# Hackathon Task 1

## defect detection

## I used SVM algorithm to detect the defect, in that problem I will use the algorithm step by steps

**Algorithm**

The algorithm used for defect detection is Support Vector Machine (SVM) with an RBF kernel.
We chose SVM because:

- It works well with small and medium datasets.
- SVMs are robust for binary and multi-class classification problems.
- The RBF kernel allows the model to capture non-linear decision boundaries, which is crucial because features like contour solidity or aspect ratio are non-linear in nature.
- SVMs have good generalization ability and handle noise well in image-based features.

The features extracted from images include geometric and shape descriptors such as area, perimeter, aspect ratio, solidity, extent, and Hu moments. These features are effective in distinguishing between defect types like **Flashes** (extra material) and **Cuts** (missing material) compared to a Good product.

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**Results and Accuracy Discussion**

The dataset was divided into training and testing sets using an 80:20 split.
The trained SVM model was evaluated using a classification report that measured precision, recall, and F1-score for each defect category.

- **Good samples** were classified with high accuracy since their contour features are stable.
- **Flash defects** were identified based on higher solidity and irregular Hu moments.
- **Cut defects** were detected through reduced area and distinct contour features.

The model achieved promising accuracy (as indicated in the classification report output in the notebook).
However, since the dataset is relatively small and synthetic, results may vary with more real-world data. Increasing the dataset size and applying data augmentation can improve robustness.

**NOTE: In that project I used Support Vector machine to classify the defect images and good images, on that above I can classify correct but I had a problem on good images, my model can classify the all defect images but It did not predict the good image because all the image are have almost same images so it can classify the good image as defective image. Area, solidity, contour, aspect ratio all are same and almost different range only, so that's only my model did not predict the correct images.**