

Cogs 185: Homework 3 Report
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Task group 1:

Task 1:

| | Transition | Emit |
|----------------|--|--|
| State 1 | State 1 -> State 1: 0.85 State 1 -> State 2: 0.15 | E_1 : 0.33 E_2 : 0.25 E_3 : 0.42 |
| State 2 | State 2 -> State 2: 0.9 State 2 -> State 1: 0.1 | E_1 : 0.25 E_2 : 0.25 E_3 : 0.5 |

Task 2:

Example sequences and corresponding states:

| | |
|---------------------|---------------------|
| 1,1,3,2,3,1,1,3,3,3 | 1,1,1,1,1,1,1,1,1,1 |
| 3,1,3,2,2,3,3,3,2,2 | 1,1,1,1,1,1,1,1,1,1 |
| 2,3,2,1,2,1,3,1,3,3 | 2,1,2,2,1,1,1,2,1,1 |
| 3,2,3,3,2,2,3,1,3,3 | 2,1,2,2,1,1,1,1,2,1 |
| 3,3,3,3,1,1,1,1,2,3 | 2,2,2,2,1,1,1,1,2,1 |
| 3,1,1,3,2,1,2,3,3,1 | 2,2,2,2,1,1,1,1,2,1 |
| 1,1,1,3,3,1,2,2,3,2 | 2,1,1,2,1,1,1,1,2,1 |
| 3,3,3,3,2,1,3,1,2,3 | 2,1,2,2,2,1,2,1,2,1 |
| 1,3,3,1,3,1,3,1,2,3 | 1,1,2,2,2,1,2,1,2,1 |
| 3,3,1,3,3,1,3,2,3,3 | 1,1,2,2,2,1,2,1,2,1 |

Task 3:

| | Estimated Transition | Estimated Emission |
|----------------|--|--|
| State 1 | State 1 -> State 1: 0.89 State 1 -> State 2: 0.11 | E_1 : 0.11 E_2 : 0.22 E_3 : 0.67 |
| State 2 | State 2 -> State 2: 0 State 2 -> State 1: 1 | E_1 : 1 E_2 : 0 E_3 : 0 |

Task 4:

Viterbi States: 1,1,1,1,1,1,1,1,1,1

Task 5:

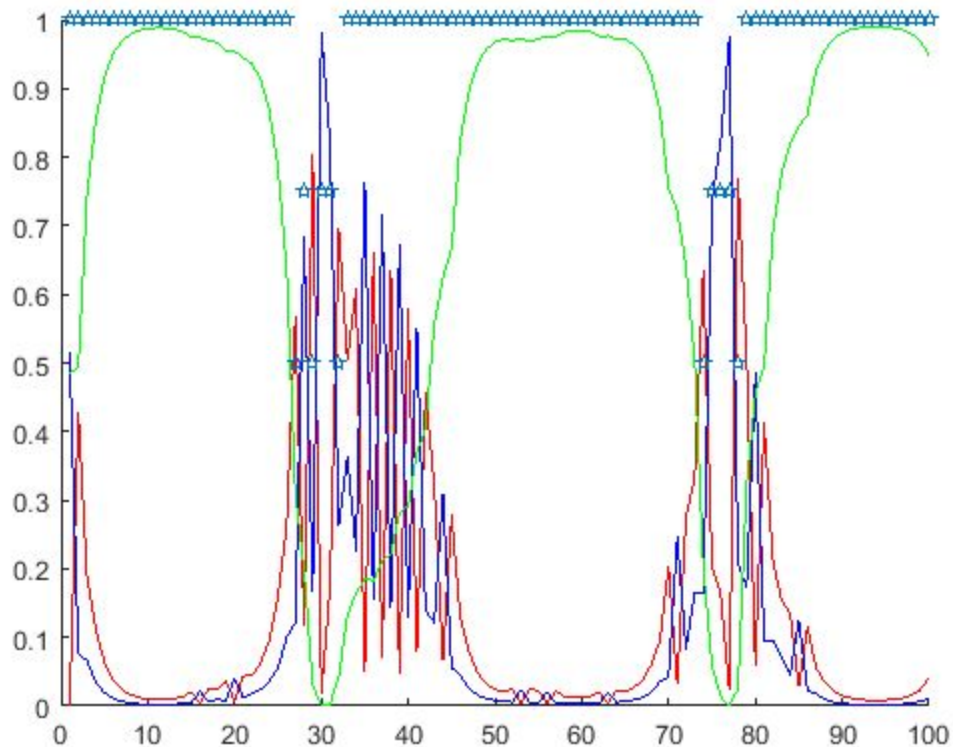
Pstates: 1,1,1,1,1,1,1,1,1,1

Task Group 2:

Tasks 6-10:

See code (tg2.m) for implementation details

Results:



Above is the model's predictions regarding the state of the S&P500. The green line represents the predicted probability of a stable market, and the red and blue lines represent bull and bear markets. The blue stars represent the Viterbi state (divided by 4 to fit the axis, ie a Viterbi state of 4 is plotted on $y=1$).

The main conclusion that can be drawn from this is that the model is good at evaluating the stability of the market, but it's predictive capacity is no more fine than that. We can see that when the market is stable, the HMM is very sure that the market is stable, but when the market is not stable, the probability of a bull and a bear market are almost always close to each other (ie the model is never confident about the market being bullish or about it being bearish), and the probabilities of both change frequently in a short time course compared to the stable markets. The Viterbi states are also relatively good approximators of market stability.

When asked to predict future market days, the model was approximately 70% accurate; which is reasonable, but unlikely to yield significant monetary gains in the real world. This is probably because the model is too simple to approximate the actual stock market (ie there are

not enough hidden states) and because there is not enough training data to get a sense of the market.

Task Group 3:

Task 12:

Sample of Shakespearean text generated from default char-rnn parameters (full text at GitHub repo in mjhOutput.txt):

Where is the father, fairily!
Now, for the devil that is a time
in piteous promises not.

QUEEN E HARn VI:
My lord, that was not my motolk for general.

DUKE VINCENTIO:
Nuaret! Corioli!

ROMEO:
Ay, once the periteners
Of our twine of reverence singly
But how I am hone:
If do not slander down toward this gods
Upon the malm parting, as you be slain,
And these I meself he is said I seek
food sovereign, for him, for illibeasted here!
Why, sir, by Warwick, we did; for 'gister days;
Condition, for proud: Frebio it doen yearery.

ISABELLA:
No, hencess your brother: down withdraw.

BUCKINGHAM:
My heart my live, and victor us for good,
A-joy our knaves kins bitter, he were boved
For itselliss shoot perform'd, and did smile it.
To call the third fames: must I know a case well,
In amen: you come than the man in virtue!
An undil, govern to your lips and false
Was not kill me a virtue, Luciodesh war

And put on some parts are purged of your hands!

Task 13:

Political speech generation.

Input.txt source: <https://raw.githubusercontent.com/samim23/obama-rnn/master/input.txt>

Trained with default char-rnn parameters:

or care to join the threats like a young President private law enforcement in Iraq, he agreed to help the scraped benefits outthning jobs. But the use of democratic senators partners, benefits on the situation in highways has been done. So.

Surely Al Qaind ANIS: James Abrare Tuphely Reighping and prediction the law and they all reaffirmed their Congress for the new jobs, when those to compulate increases since they can team in addition as we didn't 20 you 3.4 more than a new security.

First, I receredate standalling discord and at rising visit to stop up your record of American forces. So I want through -- with Foreignoe of Lopollopias, the Party generations today where a free leging clean energy line work.

Now, there's the responsibility of the President to achieve a new elected outstanding violence. They'll live a good indes-brevs ensure a time for years of target and him restore the reason that two years ago and the benefits are with a system that came countries with honor the power of our world and extremest or whether Americans who would continue to get their reducing our homeland institutions, step up down our nations. And we're not only and those sangorities on their talents.â€ The vast majority of innovation we electing our country doar in us. I got to count of the world's experience. The second person is necessaring they don't grow looking. These are the gangs lasting about blove FEoths and civil liberties lay remembuned new beginning of strong, living in the nation of their chumbers -- and why we are able to face, or free families and job on them.

Let me reflect our power -- we work hard you must only forward that other pressure snates, by the Americas. She already the chance to work with a frustrating threat. And every values, the United States, America should be a guarantance that would both won't be fined. And whenever you've announcing this is what allow Africa to command to helping our like, we owe

Task 14:

RNN Parameters: 512 neurons with 4 layers

Text Source: char-rnn tiny Shakespeare

For trusty blood! O report becomes!

PRINCE:

I did: the Place I will uninmed him.

Shall I infect the ganerous flight, and calls

Cheer out too like a dove of man; the hand mercy

In Romeo die here so effect their high.

JULIET:

O, 'twas a goodly marriage stands.

What Catesby I stand as that do contented

A pleased marriage, that I cannot seize;

And that our degining question shall another

More back't, indeed, we see mine arm'd out of you.

But that him dead as we have lived myself

And make the instrument; to the garter'd dug.

'Tis find your country's to weeping, with his own,

We would bear all I be done on thy flat?

That may make here be resolved when he to give

The eastern on the heaving or home of charge,

Or so, if thou mightst be so in the stand!

Henceforward rab; nor London cannot weep,

Merin some liberty with bound upon our vaults;

Yet presently deliver forth herein,

And till her tribunes dead arrough their effects and

The people; make he body, made my forehearing

Marvel, good Paris.

Second Servingman:

Why, our house!

WARWICK:

Let place upon the book;

See these husband on, my great down leave
To the fresh earth of homes in our followers.

ROMEO:
Now, now this is the land.

PAULINA:
Why, my lord?

VOLUMNIA:
Wondrous eyes, my lord, if they have my name
Doth noble thoughts you owed.

CLAUDIO:
Tut, noble musterer,

DUKE VINCENTIO:
Do being counterpeited, that it nuns, it were called thy lord;
They she indeed I must, and shall be king.
All housed dinners of my lovely dim;
For they are too, gentlewoman, to come:
Dull traitor! you that falls, wash blund and need.
Where shall be thine with France will not be gone,
Through by Lord Gromio, of your worship not; what!
Cast me, stand other, not from that book?
O, as I die one heart. This young house here,
Should burn you cry this wamen, for peril there.
To Claudio should be canst her time, I promise
Thee. First, in miserable sons, one blood
Upon some fire in the lasting flantous foot
Lest he should in remains so he amo

Appendix:

Code, output, and text input and output files for char-rnn can be found here:
<https://github.com/TrackAddict/Cogs185/tree/master/HW3>

Output files:

mjhOutput - Shakespeare output trained with default parameters

MjhObama - Speech generation output

mjhShake512 - Shakespeare trained with 512 neurons and 2 layers (not included in report)

mjhShake512and4 - Shakespeare trained with 512 neurons and 4 layers