Assignment 1 SENG474

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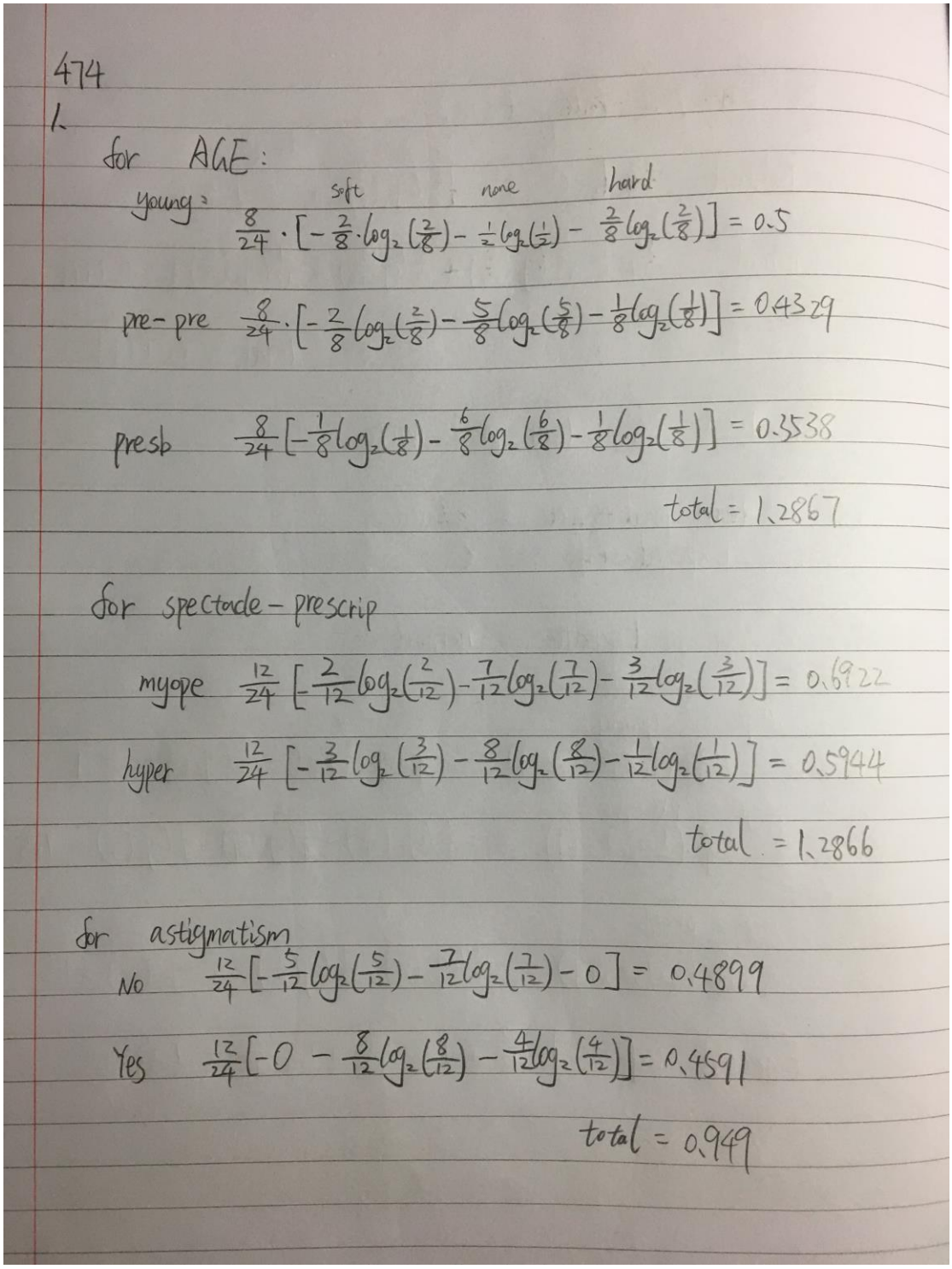


For tear-prod-rate

	soft	none	hard
reduced	$\frac{12}{24}[$ 0	$-\frac{12}{12}\log_2(1)$	$0] = 0$

normal $\frac{12}{24}\left[-\frac{5}{12}\log_2\left(\frac{5}{12}\right)-\frac{3}{12}\log_2\left(\frac{3}{12}\right)-\frac{4}{12}\log_2\left(\frac{4}{12}\right)\right] = 0.7771$

total = 0.7771

So root is tear-prod-rate

For tear-prod-rate = reduced

Expected info : 0

tear-prod-rate = normal :

age = young

info ([2, 0, 2]) = $-\frac{2}{4}\log_2\left(\frac{2}{4}\right)-0-\frac{2}{4}\log_2\left(\frac{2}{4}\right) = 1$

age = pre-pr

info ([2, 1, 1]) = $-\frac{2}{4}\log_2\left(\frac{2}{4}\right)-\frac{1}{4}\log_2\left(\frac{1}{4}\right)-\frac{1}{4}\log_2\left(\frac{1}{4}\right) = 1.5$

age = presb

info ([1, 2, 1]) = $-\frac{1}{4}\log_2\left(\frac{1}{4}\right)-\frac{1}{2}\log\left(\frac{1}{2}\right)-\frac{1}{4}\log_2\left(\frac{1}{4}\right) = 1.5$

Expected info : $1\cdot\frac{4}{12}+1.5\cdot\frac{4}{12}+1.5\cdot\frac{4}{12} = 1.3333$

spect = myope $\frac{6}{12}\left[\frac{2}{6}\log_2\left(\frac{2}{6}\right) - \frac{1}{6}\log_2\left(\frac{1}{6}\right) - \frac{3}{6}\log_2\left(\frac{3}{6}\right)\right] = 0.7296$

hypermetrope $\frac{6}{12}\left[-\frac{3}{6}\log_2\left(\frac{3}{6}\right) - \frac{2}{6}\log_2\left(\frac{2}{6}\right) - \frac{1}{6}\log_2\left(\frac{1}{6}\right)\right] = 0.7296$

total = 1.4592

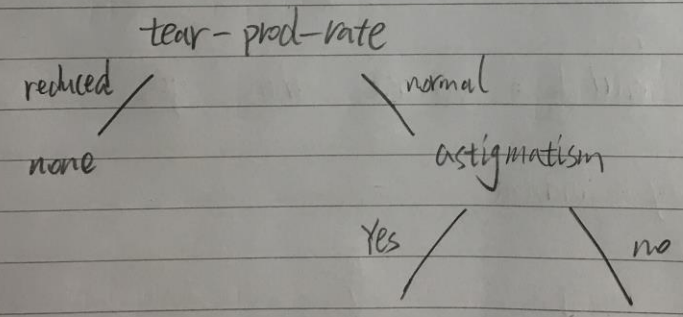
astigmatism = no $\frac{6}{12}\left[-\frac{5}{6}\log_2\left(\frac{5}{6}\right) - \frac{1}{6}\log_2\left(\frac{1}{6}\right) - 0\right] = 0.3250$

yes $\frac{6}{12}\left[0 - \frac{2}{6}\log_2\left(\frac{2}{6}\right) - \frac{4}{6}\log_2\left(\frac{4}{6}\right)\right] = 0.4591$

total = 0.7769

so astigmatism will be the next node

root and first level



2. $P(\text{Yes}) = \frac{9}{14}$ $P(\text{no}) = \frac{5}{14}$

possible tests For "Yes"

outlook = sunny $\frac{2}{5}$

overcast $\frac{4}{4}$

rainy $\frac{3}{5}$

temp = hot $\frac{2}{4}$

mild $\frac{4}{6}$

cool $\frac{3}{4}$

humidity = high $\frac{3}{7}$

= normal $\frac{6}{7}$

windy = False $\frac{6}{8}$

= True $\frac{3}{6}$

Then: If outlook = overcast ($\frac{4}{4}$) then yes

If humidity = normal

possible tests

outlook = sunny $\frac{2}{7}$

rainy $\frac{2}{3}$

temp = hot $\frac{1}{1}$

mild $\frac{2}{2}$

cool $\frac{3}{4}$

windy = False $\frac{4}{4}$
= True $\frac{2}{3}$

If humidity = normal
and windy = False then yes

possible tests
outlook = sunny $\frac{1}{4}$
rainy $\frac{1}{3}$

temp = hot 0
mild $\frac{2}{4}$
cool 0

humidity = normal $\frac{1}{2}$
high $\frac{1}{5}$

windy = False $\frac{1}{4}$
True $\frac{1}{4}$

choose mild
If temp = mild
possible tests
outlook = sunny $\frac{1}{2}$
rainy $\frac{1}{3}$

humidity =	normal	1
	high	$\frac{1}{3}$
windy =	False	$\frac{1}{2}$
	True	$\frac{1}{2}$

If temp = mild and humidity = normal
then yes

possible tests

outlook =	sunny	0
	rainy	$\frac{1}{3}$
temp =	hot	0
	mild	$\frac{1}{2}$
	cool	0
humidity =	normal	0
	= high	$\frac{1}{5}$
windy =	False	$\frac{1}{3}$
	True	0

If outlook = rainy

possible tests

temp =	hot	0
	mild	$\frac{1}{2}$
	cool	0

humidity = high $\frac{1}{2}$
normal 0

windy = False 1
True 0

If outlook = rainy and windy = False
then yes.

For "No"
possible tests

outlook = sunny $\frac{3}{5}$
rainy $\frac{2}{5}$
overcast 0

temp = hot $\frac{2}{4}$
mild $\frac{2}{3}$
cool $\frac{1}{4}$

humidity = high $\frac{4}{7}$
normal $\frac{1}{7}$

windy = False $\frac{2}{8}$
True $\frac{3}{6}$

If outlook = sunny

possible tests

temp = hot $\frac{2}{2}$
mild $\frac{1}{2}$
cool 0

humidity = high $\frac{3}{3}$
normal 0

windy = False $\frac{2}{3}$
True $\frac{1}{2}$

If outlook = sunny and humidity = high
then no

possible tests

outlook = sunny 0
= rainy $\frac{2}{5}$
= overcast 0

temp = hot 0
= mild $\frac{1}{4}$
= cool $\frac{1}{4}$

humidity = high $\frac{1}{4}$
= normal $\frac{1}{7}$

windy = False 0
True $\frac{2}{5}$

If outlook = rainy
possible tests
temp = hot 0
mild $\frac{1}{2}$
cool $\frac{1}{2}$

humidity = high $\frac{1}{2}$
normal $\frac{1}{3}$

windy = False 0
True $\frac{2}{2}$

If outlook = rainy and windy = True
then no.

Prism rules: If outlook = overcast then yes
If humidity = normal and windy = False then yes
If temp = mild and humidity = normal then yes
If outlook = rainy and windy = False then yes
If outlook = sunny and humidity = high then no
If outlook = rainy and windy = True then no

pre-presb, hyper, yes, reduced, ?

3.

$P(\text{contact-lenses} = \text{soft} \mid E)$

$= \left(\frac{2+1}{8+3}\right) \cdot \left(\frac{2+1}{12+2}\right) \cdot \left(\frac{1}{12+2}\right)\left(\frac{1}{12+2}\right) / P(E) = 0.0002982 / P(E)$

$P(\text{contact-lenses} = \text{none} \mid E)$

$= \left(\frac{5+1}{8+3}\right) \cdot \left(\frac{8+1}{12+2}\right) \cdot \left(\frac{8+1}{12+2}\right) \cdot \left(\frac{12+1}{12+2}\right) / P(E) = 0.2093 / P(E)$

$P(\text{contact-lenses} = \text{hard} \mid E)$

$= \left(\frac{1+1}{8+3}\right) \cdot \left(\frac{1+1}{12+2}\right) \cdot \left(\frac{4+1}{12+2}\right)\left(\frac{1}{12+2}\right) / P(E) = 0.0006626 / P(E)$

$P(E) = 0.2103$

$P(\text{contact-lenses} = \text{soft} \mid E) = 0.001418$
$P(\text{contact-lenses} = \text{none} \mid E) = 0.9952$
$P(\text{contact-lenses} = \text{hard} \mid E) = 0.003151$