Assignment 9

Decision analysis

anonymous

1 General information

This is the template for assignment 9. You can download the qmd-file or copy the code from this rendered document after clicking on `</> Code` in the top right corner.

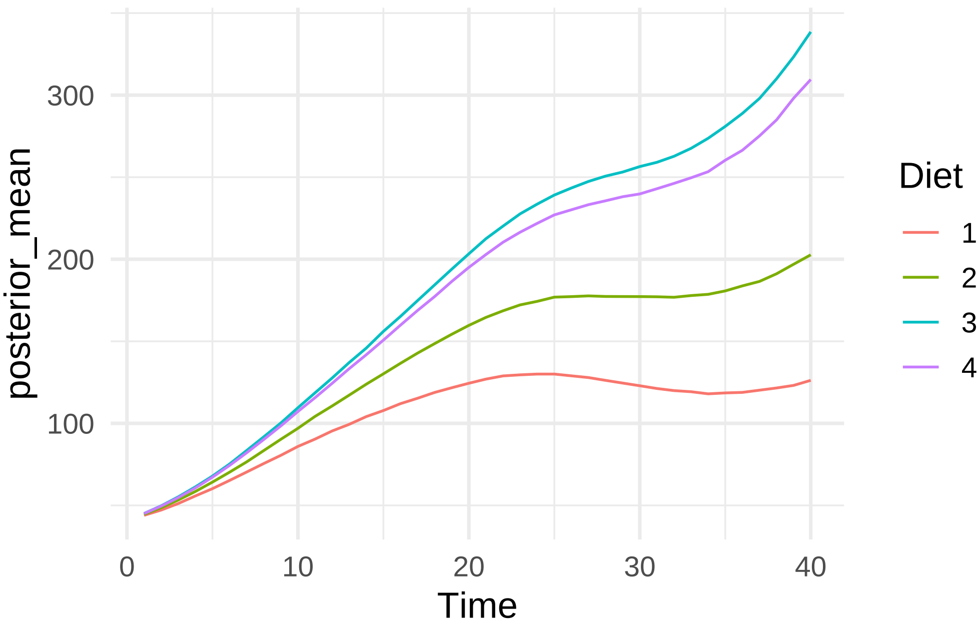
2 Escaping from the chicken coop

2.0.1 (a)

2.0.2 Expected chicken weight for days 1-40 per diet.

For this we get the posterior prediction for new chicken (non-seen) that would be equivalent to an offspring.

```
Chick = rep(30, each=4*40)
Time = rep(seq(1,40), times=4)
Diet = rep(seq(1,4), each=40)
newdata = data.frame(Chick=Chick, Time=Time, Diet=as.factor(Diet))

posterior_prediction = posterior_predict(fit, newdata = newdata, allow_new_levels=TRUE, sample_new_l

df = cbind(newdata, posterior_mean = colMeans(posterior_prediction))
df['rownumber'] = seq.int(nrow(df))


ggplot(data=df) +
  geom_line(aes(x=Time, y=posterior_mean, group=Diet,  color=Diet))
```



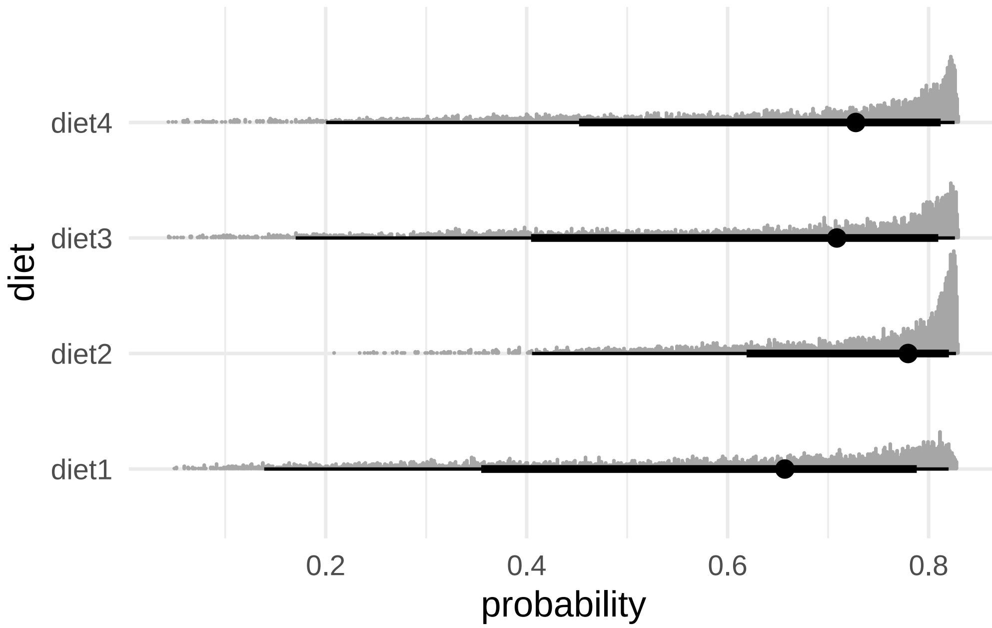
They look pretty much reasonable but I think something is weird in terms of how Time is treated after the value 21 that is the data we have. Diets 3 and 4 keep growing at almost the same rate with some bumps but diets 1 and 2 stay much lower, even 1 seems to stall. Not sure how the differences appear for time points after the maximum Time value we have seen in the data.. Also 3 and 4 can make no sense neither if they keep growing at the same rate for ever.

2.0.3 (b)

2.0.4 Escape probabilities for 4000 draws (4000 chicken simulations) under each diet.

```
total_results = vector("list")
for(diet in 1:4){
  diet_results = vector(mode="list", length=4000)
  diet_df =  df %>% filter(Diet==diet)

  for (i_row in 1:dim(posterior_prediction)[1]){

    from = min(diet_df$rownumber)
    to = max(diet_df$rownumber)

    diet_results[[i_row]] =
      chickenwise_probability_of_escape(posterior_prediction[i_row, from:to])
  }
  total_results[[diet]] <- diet_results
}

df_2b =  data.frame(diet1=unlist(total_results[1]),
                    diet2=unlist(total_results[2]),
                    diet3=unlist(total_results[3]),
                    diet4= unlist(total_results[4]))
```

```r
df_2b_long = df_2b %>% pivot_longer(cols=diet1:diet4, names_to="diet",
                                    values_to="probability")
ggplot(data=df_2b_long, aes(x=probability, y=diet)) +
  stat_dotsinterval()
```



2.0.5 (c)

```r
df_expected = df_2b_long %>% group_by(diet) %>%
  summarise(expected = mean(probability))
```

```r
wrong_total_results = vector("list")
for(diet in 1:4){

  diet_df =  df %>% filter(Diet==diet)

  wrong_total_results[[diet]] =
    chickenwise_probability_of_escape(diet_df$posterior_mean)
}


df_expected['wrong_expected'] = unlist(wrong_total_results)

df_expected
```

```
# A tibble: 4 x 3
  diet  expected wrong_expected
  <chr>    <dbl>          <dbl>
1 diet1    0.591          0.712
2 diet2    0.727          0.824
3 diet3    0.632          0.764
4 diet4    0.652          0.800
```

It is wrong to compute the expected probability of escape with the expected chicken weight from 2a because that only takes into account the expected value discarding the tails and all values that can arise for each day and have a low probability of escaping compared to the expected value.

The correctly calculated expected escape probability is always lower because it takes into account all the uncertainty of the distribution, it accounts for all the values that have really low probability of escaping and that can happen despite the mean value having a larger escape probability.
The difference is not minor (around 0.1-0.15 pp).