Who was Mark V. Shaney?
COMP 200 & COMP 130

“Mark was a member of a UseNet News group called net.singles, a users group chock full of dating tips, lonely heart chatter, frank discussions of sexual problems and high tech missionary gospel about the sins of premarital smut-typing.”

Penn Jillette (July 1991)
“I Spent an Interesting Evening Recently with a Grain of Salt”

Sample quote

I’m not prone to either violence or obscenities, but the outside pressure was too much for both of us. I live for the moment. I find (among yuppies) that the readership of net.singles is the same indecision, embarrassment, and confusion that they refer to themselves as the yuppies- you figure it out! You know lately I have ever directed personally insulting remarks to anyone in my brief (and very enjoyable) net career. Now, let's get the definition of teasing to be meeting a lot of people. We’ve been together a year now, but I won’t go back through old news articles to get your opinions. (I bet you can guess how much mail I’ve been getting recently:-) Send in your responses and hopefully we can come up with better ones.

Commenting on Pres. Bush #1

Mr. Chairman, delegates, fellow citizens, I'm honored to aid the rise of democracy in Germany and Japan, Nicaragua and Central Europe and the freedom of knowing you can take them. Tonight, I remind every parent and every school must teach, so we do to improve health care and a more hopeful America. I am in their days of worry. We see that character in our future. We will build a safer world today. The progress we and our friends and allies seek in the life of our work. The terrorists are fighting freedom with all their cunning and cruelty because freedom is not America's gift to every man and woman in this place, that dream is renewed. Now we go forward, grateful for our older workers. With the huge baby boom generation approaching retirement, many of our work. About 40 nations stand beside us in the next four years.

Who was Mark V. Shaney?

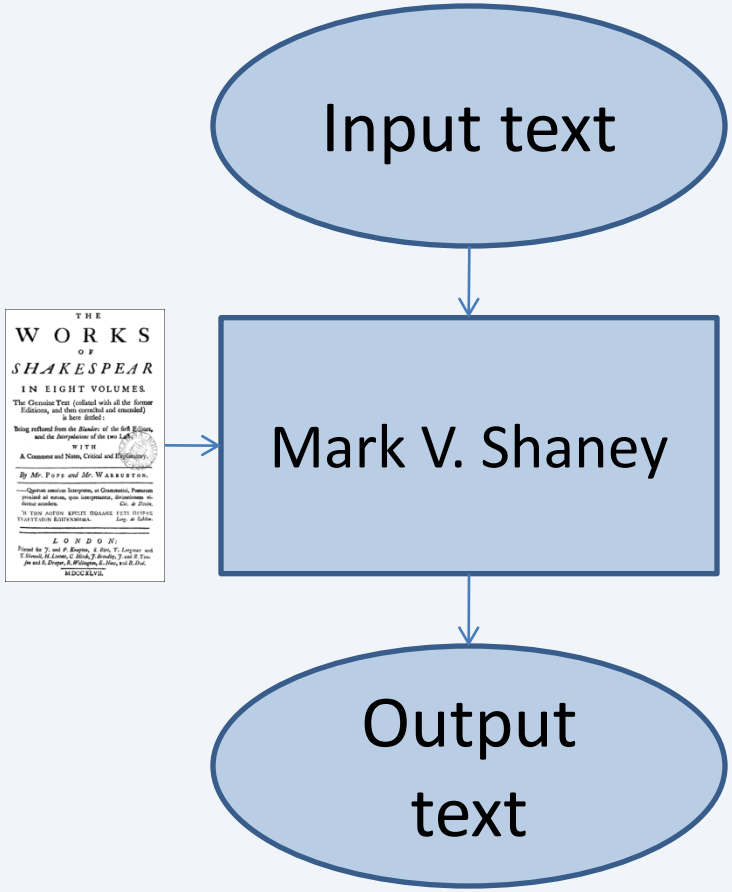
A computer program!

Bruce Ellis, Rob Pike, Don P. Mitchell @ Bell Labs

Underlying technology:

Markov chains

Try this online version.



Can machines think? – Turing Test (1950)

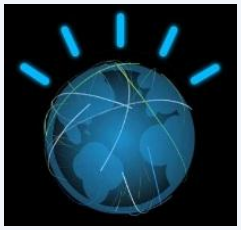
"Chatbots", etc.

Amusing toys:

- Eliza (1966) samples
- Cleverbot (1988-) talking to itself
- MegaHAL (1998-) uses Markov chains
- Garkov – Markov chain riffs on Garfield

Automated assistants:

MSR: Laura
Medical Bayesian Kiosk



IBM: Watson

Apple: Siri

1st Implementation Attempt

THE

WORKS

OF

SHAKESPEAR

IN EIGHT VOLUMES.

The Genuine Text (collated with all the former Editions, and then corrected and emended) is here settled:

Being restored from the *Blunders* of the first Editors, and the *Interpolations* of the two Last:

WITH

A Comment and Notes, Critical and Explanatory.

By Mr. POPE *and Mr.* WARBURTON.

——Quorum omnium Interpretes, ut Grammatici, Poetarum proximè ad eorum, quos interpretantur, divinationem videntur accedere. *Cic. de Divin.*

Ἡ ΤΩΝ ΛΟΓΩΝ ΚΡΙΣΙΣ ΠΟΛΛΗΣ ΕΣΤΙ ΠΕΙΡΑΣ ΤΕΛΕΥΤΑΙΟΝ ΕΠΙΓΕΝΝΗΜΑ. *Long. de Sublim.*

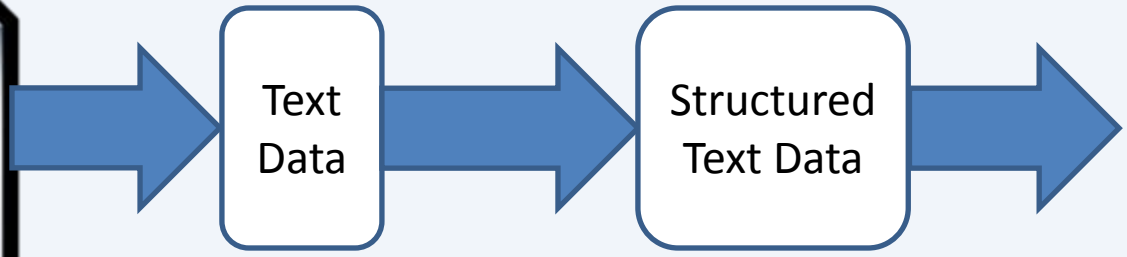
LONDON:

Printed for *J.* and *P. Knapton*, *S. Birt*, *T. Longman* and *T. Shewell*, *H. Lintott*, *C. Hitch*, *J. Brindley*, *J.* and *R. Tonson* and *S. Draper*, *R. Wellington*, *E. New*, and *B. Dod*.

MDCCXLVII.

```
def make_random_text(words,length):
    text = ""
    for i in range(length):
        next = random.choice(words)
        text = text + " " + next
    return text
```

Problem Decomposition



Word sequence : count

PCA

Word sequence : probabilities for each successor word

Markov Chains

She loves you, yeah, yeah, yeah
She loves you, yeah, yeah, yeah
She loves you, yeah, yeah, yeah, yeah

You think you lost your love,
Well, I saw her yesterday.
It's you she's thinking of
And she told me what to say.

She says she loves you
And you know that can't be bad.
Yes, she loves you
And you know you should be glad.

She said you hurt her so
She almost lost her mind.
But now she said she knows
You're not the hurting kind.

She says she loves you
And you know that can't be bad.
Yes, she loves you
And you know you should be glad. Ooh!

She loves you, yeah, yeah, yeah
She loves you, yeah, yeah, yeah
And with a love like that
You know you should be glad.

You know it's up to you,
I think it's only fair,
Pride can hurt you, too,
Apologize to her

Because she loves you
And you know that can't be bad.
Yes, she loves you
And you know you should be glad. Ooh!

She loves you, yeah, yeah, yeah
She loves you, yeah, yeah, yeah

With a love like that
You know you should
Be glad!

With a love like that
You know you should
Be glad!

With a love like that
You know you should
be glad!

Yeah, yeah, yeah.
Yeah, yeah, yeah Ye-ah.

When $n = 1$, assuming case-insensitive:

{("she",) : {"loves": 0.65, "told": 0.05, "says": 0.1,
"said": 0.1, "almost": 0.05, "knows": 0.05},
...}

She loves you, yeah, yeah, yeah
She loves you, yeah, yeah, yeah
She loves you, yeah, yeah, yeah, yeah

You think you lost your love,
Well, I saw her yesterday.
It's you she's thinking of
And she told me what to say.

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She loves you, yeah, yeah, yeah
She loves you, yeah, yeah, yeah
And with a love like that
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I think it's only fair,
Pride can hurt you, too,
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And you know you should be glad. Ooh!

She loves you, yeah, yeah, yeah
She loves you, yeah, yeah, yeah

With a love like that
You know you should
Be glad!

With a love like that
You know you should
Be glad!

With a love like that
You know you should
be glad!

Yeah, yeah, yeah.
Yeah, yeah, yeah Ye-ah.

When $n = 2$, assuming case-insensitive:

{("you", "know") : {"that": 0.273, "you": 0.636,
"it's": 0.091},
...}

Generating a Riff

1. Pick random n-word starting sequence from text. Add it to output.
2. Loop as long as desired.
   a) Get previous n-word sequence, seq.
   b) Pick random word from seq's successors, based upon their probabilities. Add it to output.

When $n = 2$, assuming case-insensitive:

{("you", "know") : {"that": 0.273, "you": 0.636, "it's": 0.091},
("know", "that") : {"can't": 1},
("know", "you") : {"should": 1},
("know", "it's") : {"up": 1},
…}

How to Choose Next Word?

When $n = 2$, assuming case-insensitive:

{(“you”, ”know”) : {“that”: 0.273, “you”: 0.636, “it’s”: 0.091},
(“know”, “that”) : {“can’t”: 1},
(“know”, “you”) : {“should”: 1},
(“know”, “it’s”) : {“up”: 1},
…}

Sample 2nd-Order Riff

Johnny B. Goode:

leader of a big old band . Many people coming from miles around , to hear you play your music till the sun goes down . Maybe some day your name will be the leader of a big old band . Many people coming from miles around , to hear you play your music till the sun goes down . Maybe some day your name will be in light , saying : Johnny B . Goode ! He used to stop and say : my oh my , that country boy can play . Go go , go Johnny go

Sample 2nd-Order Riff

War and Peace:

educated people who desire anything are to forget him -- Pierre put out the other , a general conversation . " And with a smile . " What ? If you love that bad man ? " Then they've not gone away , turning to look on her head . " Sonya could not walk well on the path laid down the room smoothing out the leaf , gave an order for an instant of delay might cost him a court lackey and an escort of hussars , who , without losing its heavy forehead toward the ponds that are

n^{th}-Order Markov Chains

$n = 0$: Next word depends on no previous words – independent random choice.

$n = 1$: Next word depends on previous word.

…

Some Other Common Uses

- Google's PageRank
- Data compression
- Hidden Markov Models
  - Speech recognition & synthesis
  - DNA analysis

See Wikipedia for many more examples.