### Project Plan for Developing AI Model to Detect Vehicles and Security Guards

#### 1. Data Collection and Preparation (2-3 weeks)

* Collect Video Data:
  + Gather a diverse dataset of videos showing vehicles on driveways and security guards inspecting around the vehicles. Ensure variability in lighting, weather, and scenarios.
* Data Annotation:
  + Annotate the videos to label vehicles and security guards. Frame-by-frame annotation might be necessary. Consider outsourcing if the dataset is large.
* Data Splitting:
  + Divide the annotated dataset into training, validation, and test sets.

#### 2. Environment and Tool Setup (1 week)

* Setup Development Environment:
  + Install necessary libraries and frameworks (e.g., TensorFlow, OpenCV) on development machines.
* Choose Hardware:
  + Decide whether to use local GPUs, cloud-based services, or dedicated AI hardware accelerators for training and inferencing.

#### 3. Model Development (4-6 weeks)

* Select Pretrained Model:
  + Choose a suitable pre trained CNN model (e.g., ResNet, MobileNet) for feature extraction. Pretrained models are trained on large datasets and can capture general features effectively.
* Customize Model Architecture:
  + Add custom layers for object detection and recognition. Implement mechanisms to identify both vehicles and security guards.
* Loss Function and Metrics:
  + Define appropriate loss functions for both vehicle and security guard detection. Choose evaluation metrics such as accuracy, precision, and recall.
* Data Pipeline:
  + Develop efficient data loading and preprocessing pipelines to feed video frames into the model during training.

#### 4. Model Training and Evaluation (6-8 weeks)

* Training:
  + Train the model using the annotated dataset. Implement techniques like data augmentation to enhance model generalization.
* Validation and Fine-tuning:
  + Validate the model on the validation set. Fine-tune hyperparameters based on validation performance.
* Evaluation:
  + Evaluate the final model on the test set. Iterate on the model and data if performance is not satisfactory.

#### 5. Deployment (2 weeks)

* Inference Pipeline:
  + Develop an inference pipeline that can process video streams in real-time and make predictions using the trained model.
* Integration with CCTV System:
  + Integrate the AI model into the CCTV system, ensuring compatibility and efficiency.
* Testing and Optimization:
  + Conduct extensive testing to ensure real-time processing. Optimize the model for performance if needed.

#### 6. Documentation and Knowledge Transfer (1-2 weeks)

* Documentation:
  + Document the entire development process, including dataset details, model architecture, training procedures, and deployment instructions.
* Knowledge Transfer:
  + Transfer knowledge to the operations and maintenance teams, including how to monitor, troubleshoot, and update the deployed system.

#### 7. Maintenance and Iteration (Ongoing)

* Monitoring:
  + Implement monitoring tools to track the system's performance and accuracy over time. Set up alerts for any anomalies.
* Model Updates:
  + Periodically retrain the model with new data to improve accuracy and adapt to changing scenarios.
* Feedback Loop:
  + Establish a feedback loop with end-users and security personnel to gather feedback for further enhancements.

Remember, the timeline provided is approximate and can vary based on the complexity of the project, the size and quality of the dataset, and the experience of the development team. Regular communication and collaboration among team members are crucial to the success of the project.