TIME SERIES MODELLING OF COVID CASES AND HOSPITALISATIONS

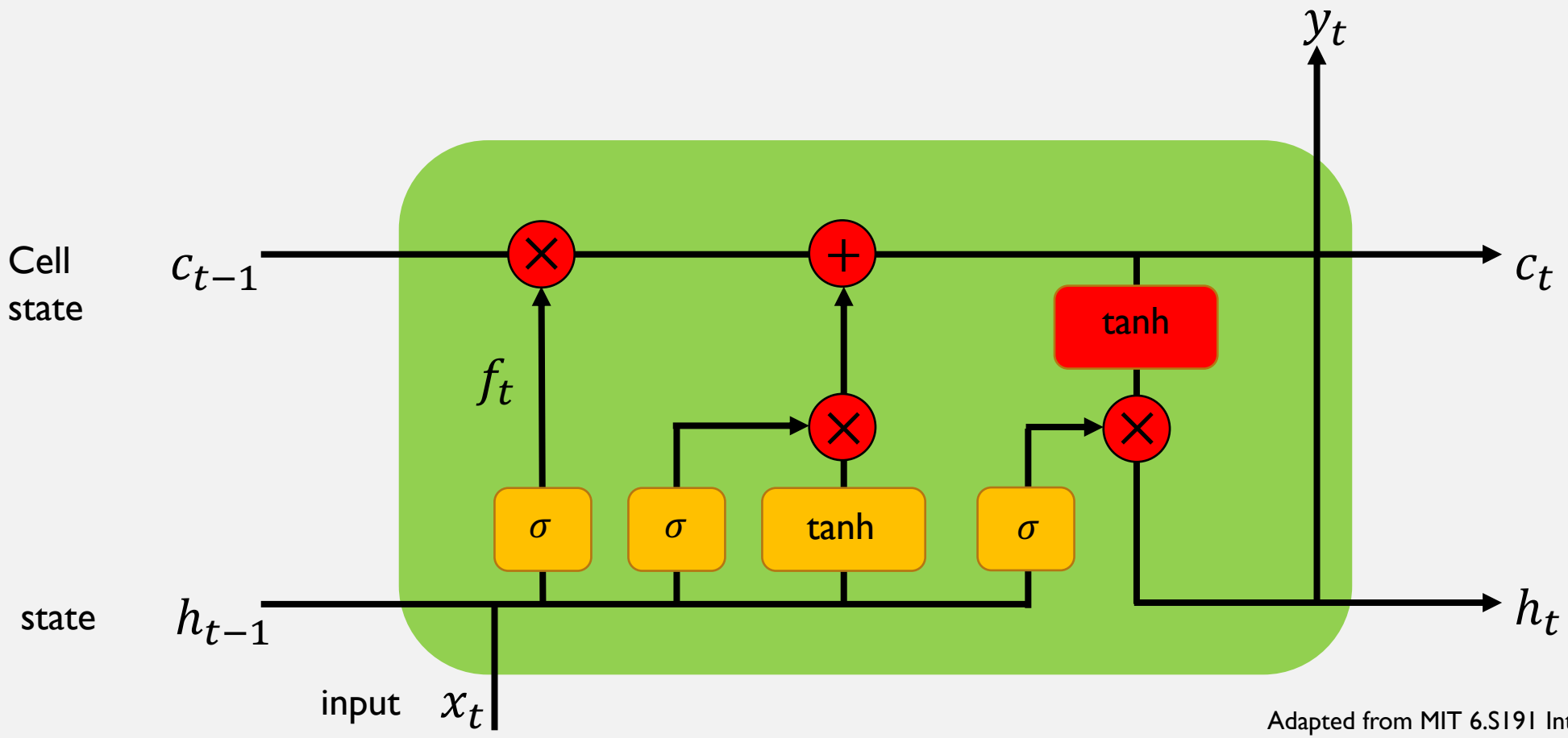
LONG SHORT TERM MEMORY (LSTM) NETWORKS

Information is added or removed through gates

Gates optionally let information through for example via a sigmoid neural net layer and pointwise multiplication.

LONG SHORT TERM MEMORY (LSTM) NETWORKS

1- Forget 2- Store 3- Update 4-Output



Adapted from MIT 6.S191 Intro to Deep Learning course

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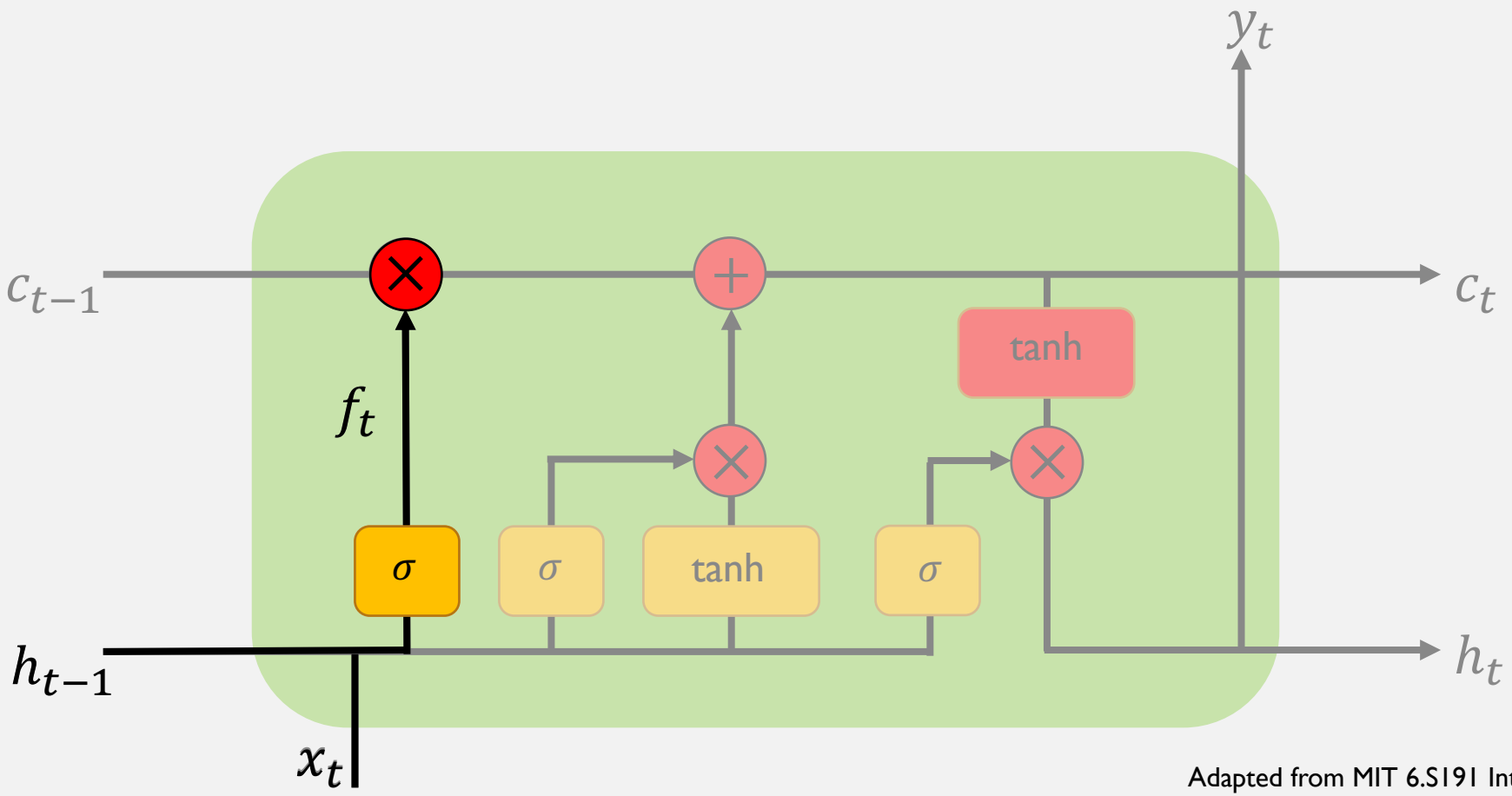

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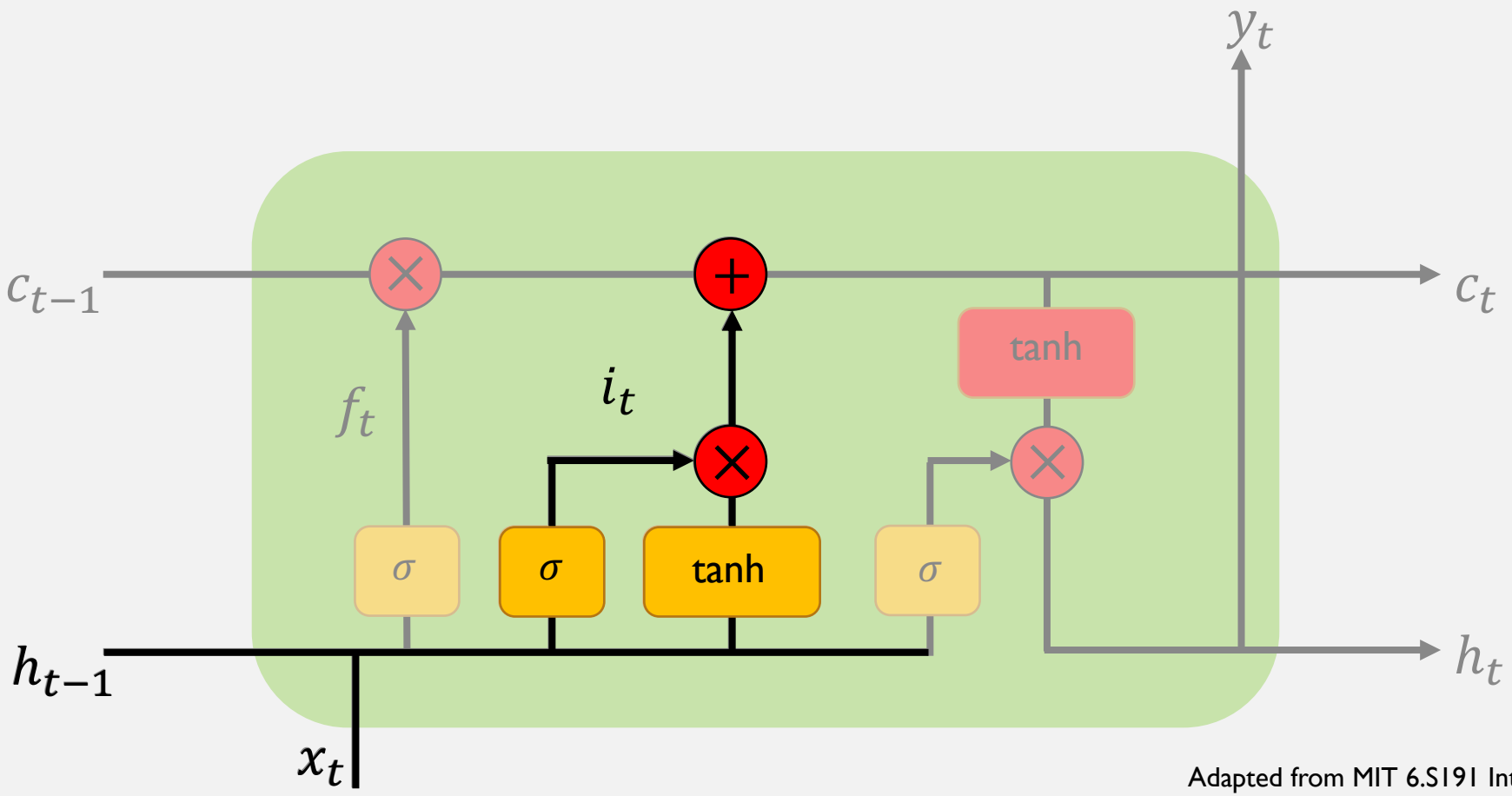

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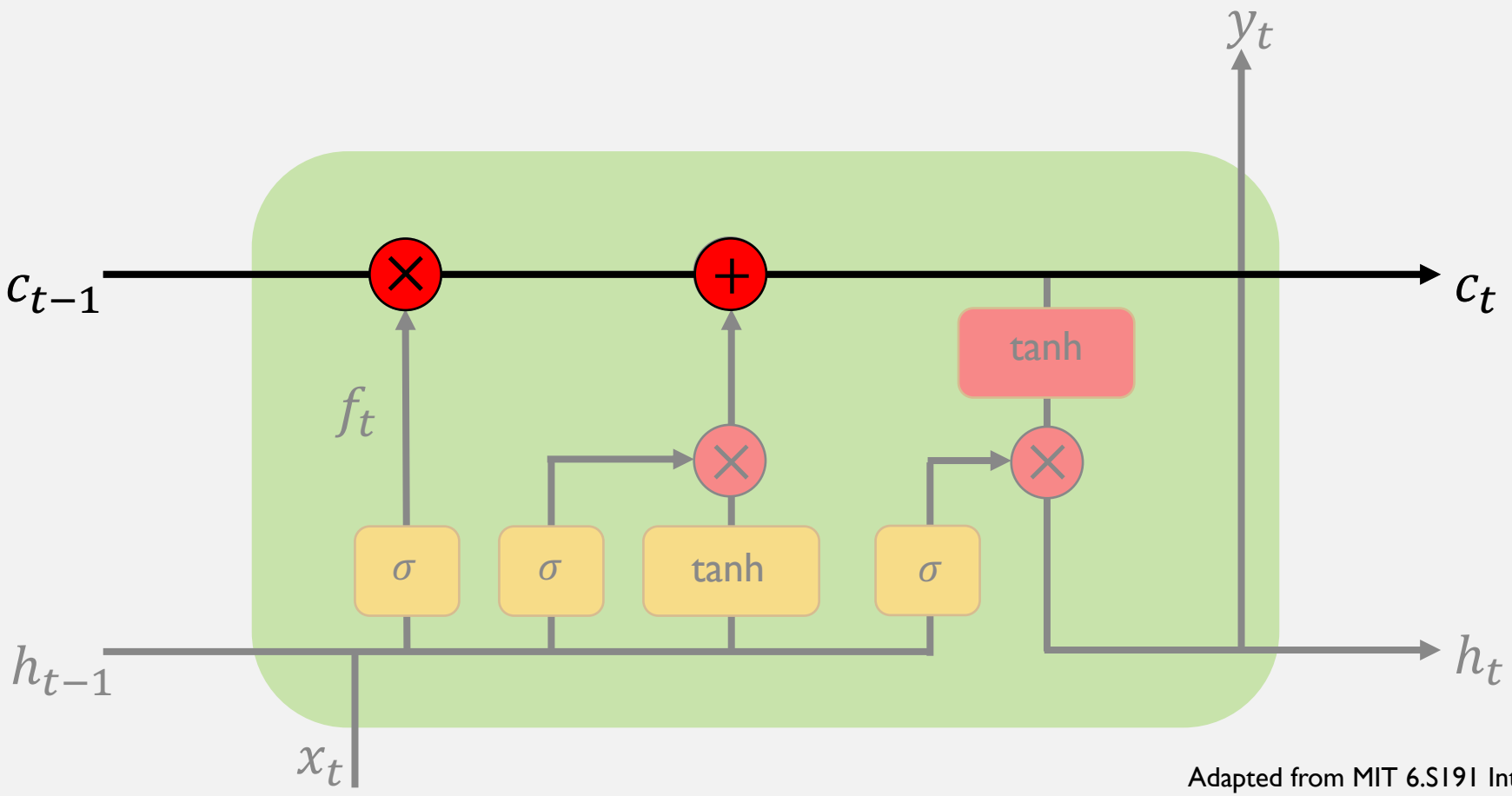

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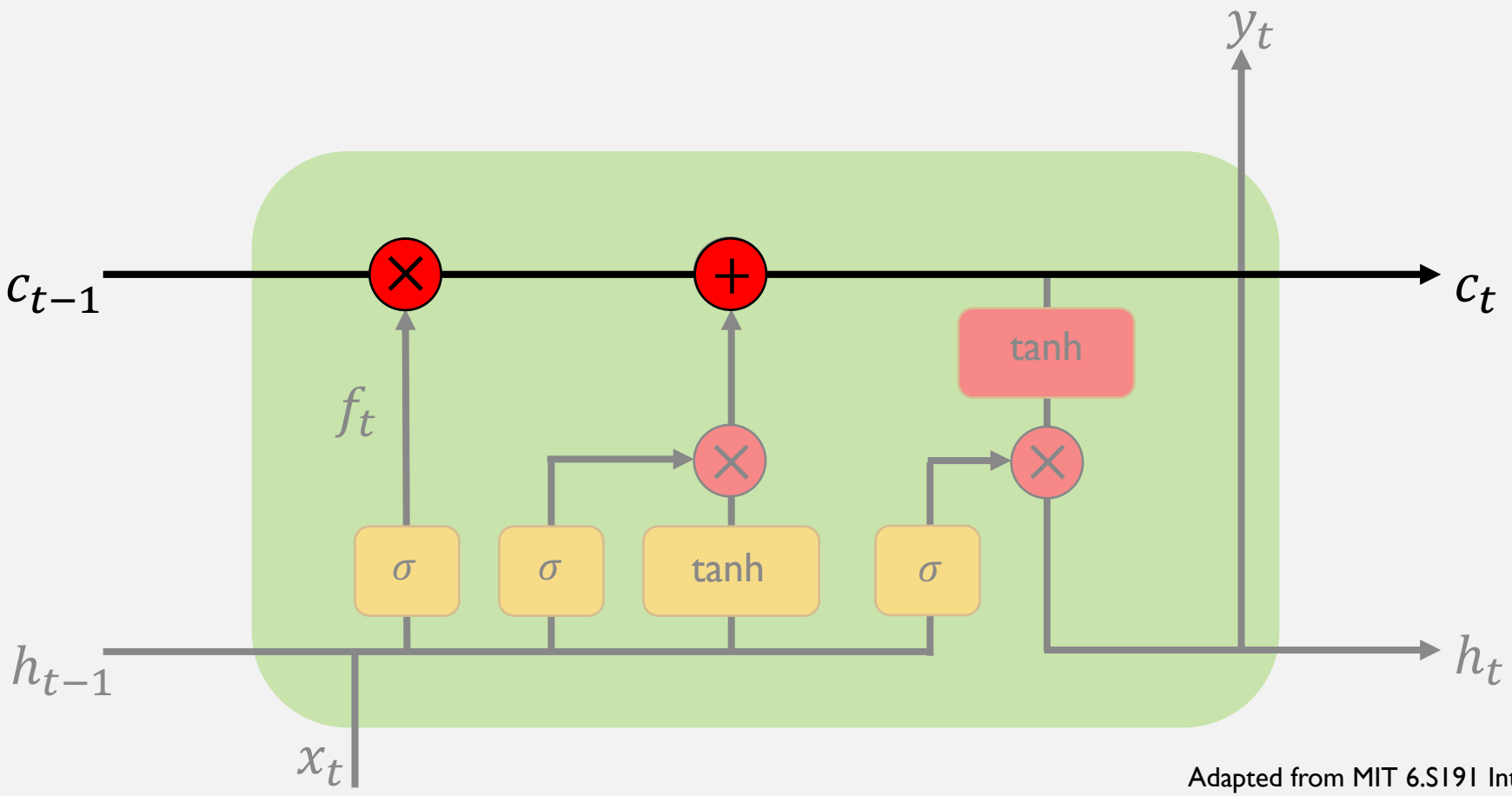

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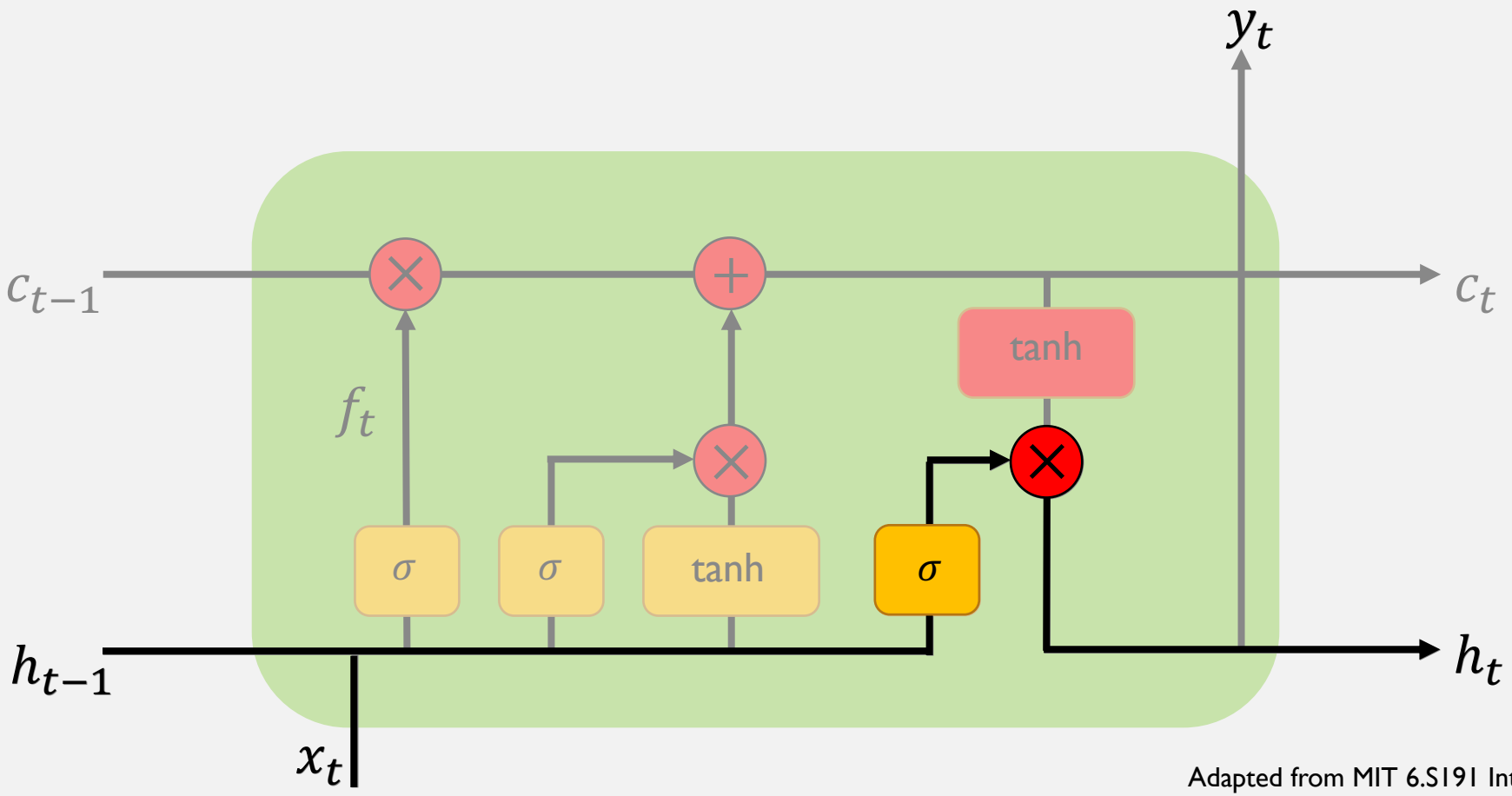

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LONG SHORT TERM MEMORY (LSTM) NETWORKS

Key concepts

1- Maintain a separate cell state from what is outputted
2- Use gates to control information flow.
    - forget gates get rid of irrelevant information
    - store information from current input
    - selectively update cell state
    Output gate returns a filtered version of the cell state.
3- There is backpropagation through time with uninterrupted gradient flow

LSTM DATA

- Total transaction counts in Oxford street
- Total international arrivals in the UK
- Day of the week

Outcomes:

- Total number of new Covid-19 positive tests (per date of test) in greater London

OR

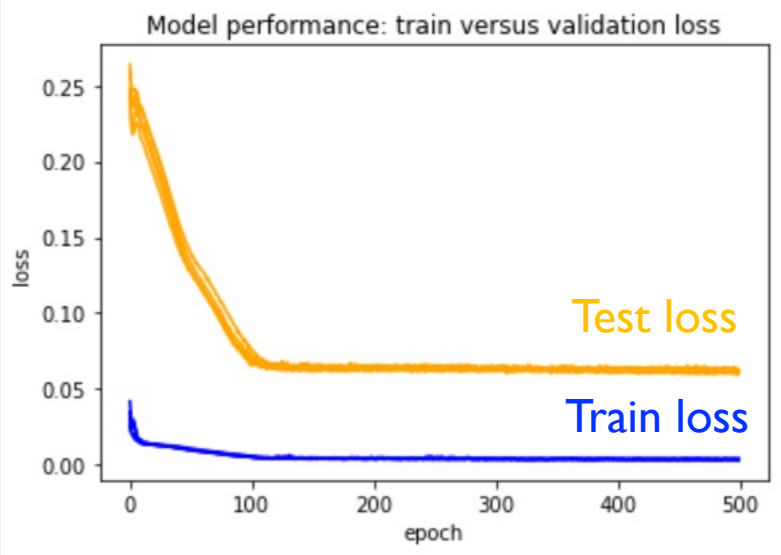
- Total Number of new Covid-19 hospitalisations in greater London per date

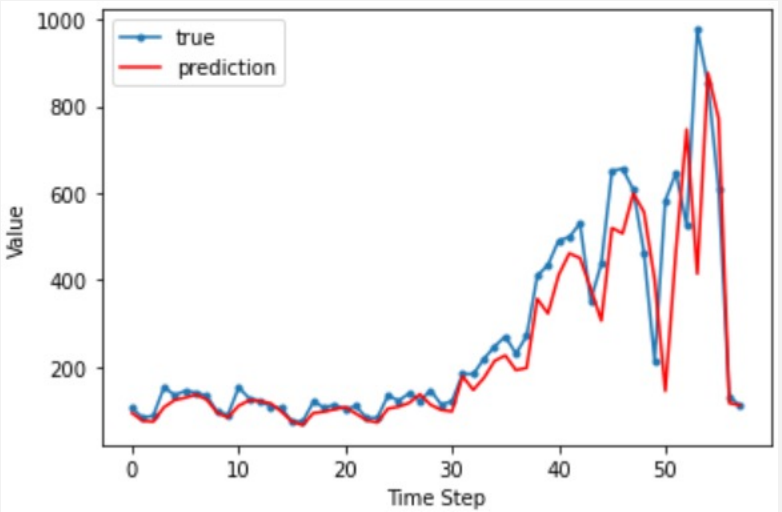
From 19/03/2020
To 31/01/2021
n= 289

LSTM PREPROCESSING

- Min-max scaling between 0 and 1
- Transformation of time series to supervised data (generating a shift of one day before as the predictors).
- Prediction lag = 1 day (it would be interesting to see if we can use several days prediction lag).

LSTM RESULTS: CASES MODEL





LSTM RESULTS: HOSPITALISATIONS MODEL