Homework 6

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Q1 a) Installed the packages b)I found a post where someone was sharing the code from recent work on vegetation and ecological modeling. One of the code examples was for a mechanistic model to predict flowering times. I'm very interested in the timing of vegetation emergence, so this seems like something I might be able to use as a starting off point for a model of green up timing.

https://discourse.mc-stan.org/t/some-recent-publications-using-stan/1679/6

Q2, Choice 2

In Borge's story, The Garden of Forking Paths is a novel written by a man named Ts'ui Pên, a Chinese leader become philosopher and relative of the protagonist. While a regular novel presents a story as a series of choices and outcomes- i.e. turns made at forks in paths through time, The Garden of Forking Paths tells the story of the world as if no such choices were made: it is a story containing all possible paths and outcomes. Because many paths contain mutually exclusive options, the resulting world is full of contradictions, and contains no particular destination or truth.

The Garden of Forking Paths is a useful metaphor to describe the challenges scientists often face with data analysis. In a given dataset -particularly if it is especially noisy data- any number of paths (leading to destinations/ "outcomes") can be charted through it– particularly through choices about which data points to include, and which tests and manipulations to use. It is likely that somewhere in such a garden of paths, one can be found that leads to a desired or understandable outcome. Searching for such a path is often referred to as "P-hacking". The result of reporting only the paths that are most significant or desirable misleads readers into thinking there was a clear story from the data, when in fact what was reported was only one of many forking paths through a convoluted garden of possible stories that could be told from the data.

In contrast to cherry picking from a garden of forking paths, a goal and a set of guiding principles are more likely to direct one to a coherent destination. Our protagonist models this approach when he goes looking for a man named Albert. He exits a train in a part of the city unknown to him, but with the instructions to take a left at every opportunity, he finds Albert with no trouble. He reflects on how this same set of instructions is also common as a guide for how to navigate through a labyrinth. Similarly, this is good advice for scientists: stick to a goal and a set of guiding principles instead of searching for one of what may be many contradictory paths to a tenuous story in the data. Furthermore, be careful about accounting for what you don't know- a key piece of missing information may be the entire key. This short story itself turns out to be such a key: it is an account from a man named Dr. Yu Tsun that completely upends prior assumptions about why a military delay occured

in WW1, and it contains an unexpected twist that almost certainly would not have been guessed at without this particular piece of data evidence.

Q3 P(Earth | Land) = [P(Land | Earth)* P(Earth at all)]/P[Land at all]

```
ProbEarthLand = (.3*.5)/.65
ProbEarthLand

## [1] 0.2307692
```

Q4 A) P(A|Twins) = [P(Twins|A)*P(A)]/P(Twins)

```
ProbA.1 = (.1*.5)/.15
ProbA.1

## [1] 0.3333333
```

B) P(A|Baby data) = [P(Baby data|A)*P(A)]/P(Baby data)

```
#Baby data: prob of a twin and a single= twin prob * single prob
#Baby data for A
#.1*.9 = .09
#Baby data for B
#.2*.8=.16
#P(babydata)= (.09*.16)/2 = .125

ProbA.2 = (.09*.5)/.125
ProbA.2

## [1] 0.36
```

a) P(A|Test returns A)= [P(Test returns A|A)* P(A)]/P(Test returns A)

```
#P(Test returns A|A) = .8
#P(A) = .5
#P(Test returns A) = (.8+.35)/2= .575

ProbA.test1 = (.8*.5)/.575
ProbA.test1

## [1] 0.6956522
```

b) Given birth data, which now estimates P(A)=.36 on outside evidence

```
#P(Test returns A|A) = .8
#P(A) = .36
#P(Test returns A) = (.8+.35)/2= .575

ProbA.test2 = (.8*.36)/.575
ProbA.test2

## [1] 0.5008696
```