

— Recurrent Neural Networks

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RNNs: Used on Sequence Data

- Autocompletion: Predicting the next word in a sentence
- Text to Speech
- Timeseries
 - Stock prices
 - Weather
 - Fantasy sports



Keras TimeseriesGenerator

	Volume	Open	Close	Target
2019-01-01	1,000,000	\$150.00	\$155.00	NaN
2019-01-02	2,000,000	\$160.00	\$165.00	1
2019-01-03	3,000,000	\$155.00	\$160.00	0
2019-01-04	4,000,000	\$180.00	\$185.00	1
2019-01-05	5,000,000	\$175.00	\$180.00	0
2019-01-06	6,000,000	\$170.00	\$175.00	0

Keras TimeseriesGenerator: Length = 3

	Volume	Open	Close	Target
2019-01-01	1,000,000	\$150.00	\$155.00	NaN
2019-01-02	2,000,000	\$160.00	\$165.00	1
2019-01-03	3,000,000	\$155.00	\$160.00	0
2019-01-04	4,000,000	\$180.00	\$185.00	1
2019-01-05	5,000,000	\$175.00	\$180.00	0
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2019-01-05	5,000,000	\$175.00	\$180.00	0
2019-01-06	6,000,000	\$170.00	\$175.00	0

Keras TimeseriesGenerator: Length = 4

	Volume	Open	Close	Target
2019-01-01	1,000,000	\$150.00	\$155.00	NaN
2019-01-02	2,000,000	\$160.00	\$165.00	1
2019-01-03	3,000,000	\$155.00	\$160.00	0
2019-01-04	4,000,000	\$180.00	\$185.00	1
2019-01-05	5,000,000	\$175.00	\$180.00	0
2019-01-06	6,000,000	\$170.00	\$175.00	0

RNN Architecture

	Volume	Open	Close
2019-01-01	1,000,000	\$150.00	\$155.00
2019-01-02	2,000,000	\$160.00	\$165.00
2019-01-03	3,000,000	\$155.00	\$160.00

RNN Architecture: Unfolded

	Volume	Open	Close
2019-01-01	1,000,000	\$150.00	\$155.00
2019-01-02	2,000,000	\$160.00	\$165.00
2019-01-03	3,000,000	\$155.00	\$160.00

The problem with RNNs: Vanishing Gradients

	Volume	Open	Close
2019-01-01	1,000,000	\$150.00	\$155.00
...
2019-12-31	3,000,000	\$155.00	\$160.00

The solution: LSTMs (and more recently GRUs)



