

# Exploring Emoji Usage and Prediction Through a Temporal Variation Lens



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# How are emoji used over time?

*Good morning!*



*I love Mondays...*



*Good night*



*I love Friday!*



*Santa is HERE!*



*Summer is HERE!*



# How are emoji used over time?

Spring															
Summer															
Autumn															
Winter															

# How are emoji used over time?

Spring	              
Summer	              
Autumn	              
Winter	              

# Outline

1. Exploring emoji embeddings (trained on different time period)
2. Using time information to improve emoji prediction

# Exploring Emoji Embeddings

- We learn emoji embeddings from dataset of different period of the year: **Winter, Summer, Spring, Autumn**
- How does the semantic representation of emoji change over the year?

# Exploring Emoji Embeddings

Comparing 10 Nearest Neighbours of the same emoji on different models (seasons)



<b>Spring</b>										
<b>Summer</b>										
<b>Autumn</b>										
<b>Winter</b>										

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# Exploring Emoji Embeddings
















Comparing 10 Nearest Neighbours of the same emoji on different models (seasons)



<b>Spring</b>										
<b>Summer</b>										
<b>Autumn</b>										
<b>Winter</b>										
















# Exploring Emoji Embeddings

Comparing 10 Nearest Neighbours of the same emoji on different models (seasons), (10 = full overlap, 0 = no overlap)

Emoji															
<b>Spr–Sum</b>	9	9	9	9	9	9	10	10	9	10	8	8	8	8	8
<b>Spr–Aut</b>	10	10	10	9	9	9	10	9	9	10	8	8	8	8	10
<b>Spr–Win</b>	9	9	9	10	9	9	9	9	9	9	8	9	8	9	10
<b>Sum–Aut</b>	9	9	9	10	9	10	10	9	9	10	9	8	8	9	8
<b>Sum–Win</b>	10	9	10	9	9	10	9	9	9	9	8	8	8	8	8
<b>Aut–Win</b>	9	9	9	9	9	10	9	9	9	9	8	9	9	9	10
<b>All</b>	9	9	9	9	9	9	9	9	9	9	8	8	8	8	8
















# Exploring Emoji Embeddings

Comparing 10 Nearest Neighbours of the same emoji on different models (seasons), (10 = full overlap, 0 = no overlap)

Emoji															
Spr–Sum	5	5	3	6	2	6	6	2	7	2	6	8	3	2	3
Spr–Aut	3	4	4	5	3	6	4	5	4	3	5	3	3	1	1
Spr–Win	4	3	3	4	4	4	3	3	5	1	5	1	1	2	2
Sum–Aut	3	5	5	4	3	5	6	1	3	2	6	3	1	5	2
Sum–Win	4	4	8	2	4	4	4	2	5	5	5	1	2	2	0
Aut–Win	5	3	5	5	3	3	2	4	4	2	3	7	1	3	0
All	2	2	2	1	1	1	1	1	1	1	1	0	0	0	0

# Exploring Emoji Embeddings

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Emoji															
Spr–Sum	5	5	3	6	2	6	6	2	7	2	6	8	3	2	3
Spr–Aut	3	4	4	5	3	6	4	5	4	3	5	3	3	1	1
Spr–Win	4	3	3	4	4	4	3	3	5	1	5	1	1	2	2
Sum–Aut	3	5	5	4	3	5	6	1	3	2	6	3	1	5	2
Sum–Win	4	4	8	2	4	4	4	2	5	5	5	1	2	2	0
Aut–Win	5	3	5	5	3	3	2	4	4	2	3	1	1	3	0
All	2	2	2	1	1	1	1	1	1	1	1	7	0	0	0
												0			

# Emoji Prediction

*Can we use time information to improve emoji prediction?*

# Emoji Prediction

*“Predict the emoji included in a text message”*

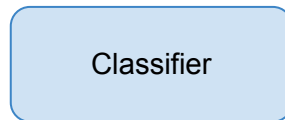


**Roger Federer**  @rogerfederer · Mar 15

Can't wait to visit [#Chicago](#) for the first time next week. What shall I do while I am in town? [#LaverCup](#) 🤔



*Can't wait to visit #Chicago for the first time next Week. What shall I do while I am in town? #LaverCup*



*300 emojis*



# Emoji Prediction

“Predict the emoji included in a text message, *given the text and time information*”

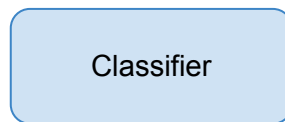


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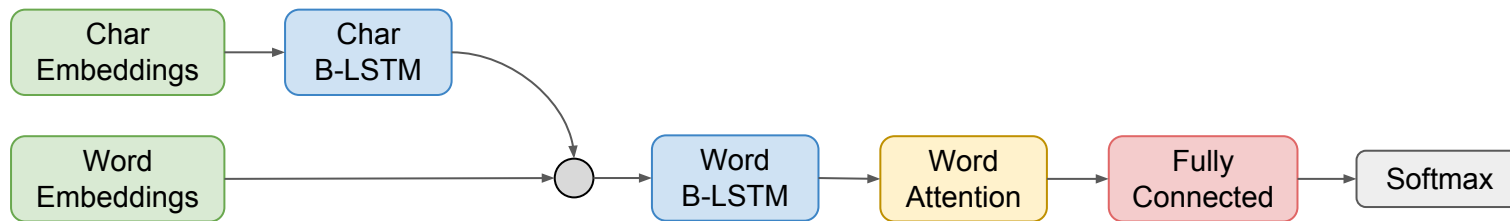
*Can't wait to visit #Chicago for the first time next week. What shall I do while I am in town? #LaverCup*

*8 am  
Wed  
March*

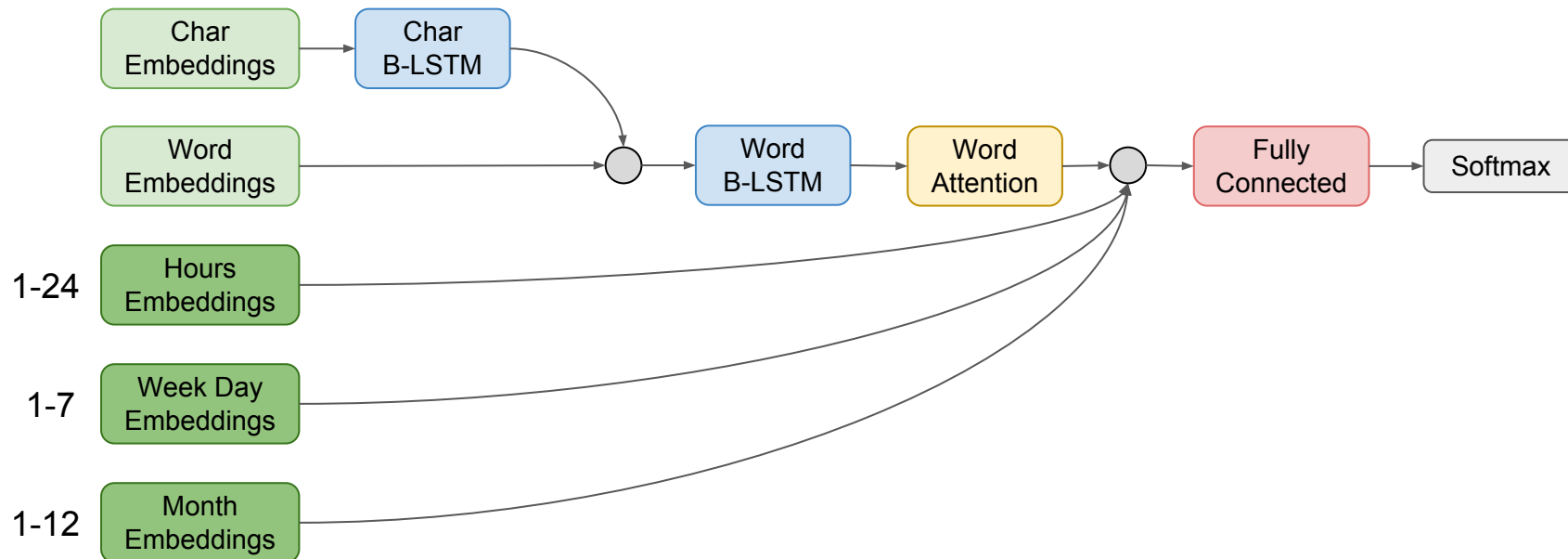


*300 emojis*

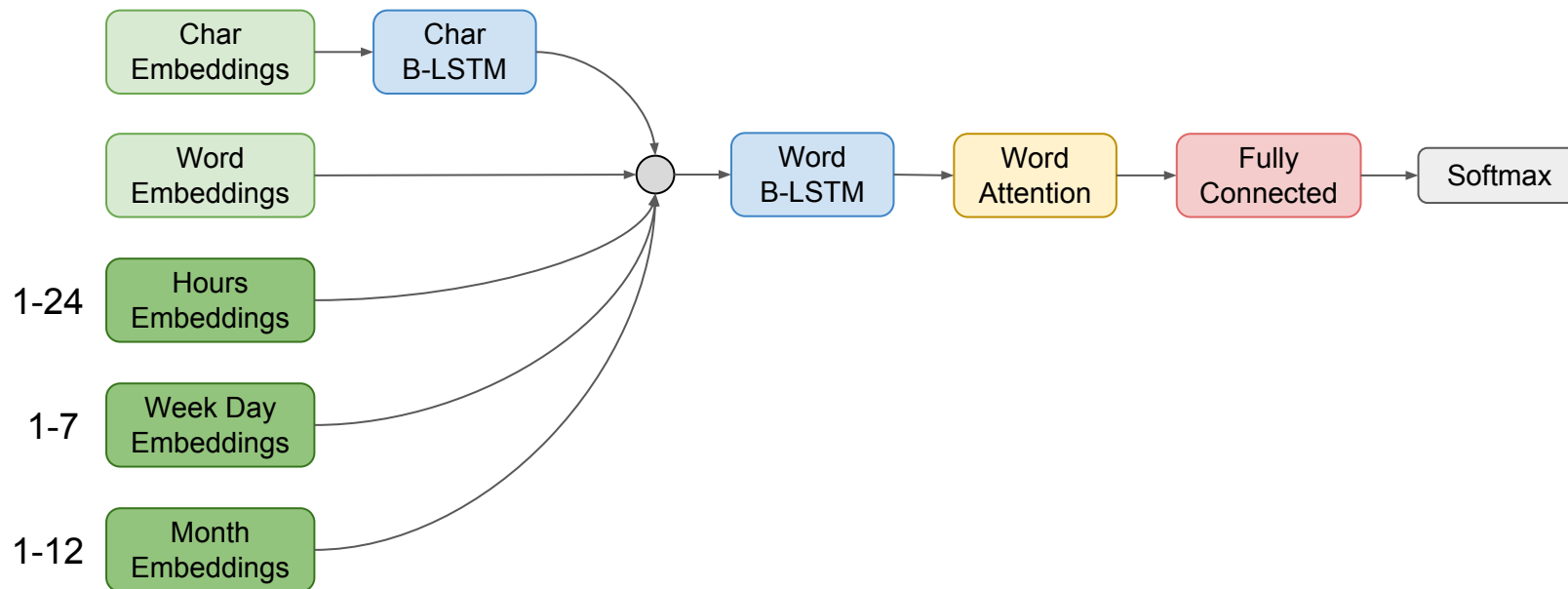
# Emoji Prediction



# Emoji Prediction - Late



# Emoji Prediction - Early























# Emoji Prediction - Results

	<b>P</b>	<b>R</b>	<b>F1</b>	<b>a@1</b>	<b>a@5</b>	<b>a@10</b>	<b>CE</b>
<b>W/O</b>	21.97	23.22	21.89	23.13	38.22	45.70	44.29
<b>Early</b>	<b>22.10</b>	<b>23.43</b>	<b>22.06</b>	<b>23.33</b>	<b>38.55</b>	<b>46.29</b>	<b>42.59</b>
<b>Late</b>	21.83	23.00	21.63	22.91	37.85	45.62	43.91

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	<b>P</b>	<b>R</b>	<b>F1</b>	<b>a@1</b>	<b>a@5</b>	<b>a@10</b>	<b>CE</b>
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# Emoji Prediction - Results

<b>Emoji</b>										
<b>W/O</b>	0.54	0.4	0.15	0.34	0.40	0.4	0.22	0.19	0.30	0.31
<b>Early</b>	0.63	0.11	0.22	0.41	0.47	0.10	0.27	0.24	0.35	0.36
<b>Emoji</b>										
<b>W/O</b>	0.44	0.30	0.36	0.50	0.10	0.12	0.15	0.18	0.22	0.11
<b>Early</b>	0.49	0.34	0.40	0.54	0.14	0.16	0.19	0.22	0.26	0.15

# Conclusions

- (Some) Emoji usage/semantics depends on the date
- We can exploit date information to improve emoji prediction
- Future:
  - Using both early and late at the same time
  - Exploring different languages / countries