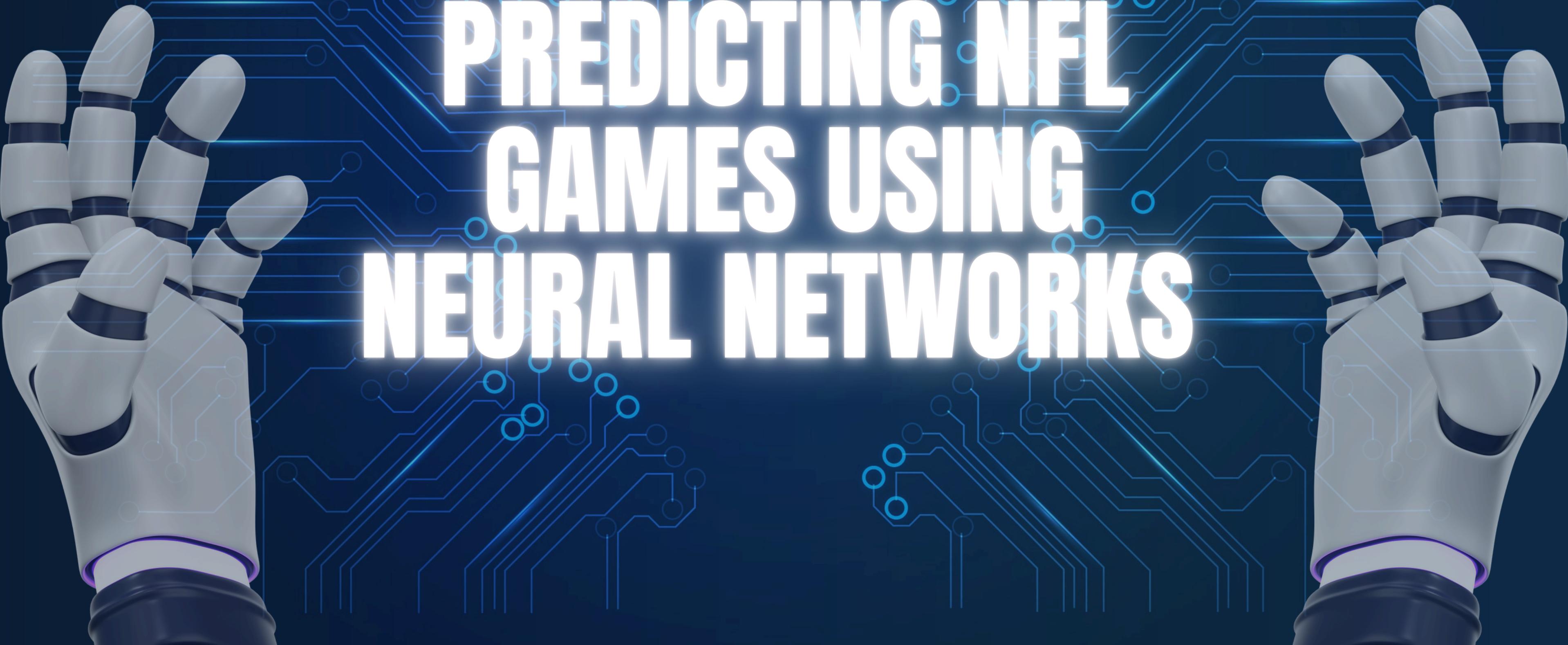


# PREDICTING NFL GAMES USING NEURAL NETWORKS



# INTRODUCTION

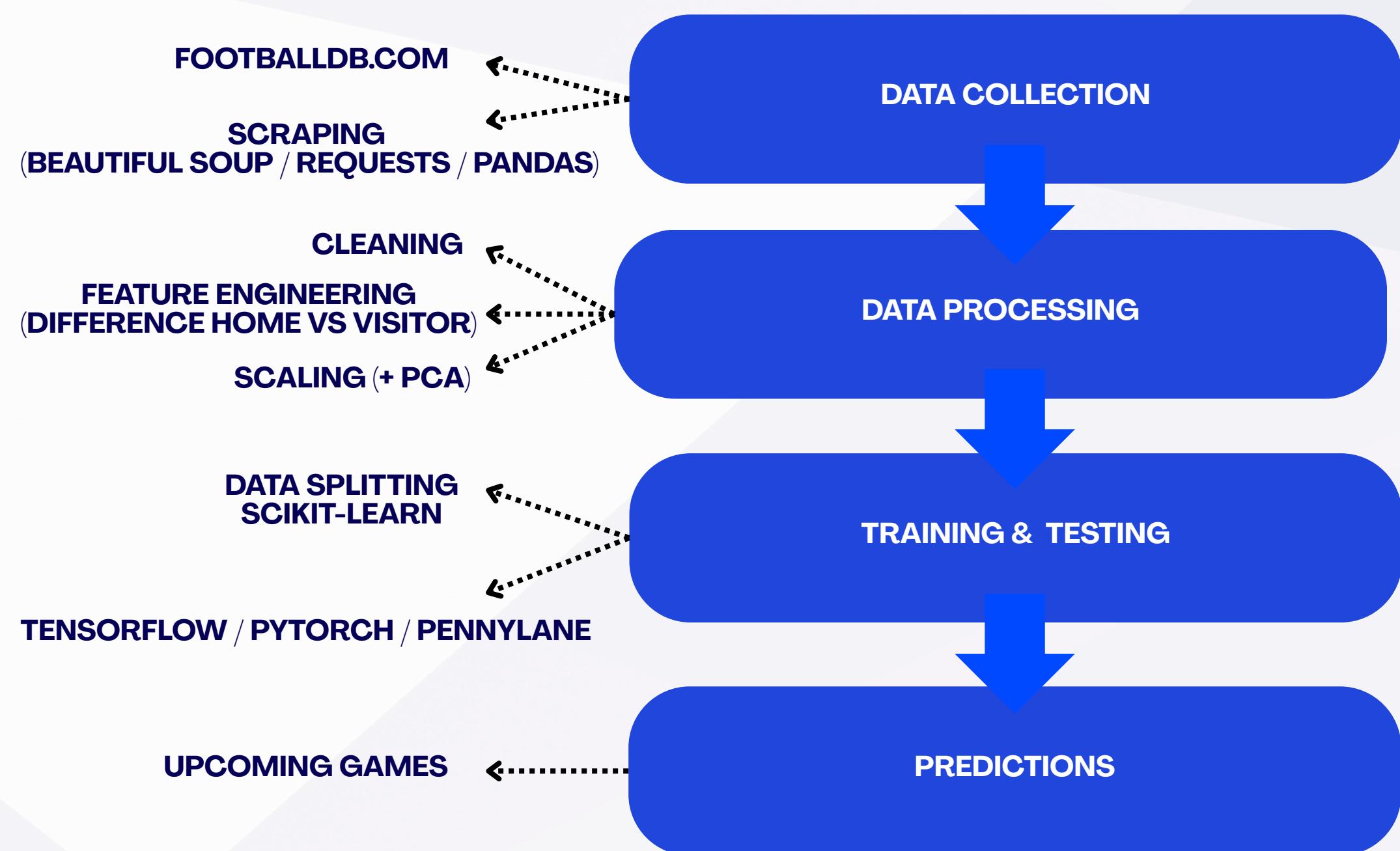
Predicting NFL game outcomes using machine learning

- Classical Neural Network
- Quantum Neural Network
- Hybrid model ( combining classical and quantum model )

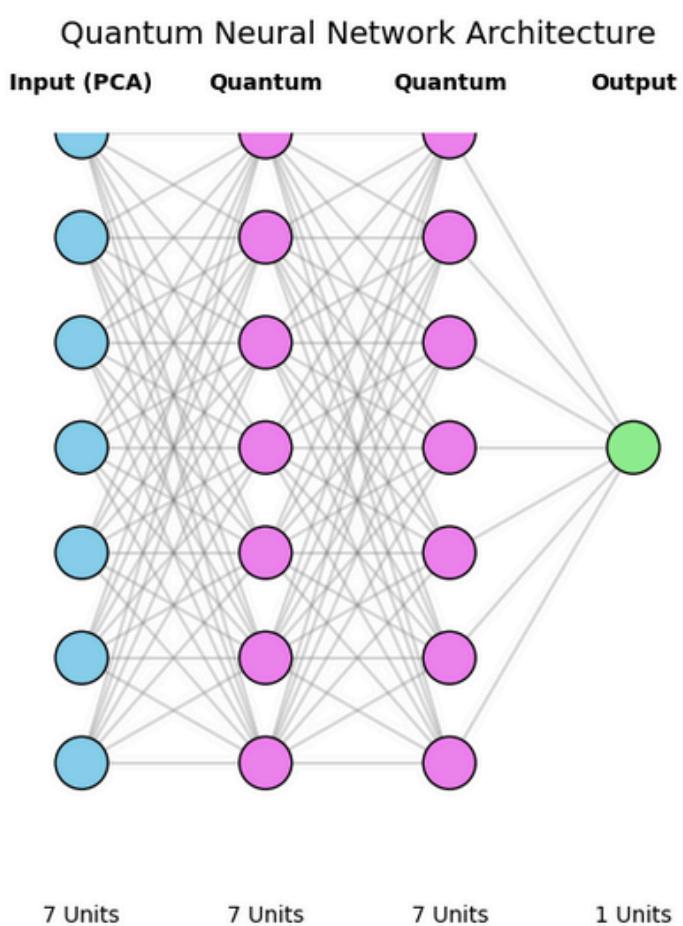


Goal : Predict whether the home team wins or loses using pre-game team statistics

# MAIN PIPELINE



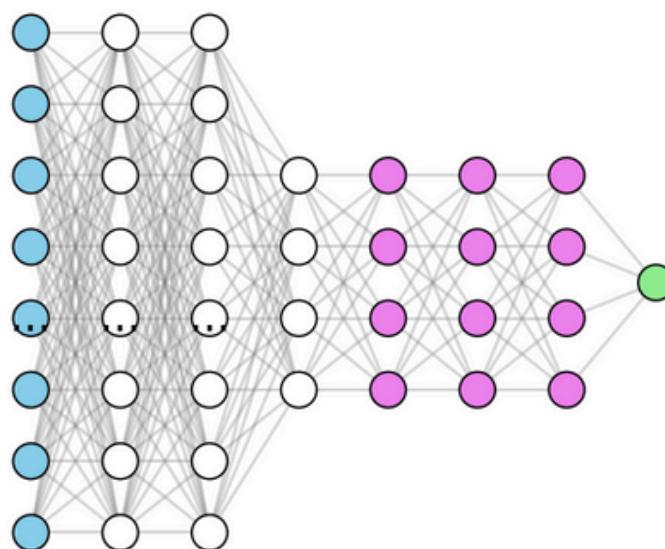
# NEURAL NETWORKS



## VARIATIONAL QUANTUM CLASSIFIER (VQC)

Hybrid Neural Network Architecture

Input   RELU   RELU   TANH   Quantum   Quantum   Quantum   Output

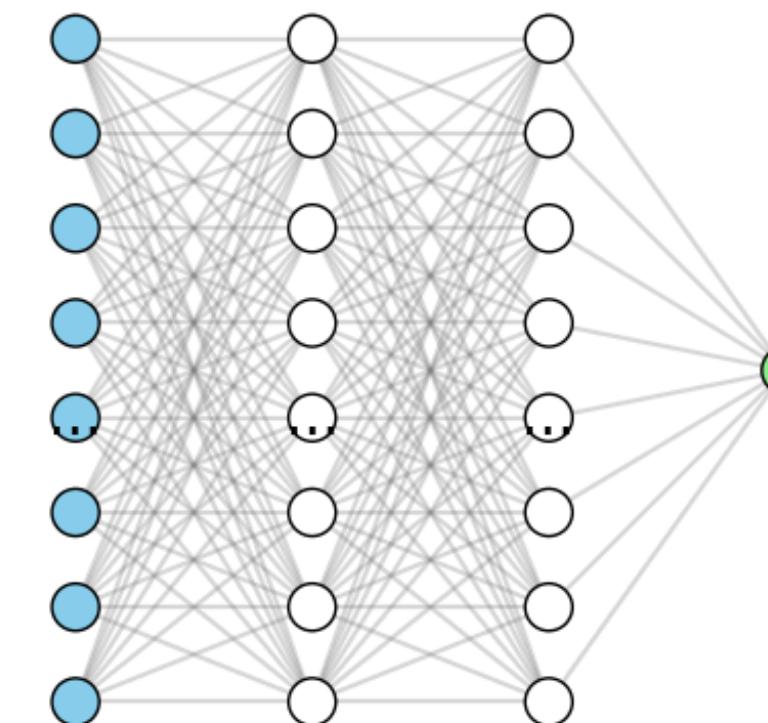


146 Units   28 Units   28 Units   4 Units   4 Units   4 Units   1 Units

CLASSICAL (FEATURE REDUCTION) + QUANTUM TAIL (PREDICT)

Classical Neural Network Architecture

Input   RELU   RELU   Output



FEED FORWARD

# RESULTS

Comparative Results of Classical, Hybrid, and Quantum Models

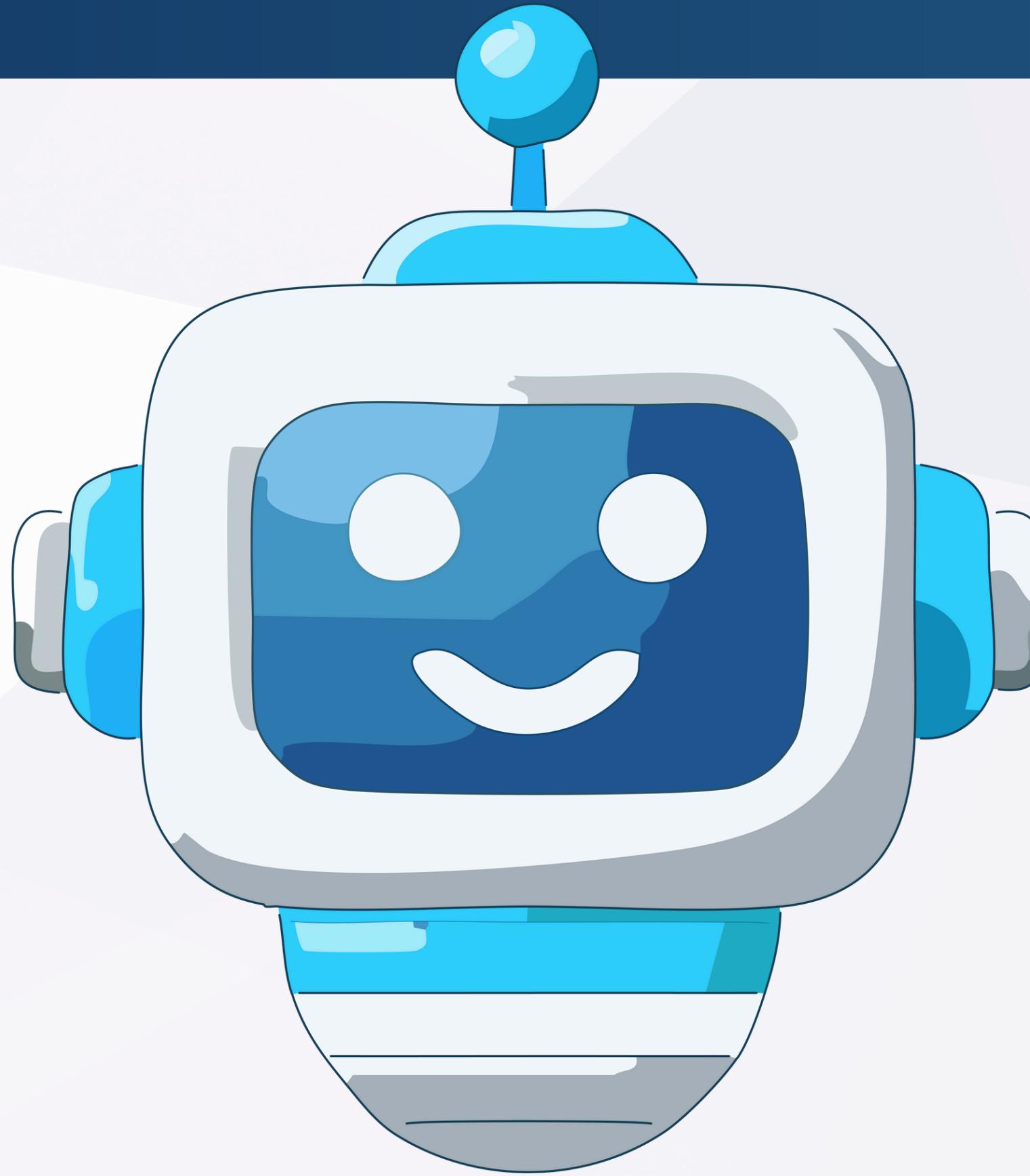
Model	Correct / Total (External)	Accuracy (External)	Correct / Total (Internal)	Accuracy (Internal)
Hybrid	19/31	60.29%	17/23	73.91%
Classical	20/31	64.52%	36/45	80%
Quantum	16/31	51.61%	16/23	69.57%
Classical + PCA	18/31	58.06%	36/45	80%
Hybrid + PCA	20/31	64.52%	19/23	82.61%

Classification Report (Precision, Recall, F1-Score) and training time on Test Data

Model	Precision (0)	Recall (0)	F1-score (0)	Precision (1)	Recall (1)	F1-score (1)	Training Time (s)
Classical	86.67%	65.00%	74.29%	76.67%	92.00%	83.64%	2.39
Classical + PCA	72.00%	90.00%	80.00%	90.00%	72.00%	80.00%	2.93
Hybrid	75.00%	60.00%	66.67%	73.33%	84.62%	78.57%	6.34
Hybrid + PCA	80.00%	80.00%	80.00%	84.62%	84.62%	84.62%	7.67
Quantum	66.67%	60.00%	63.16%	71.43%	76.92%	74.07%	10.98

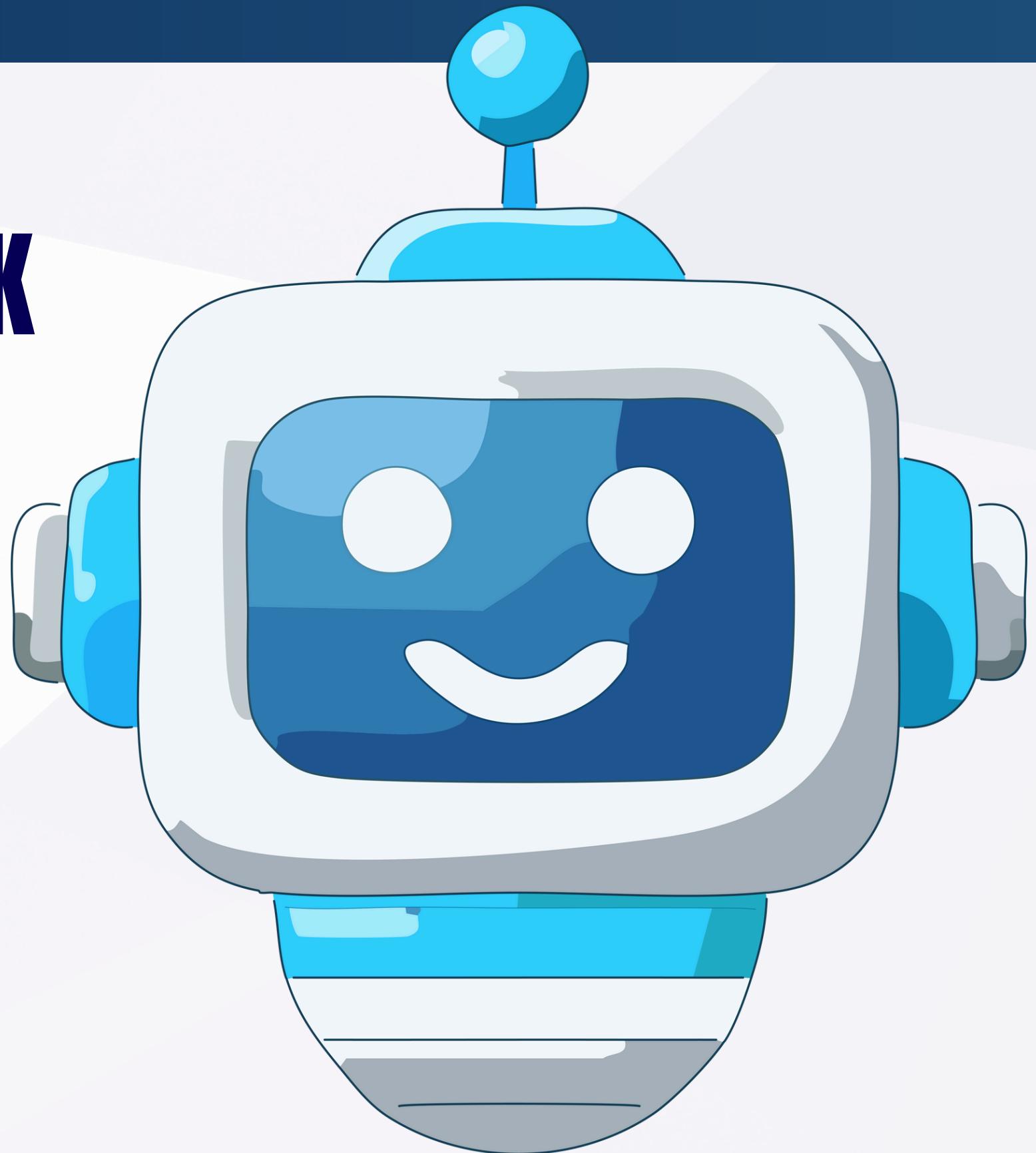
# DISCUSSION

- WHY QUANTUM FAILED: CURSE OF DIMENSIONALITY  
(7 QUBITS VS. 146 FEATURES).
- WHY HYBRID WORKED: BEST OF BOTH WORLDS.  
THE "GENERALIZATION GAP": CONCEPT DRIFT.



# CONCLUSION & FUTURE WORK

- Challenging Project
- Happy about the results (Testing vs Predictions)
- Run the neural networks on a Real Quantum Computer



# TIME FOR DEMO



# THANK YOU ANY QUESTIONS ?

