop Prediction (05/12/2024)

Objective: Design and implement a Neural Network algorithm to predict the landing position and orientation of a coin dropped from a height of 1 meter, distinguishing between heads and tails. Consider various initial dropping conditions, such as head facing up, vertical drop, or tail facing up, and ensure predictions include where the coin will land (with >80% accuracy).

Steps:

1. **Data Collection:**
 - Capture a minimum of 100 iterations of coin drops from a height of 1 meter, utilizing either images or videos. Alternatively, manual recording is acceptable, but meticulous attention is required when preparing the Excel file. Ensure that images or videos distinctly capture the coin at the moment of landing. If conducting manual recording, include related diagrams for clarity.
2. **Data Labeling:**
 - Manually label each dataset entry, specifying heads or tails, as well as distance from an selected origin.
3. **Preprocessing:**
 - Extract essential features from images or videos, including coin orientation, position, and environmental factors.
 - Normalize and preprocess the data to prepare it for the Neural Network.
4. **Model Selection:**
 - Choose an appropriate Neural Network architecture for binary classification of heads or tails.
 - Train the Neural Network using the labeled dataset. Don't forget to separate training and test data sets.
5. **Model Evaluation:**
 - Assess the Neural Network's performance through metrics like accuracy, precision, recall, etc.
6. **Prediction:**
 - Apply the trained Neural Network to predict the outcome of new coin drops.
7. **Video Validation:**
 - Record a video demonstrating the Neural Network's predictions in real-time.
 - Visualize the predicted outcomes for each coin drop.
8. **Code Implementation:**
 - Develop the code for data preprocessing, Neural Network model training, and predictions.
 - Ensure code clarity with comments for ease of understanding.
9. **Short Report:**
 - Document the complete process, covering data collection, preprocessing, Neural Network architecture selection, and evaluation.
 - Discuss encountered challenges and the strategies employed to overcome them.
 - Present the results, including Neural Network performance metrics and video validation outcomes.

10. Upload Code and Report:

- Share the code on a version control platform (e.g., GitHub) alongside the short report. Also upload to Ninova.
- Provide clear instructions for running the code and reproducing the results.

Note: Adhere to ethical guidelines, obtain necessary permissions for data usage, and recognize that the model's success may hinge on the intricacies of the coin's behavior during descent, potentially requiring experimentation and fine-tuning.