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Rock Lyrics Generation

Natural Language Processing
CS 584

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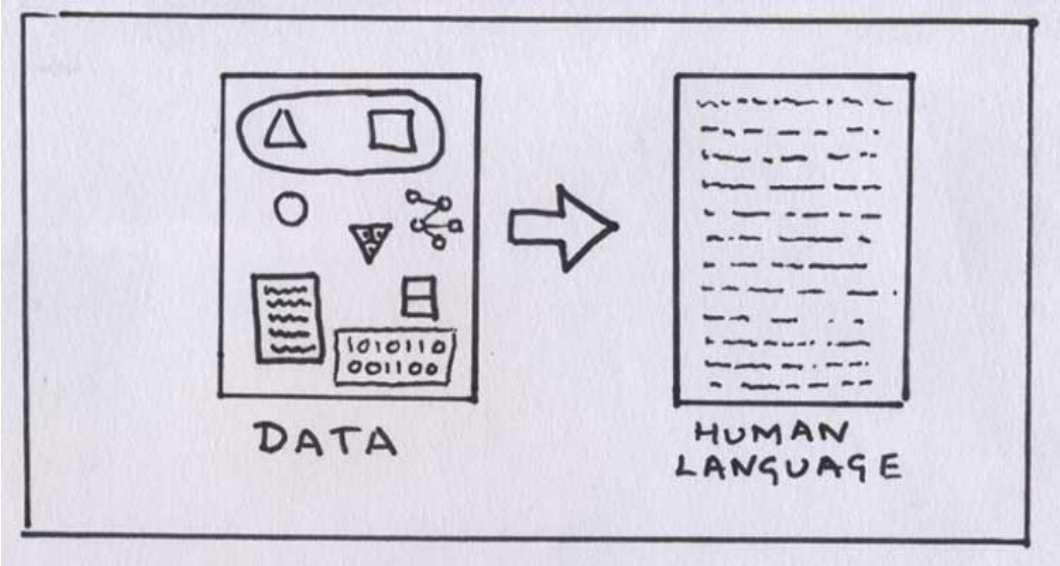
NLG Overview:

- **Natural Language Generation**



- **Conditional Language Modeling:**

$$P(w_t | w_1, \ldots, w_{t-1}, x)$$

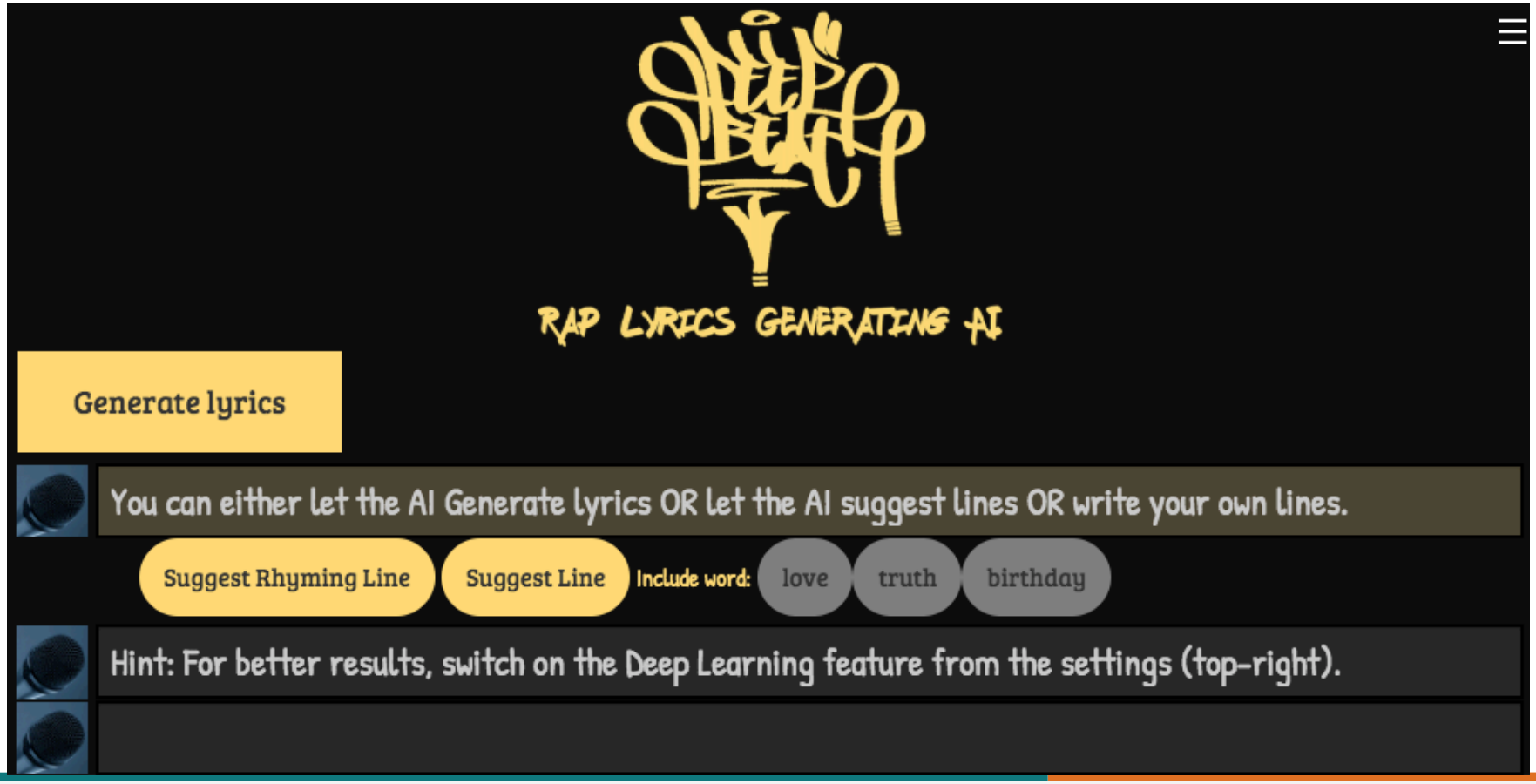
Related work:

- Lyric Generation with Style
  - a GAN-like framework with hierarchical generator and encoder to generate lyrics given a specified style and topic pair.

- Combining Learned Lyrical Structures and Vocabulary for Improved Lyric Generation
  - combining two separately trained language models into a framework

Related work:

- DopeLearning: A Computational Approach to Rap Lyrics Generation
  - DeepBeat http://deepbeat.org/



Proposed Architecture:

Meds

Title

Placebo

Artist

Model

I was alone, falling free
Trying my best not to forget
What happened to us, what happened to me
What happened as I let it slip
I was confused by the powers that be
Forgetting names and faces
Passers by were looking at me
As if they could erase it
Baby, did you forget to take your meds?
Baby, did you forget to take your meds?
Baby, did you forget to take your meds?
Baby, did you forget to take your meds?
I was alone staring over the ledge
Trying my best not to forget
All manner of joy, all manner of glee
And our one heroic pledge
How it mattered to us, how it mattered to me
And the consequences
I was confused by the birds and the bees
Forgetting if I meant it

Lyrics

Proposed Architecture:

The Light Behind Your Eyes

Title

My Chemical Romance

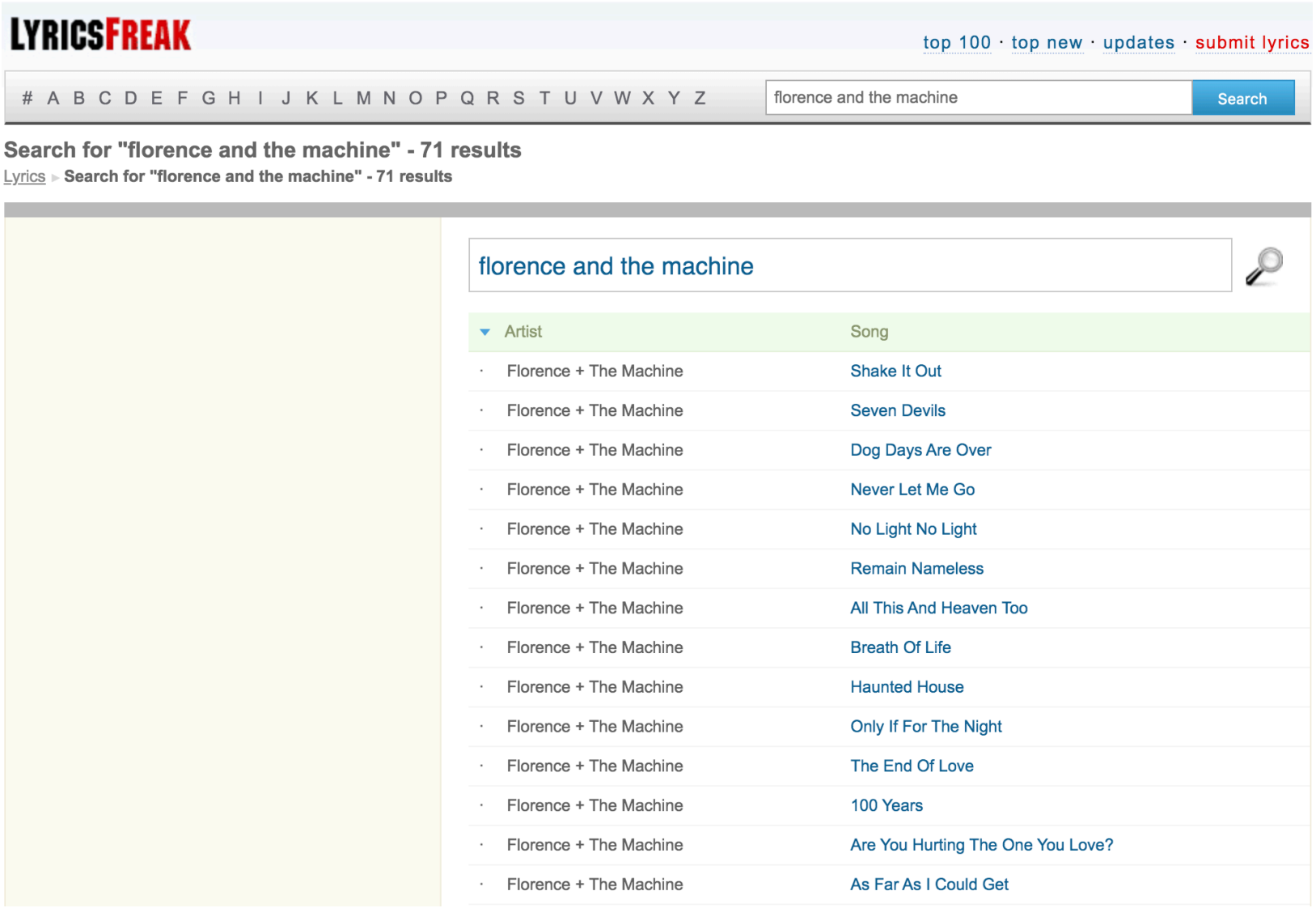
Artist

Model

So long to all of my friends
Every one of them met tragic ends
With every passing day
I'd be lying if I didn't say
That I miss them all tonight
And if they only knew what I would say
If I could be with you tonight
I would sing you to sleep
Never let them take the light behind your eyes
One day I'll lose this fight
As we fade in the dark
Just remember you will always burn as bright
Be strong and hold my hand
Time becomes for us, you'll understand
We'll say goodbye today
And I'm sorry how it ends this way

Lyrics

Datesets - web scripting



Datesets - web scripting

About Shake It Out lyrics

Album MTV Unplugged
by Florence + The Machine
Labels Universal Music, Island Records Group, Luv Luv Luv

Guest	Josh Homme
Band	Christopher Lloyd Hayden, Robert Ackroyd, Rusty Bradshaw, Tom Monger

Florence + The Machine – Shake It Out Lyrics

Regrets collect like old friends
Here to relive your darkest moments
I can see no way, I can see no way
And all of the ghouls come out to play

And every demon wants his pound of flesh
But I like to keep some things to myself
I like to keep my issues strong
It's always darkest before the dawn

```
data-sorting-artist="Florence + The Machine" data-sorting-song="Dog Days Are Over">…</div>
data-sorting-artist="Florence + The Machine" data-sorting-song="Never Let Me Go">…</div>
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data-sorting-artist="Florence + The Machine" data-sorting-song="Remain Nameless">…</div>
data-sorting-artist="Florence + The Machine" data-sorting-song="All This And Heaven Too">…</div>
data-sorting-artist="Florence + The Machine" data-sorting-song="Breath Of Life">…</div>
data-sorting-artist="Florence + The Machine" data-sorting-song="Haunted House">…</div>
data-sorting-artist="Florence + The Machine" data-sorting-song="Only If For The Night">…</div>
data-sorting-artist="Florence + The Machine" data-sorting-song="The End Of Love">…</div>
data-sorting-artist="Florence + The Machine" data-sorting-song="100 Years">…</div>
data-sorting-artist="Florence + The Machine" data-sorting-song="Are You Hurting The One You
```

Datesets - dataframe

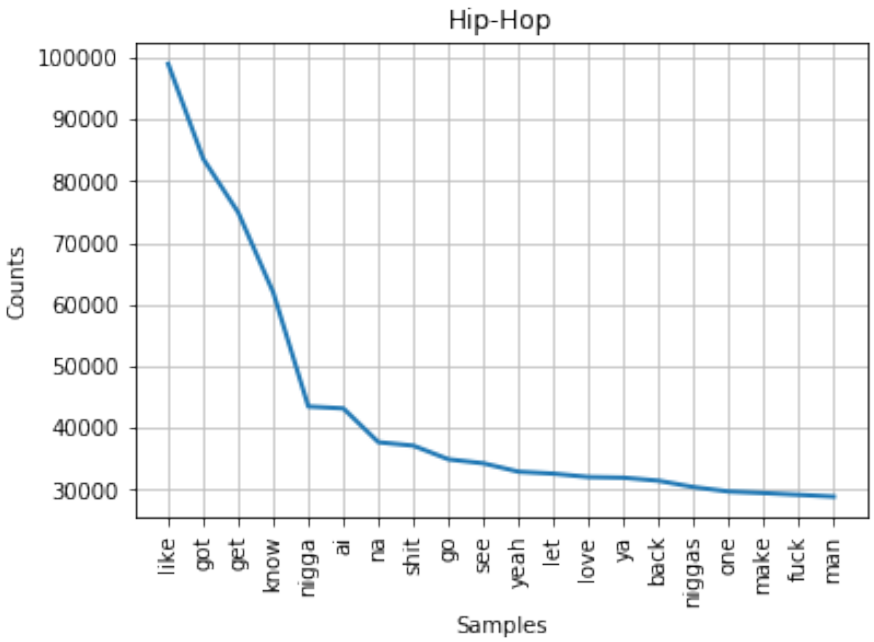
By line

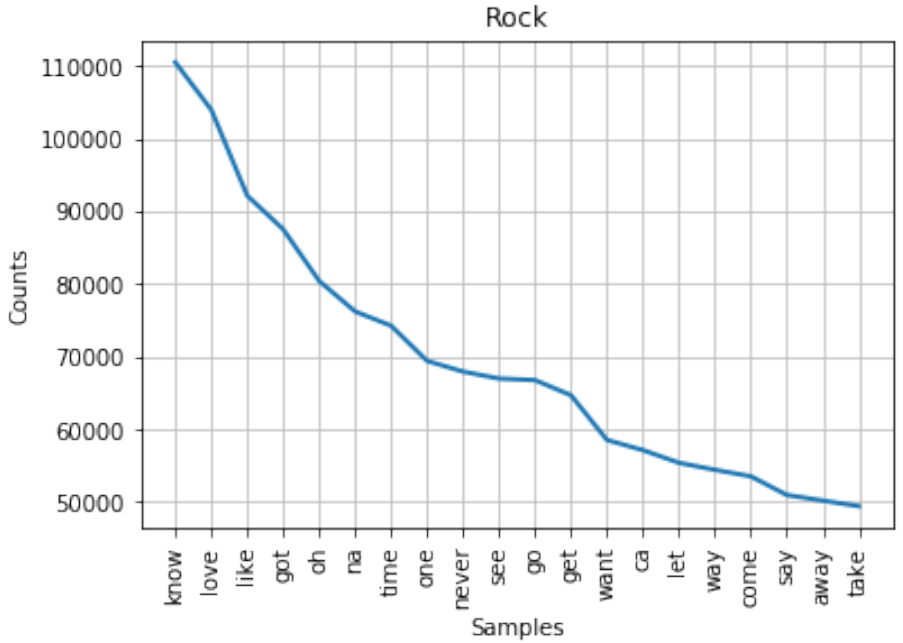
artists	titles	lyrics
ACDC	aint no fun	the following is a true story
ACDC	aint no fun	only the names have been changed
ACDC	aint no fun	to protect the guilty
ACDC	aint no fun	well i left my job in my home town
ACDC	aint no fun	and i headed for the smoke
ACDC	aint no fun	got a rock n roll band and a fast right hand
ACDC	aint no fun	gonna get to the top
ACDC	aint no fun	nothings gonna stop us
ACDC	aint no fun	no nothing
ACDC	aint no fun	so if youve got the money

By song

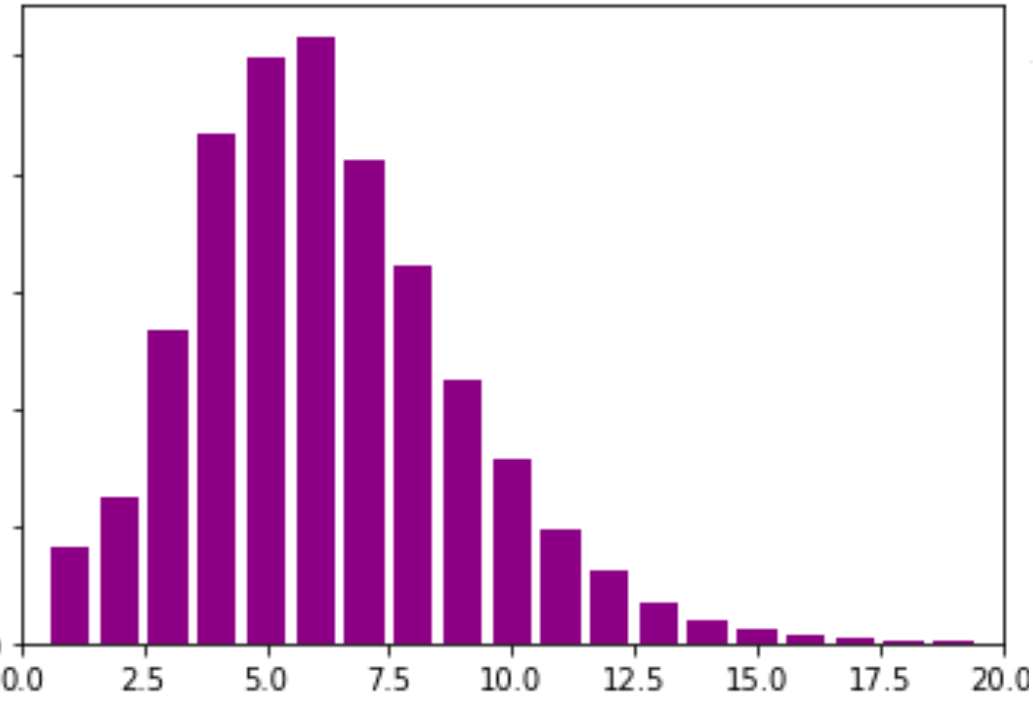
artists	titles	lyrics
ACDC	aint no fun	the following is a true story only the names have bee
ACDC	aint no fun waiting round	the following is a true story only the names have bee
ACDC	all screwed up	get ready you think youre kind of tough youre walkin
ACDC	alright tonight	do you wanna boogie do you wanna blow she said i c
ACDC	anything goes	got a taste of a rocking band standing there holding
ACDC	are you ready	are you ready are you ready are you ready are you re
ACDC	baby please dont go	baby please dont go baby please dont go baby please
ACDC	back in black	back in black i hit the sack ive been too long im glad
ACDC	back in business	breakin out about to shout feel the need for one mor
ACDC	back seat confidential	old mans car on a saturday night got me a woman n
ACDC	bad boy boogie	on the day i was born the rain fell down there was tr

Datasets - Analysis





Datesets - Analysis



Sentence Length distribution of rock lyrics

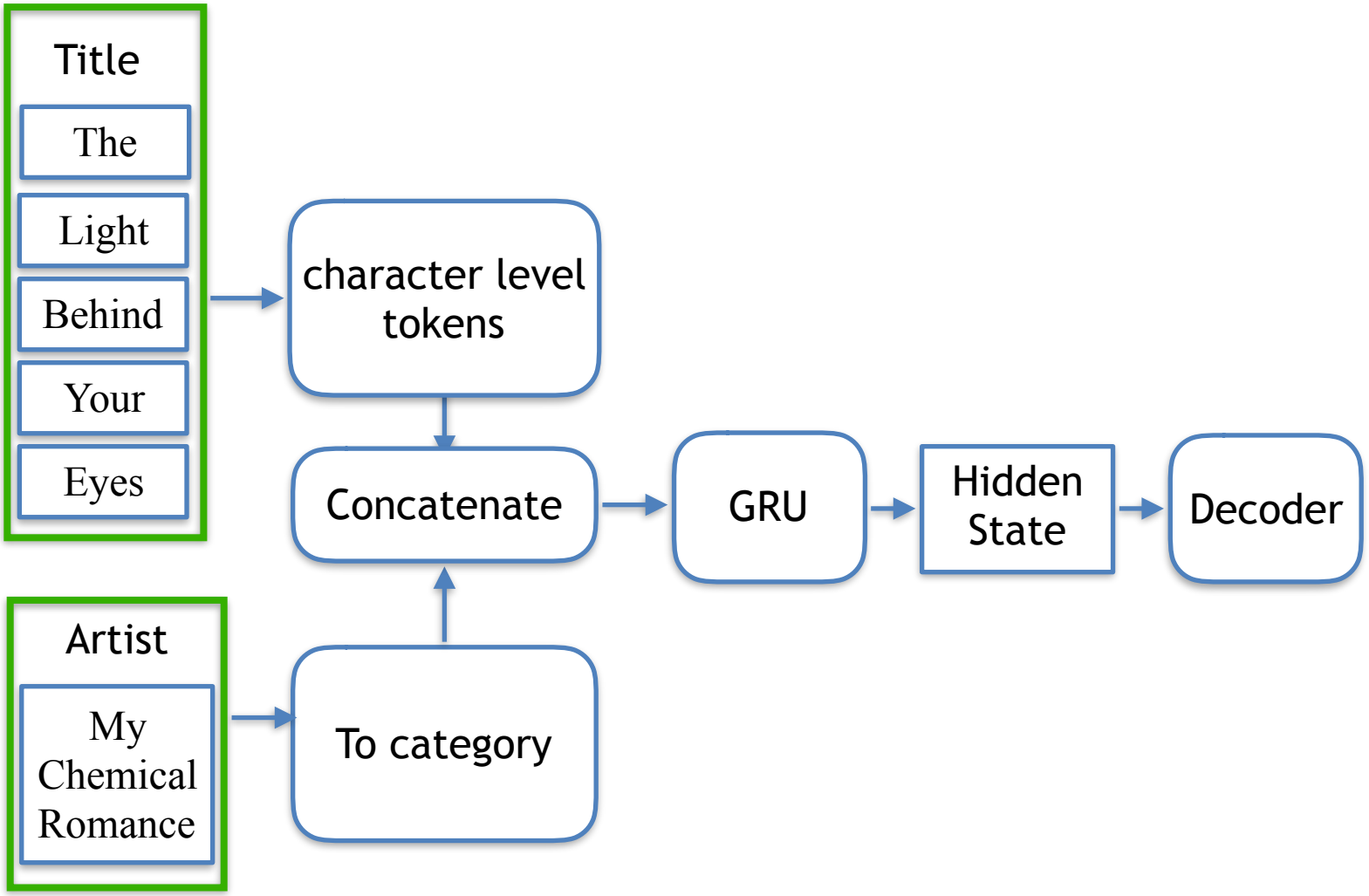
Death of a Bachelor

Panic! at the Disco

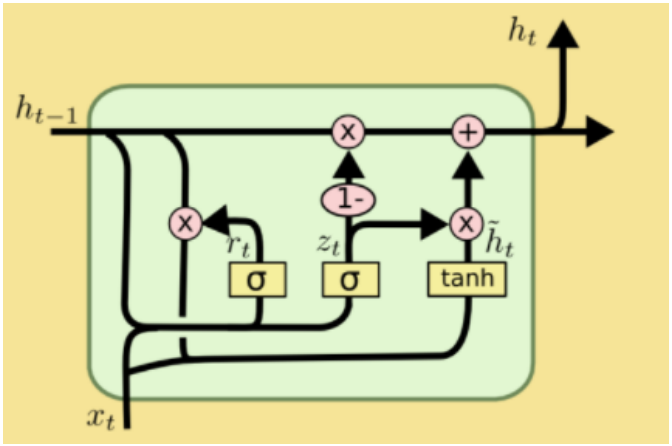
Do I look lonely?
I see the shadows on my face
People have told me I don't look the same
Maybe I lost weight
I'm playing hooky with the best of the best
Put my heart on my chest so that you can see it, too
I'm walking the long road, watching the sky fall
The lace in your dress tingles my neck, how do I live?

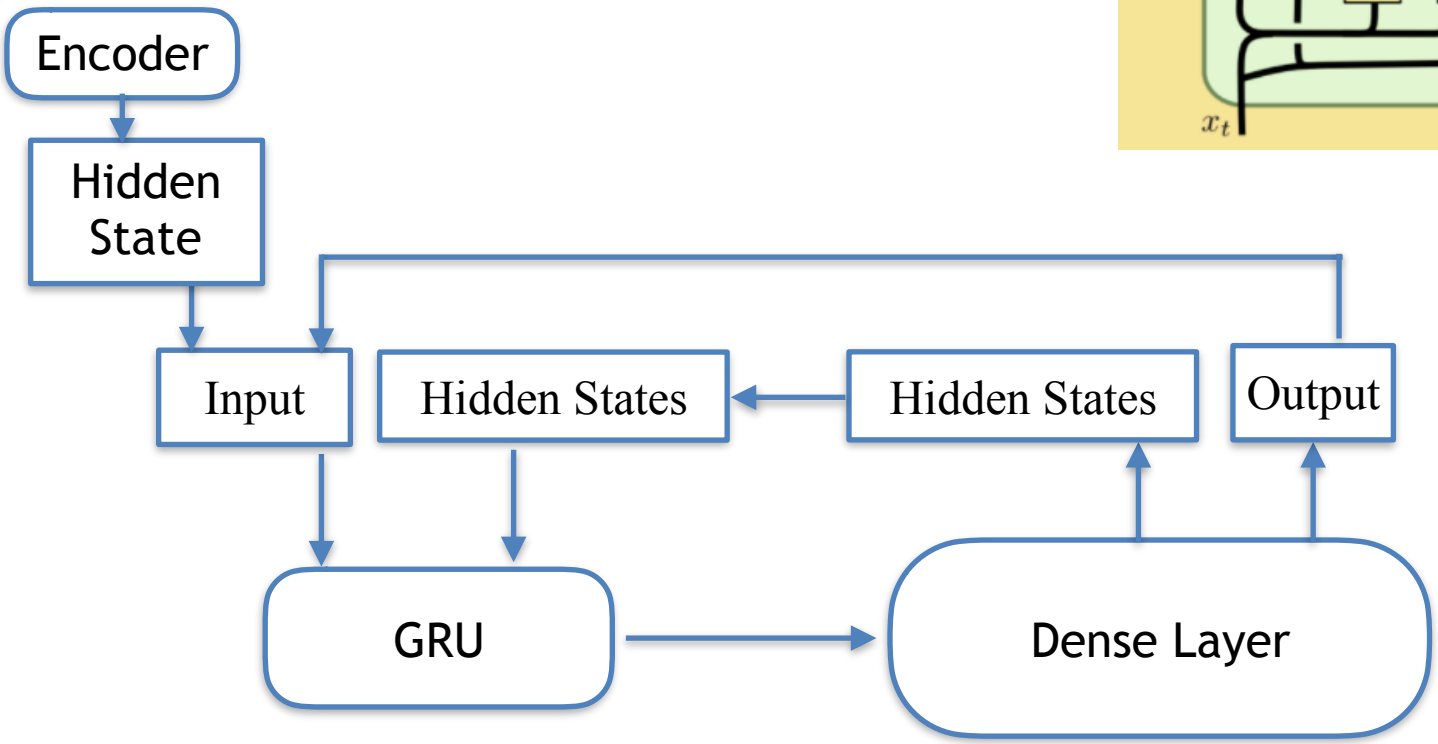
The death of a bachelor
Oh oh
Letting the water fall
The death of a bachelor
Oh oh
Seems so fitting for
Happily ever after (woo)
How could I ask for more?
A lifetime of laughter
At the expense of the death of a bachelor

Proposed Architecture - Encoder

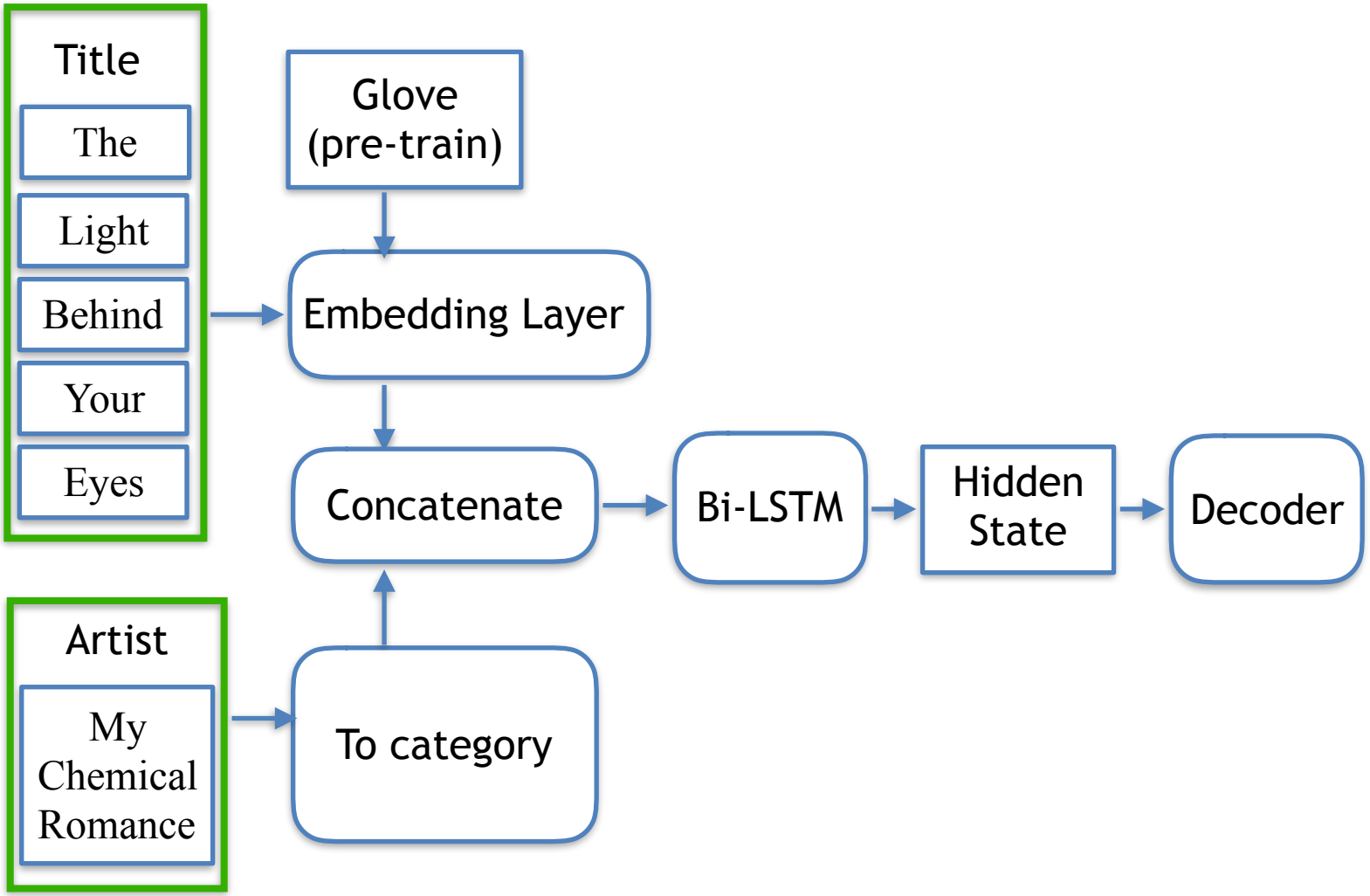


Proposed Architecture - Decoder

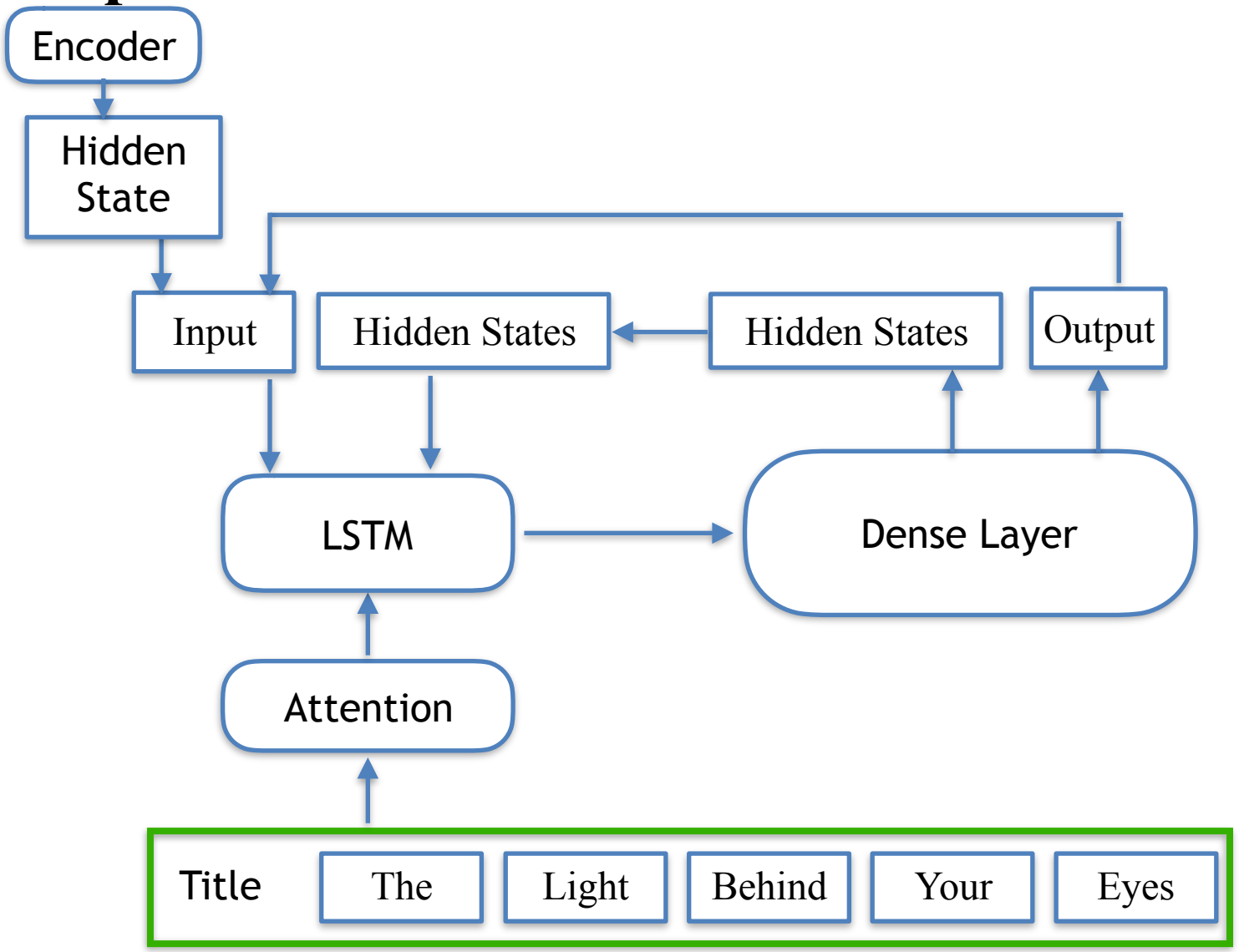




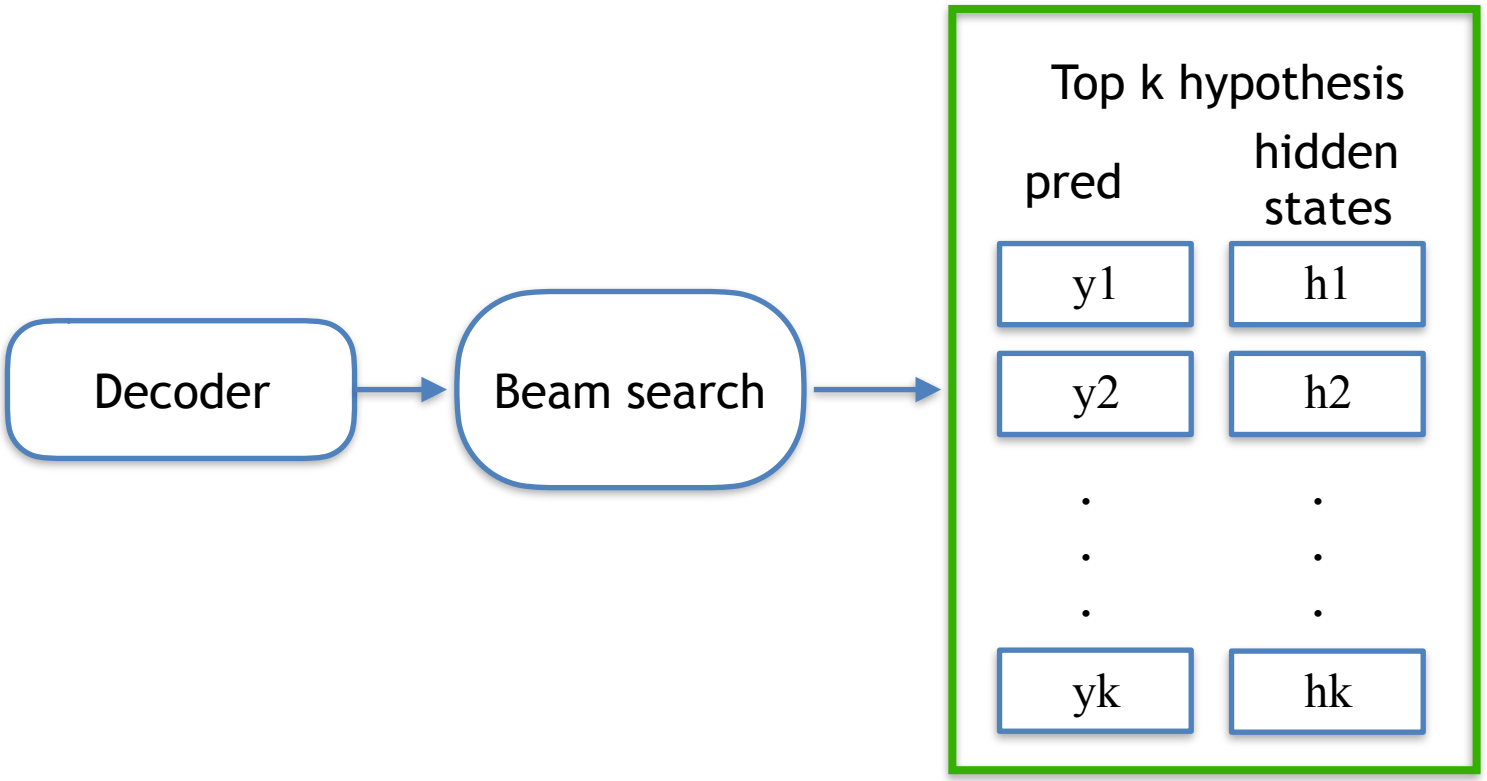
Proposed Architecture - Encoder



Proposed Architecture - Decoder



Proposed Architecture - Predictions



Proposed Architecture - formulas

LSTM:

$$i_t = \sigma(W_{\omega i} w_t + W_{hi} h_{t-1})$$

$$f_t = \sigma(W_{\omega f} w_t + W_{hf} h_{t-1})$$

$$o_t = \sigma(W_{\omega o} w_t + W_{ho} h_{t-1})$$

$$\hat{c}_t = \tanh(W_{\omega c} w_t + W_{hc} h_{t-1})$$

$$c_t = f_t \cdot c_{t-1} + i_t \cdot \hat{c}_t)$$

$$h_t = o_t \cdot \tanh(c_t)$$

GRU:

Initially, for $t = 0$, the output vector is $h_0 = 0$.

$$z_t = \sigma_g(W_z x_t + U_z h_{t-1} + b_z)$$

$$r_t = \sigma_g(W_r x_t + U_r h_{t-1} + b_r)$$

$$h_t = (1 - z_t) \circ h_{t-1} + z_t \circ \sigma_h(W_h x_t + U_h(r_t \circ h_{t-1}) + b_h)$$

Proposed Architecture - formulas

Beam Search

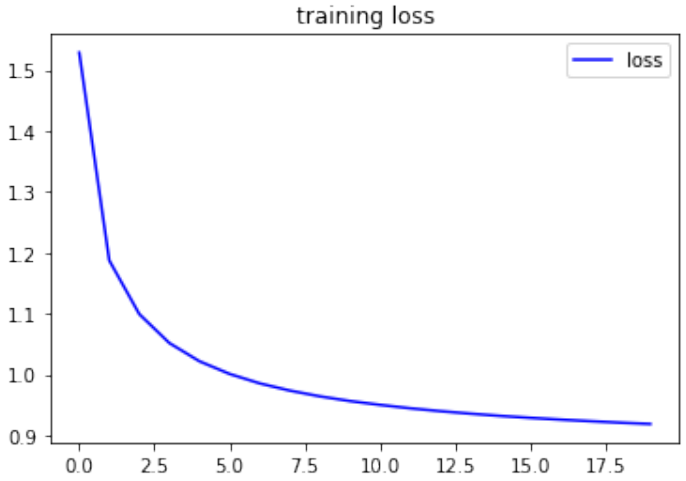
- Beam score (log probability)

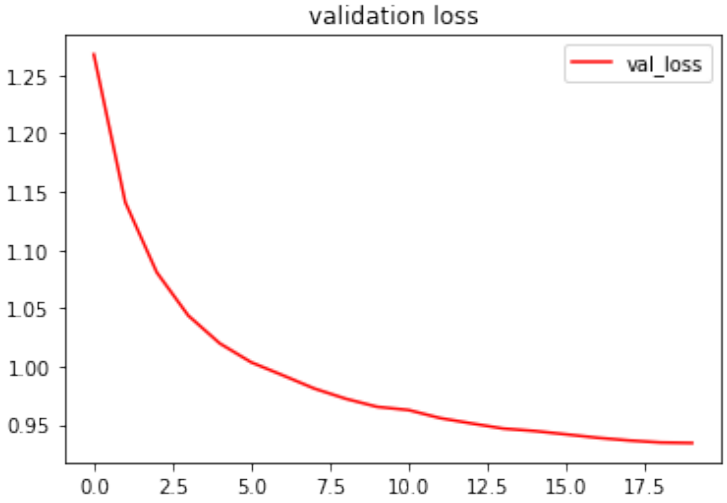
$$score(y_1, ..., y_t) = logP_{LM}(y_1, ..., y_t|x) = \sum_{i=1}^{t} logP_{LM}(y_i|y_1, ..., y_{i-1}, x)$$

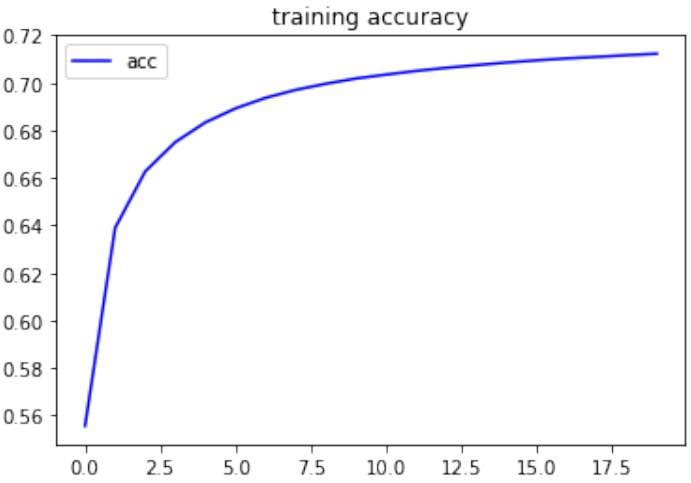
- Normalize score by length

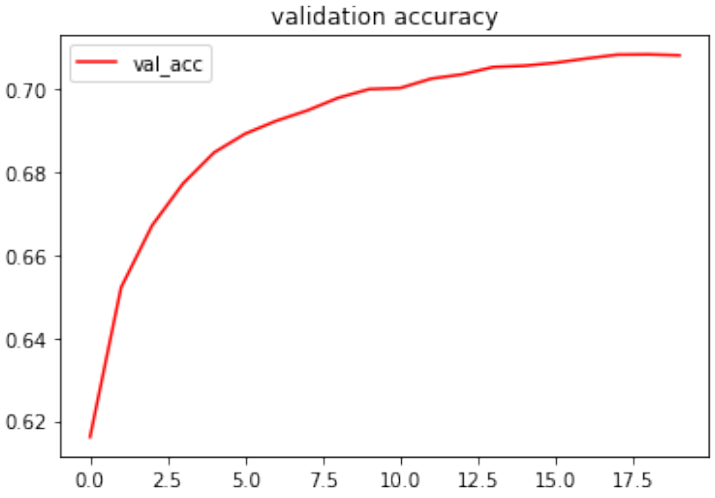
$$\frac{1}{t}\sum_{i=1}^{t} logP_LM(y_i|y_1, ..., y_{t-1}, x)$$

Results - training









Results - training

```
model.compile(optimizer='rmsprop', loss='categorical_crossentropy',
              metrics=['accuracy'])
history = model.fit([encoder_input_data, decoder_input_data], decoder_target_data,
          batch_size=64,
          epochs=20,
          validation_split=0.2,
          [his, tensorboard])
```

```
Train on 40000 samples, validate on 10000 samples
Epoch 1/1
 7488/40000 [====>.........................] - ETA: 14:16 - loss: 0.8825 - acc: 0.7218
```

Results - beam search

Beam_size = 8 Step = 10

```
hypos # input_data[1000]
```

```
['\tyou cant s',
 '\twhen you d',
 '\twhen you c',
 '\ti cant be ',
 '\twhen your ',
 '\ti want you',
 '\ti want to ',
 '\twhen youre']
```

```
hypos # input_data[66]
```

```
['\ttheres a b',
 '\ttheres som',
 '\twhen they ',
 '\twhen your ',
 '\ttheres a s',
 '\twhen youre',
 '\ttheres not',
 '\ttheres no ']
```

Results - beam search

Beam_size = 8 Step = 24

```
hypos # input_data[1000]
```

```
['\twhen youre the one you c',
 '\twhen youre the one you w',
 '\twhen youre the one you k',
 '\twhen youre the only the ',
 '\twhen youre the one youre',
 '\twhen youre the only way ',
 '\twhen youre the one that ',
 '\twhen youre the only one ']
```

```
hypos # input_data[66]
```

```
['\ttheres nothing and the w',
 '\ttheres nothing and the s',
 '\ttheres nothing in the st',
 '\ttheres nothing in the mo',
 '\ttheres nothing to be the',
 '\ttheres nothing there is ',
 '\ttheres nothing theres a ',
 '\ttheres nothing theres no']
```

Results - beam search

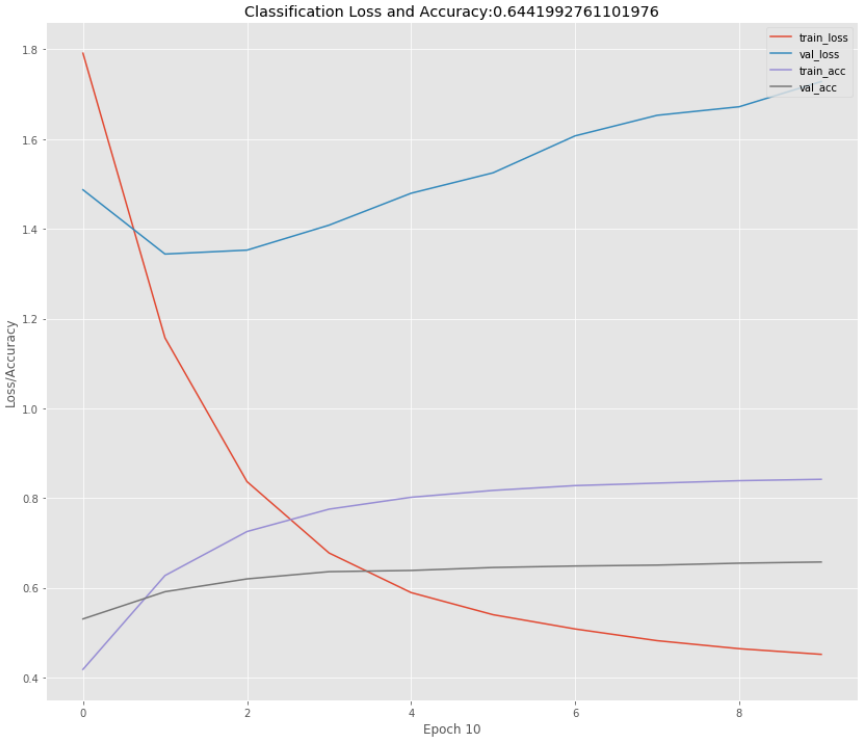
```
2]: hypos

2]: ['\ttheres nothing left to see your heart and there is not ',
     '\ttheres nothing left to see your heart and the world wil',
     '\ttheres nothing left to see your heart and the world the',
     '\ttheres nothing left to see your heart and there is noth',
     '\ttheres nothing left to see your heart and the world tha',
     '\ttheres nothing left to see your heart and the world and',
     '\ttheres nothing left to see your heart and theres someth',
     '\ttheres nothing left to see your heart and the world is ',
     '\ttheres nothing left to find the world that you want to ',
     '\ttheres nothing left to see your heart and theres nothin']
```

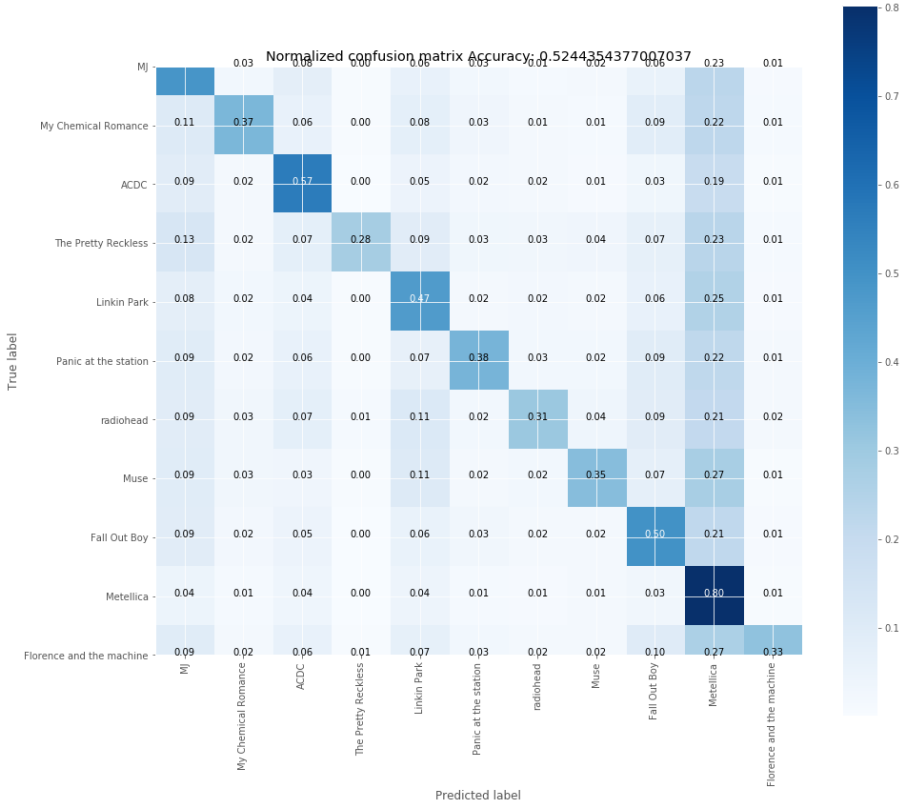
Evaluation

- Word overlap based metrics (BLEU, ROUGE, METEOR, F1, etc)
- We know that they're not ideal for machine translation
- They're even worse for summarization, which is more open-ended than machine translation
  - Unfortunately, ROUGE also rewards extractive summarization systems more than abstractive systems
- And they're even worse for dialogue, which is more open-ended than summarization
  - similarly for e.g. story generation

Evaluation - classifier



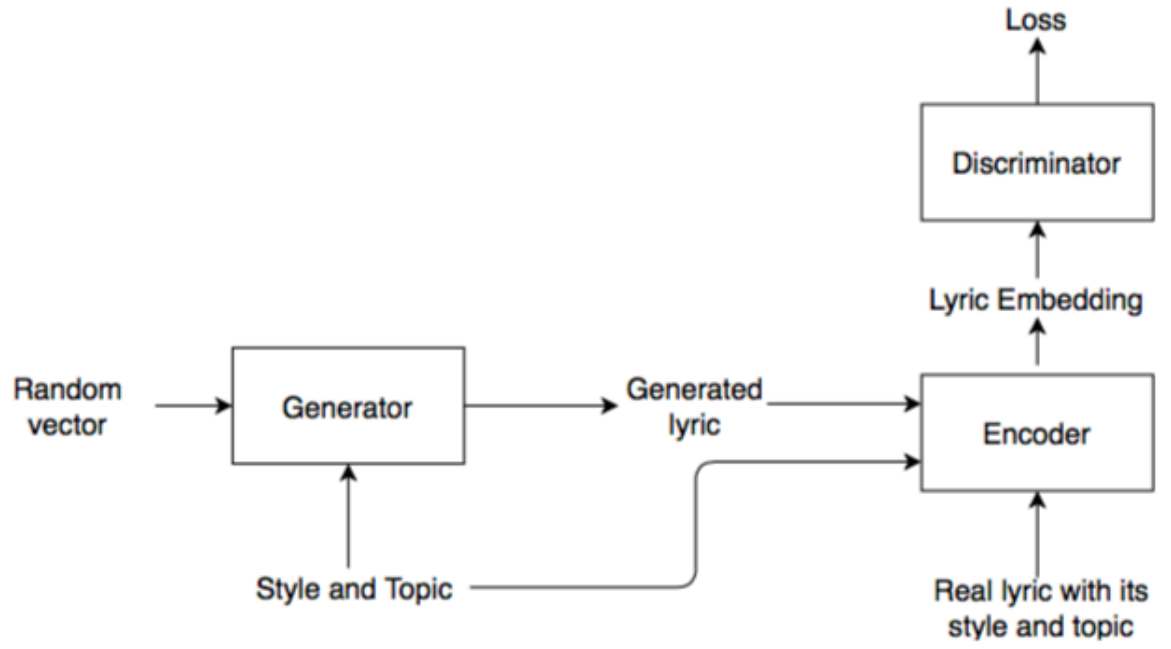
Training Loss



Test on predictions

Future Work

- Word level Model
  - Time consuming
- Evaluation : ROUGE
  - Low score
- GAN
  - One generative net and an adversarial net.



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