

A Story Composed by Members of Statistics 585, Spring 2012

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Once upon a time, deep in the prairies of the Midwest, a farmer named Snedecor planted a new kind of seed. The seeds were dispersed randomly through 3.141593 acres of rich brown Iowan soil. A tiny grey bird, with a bright red spot on both wings, was watching ever so closely from the stalk of a tall grass close by. The farmer surveyed his spread of seeds, and used his rake to dust over a covering layer. The sun cast a golden gleam over the field, a contrast against the brilliant blue sky, as the farmer strode away, happy with his work. In darted the grey bird. She landed on a black sod, and proceeded to hop a straight line through the field, sifting the top layer of dirt, eating the seeds. Three perfectly straight lines devoid of seeds resulted.

The next day, Snedecor convinced his good friend R.A. Fisher to help him estimate the effects of the grey birds actions on his expected harvest. After a careful examination of Snedecor's method of seed dispersion, Fisher reached the conclusion that the seeds were not randomly distributed through the soil. Thus, Fisher had the misfortune of explaining to his friend that any estimation of these effects would be biased. Unhappy with the turn of events, Snedecor swallowed hard and invited his friend inside for some tea and crumpets.

The secretary of Snedecor noticed both of them getting in having their minds occupied with some complex thoughts. She knew Snedecor very well. But it was this strange Fisher about whom she did not have much of understanding. Whenever he travelled to this prairies, Snedecor became excited with his various experiments. But today was different, they were not talking to each other. Snedecor prepared tea for both of them and sat on his working table while Fisher was glaring at the vapor curling from the hot tea. At some point, Fisher told something to Snedecor and both of them rushed out of the room. She knew, none of them had a chance to get a sip from the tea cup before they potentially reached another solution of their disturbing problem. She was 95% confident that this apparent solution would turn out to be flawed again.

But his secretary did not know that it was different this time.

"I'm sorry I rushed us out of the room so quickly but this just arrived!" said Fisher.

"What is it?" Snedecor promptly inquired.

"A note that I think you'll find to be most illuminating" was Fisher's response before displaying the following to his dashing colleague.

*I was the one that sent that bird. If you want
to find out more then ask 'The Reverend' where
to find me. He'll know.*

*Love,
Evil Zombie Lincoln*

*P.S. I'm holding the Central Limit Theorem
hostage until you find me.*

Snedecor didn't understand. He wondered silently to himself about who this "Evil Zombie Lincoln" could be and if he really was an evil undead version of one of the country's greatest Presidents. Gazing over to his friend Fisher he could see by the look in his eyes that not only did he know of this "Evil Zombie Lincoln" but that he has had past dealings with him as well.

Fisher started running and shouted back to his friend "We need to go see Sir Reverend Bayes as soon as possible. Not that I'm looking forward to it... The last time I was in a room with him he cut off my right hand."

As only the uberest of Mensches have done, the Reverend had long since retired to the floating island of Laputa, the existence of which Jonathan Swift only suspected when he wrote, *Gulliver's Travels*. As Fisher related this secret to Snedecor, they both puzzled over some important practical issues. How would they find the island? How would they breathe once they arrived? After all, the island was currently somewhere in the mesosphere.

The Jackal, eavesdropping, said, "Not to worry. Laputa has its own atmosphere, which feels like the lower troposphere."

This strange creature's sudden appearance prompted several questions for Snedecor, who immediately voiced his most urgent concern: "Are you going to eat me?"

"No." proudly boomed the Jackal. "I am a Jackal, and therefore I eat bricks."

The Jackal proceeded to eat a lone brick that was concealing the bird who had earlier eaten the seeds. After he finished, the wondrous extraneous masonry eater-upper pointed a deft paw at the feathered rogue and declared, "You, sir, are a beanstalk."

With a cry of jubilation, glee, passion, enlightenment, morality, inquiry-based learning, and shrill inflections (for it was the bird's lifelong ambition to become some sort of tall leafy thing), the bird poofed into a beanstalk and grew at an alarming rate, rocketing the two men and the fabulous fanged demigod up into the clouds.

With the Central Limit Theorem in captivity, things were no longer as they once seemed. As the Jackal explained on their way up through the clouds, without the Central Limit Theorem to benevolently govern us, the Bayes Estimator always takes the form of a beanstalk. That's why the best way to find The Eternal Reverend Bayes is to hop on a beanstalk and wait five minutes. Although riding a fast-growing beanstalk is extremely risky (you could fall off and die), the Bayes Risk of this undertaking is extremely small because:

1. 99.99% of all beanstalks eventually find their way to Bayes
2. Bayes is an Ubermensch and safe in the clouds, so beanstalks pose a minimal threat to his well-being.

As the Jackal explained all this, Snedecor and Fisher furiously scribbled down notes, particularly the warning that a low-Bayes-Risk undertaking can still be very risky.

Meanwhile, Snedecor's secretary, Marge chuckled to herself as she watched Snedecor and his troublesome friend be whisked into the air by a beanstalk. Grabbing a very large teacup, Marge poured herself the entire pot of tea Snedecor had been brewing and whipped out her cell phone.

"Yes. Mhmm. Of course. Do you know who I am!" she exclaimed into the phone.

"These people are ridiculous." she muttered under her breath.

"Abe, darling, how are you? "

"They are on their way to the Reverend. However they do have the jackal with them." she reported.

"Oh dear, ..."

Just then, across the field, visible through the window, raced a hare, chased by his nemesis, a TortoiseGit, going rather faster than might expect a creature like this to be travelling. This was going to be a long day for the hare.

After 2.718282 days on the beanstalk, Snedecor and Fisher eventually arrived at the island of Laputa. "Where is Sir Reverend Bayes? The expected life time of such a beanstalk is 3.14 days, and I don't want to stay here for the rest of my life." Snedecor asked the jackal.

"My dear friends, look, there are three cloud caves, Mr. Bayes is in one of them." Answered the jackal proudly, "Let's make a deal. You choose one cave, then I will tell you another cave which Mr. Bayes is not in. You can stay with or switch your choice. Deal or not deal?"

“Alright. The left one.” Said Fisher.

“Well, he is not in the middle cave. Stay or change?” Said the jackal.

Then Fisher had to start his first Bayesian problem.

As the sunlight was refracted through the torrential beads of sweat appearing on the bald and now resplendent head of Fisher, a sign no doubt of both the heightened intensity of the sun’s heat at such an altitude, and of the perspiration-inducing subtlety of the Jackal’s inquiry, the inquiry itself which would later go down in history as one of the most common-sense-confounding and thereby wholly divisive to emerge from the realm of probability, Snedecor felt a near irrepressible urge to pet the Jackal, as if the animal-deity were no more than a common house cat or lapdog, rather than an omnipotent being who distinctly disdained physical contact with humans, owing to its unfortunate childhood in an animal-god petting zoo. Snedecor refrained, however.

Then there was a collective sigh to let everyone catch up.

Let’s go back to the barn. We need to check on the treatments that we applied to the hogs. How many are still alive, I wondered.

But as Fisher pet the Jackal, the statis-mensch began to hum and shine with enlightenment. After all, petting jackals makes people wiser and more powerful, able to extract certainty from pure randomness. And as he hummed and shined, Fisher suddenly chose the left cloud, for he suddenly knew with certainty that Bayes resided there. And off they zoomed into the cloud.

The beanstalk zoosed and woofelled them through the gale force winds, storms, and lightning bolts inside the treacherous left cloud. The trio held on to the beanstalk for dear life as tornados and hail and electricity crashed, whirled, boomed, and banged all around them. It was so scary that eventually, all three companions went into shock.

When they woke up, they were on what appeared to be solid ground. The sun was shining, and the sky was clear and tranquil again. Moreover, there was a small rabbit standing calmly before them. The rabbit had a notebook in one hand, a Bible in the other, glasses on his nose, and glorious majestic vestaments that were much too large for a rabbit.

“Good Morning. I am the Eternal Sir Reverend Bayes. I trust you enjoyed your journey?”

Snedecor and Fisher didn’t know what to say. Why was Bayes a rabbit? With that signature smug look on his face, the Jackal seemed to know the answer.

“Surely you didn’t expect me to live up here for in Laputa without eventually turning into a rabbit,” said Bayes as he nonchalantly nibbled on the beanstalk. “It eventually happens to everyone up here who was originally human. It’s the Laputa equivalent of death on mainland Earth. In fact, that’s why I’m still alive. And I’m grateful. I’d rather be a live rabbit than a dead man.”

“But...but...what if...what if...” was all that Snedecor could manage stammer.

Fisher just gave up trying to understand.

Meanwhile, the Jackal spotted a brick house 30 feet away. Hungry after the stressful ascent, he rushed over to the house and proceeded to knaw at a wall. The inhabitants of the house, three little pigs, immediately appeared at the nearest window and started yelling at the Jackal to get away. They were shouting something about a big bad wolf lurking nearby. The Jackal didn’t hear, and he didn’t care. But before he ate his fill and before he could compromise the structural integrity of the house, he passed out again. For you see, the bricks in that house were laced with a powerful sedative. The mason who made the bricks was once an apothecary, and oh how he missed his old job.

Bayes, watching the Jackal, chuckled and shook his head. “Silly kid. Bricks are for rabbits.”

“Don’t you mean tricks?” asked Snedecor.

“You eat bricks too?” said Fisher.

“No to both questions.”, said Bayes. “It’s just a figure of speech. But now that you’re both settled, you need to listen to me now and listen to me carefully, especially since the Jackal will no longer be able to help you. I have watched the pattern of seeds appear in your field. Combining the data from my telescope with my extensive prior knowledge, I figured out what has happened. Your secretary, Marge, secretly hired the little gray bird - the one that this very beanstalk used to be - to draw the pattern of lines in the seeds in your field. Marge used the pattern to send a message to our Laputian Evil Underground Astronomy Society

up here in the floating island. The message requested that Evil Zombie Lincoln, a member of that pesky Laputian Evil Underground Astronomy Society, descend to Earth and capture the Central Limit Theorem. Apparently, she was annoyed that you always talked statistics amongst yourselves nonstop instead of getting in your paperwork ontime.

Anyway, your task is to find Evil Zombie Lincoln. According to the telescope, right now he is sitting down, cross-legged, meditating in the middle of your field. The Central Limit Theorem is trapped inside his signature 1850s Eternal Tophat. Your task is the knock over that infernal hat, releasing both the Central Limit Theorem and the soul of Humphrey Bogart.

Now, the hat was made in the 1800s, so the only way to knock it off Lincoln's head is with this..."

Bayes pulled something out of his own tophat that looked rather like a giant integral sign.

"You will need this integral" he continued. "Use it like a baseball bat to knock Lincoln's hat out of the proverbial ballpark."

"Why an integral?" asked Fisher. "Why not just used a baseball bat. Although unknown, a baseball bat is a fixed quantity, and therefore perfectly useable for the task of de-hat-pitating the zombie."

"You need an integral," answered Bayes, "because the integral is the origin of all things. Everything comes from the integral: normalizing constants of posterior distributions, impossibly difficult posterior probabilities, Swiss cheese, The Dalai Lama...the list goes on. But you Frequentists wouldn't understand... All you need to know is that that integral is your key to freeing the Central Limit Theorem."

Although Snedecor and Fisher disagreed with Bayes' statistical ideology, they accepted the fact that the integral was perfectly suited to the current task. Fisher, brandishing the integral, thanked Bayes by bowing deeply and majestically. Without further ado, Snedecor and Bayes hopped on the beanstalk, and off they went back to the Earth.

On the ground, Snedecor and Fisher spotted Evil Zombie Lincoln immediately. The zombie was very tall, even sitting down. He was also ominously serene. The mangled, rotting president opened his jaundiced eyes and looked at the two approaching statisticians.

"Excuse me," said Snedecor, "but would you happen to be Evil Zombie Lincoln."

"...No," Lincoln lied. "I am but a simple language object."

Snedecor and Fisher looked puzzled. They had never heard of a language object before.

"What is a language object?" asked Fisher.

Indignant at Fisher's ignorance, Lincoln suddenly lost his serenity, for zombies are quite volatile. "I'll language YOUR object!" he retorted.

"Watch your language, object!" quickly spat back Snedecor.

Lincoln, like other zombies, did not enjoy being called an object. The undead president Lincoln defensively replied, "Don't you language ME, an object!"

"I object to your language!" declared Fisher. And that was the last word. For with one mighty swoop of the integral, the statis-mensch lobbed off Evil Zombie Lincoln's hat into the sunset. Three strange phenomena immediately followed:

1. The Central Limit Theorem escaped from the hat, and classical statistics was restored.
2. The soul of Humphrey bogart escaped. He adjusted on his own hat, started smoking quite repulsively, and walked off into the sunset muttering, "I've been around a long time, see. A long time, see, see. Casablanca, see. Casablanca. Get a visa so you can go home, see, see, see, see. Tophats. Whiskey." But before he could get far, he turned into a chimney made of bricks. That's what happens when dead people smoke, and live people for that matter. It's was shame that the Jackal wasn't around...
3. Evil Zombie Lincoln smiled smugly at the statisticians and proceeded to explain the consequences of swinging at the hat.

"Nice try", said the zombie. "You have used the integral to release the Central Limit Theorem and that funny little man who personified the 1940s. But in doing so, you have injured the integral. The integral will take decades to heal. Until then, life will be harder. Most expressions will be difficult to integrate, and many will be impossible, including your precious normal density function."

A cold shiver shot down Fisher's spine.
After a moment of silence, Evil Zombie Lincoln vanished.
"Well," said Snedecor, "I guess we'll have to use what's left of statistics to do even more good in the world."
"Yes," replied Fisher, "so it seems. But I still think that smoking doesn't cause cancer."
"Old friend, you are absolutely wrong."
And that's the story of why Bayesian problems in STAT 543 are so hard.

The End.