Paper Review-
“A Modified LeNet CNN for Breast Cancer Diagnosis in Ultrasound Images”

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CSE707 DIstributed Computing System
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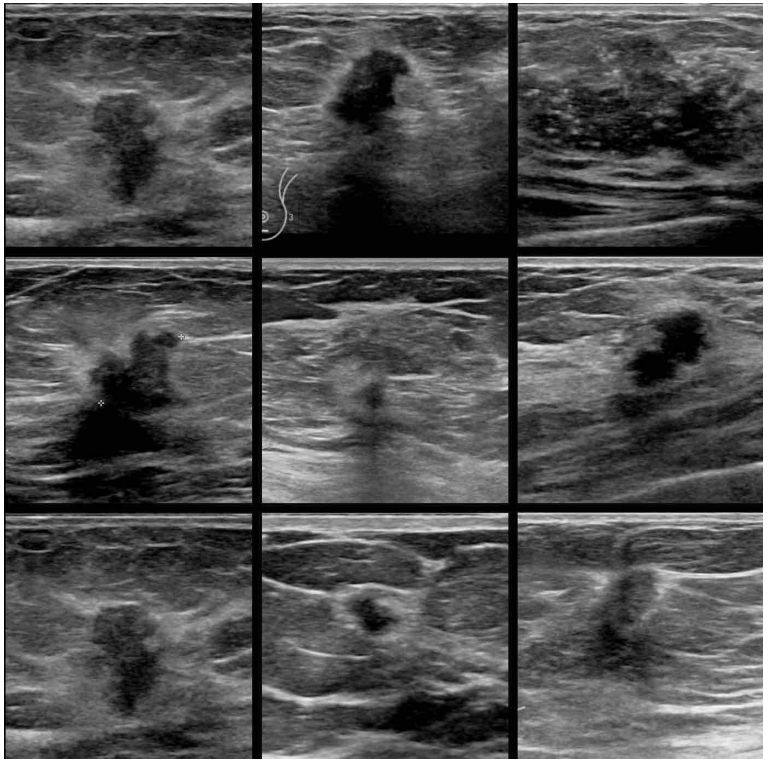
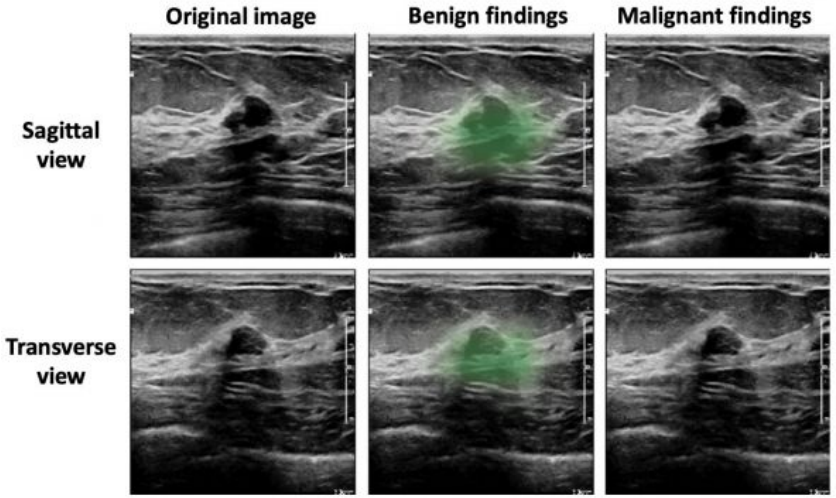


Summary

Motivation

- Advanced breast cancer prediction accuracy.
- Explore ensemble methods, specifically ensembled LeNet CNN.



Summary

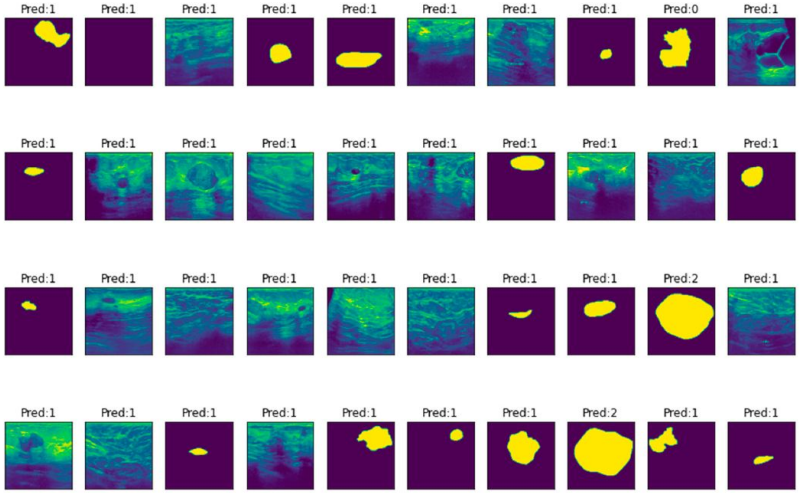
Contribution

- Develop a modified LeNet model.
- Surpass existing architectures in accuracy.
- Offer a systematic approach integrating ensemble techniques, hyperparameter tuning, and rigorous data preprocessing.

Summary

Methodology

- Meticulous preprocessing of BUS dataset.
- Train multiple LeNet CNN models with diverse settings.
- Ensemble methods, ReLU activation, and 40% dropout enhance the model.
- Soft voting and early stopping for robustness.
- Emphasize the importance of ensemble methods, hyperparameter optimization, and data preprocessing.



Summary

Methodology

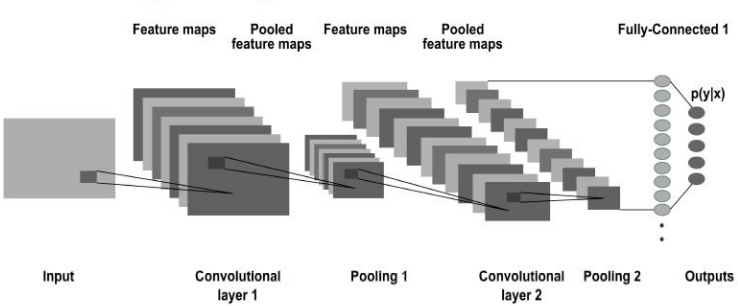


Figure 1. Convolutional neural network.

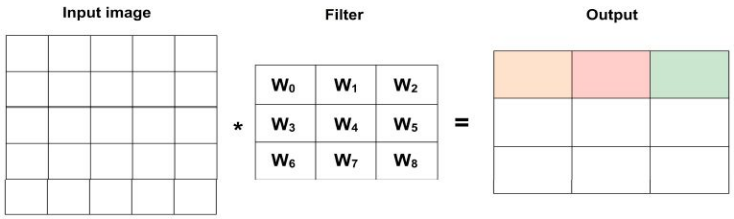


Figure 2. CONV layer.

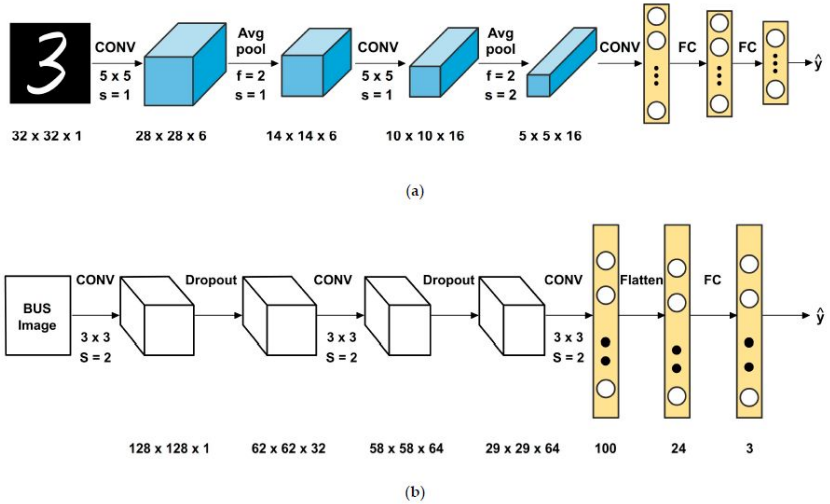


Figure 4. (a) Classical LeNet architecture. (b) Modified LeNet architecture.

Conclusion

- Successfully demonstrate the superiority of the ensembled LeNet model.
- Achieve commendable accuracy, precision, recall, and F1 score.
- Affirm the significance of ensemble methods and hyperparameter tuning.
- Set the stage for future advancements in medical image classification.

Limitations

First Limitation

- Dataset size and representativeness.
- May constrain model generalizability.

Second Limitation

- Sensitivity of hyperparameter tuning.
- Raises concerns about stability and generalizability.

Synthesis

- Introduce a novel approach using an ensembled LeNet CNN for breast cancer prediction.
- Formulate an ensemble of thirteen LeNet models, surpassing individual architectures.
- Contribution extends to exploring ensemble methods in medical imaging.

Synthesis

- Achieve 89.91% accuracy, outperforming traditional LeNet and other CNNs.
- Acknowledge limitations and emphasize future applications in computer-aided diagnosis.

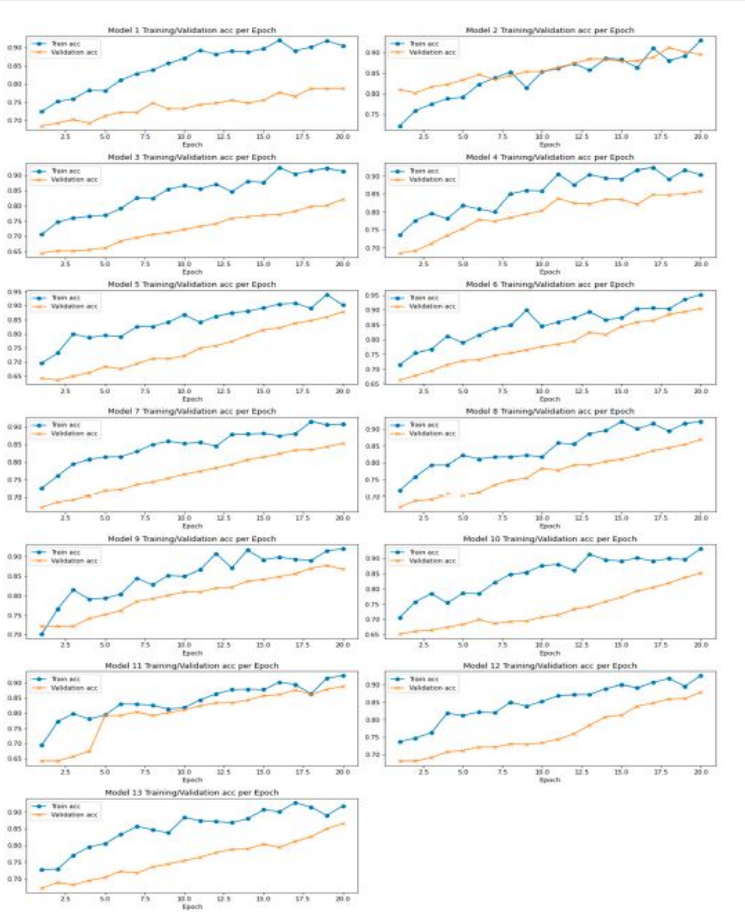


Figure 6. Training and validation Accuracy per epoch for ensemble of 13 LeNet Models in BUS Dataset.

Reference

Balasubramaniam, S., Velmurugan, Y., Jaganathan, D., & Dhanasekaran, S. (2023). A Modified LeNet CNN for Breast Cancer Diagnosis in Ultrasound Images. Diagnostics, 13(17), 2746. https://doi.org/10.3390/diagnostics13172746