# MNIST Dataset

MNIST consists of handwritten digits, a relatively straightforward dataset for CNNs

**Results**:

- **LeNet-5**: High performance with accuracy, precision, recall, and F1-score all around 0.9859.
- **ResNet**: Strong performance with accuracy and F1-score at 0.9873.
- **SENet**: Excellent accuracy at 0.9947, making it the top performer on MNIST.
- **GoogLeNet**: Very high performance at 0.9906 across all metrics.
- **VGGNet**: Underperformed with an accuracy of 0.1135, suggesting issues in model training.
- **Xception**: Good performance, though lower than SENet.

**Conclusion**:

Most architectures perform well, but SENet stands out. VGGNet's poor result indicates potential misconfiguration.

# Fashion MNIST Dataset

Fashion MNIST features images of clothing, making it more complex than MNIST

**Results**:

- **LeNet-5**: Good performance with accuracy and F1-score near 0.8838.
- **GoogLeNet**: Similar strong performance with accuracy of 0.9021.
- **AlexNet**: Accuracy at 0.8956, competitive with GoogLeNet.
- **ResNet**: Slightly lower at 0.8775.
- **SENet**: The best performer at 0.9276 accuracy, outpacing other models.
- **Xception**: Very strong at 0.9024 accuracy and F1-score.
- **VGGNet**: Extremely low accuracy at 0.1000, again indicating training issues.

**Conclusion**:

SENet leads, followed closely by GoogLeNet and Xception. VGGNet's repeated underperformance needs addressing.

# CIFAR-10 Dataset

CIFAR-10 is a challenging dataset of 32x32 color images across 10 classes

**Results**:

- **LeNet-5**: Limited performance with an accuracy of 0.5595.
- **GoogLeNet**: Very low performance at 0.1000 accuracy.
- **AlexNet**: Similar low performance at 0.1000.
- **ResNet**: Best among traditional models with 0.6937 accuracy.
- **SENet**: Strongest model with 0.7728 accuracy, proving effective for complex data.
- **Xception**: Good accuracy at 0.6597, though below SENet.
- **VGGNet**: Consistently low performance at 0.1000.

**Conclusion**:

SENet and ResNet are most suited for complex data like CIFAR-10. GoogLeNet and AlexNet struggle, with VGGNet showing consistent underperformance.

# Overall Analysis

- **Top Performers**: SENet and ResNet consistently rank high across datasets, with SENet often taking the lead.
- **Poor Performers**: VGGNet's performance remains poor, possibly due to configuration issues.
- **Dataset Complexity**: Simpler models like LeNet-5 perform well on MNIST but struggle with CIFAR-10.
- **GoogLeNet**: Performs well on simpler datasets but is less effective on CIFAR-10, indicating it may not handle complex images as robustly as SENet and ResNet.

# Recommendations

- For simple tasks (e.g., MNIST), most CNNs will suffice; LeNet-5 is a good choice for its efficiency.
- For more complex tasks (e.g., CIFAR-10), architectures like SENet, Xception, and ResNet are recommended.
- **VGGNet** requires further investigation due to consistent underperformance.