University Of Asia Pacific

Department of Computer Science & Engineering

Program: B.Sc. in Computer Science and Engineering
<u>Final-Term Examination, Spring 2021</u>

Course Code : CSE 403

Course Title : Artificial Intelligence and Expert Systems

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Semester: 4th Year 1st Semester

Section: B

Date: 15-11-21

Ans to the qus no. 1 (a)

As Bayes theorem states the following:

posterior = prior * likelihood.

This can be also stated as,

P(A|B) = P(B|A) * P(A))/P(B), where P(A|B) is the probality of A given B. also called posterior.

posterior probability: conditional probabity distribution representing what parameters are likely after observing the object.

Likelihood: The probability of falling under a specific catagory of class.

prior: probality distribution representing knowledge.

Example:

As Bayes theorm:

Likelihood class prior

$$P(A|B) = \frac{P(B|A)\ P(A)}{P(B)}$$

posterior probability

predictor prior.

Ans to the qus no. 1 (b)

Last 2 digit of reg no = 94 mod 3

= 1.

So, predrict the probability of, 'players will play cricket if weather is cloudy".

Frequency Table			Likelihood Table	
weather	Yes	No	Yes	No
Sunny	2	1	2/3	1/3
Rainy	1	2	1/2	2/2
Cloudy	1	1	1/2	1/2

Let,

A = playing cricket "yes"

B = weather is "cloudy"

Then, Play yes if weather is ~~sunny~~. cloudy:

Here,

$P(A) = \frac{4}{8}$

$P(B) = \frac{2}{8}$

$P(B|A) = \frac{1}{2}$

$$P(A|B) = \frac{P(B|A) \times P(A)}{P(B)}$$

$$= \frac{1/2 \times \frac{4}{8}}{2/8}$$

$$= \frac{1/2 \times \frac{1}{2}}{1/4}$$

$$= 1$$

Ans

Ans to the qus no. 2(a)

Heuristic function is a function that estimate the cost of getting from one place to another from the current state to the goal state.

A ~~fu~~ heuristic function is admissible if the estimated cost is never more than the actual cost from the current node to the goal node.

And, a heuristic function is consistent if the cost from current node to a sucessor node, puls the estimated cost from the sucessor node to the goal is less than or equal to the estimated cost from the current node to the goal node.

This is the difference between admissibility and consistency of a heuristic function.

Ans to the qus no. 2(b)

Here,

Last 2 digit of Reg No = 94

So,

$h(S) = 1$

$h(A) = (94 \bmod 2) + 3$

$= 0 + 3$

$= 3$

$h(B) = h(A) + 4$

$= 3 + 4$

$= 7$

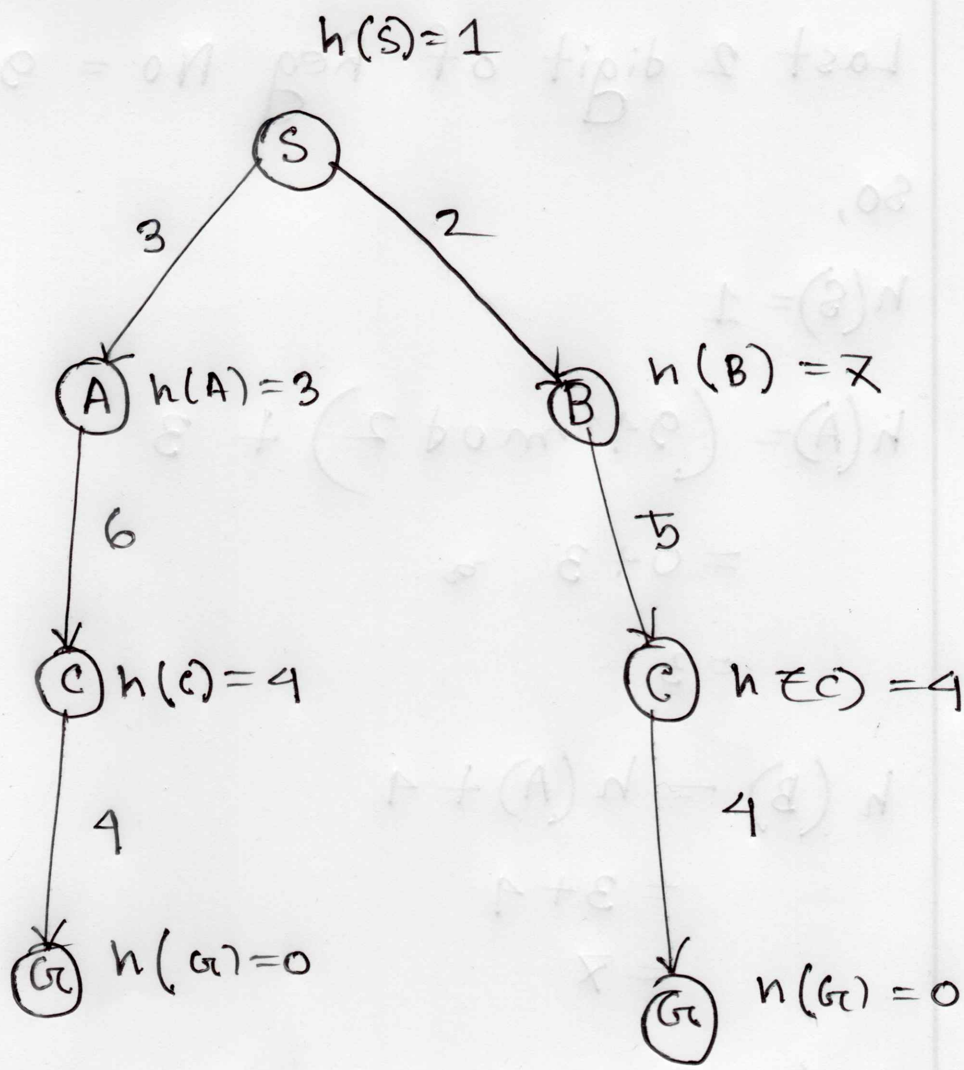
$h(C) = (94 \bmod 4) + 2$

$= 2 + 2$

$= 4$

$h(G) = 0$

Now, corrosponding Search Tree:



A* search Algorithm:

States Expanded	close fringe	open fringe
S	S 1	A B 6 9
S → A	S A 1 6	C B 10 9
S → A → B	S A B 1 6 9	C C 10 94
S → A → B → C	S A B C 1 6 9 9	C G 10 4
S → A → B → C → G	S A B C G 1 6 9 9 4	C G 10

path return : S → B → C → G

path cost : 11

Ans to the qus no. 3(a)

Back propagation algorithm in neural network computes the gradient of the loss function for a single weight by the chain rules.

Learning proeess:

1. Input arrive through preconneted path.

2. Input is modeled using real weight.

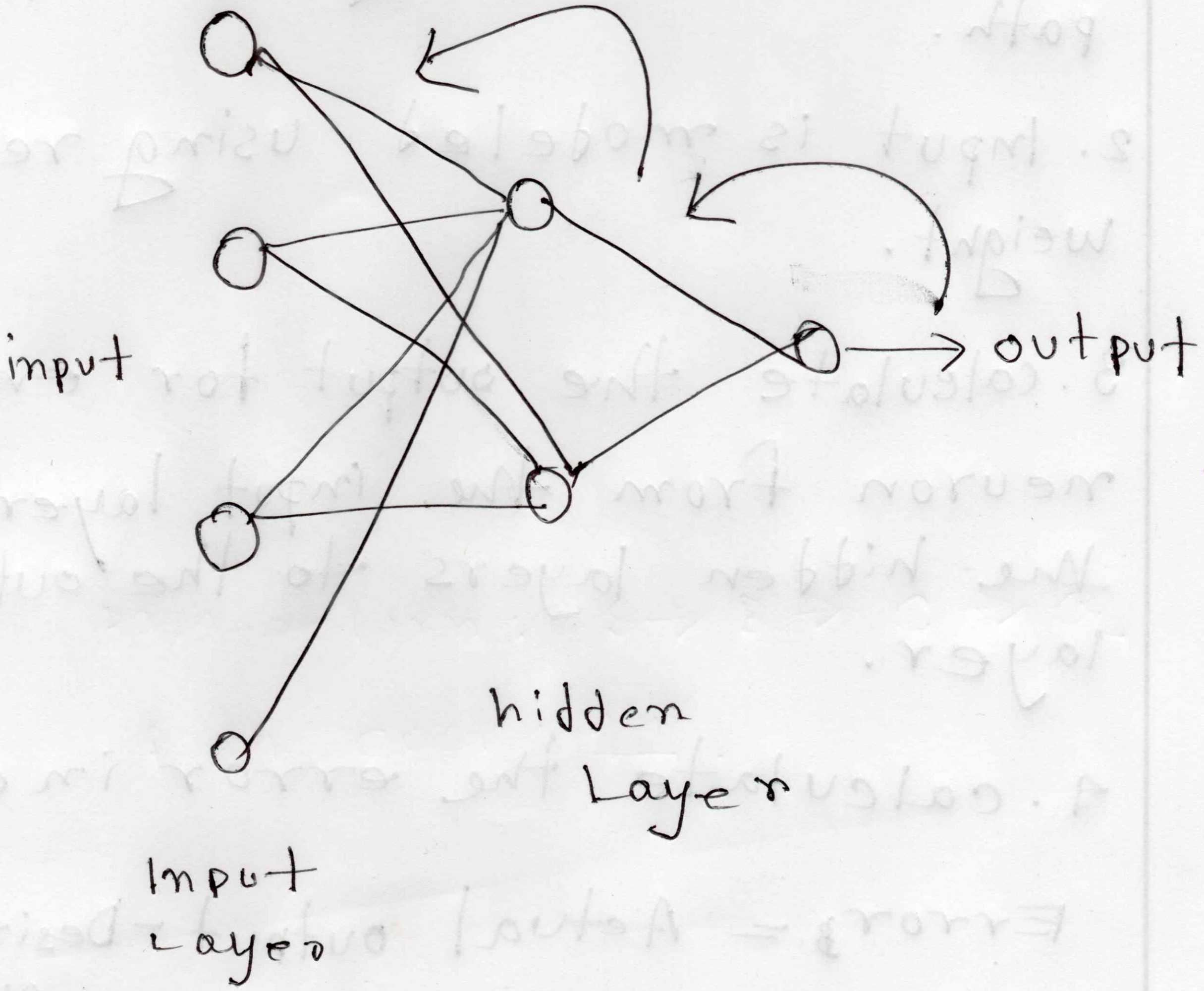
3. calculate the output for every neuron from the input layer, to the hidden layers to the output layer.

4. calculate the error in output.

$$\text{Error}_B = \text{Actual output} - \text{Desire output}.$$

5. Travel back from the output layer to the hidden layer to adjust weight.

Keep reapting the process untill the desired output achivel.



Ans to the qus no. 3(b)

Here,

$w_1 = 94 \bmod 3 - 0.3 = 1 - 0.3 = 0.7$

$w_2 = w_1 + 0.4 = 1.1$

$w_3 = w_2 - 0.2 = 1.1 - 0.2 = 0.9$

① $\theta = 0.3$,

Now, predicted output,

$y_p = \text{step}(x_1 \times w_1 + x_2 * w_2 + x_3 * w_3) - \theta)$,

$y_p = \text{step}([x] \cdot [w]^t - \theta)$

$= \text{step}\left([1\ 1\ 0] \cdot \begin{bmatrix} 0.7 \\ 1.1 \\ 0.9 \end{bmatrix} - 0.3\right)$

$= \text{step}((1 \times 0.7 + 1 \times 1.1 + 0 \times 0.9) - 0.3)$

$= \text{step}(0.7 + 1.1 - 0.3)$

$= \text{step}(1.8 - 0.3)$

$= \text{step}(1.5$

so, 1.5 is ≥ 0.5 so, in step activation function its value is 1

$= step\ (1.5)$

$= 1$.

~~Now~~

ii) Here,

Desired output: $\alpha = 0.1$

Error ϵ = Desired output − predicted output

$= 1 - 1$

$= 0$

Now, my predicted output $y_p = 1$ which is equal to my actual output or desired output, so the error ϵ will be 0.

$w_1^2 = w_1^1 + \alpha * x_1 * \epsilon$

$= 0.7 + 0.1 \times 1 \times 0$

$= 0.7$

$w_2^2 = w_2^1 + \alpha * x_2 * \epsilon$

$= 1.1 + 0.1 \times 1 \times 0$

$= 1.1$

$w_3^3 = w_3^1 + \alpha * x_2 * E$

$= 0.9 + 0.1 \times 0 \times 0$

$= 0$

Because, error (E) is 0, so update weight will remain same

$w^1 = [w_1^1 \quad w_2^2 \quad w_3^1]$

$= [0.7 \quad 1.0 \quad 0.9]$

after ~~of~~ updated weight $E = 0$

$w^2 = [w_1^2 \quad w_2^2 \quad w_3^2]$

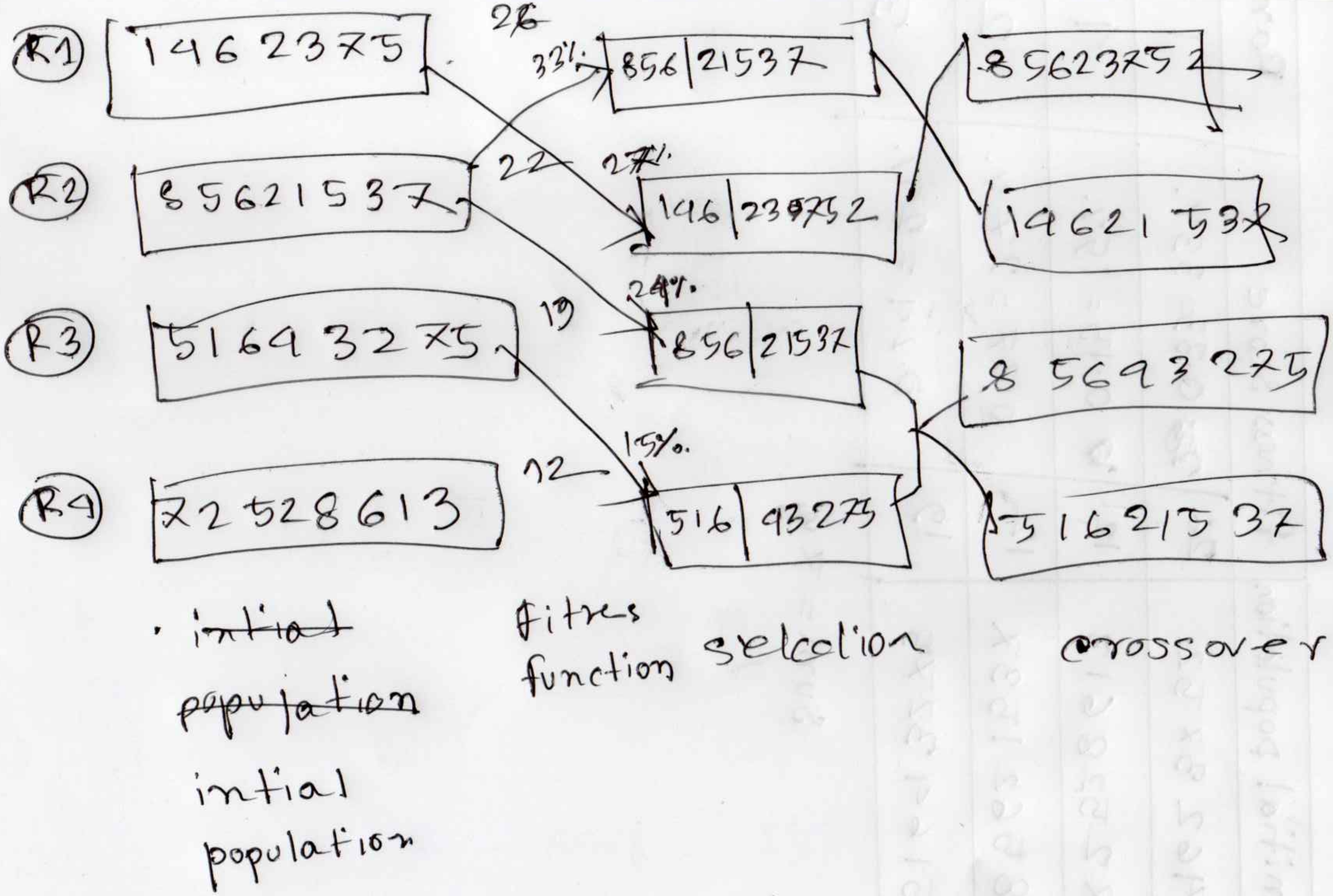
$= [0.7 \quad 1.1 \quad 0.9]$

Ans to the qus no. 4 (i)

crossover point: 94 mod 4+2 = 3

Initial population	fitness score		Rank
14623752	26	~~28~~ 0.33 = 33%	1
72528613	12	~~15~~ 0.15 = 15%	4
85621537	12	0.27 = 27%	2
51693275	19	0.24 = 24%	3

sum = 79


R1
1462375
R2
85621537
R3
51643275
R4
72528613
~~intial population~~
intial population
~~28~~ 26
22
19
12
fitnes function
33%
856|21537
27%
146|23752
24%
856|21537
15%
516|43275
selcetion
8562375 2
146215 37
8 5643275
5162153 7
crossover

(11) mutation operation = 94 mod 3+4

= 5

crossover	mutation
85623752	8562 $\boxed{5}$ 752
1962 1537	1462 $\boxed{4}$ 537
85693275	8569 $\boxed{6}$ 275
5162 1537	5162 $\boxed{4}$ 621537

~~crossove~~
crossover

~~mutation~~
mutation