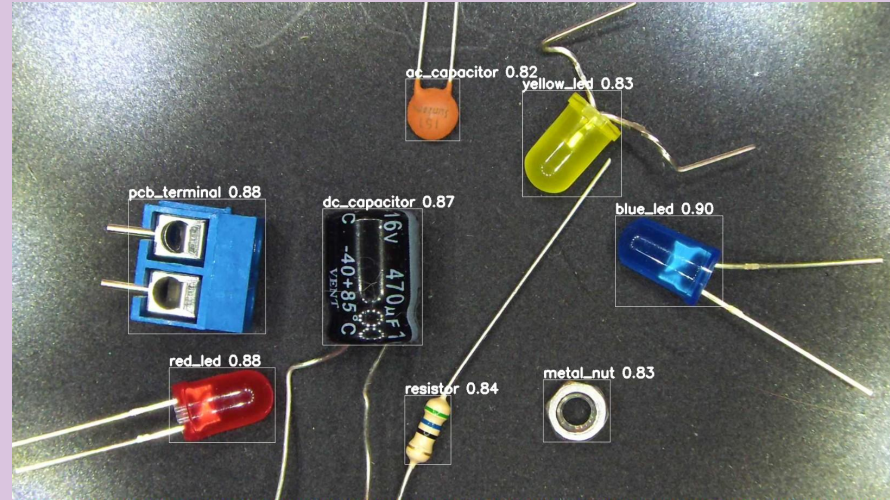


AI based Electronic Component Identifier

Student name: Violet Concordia
Student number: B00125142
Course ID: TU807

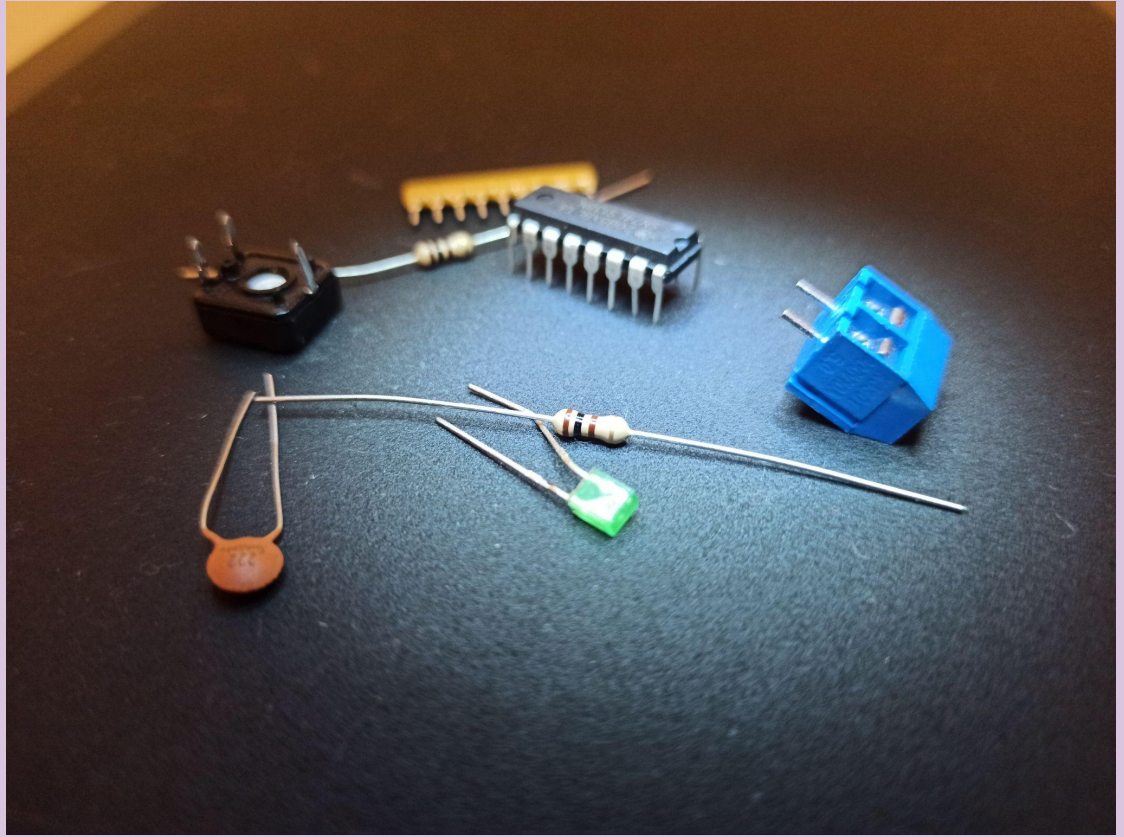
AI based Electronic Component Identification

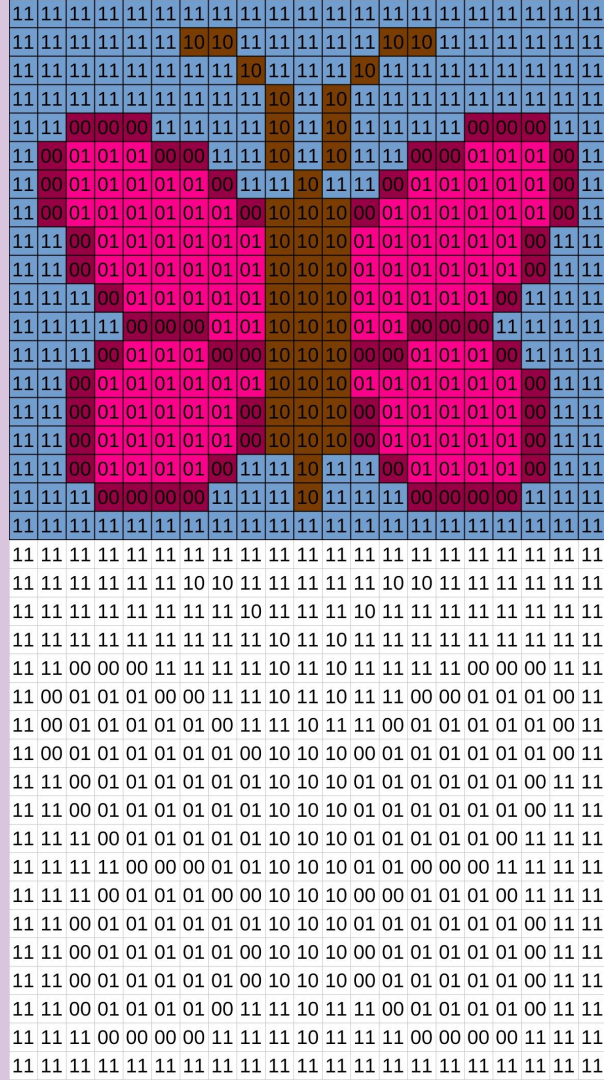
- GUI display
- Identifies:
 - Position (Bounding Box on a live display).
 - Class name.
 - Confidence (Percentage).
 - Quantity.
 - Potential extra information:
 - Resistors - Color code to Ohms.
 - Capacitors - Number code to farad.
 - IC - Pin count, text on the IC if visible.



Object detection

- Important in
 - Security
 - Notifying concerns
 - People
 - Animals
 - Flora
 - Production
 - Discarding defects
 - Damage
 - Analysis
 - Quality inspection
 - Scratches
 - Spots
 - Classification
 - Resistor
 - Capacitor
 - Total and class count



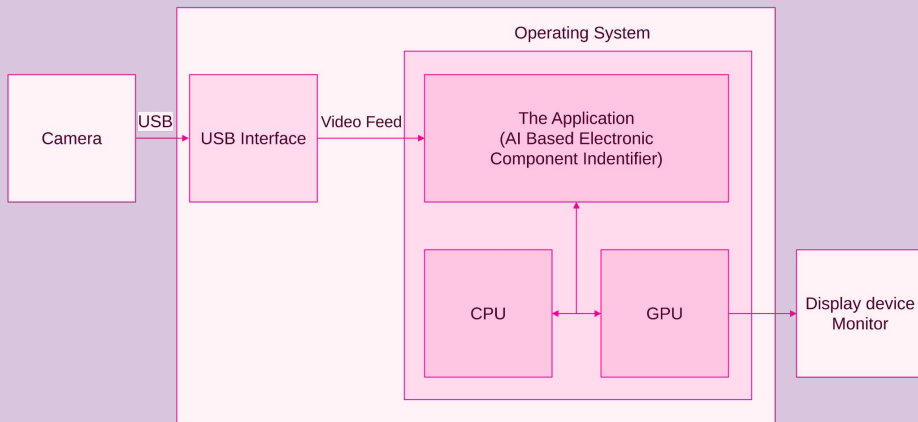


The problem

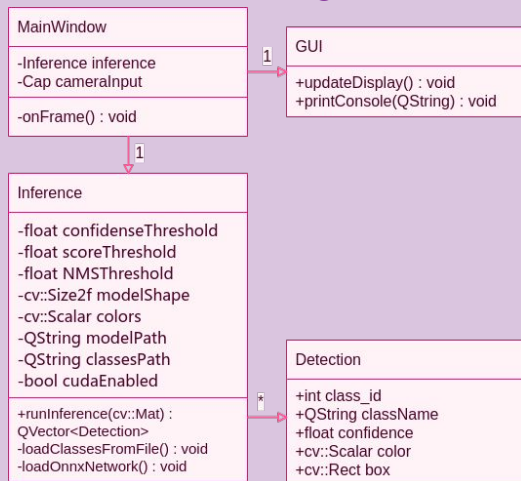
- Object detection from images:
 - Natural to intelligent creatures.
 - Designed for object detection through evolution.
 - Second nature.
 - Binary data to computers.
 - Has no concept of object, image, or color.
 - Everything is processed the same.

System Block Diagram

Machine running the Application



Class Diagram

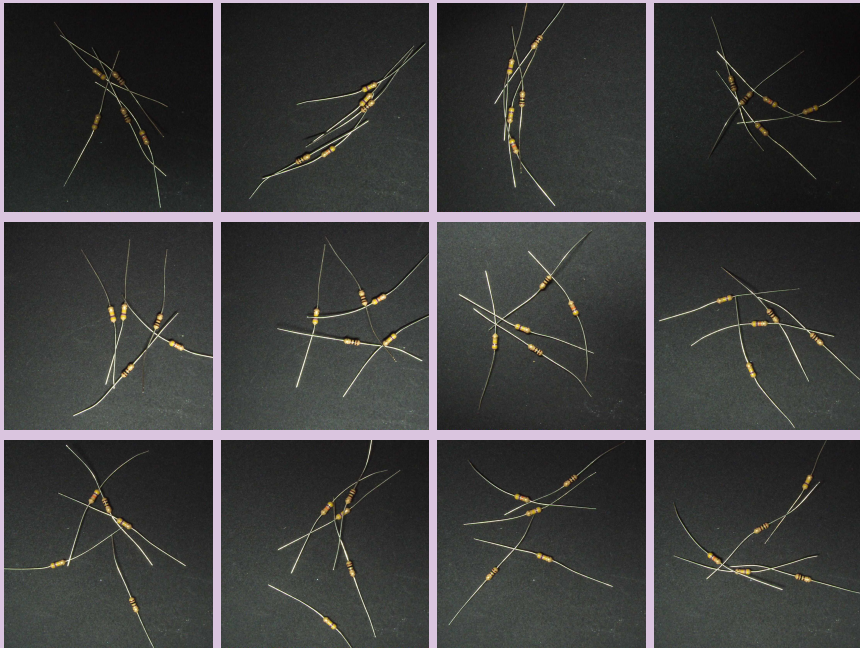
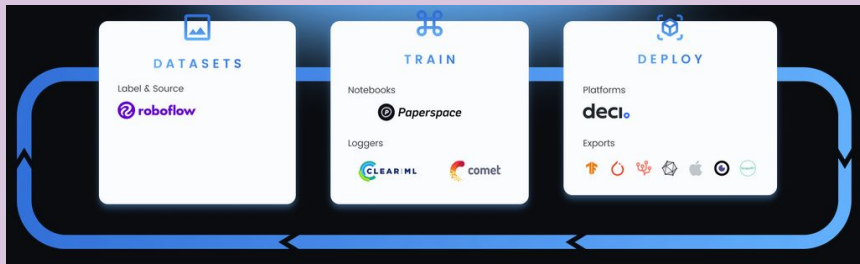


Concept Diagrams

- **System Block Diagram**
 - Camera is External.
 - Communication through USB.
 - The application utilises both CPU and GPU
- **Class Diagram**
 - MainWindow is the controller.
 - Inference is responsible for object detection.
 - GUI is the output.

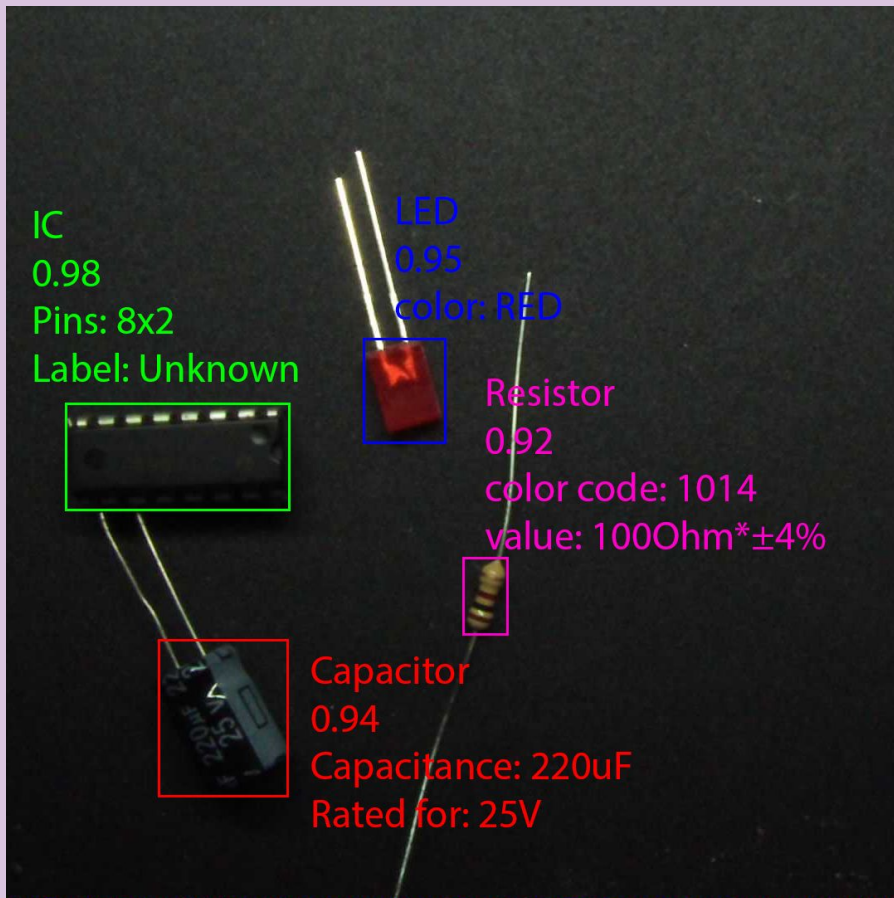
Solution

Inference, Deep Learning



Model Training

- Trained on over 3000 images
 - Taken on the rig.
 - Manually labeled.
- Each picture should have different conditions
- Ideally, multiple items should be present, not only the target
 - Trains against false positives



Note: For now, this was achieved through image manipulation.

Post-Processing

Additional processing after Inference has finished running

- Identification of (For those that apply)
 - Labels using Text Recognition
 - Color codes
 - IC
 - Pin count
 - Color (LED)

Discussion

- Inference is capable of extracting an Extremely high level of information.
 - Post-processing is expected to be considerably less accurate.

Conclusion

- Data gathering and training of the model will be the most time and computation intensive process.
- While the project is mostly software-focused, the physical aspects are a crucial key to the overall success of the project.

References

- [1] YoloV5 <https://github.com/ultralytics/yolov5>, accessed on 6th of November, 2022
- [2] Ultralytics <https://ultralytics.com/>, accessed on 6th of November, 2022
- [3] COCO dataset <https://cocodataset.org/#home>, accessed on 7th of November, 2022



The end

Any questions?