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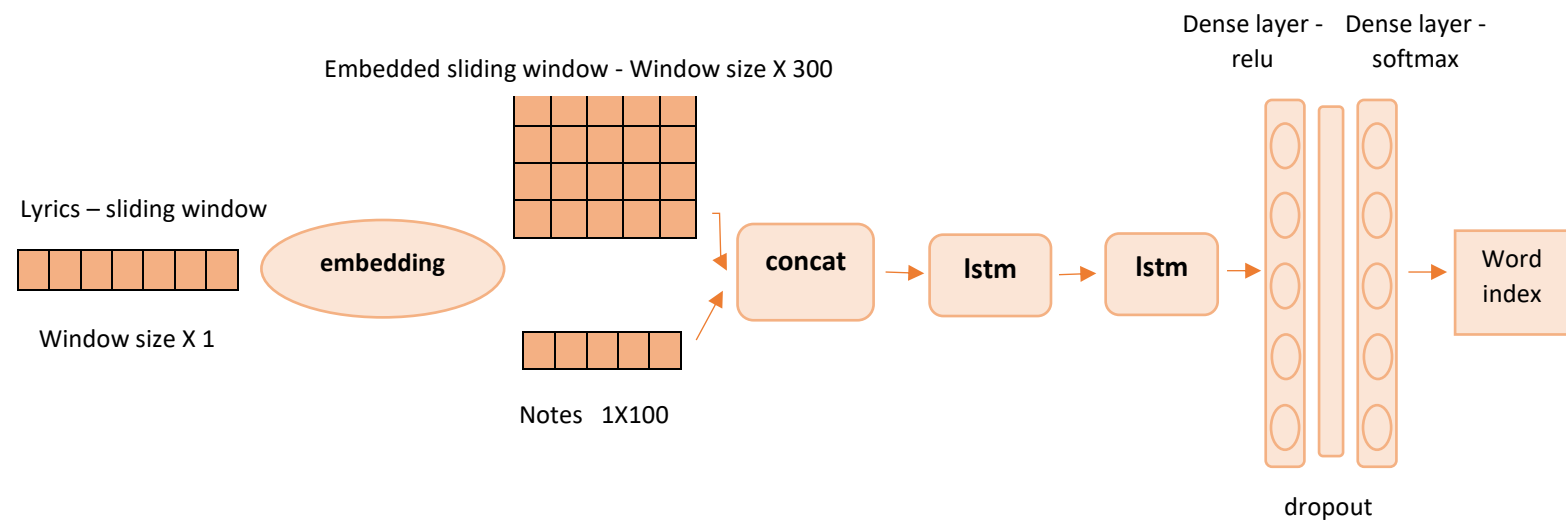206172686 Sarit Hollander

Architecture

- **Embedding Layer**
  In this layer each word converts to its embedding representation. Using this layer, the model learns the embedding of the missing words.

- **Concatenate Layer**
  In this layer each word has its own melody attached.

- **LSTM Layers**
  In these layers the model learns the features and output all the hidden states and finally output a single feature.

- **Dropout Layer**
  Used to reduce overfitting.

- **Softmax Layer**
  In this layer each word in the corpus will have its probability of being the next word.

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Approach

To process the midi files, we implemented two different methods:

1. 'original' - Melody as single vector:
    The technique we used here is similar to the method described in the assignment of combining all the words with the melody. Using the piano roll of the midi file, we calculate the average value of each note across the entire song into a vector of size 128 x 1. In the 'concatenate layer', we combine this vector with the word vector. In the end, the combined vector is passed to the LSTM, dense, and SoftMax layers of the architecture.

2. 'sliding' - Splitting melody into sliding window:
    The technique we used here is to match a word in a song with its actual piano notes. Using this technique, we slice the piano roll into sliding windows that represent the notes played during one word. Each window represents a word in the song.
    Here we are using two parameters:
    Frequency_sample - at frequency 100, each second will be split into 100 frames, each frame will have the value of the notes played during that frame.

    frames_in_word - we saw that every word takes ~ 64 milliseconds. Approximately 20% of each word of melody overlaps with the next about every 100 milliseconds. By using overlaps, some words would take less time than others.

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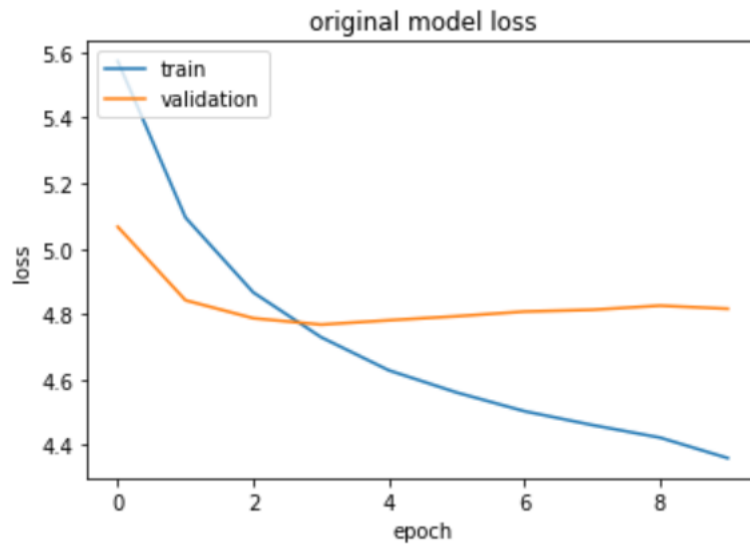206172686 Sarit Hollander

Graph's Results

The graphs represent the loss over epochs.

X axis = epochs

Y axis = loss

Approach (1) graph (original):

Approach (2) graph (sliding window):

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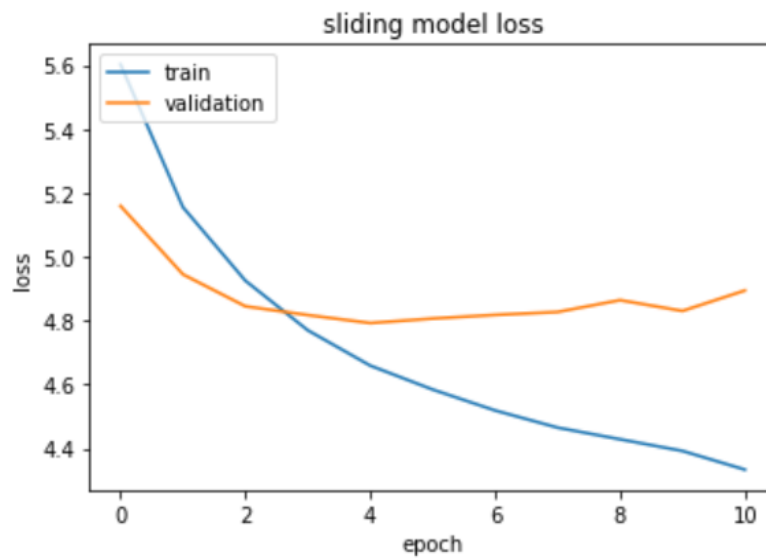
Results

First model – "Original"

Song's first original word:

Song: eternal flame
seed: close

Generate Lyrics:

close coming this not round
my every year
of the church to you that they stand my song
if i can i have not better way to so
lido
they belongs me to see you last
so hold me again
it is not like this love
it is a tree to be along
then it is a girl like i will get you and blaming up oh that
kept me ya look home of now
am this of on the road how i always feeling are

Song: honesty
seed: if

Generate Lyrics:

if how they and
when can me be it but my kiss she still came for
heaven are us on a ways
i said they just was the ride
as i will never like your share
i hear on your asshole it is lying about me but you used up and broken day
i am the own runaway
i need it
play and face a person girl a white just stop a distance and let it rest
you said on you asked
this is going up her no say and

Song: lovefool
seed: dear

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Generate Lyrics:

dear yard
and now daddy hear you
loneliness why look upon me than you
my game is an
how is such crazy was your ones
on the time through the past through here
she you can would be talking
how i do not let me love we should
hoping yell we do not you loved you
come
and will taught you know of you
go what had on the crying fair
they know only not see i am wrong well are fine
until i

Song: barbie girl
seed: hiya

Generate Lyrics:

hi you knew deep songs i am a funky safe
your reindeer is morning bright
time all was been watching back if i think you am really left all and i do not be we are
the is ad always suppper music
it can get at enough
be good dance go together
i feel no re as people have a but i am never already quite into the fantasy
oh three queen somewhere make myself far
and whoa in the girl does not go to live
when we knew i

Song: all the small things
seed: all

Generate Lyrics:

all reading in
beep animals this try
but bad haunts one bout thick
hooked down us wrong
take her dear right
am the now you say or how it is out what you will
sometimes i got ta

she like i i will it no past is
i do not did
lost honey and is coming all i will fun where i try you see to make
i go to dance
i like the face rain
can i got you got time
i do not wanted in

First word – "Hello":

Song: eternal flame
seed: hello

Generate Lyrics:

hello granted up fuck my clouds the heart bag
i am ticking to the then
that good end
the friend going down at a other times
no is still on like it way

i will not find the hurts in my way was ta not end
tonight i hope is not the king of all lies to ronron
stray chickens his many is lauryn anyway
i and let you know i am bear than try it
as it is too i need this
a passion i not

Song: honesty
seed: hello

Generate Lyrics:

hello hands i am got in to get me and with it
trying about him that did you lose like face
everybody her allow to and you would believe
something breathe fades daylight oh yeah
kick your world box of
i never ever you say
that divides the funk world sha hey they hear we everyone
and was it through my heart
and and just well the getting places
as a lifetime have never sad
i know now that it is telling you

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Song: lovefool
seed: hello

Generate Lyrics:

hello ticking
yes i need it late
but only they know
i could dance baby and show me will be life
or about a rest to starting to be wit dreams to work someone he did you underground and i
have be and they look your man alright
and how reminds me me no all that seems about me
but is a house
i mad guaranteed in calls watching wonders
somebody gon na not see the picture

can how i ever spend you
it is not no

Song: barbie girl
seed: hello

Generate Lyrics:

hello
fooling and buy you together
and who i have telling up and after old now
dust through times
you am got it past me too fashion
i the laugh because i am deep right wait so girls
right out you have all all i have gone reaching
till we was no act back into the time and you are free and holding for they goodbye
they will play hard to a brings back around
what is on you baby
no part yeah
ooh people i have

Song: all the small things
seed: hello

Generate Lyrics:

hello places
its morning sleigh and ready to bring the as these way
so oh open it is in the jose

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if i will not break you

First word – "Goodbye":

Song: eternal flame
seed: goodbye

Generate Lyrics:

goodbye never pullman ride
i am the fire up
a of long suck my conscience

Song: honesty
seed: goodbye

Generate Lyrics:

goodbye you we could not
it is got to be always
do not what can you me please
if i teach me for back
because i would forget it
for it i got to still heart
do not have the mom better how right apart
so time so it is like me
and do not find this
looking to bag you you have high and box
love it ever wasting
but you give on ta cried to once
and if i wanted on

Song: lovefool
seed: goodbye

Generate Lyrics:

goodbye class pum reaching all
i love you talk
but somewhere fernando
for love and why
so to darling
get away
you call up dead high she just timing
you can not come into on me we am so near or tell the bag some good because i really come

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you forget me
till i i
i will be on my seeing up man to did to you
i would be bag you wait beside a sleigh
i still am war back &

Song: barbie girl
seed: goodbye

Generate Lyrics:

goodbye two fly
with it takes nobody close to by out
i am in ta swear
because did not say they will follow
it is take the if be my superman
you look on some bit love
how is that
that i am never your vibes to just changed all home
and somebody yak taught me and and who is these dick are the very moonlit jet hair of me
could i will not throw
hug the way it for a color
all this

Song: all the small things
seed: goodbye

Generate Lyrics:

goodbye he spoke alone
and stay true down this life is at the bitter heart

First word – "Love":

Song: eternal flame
seed: love

Generate Lyrics:

love a city into dre
she are thy passion teach am
like loving
as soda game do is everything i will na go me together
three there cry call it are my man
i am gon na go now your nights in what oh it is who

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they better dance
if if i never
come whoa
that looks a original turning
sometimes you roll away they just follow your chance
i know i would not all
because you hear ta be than seem everything again
please

Song: honesty
seed: love

Generate Lyrics:

love woman think
i will not you succeed
oh do not mean is fun
to show i would runaway
and beware away
should were of play through
i without the different place around
oh see it was behind
i am times when the things baby
i fight you do not like this hair brown here
blue really show him is goodbye for in a go through the teacher of your one rain again
and hold to mine
my gon na believe he is my heart now bitch

Song: lovefool
seed: love

Generate Lyrics:

love from free
got it found it a word
it is around of time
oh without me wishing for you
if you still all kick up
get broadway again
feeling something
can makes me you have gon na go say we may get your inside
you will
that sing
some hopes another reason and no more
so my levee is be who and just all this
their heat is a road

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it is your far social free
oh you am and the only hand &

Song: barbie girl
seed: love

Generate Lyrics:

love sign we packing right lost more come in in get keep another memory
how not once last no good and you look her thank you
that deep leads it lying
lived me we as is confused i let you go
you was not there to trying me
and that life i want
when she is it all
i am start blue thirty when i really suck a man at the one words
i part what spread us
in the piece die till when that is heavy
it is

Song: all the small things
seed: love

Generate Lyrics:

love burn
anywhere that drinking banana
really tear me into
i know you will not but you find you out
let you let me love him
sherry can not you matter
i will be confused
if i forget me that i needed that forever
will you
we like to say to be fast
it is living down you can you got em
kick your
like a times who went into over day
all there is a sun dry
i be between this tree
if

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Second model – "Sliding Window"

Song's first original word:

Song: eternal flame
seed: close

Generate Lyrics:

close way and in lonely
do you live and the fire
she is feel in oh young
through
i am a flatbed there like smoking night
where your thank around so sin
all i miss every brand other eyes
filled right our and circumstance only very wrong to always
i want to what long
and for you
wolf can not let me the joke that i do you know bout cause of another star
stand it around the green at your one that town in my

Song: honesty
seed: if

Generate Lyrics:

if heal myself
when the pink won but i be going
let me gon na be intention way who you are white day for you
because you understand to it
do you want that get this thing about my best will do
loved to paint the toast
here
closer til the face in you
i am the own town i have heard
but i wan na forgotten
i understand i fly down
walk
gon na want not go every
like let and school mistletoe heart
i

Song: lovefool

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seed: dear

Generate Lyrics:

dear crocodiles else down
kick in the right road
it will make me fade me
walking
how one time the music true

Song: barbie girl
seed: hiya

Generate Lyrics:

hi you trouble never no key on golden heartache love
but love i can what not
i will be you i will met kungfu home after piece
everyone is your
am find to wrong it is it on another life
goes sit the alien
time such the magic girl
oh i fly
you are got real bright baby oh this she is not all and i fall
when you should been your dad oh
and i do not go to
then you better stayin all as you turn

Song: all the small things
seed: all

Generate Lyrics:

all mockingbird rich the children place
can i got because to fade in
here
and it is been beyond me
kind you more the but take you
while i get i used
the sunday cry i have like no sad
sweet good is red heart
check me down it just the blood thin to highway with em little twisting way
sure it is only be on a mind
she the home been mean
it is you a moon hey as my magic mind
i do you could take

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First word – "Hello":

Song: eternal flame
seed: hello

Generate Lyrics:

hello plan
because you break to sure

Song: honesty
seed: hello

Generate Lyrics:

hello c lineman another beat
should do i think while you are for first
i will be me
if you want it know and you see you say please go and the so clinic from our kids
days cold are fool
inside not three little guns
me it is feeling here
that that i have wake business
and the king the march
eyes oh he is your voice in some times you you can felt
the was boardwalk for a place of what of no on i wan

Song: lovefool
seed: hello

Generate Lyrics:

hello
ya whole song is lovely land
let around a dress
i would
did not know how if you was ta somebody not be boy
i drank in the fittest way now tight now
a surprise of your blues
tomorrow repeat
this sweet girls showed back
but the past just we believe
there is of you with you
it is a air and when you never heal your turn
of him you will you into my child

am your tie by you
tonight warm

Song: barbie girl
seed: hello

Generate Lyrics:

hello wei as and you well this son
with i says you used to say
they will what you give your ground for
tell me every day on you
kick my you touch to find on by still
down to my water strikes it just things voice
oh i stop for up so known
pa i you
makes me fight
just come up about your run
is them glad a fellow star
if the room came just within my game
show me them around in time

Song: all the small things
seed: hello

Generate Lyrics:

hello blues
i need it
you really happy words what you made her slowly
i want you your darling thinking right
take you me come part

First word – "Goodbye":

Song: eternal flame
seed: goodbye

Generate Lyrics:

goodbye why
gim your city came i be
when we want to say
you are gone high is my balloon but help your past room by out
i give the time you
oh

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ready at a cries their that
there is been place
can it is unlimited from my one word
i am me
you do not live will nothing him alone
do not you could talk you
no line down
him something true is beyond my way to was could a

Song: honesty
seed: goodbye

Generate Lyrics:

goodbye must turn
there will you am standing
there is last smile needs for long
put me me flies inside in waiting
hit the babies kid into
you photograph you do not get that why nobody will not be before
you roll it has everyone you call each attention and i go
your breath too wanted
i do not love anybody too have we be girls
only was me copacabana
dee do i help i will be give to go
someday you feel to

Song: lovefool
seed: goodbye

Generate Lyrics:

goodbye tired with for touch go
they really did not just feel from
i am familiar to fair right
gon na love too my summer a change of knowing the are way
that i know you will you be now
i only realize
i never say you will
all wants ta night my light in a powder length i go in a first price
as did not
be this kid
he better dif price here my own move
if you could some foolish you

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Song: barbie girl
seed: goodbye

Generate Lyrics:

goodbye that then i want you too up and the man back
from home
whenever she seems to a sunday tears there is the copacabana in a cloud of you
the shadows these tiled whatever
its thrown the eye but you will for me but
when we tried me now
you got no makes behind wine
i go with somewhere of a smart oh running this closer
it is on them baby
er little che clouds why
da da ba pum ba da oh and

Song: all the small things
seed: goodbye

Generate Lyrics:

goodbye my there
you guess you know what is look from the let me sink there be the and what we are would
yours would shine
let me be nobody this top
often take you around
maybe
i do not be
there is everything
i feel fed tired
up up back
what i matter she feels
let me say to you
it will
with myself
why i am a price by god
think it is this road
that i am

First word – "Love":

Song: eternal flame
seed: love

Generate Lyrics:

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love rum

walk in the local air
you dream i got the my late who the bunch in the talking now my invisible passion tell the
other forever is
lost in night
and i tried them of a real door
do not let me swing me now
the much hip than burns

hear you get for mind
and i hear the body says far
i do not do not care to not as
i was gon na think please

Song: honesty
seed: love

Generate Lyrics:

love da i dancing glass for days
mmm charlie whole mood
from a ooo now

baby you come love for you

Song: lovefool
seed: love

Generate Lyrics:

love sights

Song: barbie girl
seed: love

Generate Lyrics:

love whoopityayeyay
and you heard
well that we said
rock the equality to play
we said where me
why

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last bill well over to stay
ooh here because we needed me in life
do you might stand cold a for bright
tragedy
talk of let a burn into his view
such a booty rain for roll
her time of is uh in the is
and i would say
i am like this life has on every world
say of the own that
the

Song: all the small things
seed: love

Generate Lyrics:

love
space baby oh come
and we to call the attitude
i say what is move out and fun to let the lands never am wait
wrap nowhere of no who trouppper
cross
my christ up Copacabana

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Comparison:

We can see that the second model is sometimes generating very short songs in comparison to the first model, but in both approaches most of the songs generative are not making any sense.

Same melody and architecture - different first word:

'Bangles Ethereal Flame' different first word - original first word vs 'Love':

We see that even though the melody and architecture are the same, the semantics of the first word have a significant impact on the context of the song. Compared to the one that begins with 'close' (lonely, smoking night, wrong), the one that begins with 'love' has a more passionate context (dream, passion, body, hip).

Same First Word and Architecture - Different Melody

'Billy Joel Honesty' vs 'Barbie girl' - different melodies, same first word – "goodbye":

We see that both songs produce semantics of sadness even though one is with more happy and fast melody compared to the other.

In conclusion, lyrics in the data set tend to have words that are very common and are mostly unintelligible. The subjective quality of lyrics produced does not appear to be improved by more advanced melody features. Also, it's apparent that the seed chosen changes the words produced. We think this is because the melody plays a much smaller part in predicting the lyrics compared to the seed, so even with the same melody the dominating factor in producing the lyrics is the seed. Using the sliding window approach does not seem to improve things much for us, personally. It sometimes results in better combinations, but it's usually hit-or-miss. Two main reasons may be responsible: songs often contain slang words that aren't in the word embedding matrix, so we can't learn from them or predict them, and the lyrics aren't entirely coherent.