Summary of SHE and GAZELLE For Providing Secure Neural Network Inference

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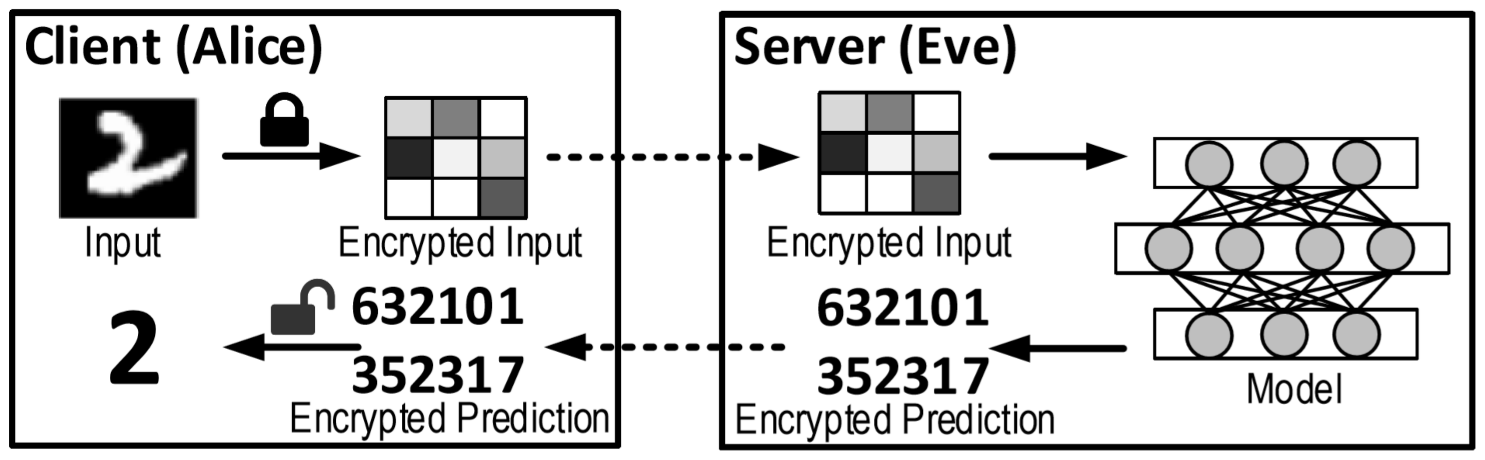
Introduction

- **Problem Space**
  - Cloud servers providing machine learning as a service can access client's raw data which produces privacy risks. So there is a strong incentive to protect the privacy of healthcare records, financial data, and other sensitive information of clients uploaded to cloud servers.

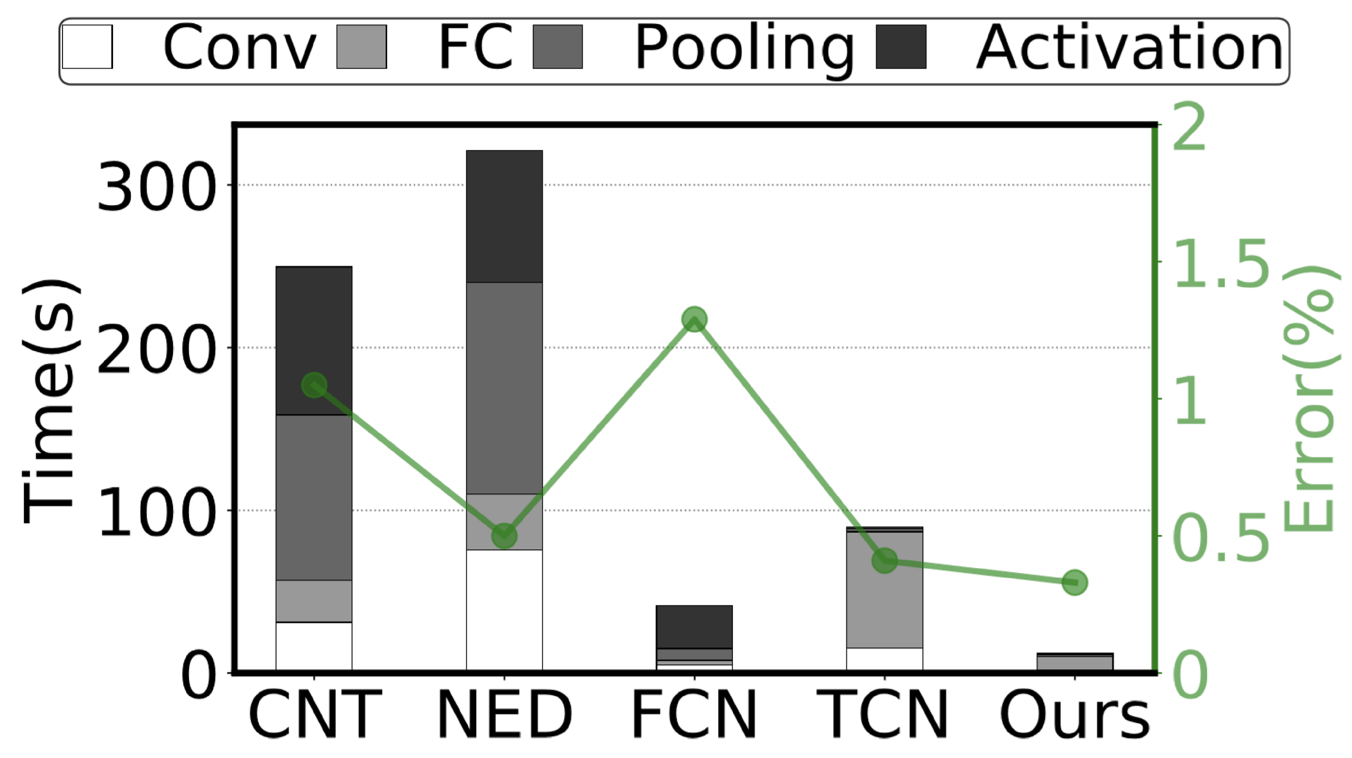
- **A secure Neural Networks by Homomorphic Encryption**
  - Servers learn on encrypted data and output encrypted prediction
  - Only client can decrypt the the encrypted prediction with the private key



SHE: A Fast and Accurate Deep Neural Network for Encrypted Data

- **Executive Summary**
  - **SHE:** Accuracy-lossless CNN, performance ↑76.12%
  - It provides faster inference and higher accuracy compared to previous works by implementing RELU and Max pooling layers using TFHE
  - It also uses cheap Shift-Accumulation to support deeper neural networks

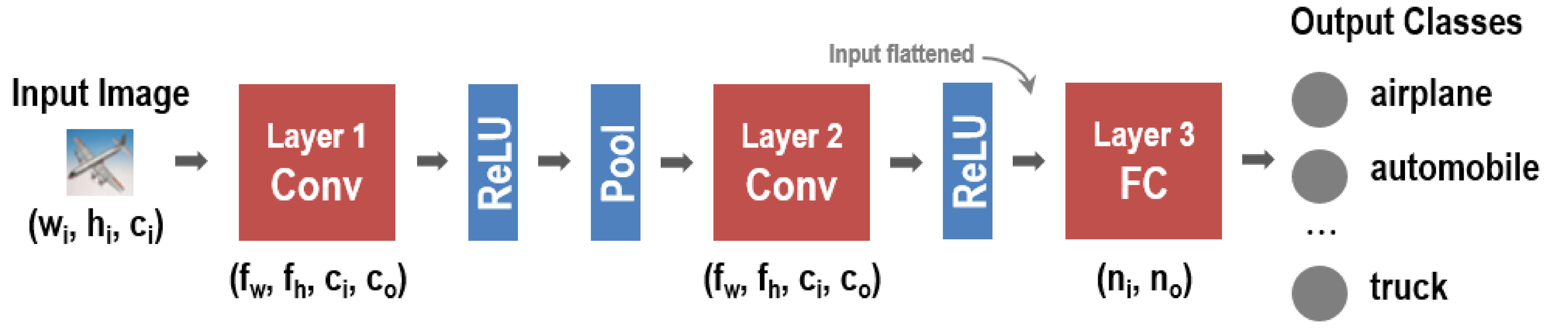
- **Result**



The performance and accuracy comparisons

GAZELLE: A low Latency Framework for Secure Convolutional Neural Networks

- **Executive Summary**
  - Gazelle efficient secure computation protocols consist of combining two conventional encryption techniques. Homomorphic encryption and garbled circuits.
  - It enables the neural network to run efficiently and quickly compared to other methods while maintaining privacy of the user's input and the parameters of the model
  - An encrypted image to the server running CNN on Gazelle is sent. The sender and server share encrypted messages forward and backward with the end goal of classifying the user's image.



Convolution Neural Networks