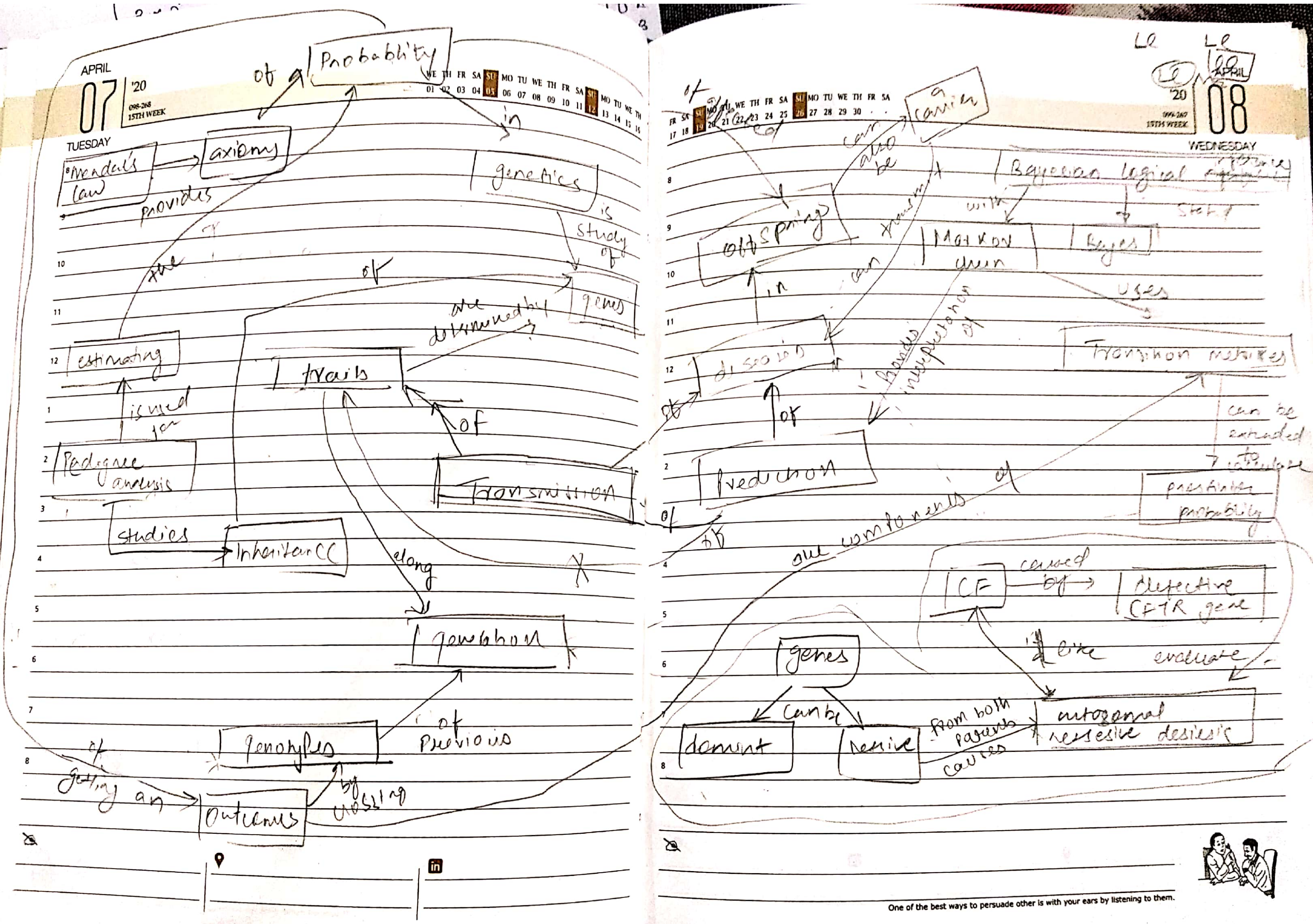
APRIL 07 '20 098-268 15TH WEEK TUESDAY

WEDNESDAY APRIL 08 '20 099-267 15TH WEEK



Given that $A = \begin{bmatrix} 1/2 & 1/4 & 0 \\ 1/2 & 1/2 & 1/2 \\ 0 & 1/4 & 1/2 \end{bmatrix}$

$$x_0 = [1, 0, 0]^T$$

$$P(h_2 | E, I) = \frac{\overset{1/2}{P(h_2|I)}\, \overset{1}{P(E|h_2, I)}}{\underbrace{\sum_{i=1}^{m} P(h_i|I)\, P(E|h_i, I)}_{P(E|I)}} \quad \text{— (a).}$$

$$P(E|I) = x_n \cdot d$$

$$P(E|I) = x_n \cdot [1\ 1\ 0] \quad \text{(normalization constant).}$$

Now for 1^{st} generation,

$n = 1$

$$\therefore\ x_1 = A x_0 = \left[\frac{1}{2}, \frac{1}{2}, 0\right]^T.$$

$$x_1 \cdot d = \frac{1}{2} + \frac{1}{2} = 1$$

for $n = 2$;

$$x_2 = A x_1 = \left[\frac{3}{8}, \frac{1}{2}, \frac{1}{8}\right]^T$$

$$x_2 \cdot d = \frac{3}{8} + \frac{1}{2} = 7/8$$

for $n=3$, $x_3 = \left[\frac{5}{16}, \frac{1}{2}, \frac{3}{16}\right]^T$

$$x_3 \cdot d = \frac{13}{16}$$

Hence, for $n=1 \Rightarrow P(E|I) = 1$

for $n=2 \Rightarrow P(E|I) = \frac{7}{8}$ $\Big] \rightarrow$ Difference $\left(\frac{-1}{8}\right)$

for $n=3 \Rightarrow P(E|I) = \frac{13}{16}$ $\Big] \rightarrow$ Difference $\left(\frac{-1}{16}\right)$

$\therefore$ In the above formula of (a).

$$P(h_2|E,I) = \frac{1/2}{\left\{1 + \left(-\frac{1}{8}\right) + \left(\frac{-1}{16}\right) + \left(\frac{-1}{32}\right) + \cdots + \frac{-1}{2^{n+1}}\right\}}$$

$$= \frac{1/2}{1 - \underbrace{\left(\left(\frac{1}{8}\right) + \frac{1}{16} + \frac{1}{32} + \cdots \frac{1}{2^{n+1}}\right)}_{\text{Solving this by G.P.}}}$$

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$a = 1/8$

$r = \cancel{...} 1/2$

$$\left[\frac{a(r^n - 1)}{r - 1} \right]$$

$$= \frac{1/2}{1 - \frac{1/8\left(1/2^n - 1\right)}{\left(-1/2\right)}}$$

$$= \frac{1/2}{3/4 + \frac{1}{2^{n+1}}}$$

Multipling by 2^{n+1} on both num & denom.

$$= \frac{\frac{1}{2} \times 2^{n+1}}{\left(\frac{3}{4} + \frac{1}{2^{n+1}}\right) \times 2^{n+1}}$$

$$= \boxed{\frac{2^n}{3 \times 2^{n-1} + 1}}$$ → For monohybrid

i.e for $m = 1$

~~for m = m,~~ $P(\text{N}_2 \mid E, \pm) =$

$$\left(\cancel{\frac{2^n}{3 \times 2^{n-1} + 1}} \right)^m$$

$$= \left(\frac{2}{3}\right)^{n\cdot m}$$

~~[illegible]~~

Now for monohybrid — $\dfrac{2^n}{3\times 2^{n+1}+1}$

	Monohybrid	Dihybrid	Trihybrid
$n=2$	$4/7$	$16/49$	$64/343$
	$\dfrac{2^n}{3\times 2^{n-1}+1}$	$\left(\dfrac{2^n}{3\times 2^{n-1}+1}\right)^2$	$\left(\dfrac{2^n}{3\times 2^{n-1}+1}\right)^3$

Hence for m pairs —

$$\left(\frac{2^n}{3\times 2^{n-1}+1}\right)^m$$

OR

$$\left[\frac{2^n}{3}\times\frac{1}{(2^{n-1}+3^{-1})}\right]^m$$

$$=\left(\frac{2^n}{3}\right)^m\times\frac{1}{(2^{n-1}+3^{-1})^m}$$

110
110
101
101
~~[illegible]~~
0111 1
0011 11
3F
0001 11
1E
1101 1
~~[illegible]~~
11010
1110E
0E

~~amor~~ Dominic

G_1 LL (2) LL (1)

genotypes – {LL, Ll, ll}

Because q G_{12} ; $x_0 = [1, 0, 0]^T$

Probabilities of genotypes obtained by crossing G_n with LL, Ll & ll

A =

	Ll x LL	Ll x Ll	Ll x ll
P(LL)	1/2	1/4	0
P(Ll)	1/2	1/2	1/2
P(ll)	0	1/4	1/2

$$A = \begin{bmatrix} 1/2 & 1/4 & 0 \\ 1/2 & 1/2 & 1/2 \\ 0 & 1/4 & 1/2 \end{bmatrix} \underbrace{\begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}}_{x_0}$$

$$x_1 = A x_0 = \begin{bmatrix} 1/2 \\ 1/2 \\ 0 \end{bmatrix}$$

$$x_2 = \begin{bmatrix} 1/2 & 1/4 & 0 \\ 1/2 & 1/2 & 1/2 \\ 0 & 1/4 & 1/2 \end{bmatrix} \begin{bmatrix} 1/2 \\ 1/2 \\ 0 \end{bmatrix}$$

$\times \frac{1}{8}$

$$x_2 = \begin{bmatrix} 3/8 \\ 1/2 \\ 1/8 \end{bmatrix} \ldots$$

alleles - L/l

sagar. k.

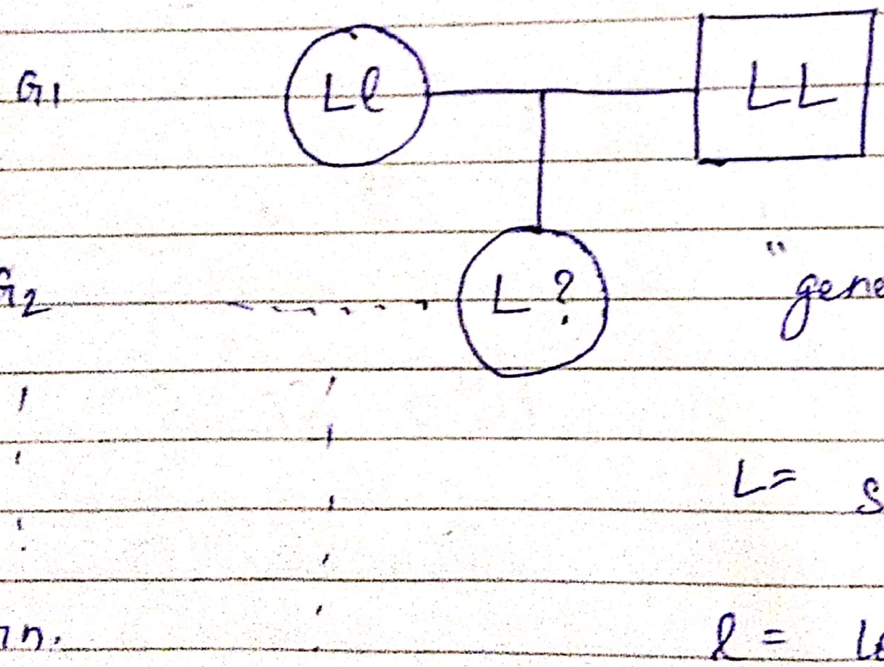
Bayes theorem for result.

Uncertainty ?

How to model the uncertainty ?

★ Pedigree Analysis.

- Pedigree Analysis is a approch to study the inheritance of genes (in human)
- To show relationship within an extended family
- To ~~ff~~ infer wether a trait from a single gene is dominant or recessive



"genetic crosses"

L = Short hair Dominant

l = Long hair recessive

★ Uncertainity :

G_{i2} ~~$G_{1,2}$~~ = $(L\ ?)$ $i > 1$

G_{i1} ~~$G_{1,1}$~~ = $(L\ l) \longrightarrow A$, given.

Given any n, we have to determine the probablity of $G_{(n+1)2}$ is genotypically hetrozygous $(L\ l)$

Starting $G_{12} = LL$ x_0 in. given

$G_{11} = Ll$ A

$\downarrow$

A

$G_{21} \longrightarrow G_{22}$ x_1

into

$G_{n+1}\ 2$ defa.

uncertainty

$L(?)$

L l

$\downarrow$ $\downarrow$

Short hair ✗ Carrier of Long hair

Short hair ✓ Carrier of long hair

* Bayesian logical inferences:

H = hypothesis
D = data (from exp.) → Next, next
I = info → Gill

d. $Pr(D|I)$: global likelihood of entire H.

$Pr(D|H,I)$: likelihood of H, which measures probability of observations D.

$Pr(H|I)$: prior probability of of H in absence of D.

$$Pr(H|D,I) = \frac{Pr(D|H,I)\,Pr(H|I)}{Pr(D|I)}$$

$$= \frac{Pr(E|h_2,I)\,Pr(h_2|I)}{\sum_{i=1}^{2} Pr(h_i|I)\,Pr(E|h_i,I)}$$

Cc x CC

Cc → 100%

Cc x Cc $\quad$ 0.23916

Cc $\quad$ Cc cc

50% $\quad$ 100%

$$\begin{array}{ccc} H_1 & H_2 & H_3 \\ \end{array}$$
$$\begin{bmatrix} Cc & CC & cc \end{bmatrix}$$

$$\begin{array}{ccc} 0 & 0 & 1 \end{array}$$

$$\begin{bmatrix} a & b & c \\ d & e & f \\ g & h & i \end{bmatrix} \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} = \begin{bmatrix} 0 \\ 0.24 \\ 0 \end{bmatrix}$$

$c = 0$

$f = 0.24$

$i = 0$

$$\begin{bmatrix} a & b & c \\ d & e & f \\ g & h & i \end{bmatrix} \begin{bmatrix} 0 \\ 0.24 \\ 0 \end{bmatrix} = \begin{bmatrix} 0.0576 \\ 0.0576 \\ 0 \end{bmatrix}$$

$$0.24b = 0.0576$$

$$b = 0.24 = e$$

$$\begin{bmatrix} a & b & c \\ d & e & f \\ g & h & i \end{bmatrix} \begin{bmatrix} 0.0576 \\ 0.0576 \\ 0 \end{bmatrix} = \begin{bmatrix} \\ \\ \\ \end{bmatrix}$$

$$\begin{bmatrix} a & 0.24 & 0 \\ d & 0.24 & 0.24 \\ g & h & 0 \end{bmatrix} \begin{bmatrix} 0.0576 \\ 0.0576 \\ 0 \end{bmatrix} = \begin{bmatrix} 0.0276 \\ 0.0138 \\ 0 \end{bmatrix}$$

$$0.0576a + 0.013824 = 0.0276$$

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$\left\{ \begin{matrix} Cc \\ H_1 \end{matrix} \quad \boxed{\begin{matrix} CC \\ H_2 \end{matrix}} \quad \begin{matrix} cc \\ H_3 \end{matrix} \right\}$ $\frac{1}{50}$ $\frac{1}{50}$ $\frac{1}{50}$.

H_1

	$Cc \times Cc$	$\boxed{CC} \times Cc$	$cc \times Cc$
Cc	$1/2 \times 1/25$	$1/2 \times 1/25$	$1/2 \times 1/25$
CC	$1/4$	$1/2$	0
cc	$1/4$	0	$1/2$

$Cc \times Cc$

CC Cc cc

$1/4$ $1/2$ $1/4$

CC Cc

$1/2$ $1/2$

CC Cc

$cc \times Cc$

Cc cc

$1/2$ $1/2$

H_2

	$CC \times Cc$	$CC \times CC$	$CC \times cc$
Cc	$1/2 \times 1/25$	0	$1/25$
CC	$1/2$	1	0
cc	0	0	0

$\begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}$ 0.24 0.12 $\frac{100}{12}$ $\begin{bmatrix} 0 \\ 1/25 \\ 0 \end{bmatrix}$ $\begin{bmatrix} \frac{1}{50} \\ 1/50 \\ 0 \end{bmatrix}$

$\frac{5}{1000}$ $\frac{24}{100}$

0.5%

$\frac{1}{100} + \frac{1}{50} \times \frac{2}{2}$

$\frac{1}{25}$ $\frac{1}{100}$ $\frac{2}{100}$ $\frac{3}{100}$ 0.03

$\frac{4}{100}$ $2/100$ $\frac{2}{50} \times \frac{2}{2}$ $\frac{1}{50} \times \frac{2}{2}$