Machine Learning Short Laboratory Course

11/03/2022

Previous lesson

- Computer Vision:
    - Definition
    - Task
    - Digital Image Filtering
    - CNN
    - Most Famous Architecture

- Materials available on github: [MLAdventure/ML_Short_Lab]

Time Series

- Definition:
    - An ordered sequence of values of a variable at equally spaced time interval
- Goal(S) :
    - To understand the variability of a phenomenon in a time interval
    - Prediction
- Basic concepts:
    - Lag
    - Trends
    - Seasonality

Time Series: Stationarity

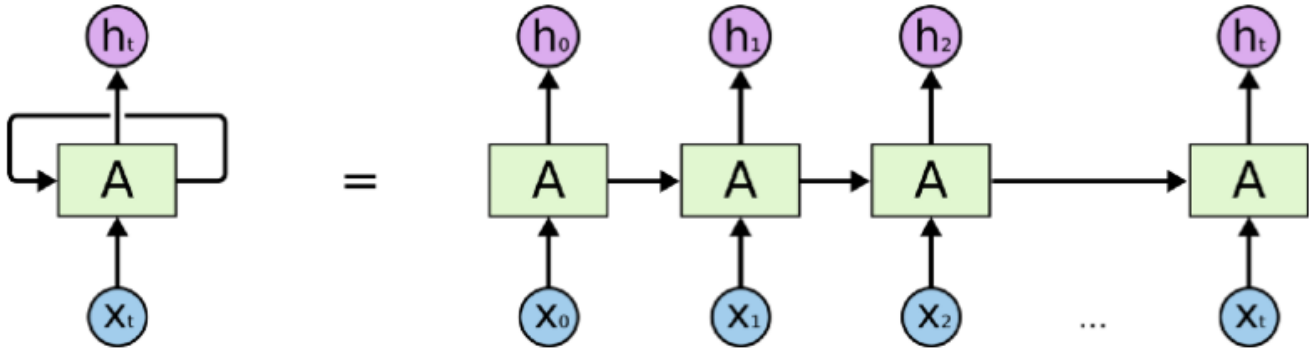
- Stationarity:
    - main assumption for time series
    - series without trend
    - constant variance over time
    - no seasonality
- Transformation :
    - remove trend
    - remove seasonality
    - log transformation
- Check Stationarity:
    - Augmented Dicky Fuller test (if you want to know here)

Time Series: Classical Model

- Auto Regressive AR(p) :
  - When a value from a time series is regressed on previous values from that same time series.
  - p is the order
- Moving Average Model MA(q):
  - It uses past forecast errors in a regression-like model
  - Not to be confused with moving average smoothing
- AutoRegressive Integrated Moving Average ARIMA(p,d,q):
  - Nonseasonal model
  - Mix AR+MA
  - Obs: ARIMA(p,0,0) = AR ; ARIMA(0,0,q) = MA

RNN

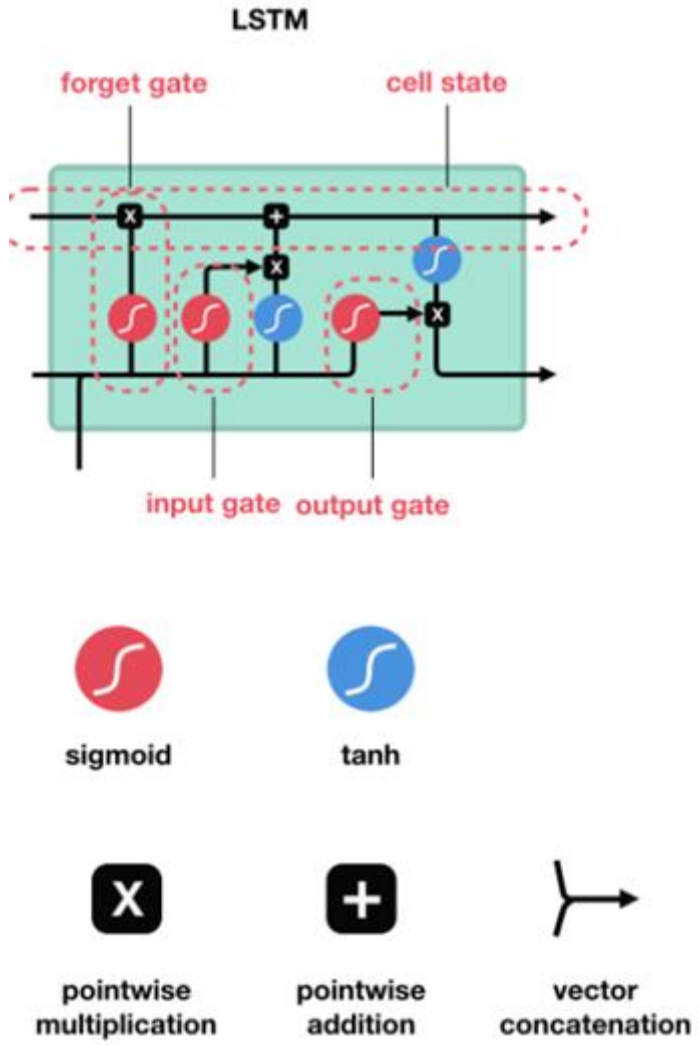
- Recurrent neural network:
  - Sequential Data
  - Memory
- Problem:
  - Vanishing Gradient
  - Exploding gradient



RNN: LSTM

- Long short term memory

- Architecture:
  - Cell state: what is important for us?
  - Forget fate: what to forget?
  - Input gate: which new information to add?
  - Output gate: what should pass?



RNN : GRU

- Gated Recurrent Unit
- Variant of LSTM

- Architecture :
  - Update gate: combination of input and forget gate
  - Reset gate: merge the current cell state and hidden state