# A Comparative Study of Deep Learning Models for Automated Detection of Lumpy Skin Disease (LSD) in Cattle

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## Abstract

Lumpy Skin Disease (LSD) is a highly contagious viral illness affecting cattle, leading to significant economic losses in the livestock industry due to reduced milk yield, weight loss, infertility, and mortality. Early and accurate diagnosis is crucial for containment and treatment. Traditional diagnostic methods are time-consuming and require expert veterinarians, which may not be accessible in rural areas. This study proposes and evaluates a range of deep learning models for automated identification of LSD from cow images. We compare the performance of six deep learning architectures: CNN-TensorFlow, CNN-SqueezeNet, CNN-Inception, CNN-Xception, MobileNet, and PyTorch based CNN, alongside traditional machine learning classifiers such as SVM, MLP, Logistic

Regression, J48, and an ensemble model. Using a dataset of 1,024 labeled images (split 80:20 for training and testing), our experiments show that Xception achieves the highest accuracy of 90.15%, followed by MobileNet (89.16%) and Inception (88.18%). The original CNN-TensorFlow model achieved 84.73%, outperforming SVM (81.28%) and MLP (67.49%). Notably, SqueezeNet failed to detect any positive cases (recall = 0), highlighting model sensitivity to architecture choice. The results demonstrate that deep learning, particularly transfer-learning-capable models like Xception and lightweight MobileNet, offers a robust solution for automated LSD detection. This work lays the foundation for developing real-time, mobile-based diagnostic tools for farmers and veterinarians, contributing to sustainable livestock management. © 2025 IEEE.

## Author keywords

convolutional neural networks; deep learning; lumpy skin disease; machine learning

## Indexed keywords

**Engineering controlled terms**

Agriculture; Deep neural networks; Diagnosis; Diseases; Learning systems; Logistic regression; Losses; Statistical tests; Transfer learning

**Engineering uncontrolled terms**

Automated detection; Cattles; Comparatives studies; Convolutional neural network; Deep learning; Economic loss; Learning models; Lumpy skin disease; Machine-learning; Skin disease

**Engineering main heading**

Automation

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