

## Motivation

Stock trading plays a vital role in economic development. It is important to learn about potential risks and trading strategies prior to investing money.

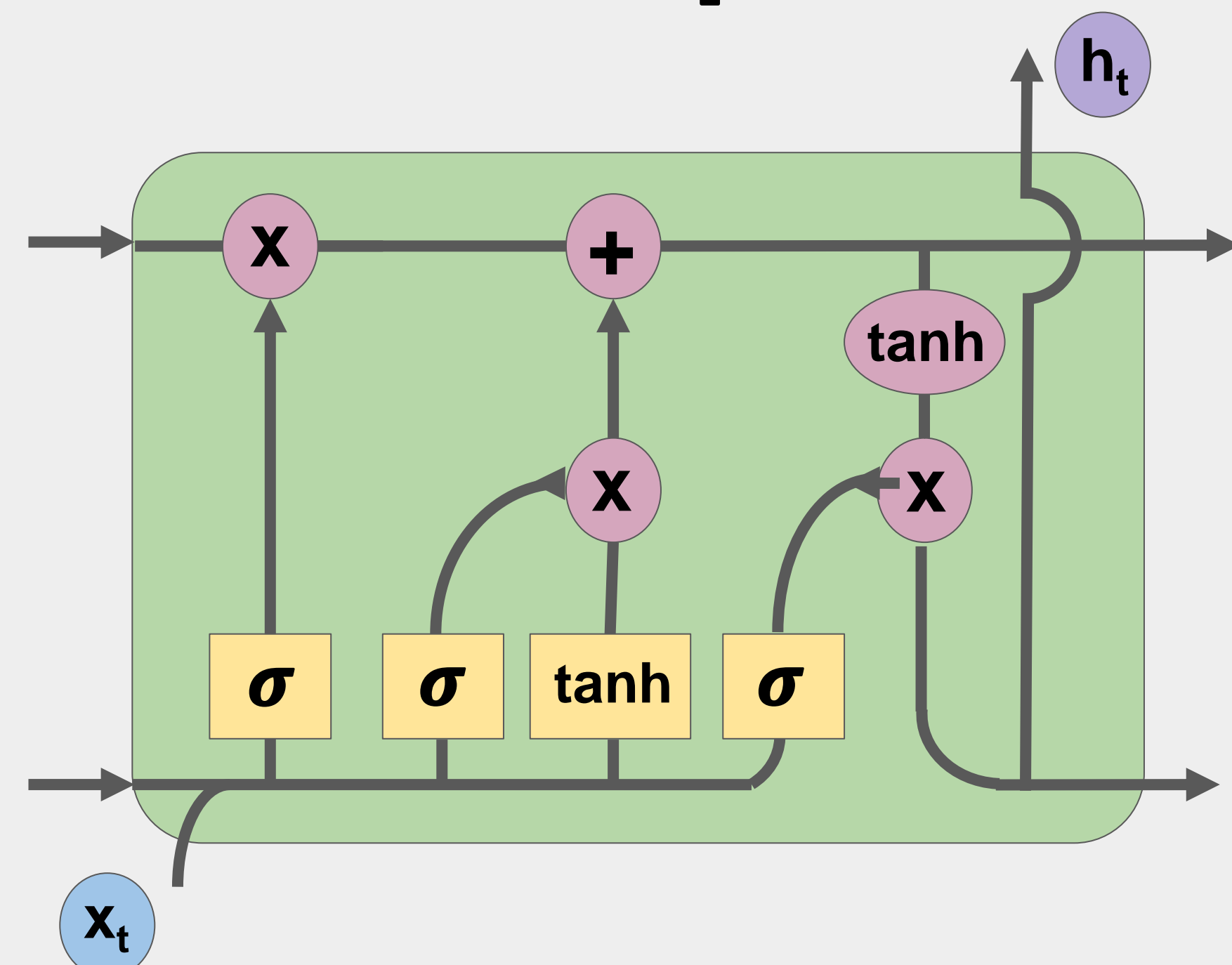
## Objective

To provide an all-in-one educational platform that features stock information, recommendation and prediction.

## Work Highlights

- Neural network
  - Input layer: past date and stock prices
  - Hidden layer: LSTM computation
  - Output layer: future date and prices
- Improved the model's accuracy
  - Minimized mean squared error using Adam optimization
- Generated insights by visualizing data

## LSTM Explained



$$f_t = \sigma(W_f [h_{t-1}, x_t] + b_f) \quad f_t = \text{forget gate layer}$$

$$i_t = \sigma(W_i [h_{t-1}, x_t] + b_i) \quad i_t = \text{input gate layer}$$

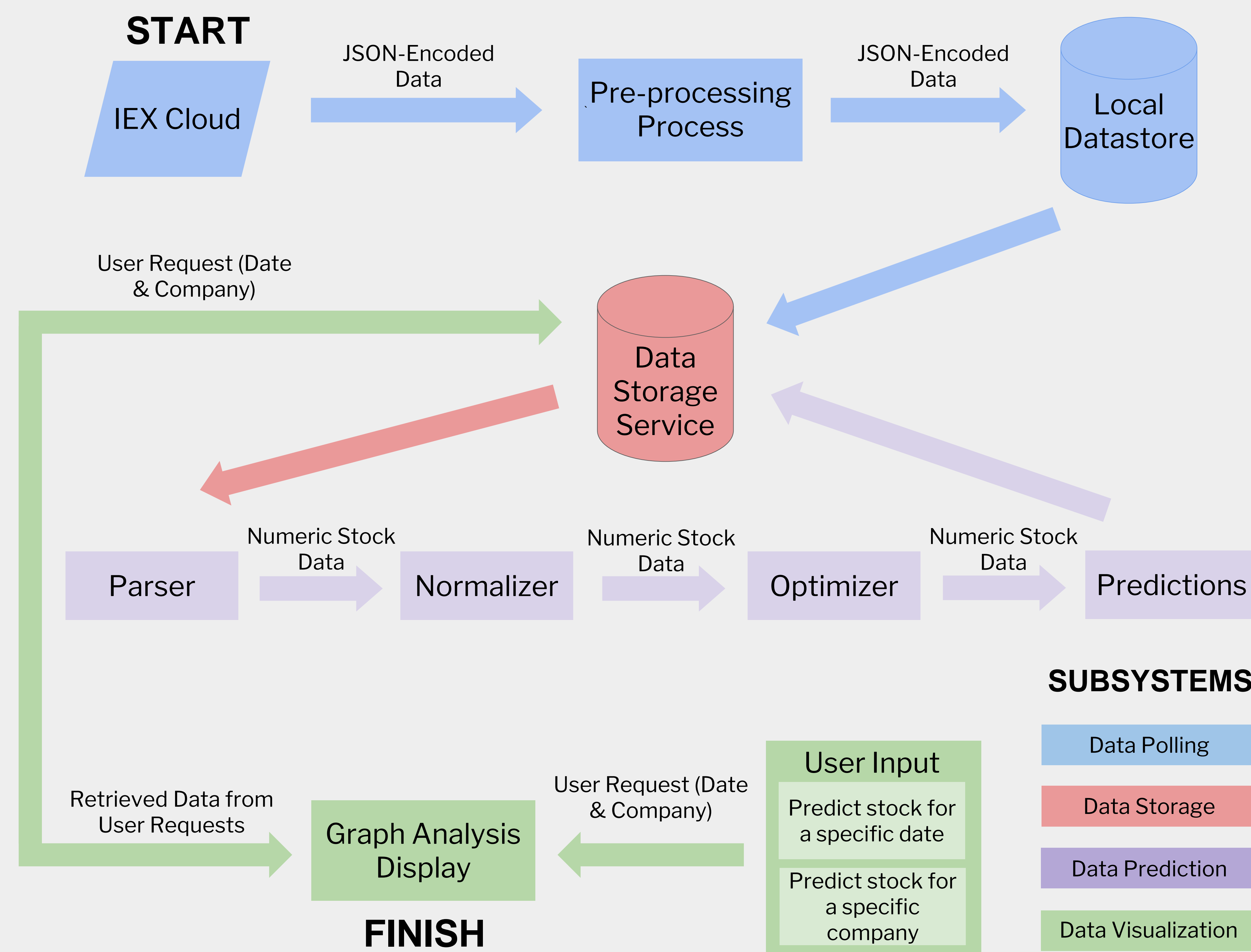
$$\tilde{C}_t = \tanh(W_C [h_{t-1}, x_t] + b_C) \quad \tilde{C}_t = \text{new candidate values}$$

$$C_t = f_t * C_{t-1} + i_t * \tilde{C}_t \quad C_t = \text{new cell state}$$

$$o_t = \sigma(W_o [h_{t-1}, x_t] + b_o) \quad o_t = \text{output sigmoid layer}$$

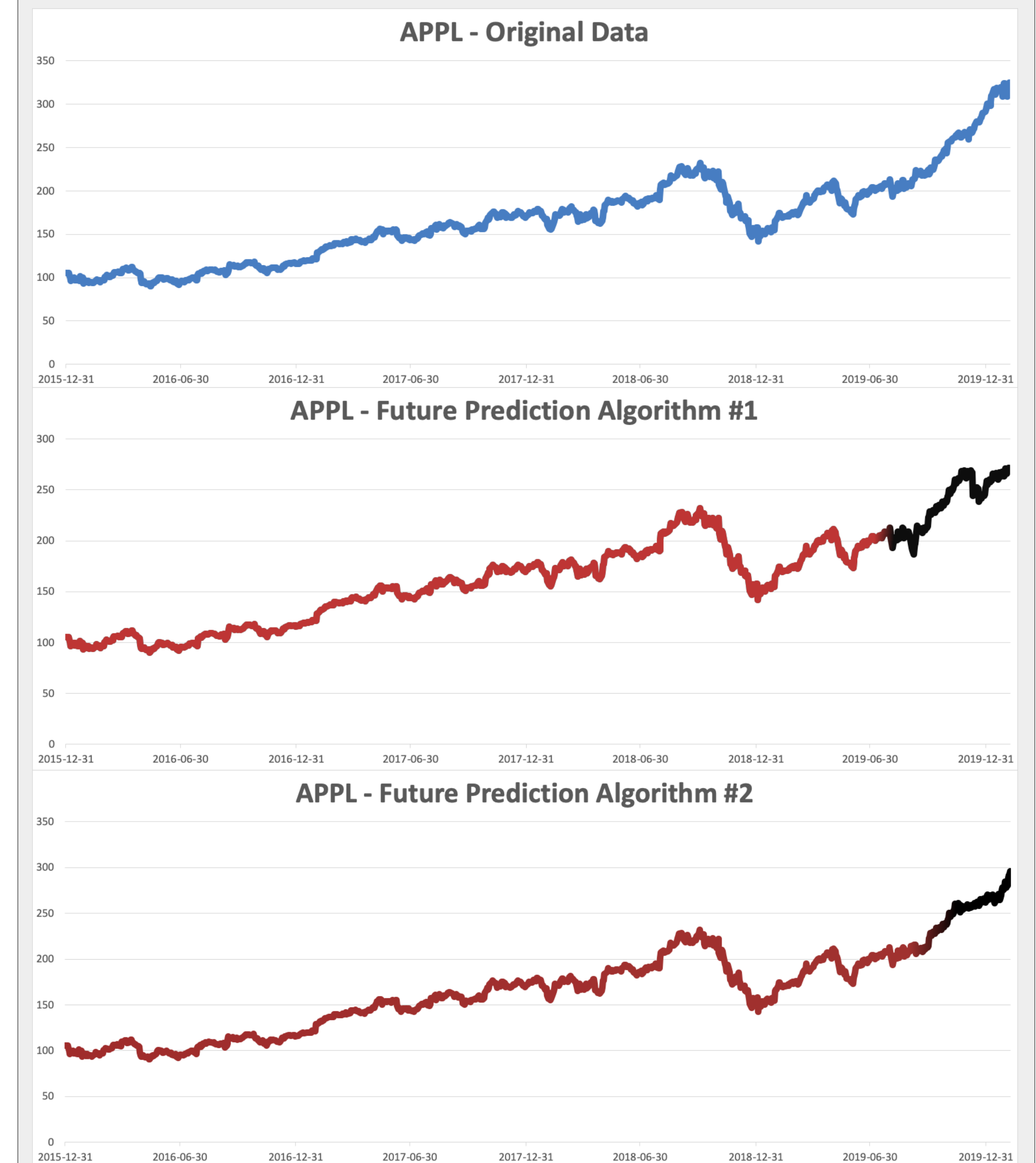
$$h_t = o_t * \tanh(C_t) \quad h_t = \text{output between -1 and 1}$$

## System Design



## Alternatives

Subsystem	Alt 1	Alt 2	Alt 3	Justification
Algorithm	LSTM	K_Nearest Neighbours	ARIMA	<ul style="list-style-type: none"> <li>• Able to handle noise and distributed representations</li> <li>• Ideal for long-term sequence prediction</li> </ul>
	RMSE: 2.15	RMSE: 71.19	RMSE: 13.99	
Cloud Service Provider	Microsoft Azure	Amazon Web Services	Google Cloud	<ul style="list-style-type: none"> <li>• Extended services (automated backup)</li> <li>• Ease of use and payment flexibility</li> </ul>
UX Platform	Tableau	QlikSense	Power Bi	<ul style="list-style-type: none"> <li>• Team familiarity</li> <li>• Extensive features for customization</li> </ul>



	Closing Price (Average)	Error (%)
Actual Data	317.84	
Algorithm 1 (Prediction)	266.81	16.06
Algorithm 2 (Prediction)	278.863	12.26

- Algorithm 1: LSTM with K-fold cross-validation
  - K = {4, 5, 6, 7, 8, 9, 10}
  - Best case: K = 5
- Algorithm 2: LSTM with train/test split
  - Training : testing = {60:40, 70:30, 80:20}
  - Best case: 70:30 training to testing ratio



## ● Interested to learn more?

- Product Feature Walkthrough[video]: <https://youtu.be/UVivtcQOm2E>
- Detailed Design and Project Timeline[report]:  
<https://www.dropbox.com/s/wsdnkimkg6i6k9x/Details-of-the-Detailed-Design-and-Project-Timeline-Document-FINAL%20%281%29.pdf?dl=0>
- ML Models Comparison[code]: [https://github.com/lilydia/ML\\_stock\\_prediction](https://github.com/lilydia/ML_stock_prediction)

## ● Questions?

- Email: [youjing.lydia.li@gmail.com](mailto:youjing.lydia.li@gmail.com)
- Phone: +1 (604) 724 0618
- Website: <https://LiLydia.github.io>