LAB-3 AI

User ID	Device Mo	o Operat	ing App	Usage Scr	een On E	Battery Dr	Number of	Data Usag	Age	Gender	User E	3eha	
1	Google Pix	x Androi	d	393	6.4	1872	67	1122	40	Male		4	
2	OnePlus 9	Androi	d	268	4.7	1331	42	944	47	Female		3	
3	Xiaomi Mi	i Androi	d	154	4	761	32	322	42	Male		2	
4	Google Pix	x Androi	d	239	4.8	1676	56	871	20	Male		3	
	iPhone 12			187	4.3	1367	58	988	31	Female		3	
	Google Pix		d	99	2	940	35	564		Male		2	
	Samsung (350	7.3	1802	66	1054		Female		4	
	OnePlus 9			543	11.4	2956	82	1702		Male		5	
	Samsung (340	7.7	2138	75	1053		Female		4	
			u							Male		4	
	iPhone 12		1	424	6.6	1957	75	1301					
	Google Pix			53	1.4	435	17	162		Female		1	
	OnePlus 9			215	5.5	1690	47	641		Male		3	
	OnePlus 9			462	6.2	2303	65	1099		Female		4	
	Xiaomi Mi		d	215	4.9	1662	43	857		Male		3	
	iPhone 12			189	5.4	1754	53	779	49	Female		3	
16	Google Pix	x Androi	d	503	10.4	2571	84	2025	39	Female		5	
17	OnePlus 9	Androi	d	132	3.6	628	32	344	47	Female		2	
18	iPhone 12	iOS		299	5.8	1431	41	985	44	Female		3	
19	Google Pix	x Androi	d	81	1.4	558	16	297	26	Female		1	
20	iPhone 12	ios		577	8.5	2774	89	2192	29	Female		5	
21	Samsung (G Androi	d	93	2.6	681	37	302	45	Female		2	
	OnePlus 9			576	11.6	2803	82	1553	43	Female		5	
	Samsung (423	6.5	2094	65	1372	23	Female		4	
	Google Pix			292	5.6	1401	46	949		Female		3	
	OnePlus 9			216	4	1711	59	748		Male		3	
	Oner las s	7 1110101	-	210		-/		, 10	50	Widic			
26	Samsung (G Android	d	91	3.4	1073	38	451	52	Male		2	
	Samsung (ge Time (nn 1			91 r of Apps II	3.4 Usage (ME	1073 Age	38 Behavior (N	451 Model Onel 9		Male I XiaoMod	el iPhting	2 g Systere	nder Ma
User ID	Samsung (ge Time (nn 1 0.639085 0	Time (ha	Drain (mA	r of Apps I	Usage (ME	8 Age		451 1odel_Onel_ 9 0			el_iPhting		ender_Ma
User ID 1	ge Time (nn 1	Time (ho .490909	Drain (mA 0.583426	of Apps I 0.606096	Usage (ME 0.425887	Age 0.126383	Behavior (N	lodel_Onel_9	Samsunlode	I_XiaoMod		g Systere	
User ID 1	ge Time (nn 1 0.639085 0.	Time (hd .490909 .336364	Drain (mA 0.583426 0.382386	o.606096 -0.32244	Usage (ME 0.425887 0.351566	Age 0.126383 0.709506	Behavior (M	1odel_Onel_ 0	Samsun <mark>lode</mark> 0	l_XiaoMod 0	0	g Systere 0	1
1 2 3 4	ge Time (nn 1 0.639085 0. 0.419014 0. 0.21831 0. 0.367958 0.	Time (hd .490909 .336364 .272727 .345455	Drain (mA 0.583426 0.382386 0.170569 0.510591	0.606096 -0.32244 -0.69386 0.19754	Usage (ME 0.425887 0.351566 0.091858 0.321086	Age 0.126383 0.709506 0.292989 -1.53968	Behavior (N 4 3 2 3	0 1 0 0 0	0 0 0 0 0	0 0 0 1 0	0 0 0	g Systeme 0 0 0	1 0 1 1
1 2 3 4 5	ge Time (nn 1 0.639085 0. 0.419014 0. 0.21831 0. 0.367958 0. 0.276408	Time (hd .490909 .336364 .272727 .345455 0.3	Drain (mA 0.583426 0.382386 0.170569 0.510591 0.395764	0.606096 -0.32244 -0.69386 0.19754 0.271823	0.425887 0.351566 0.091858 0.321086 0.369937	Age 0.126383 0.709506 0.292989 -1.53968 -0.62335	Behavior (N 4 3 2 3 3	0 1 0 1 0 0 0	0 0 0 0 0 0	0 0 0 1 0	0 0 0 0	0 0 0 0 0	1 0 1 1 0
1 2 3 4 5 6	ge Time (nn 1 0.639085	Time (hd .490909 .336364 .272727 .345455 0.3 .090909	Drain (mA 0.583426 0.382386 0.170569 0.510591 0.395764 0.237087	0.606096 -0.32244 -0.69386 0.19754 0.271823 -0.58243	Usage (ME 0.425887 0.351566 0.091858 0.321086 0.369937 0.192902	Age 0.126383 0.709506 0.292989 -1.53968 -0.62335	Behavior (N 4 3 2 3 3 2	0 1 0 1 0 0 0 0	0 0 0 0 0 0 0	0 0 0 1 0 0	0 0 0 0 0 1	9 Systeme 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0	1 0 1 1 0
1 2 3 4 5 6 7	ge Time (nn 1 0.639085 0. 0.419014 0. 0.21831 0. 0.367958 0. 0.276408 0.121479 0. 0.56338 0.	Time (hq .490909 .336364 .272727 .345455 0.3 .090909 .572727	Drain (mA 0.583426 0.382386 0.170569 0.510591 0.395764 0.237087 0.557414	r of Apps II 0.606096 -0.32244 -0.69386 0.19754 0.271823 -0.58243 0.568954	0.425887 0.351566 0.091858 0.321086 0.369937 0.192902 0.397495	Age 0.126383 0.709506 0.292989 -1.53968 -0.62335 -0.62335 -1.45638	8 Behavior (N 4 3 2 3 3 3 2 4 4	1odel_Onel_9 0 1 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0	0 0 0 1 0 0 0 0	0 0 0 0 1 0	9 Systeme 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0	1 0 1 1 0 1
1 1 2 3 4 5 6 6 7 8	9e Time (n/n T 0.639085 0. 0.419014 0. 0.21831 0. 0.367958 0. 0.276408 0. 0.121479 0. 0.56338 0. 0.903169 0.	Time (hd .490909 .336364 .272727 .345455 0.3 .090909 .572727	Drain (mA 0.583426 0.382386 0.170569 0.510591 0.395764 0.237087 0.557414 0.98625	r of Apps II 0.606096 -0.32244 -0.69386 0.19754 0.271823 -0.58243 0.568954 1.163218	0.425887 0.351566 0.091858 0.321086 0.369937 0.192902 0.397495 0.668058	Age 0.126383 0.709506 0.292989 -1.53968 -0.62335 -1.45638 -0.62335	8 Behavior (N 4 3 2 3 3 3 2 4 5 5 6 6 6 7 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0 1 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0	Xiao Mod 0 0 1 0 0 0 0 0 0	0 0 0 0 1 0 0	9 Systeme 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0	1 0 1 1 0 1 0 1
1 2 3 4 5 6 7 8 9	9 Time (n/n T 0.639085 0 0.419014 0 0.21831 0 0.367958 0 0.276408 0 0.121479 0 0.56338 0 0.903169 0 0.545775 0	Time (hd .490909 .336364 .272727 .345455 0.3 .090909 .572727 .945455 .609091	Drain (mA 0.583426 0.382386 0.170569 0.510591 0.395764 0.237087 0.557414 0.98625 0.682274	r of Apps II 0.606096 -0.32244 -0.69386 0.19754 0.271823 -0.58243 0.568954 1.163218 0.903228	0.425887 0.351566 0.091858 0.321086 0.369937 0.192902 0.397495 0.668058 0.397077	Age 0.126383 0.709506 0.292989 -1.53968 -0.62335 -0.62335 -0.62335 0.292989	8ehavior (N 4 3 2 3 3 3 2 4 5	10del_Onel_1 0 1 0 0 0 0 0 0 0 1 1 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 1	Xiao Mod 0 0 1 0 0 0 0 0 0 0	0 0 0 0 1 0 0 0	9 Systeme 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0	1 0 1 1 0 1 0 1 0
1 2 3 4 5 6 7 8 9 10	9e Time (n/n T 0.639085 0. 0.419014 0. 0.21831 0. 0.367958 0. 0.276408 0. 0.121479 0. 0.56338 0. 0.903169 0.	1.490909 1.336364 1.272727 1.345455 1.03 1.090909 1.572727 1.945455 1.609091 1.509091	Drain (mA 0.583426 0.382386 0.170569 0.510591 0.395764 0.237087 0.557414 0.98625 0.682274 0.615013	r of Apps II 0.606096 -0.32244 -0.69386 0.19754 0.271823 -0.58243 0.568954 1.163218 0.903228 0.903228	Usage (ME 0.425887 0.351566 0.091858 0.321086 0.369937 0.192902 0.397495 0.668058 0.397077 0.500626	Age 0.126383 0.709506 0.292989 -1.53968 -0.62335 -0.62335 0.292989 0.292989	8 Behavior (N 4 3 2 3 3 3 2 4 5 5 6 6 6 7 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0 1 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0	Xiao Mod 0 0 1 0 0 0 0 0 0	0 0 0 0 1 0 0	9 Systeme 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0	1 0 1 1 0 1 0 1
1 2 3 4 5 6 6 7 8 9 10 11	9 Time (n/n T 0.639085 0 0.419014 0 0.21831 0 0.367958 0 0.276408 0 0.121479 0 0.56338 0 0.903169 0 0.545775 0 0.693662 0	Time (hq .490909 .336364 .272727 .345455 .0.3 .090909 .572727 .945455 .609091 .509091 .036364	Drain (mA 0.583426 0.382386 0.170569 0.510591 0.395764 0.237087 0.557414 0.98625 0.682274 0.615013 0.049424	r of Apps II 0.606096 -0.32244 -0.69386 0.19754 0.271823 -0.58243 0.568954 1.163218 0.903228 0.903228 -1.25098	Usage (MB 0.425887 0.351566 0.091858 0.321086 0.369937 0.192902 0.397495 0.668058 0.397077 0.500626 0.025052	Age 0.126383 0.709506 0.292989 -1.53968 -0.62335 -0.62335 0.292989 0.292989 -0.37344	8ehavior (N 4 3 2 3 3 3 2 4 5 4	10del_Onel_1 0 1 0 0 0 0 0 0 0 1 1 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 1 0	I_XiadMod 0 0 1 0 0 0 0 0 0 0 0	0 0 0 0 1 0 0 0	g Systeme 0 0 0 0 1 0 0 0 1 1 0 0 1 1 1 1 1 1 1	1 0 1 1 0 1 0 1 0
1 2 3 4 5 6 6 7 8 9 10 11 12	9 Time (n/n T 0.639085 0 0.419014 0 0.21831 0 0.367958 0 0.276408 0 0.121479 0 0.56338 0 0.903169 0 0.545775 0 0.693662 0 0.040493 0	Time (hd .490909	Drain (mA) 0.583426 0.382386 0.170569 0.510591 0.395764 0.237087 0.557414 0.98625 0.682274 0.615013 0.049424 0.515793	r of Apps II 0.606096 -0.32244 -0.69386 0.19754 0.271823 -0.58243 0.568954 1.163218 0.903228 0.903228 -1.25098 -0.13673	Usage (MB 0.425887 0.351566 0.091858 0.321086 0.369937 0.192902 0.397495 0.668058 0.397077 0.500626 0.025052 0.225052	Age 0.126383 0.709506 0.292989 -1.53968 -0.62335 -0.62335 0.292989 0.292989 -0.37344 -1.20647	8ehavior (N 4 3 2 3 3 3 2 4 5 4 4 1	10del_Onel_1 0 1 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 1 0 1	Xiad Mod	0 0 0 0 1 0 0 0 0	g Systeme 0 0 0 0 1 0 0 0 1 0 0 1 0 0 0 0 0 0 0	1 0 1 1 0 1 0 1 0 1 0 1
1 2 3 4 5 6 6 7 8 9 10 11 12 13 14	9 Time (n/n T 0.639085 0. 0.419014 0. 0.21831 0. 0.367958 0. 0.276408 0. 0.56338 0. 0.903169 0. 0.545775 0. 0.693662 0. 0.040493 0. 0.325704 0. 0.760563 0. 0.325704 0.	Time (hd .490909	Drain (mA) 0.583426 0.382386 0.170569 0.510591 0.395764 0.237087 0.557414 0.98625 0.682274 0.615013 0.049424 0.515793 0.74359 0.505388	r of Apps II 0.606096 -0.32244 -0.69386 0.19754 0.271823 -0.58243 0.568954 1.163218 0.903228 -0.903228 -1.25098 -0.13673 0.531813 -0.2853	Usage (MB 0.425887 0.351566 0.091858 0.321086 0.369937 0.192902 0.397495 0.668058 0.397077 0.500626 0.025052 0.225052 0.416284 0.31524	Age 0.126383 0.709506 0.292989 -1.53968 -0.62335 -1.45638 0.292989 0.292989 -0.37344 -1.20647 1.542538 0.376293	8ehavior (N 4 3 2 3 3 2 4 5 4 4 1 1 3	10del_Onel_1 0 1 0 0 0 0 0 0 0 0 1 0 0 0 0 1 0 1 1 0 1 1 0 1	0 0 0 0 0 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0	Xiad Mod 0	0 0 0 0 1 0 0 0 0 0	g Systeme 0 0 0 0 0 1 0 0 0 1 0 0 0 0 0 0 0 0 0	1 0 1 1 0 1 0 1 0 1 0 1 0
1 2 3 4 5 6 6 7 8 9 10 11 12 13 14 15	9 Time (n/n T 0.639085 0. 0.419014 0. 0.21831 0. 0.367958 0. 0.276408 0. 0.121479 0. 0.56338 0. 0.903169 0. 0.545775 0. 0.693662 0. 0.040493 0. 0.325704 0. 0.760563 0. 0.325704 0.	Time (hd .490909	Drain (mA) 0.583426 0.382386 0.170569 0.510591 0.395764 0.237087 0.557414 0.98625 0.682274 0.615013 0.049424 0.515793 0.74359 0.505388 0.539576	r of Apps II 0.606096 -0.32244 -0.69386 0.19754 0.271823 -0.58243 0.568954 1.163218 0.903228 -1.25098 -0.13673 0.531813 -0.2853 0.086115	Usage (MB 0.425887 0.351566 0.091858 0.321086 0.369937 0.192902 0.397495 0.668058 0.397077 0.500626 0.025052 0.416284 0.31524 0.282672	Age	8ehavior (N 4 3 2 3 3 3 2 4 5 4 4 1 3 4 3 3	10del_Onel_s 0 1 0 0 0 0 0 0 0 0 0 1 0 0 1 1 0 0 0 1 0	0 0 0 0 0 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0	I_Xiad Mod 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	g Systems 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1 0 1 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1
1 2 3 4 4 5 6 6 7 8 8 9 10 11 12 13 14 15 16	9 Time (n/n T 0.639085 0. 0.419014 0. 0.21831 0. 0.367958 0. 0.276408 0. 0.56338 0. 0.903169 0. 0.545775 0. 0.693662 0. 0.040493 0. 0.325704 0. 0.760563 0. 0.27993 0.	Time (hd .490909	Drain (mA) 0.583426 0.382386 0.170569 0.510591 0.395764 0.237087 0.557414 0.98625 0.682274 0.615013 0.049424 0.515793 0.74359 0.505388 0.539576 0.843181	r of Apps II 0.606096 -0.32244 -0.69386 0.19754 0.271823 -0.58243 0.568954 1.163218 0.903228 -1.25098 -0.13673 0.531813 -0.2853 0.086115 1.237501	Usage (MB 0.425887 0.351566 0.091858 0.321086 0.369937 0.192902 0.397495 0.668058 0.397077 0.500626 0.025052 0.416284 0.31524 0.282672 0.802923	8 Age 0.126383 0.709506 0.292989 -1.53968 -0.62335 -0.62335 -1.45638 -0.62335 0.292989 0.292989 -0.37344 -1.20647 1.542538 0.376293 0.876112 0.04308	8ehavior (N 4 3 2 3 3 3 2 4 5 4 4 1 3 3 4 3 3 5	10del_Onel_S 0 1 0 0 0 0 0 0 0 0 0 1 0 0 1 0 0 1 0	0 0 0 0 0 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0	I_Xiad Mod 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	g Systems 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1 0 1 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 0
1 2 3 4 4 5 6 6 7 8 8 9 10 11 12 13 14 15 16 17	9 Time (n/n T 0.639085 0. 0.419014 0. 0.21831 0. 0.367958 0. 0.276408 0. 0.56338 0. 0.903169 0. 0.545775 0. 0.693662 0. 0.040493 0. 0.325704 0. 0.760563 0. 0.27993 0. 0.27993 0.	Time (hd .490909	Drain (mA) 0.583426 0.382386 0.170569 0.510591 0.395764 0.237087 0.557414 0.98625 0.682274 0.615013 0.049424 0.515793 0.74359 0.505388 0.539576 0.843181 0.121145	r of Apps II 0.606096 -0.32244 -0.69386 0.19754 0.271823 -0.58243 0.568954 1.163218 0.903228 -1.25098 -0.13673 0.531813 -0.2853 0.086115 1.237501 -0.69386	Usage (MB 0.425887 0.351566 0.091858 0.321086 0.369937 0.192902 0.397495 0.668058 0.397077 0.500626 0.025052 0.416284 0.31524 0.282672 0.802923 0.101044	Age	8ehavior (N 4 3 2 3 3 3 2 4 5 4 4 1 3 3 4 3 3 5 2	10del_Onel_S 0 1 0 0 0 0 0 0 0 0 1 0 0 0 1 0 0 0 1 0 0 0 1 1 0 0 1 1 1 0 0 1 1	0 0 0 0 0 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0	I_Xiad Mod 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	g Systems 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1 0 1 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 0 1 0 0 1 0
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29 0.742958 0.527273 0.774805 0.977511 0.565344 1.375932

```
import pandas as pd
from sklearn.model_selection import train_test_split
import tensorflow as tf
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense
data = pd.read_excel("/path_to/preprocessed_user_behavior_data.xlsx")
X = data.drop(columns=['User Behavior Class']) # assuming 'User Behavior Class' is the output label
Y = data['User Behavior Class']
X_train, X_test, Y_train, Y_test = train_test_split(X, Y, test_size=0.2, random_state=42)
model = Sequential()
model.add(Dense(64, input_dim=X_train.shape[1], activation='relu')) # Input layer and first hidden layer
model.add(Dense(32, activation='relu')) # Second hidden layer
model.add(Dense(1, activation='softmax')) # Output layer for classification
model.compile(loss='sparse_categorical_crossentropy', optimizer='adam', metrics=['accuracy'])
model.fit(X train, Y train, epochs=50, batch size=32, validation data=(X test, Y test))
Y_pred = model.predict(X_test)
Y_pred_classes = np.argmax(Y_pred, axis=1)
for i in range(10): # Show the first 10 predictions
    print(f"Predicted: {Y_pred_classes[i]}, Actual: {Y_test.values[i]}")
loss, accuracy = model.evaluate(X_test, Y_test)
print(f"Test Accuracy: {accuracy}")
```

```
"dW1": dW1,
        "db1": db1,
        "dW2": dW2,
        "db2": db2
   return grads
def update_parameters(parameters, grads, learning_rate):
   W1 = parameters["W1"]
   b1 = parameters["b1"]
   W2 = parameters["W2"]
   b2 = parameters["b2"]
   dW1 = grads["dW1"]
   db1 = grads["db1"]
   dW2 = grads["dW2"]
   db2 = grads["db2"]
   W1 = W1 - learning_rate*dW1
   b1 = b1 - learning_rate*db1
   W2 = W2 - learning_rate*dW2
   b2 = b2 - learning_rate*db2
   new_parameters = {
        "W1": W1,
       "W2": W2,
        "b1" : b1,
        "b2" : b2
   return new_parameters
def model(X, Y, n_x, n_h, n_y, num_of_iters, learning_rate):
   parameters = initialize_parameters(n_x, n_h, n_y)
   for i in range(0, num_of_iters+1):
       a2, cache = forward_prop(X, parameters)
       cost = calculate_cost(a2, Y)
       grads = backward_prop(X, Y, cache, parameters)
       parameters = update_parameters(parameters, grads, learning_rate)
        if(i%100 == 0):
            print('Cost after iteration# {:d}: {:f}'.format(i, cost))
   return parameters
def predict(X, parameters):
   a2, cache = forward_prop(X, parameters)
   yhat = a2
   yhat = np.squeeze(yhat)
```

```
import numpy as np
 def sigmoid(z):
     return 1/(1 + np.exp(-z))
 def initialize_parameters(n_x, n_h, n_y):
     W1 = np.random.randn(n_h, n_x)
     b1 = np.zeros((n_h, 1))
     W2 = np.random.randn(n_y, n_h)
     b2 = np.zeros((n_y, 1))
     parameters = {
         "W1": W1,
         "b1" : b1,
         "W2": W2,
         "b2" : b2
     return parameters
 def forward_prop(X, parameters):
     W1 = parameters["W1"]
b1 = parameters["b1"]
     W2 = parameters["W2"]
     b2 = parameters["b2"]
     Z1 = np.dot(W1, X) + b1
     A1 = np.tanh(Z1)
     Z2 = np.dot(W2, A1) + b2
     A2 = sigmoid(Z2)
     cache = {
         "A1": A1,
     return A2, cache
 def calculate_cost(A2, Y):
     cost = -np.sum(np.multiply(Y, np.log(A2)) + np.multiply(1-Y, np.log(1-A2)))/m
     cost = np.squeeze(cost)
     return cost
 def backward_prop(X, Y, cache, parameters):
     A1 = cache["A1"]
     A2 = cache["A2"]
     W2 = parameters["W2"]
     dW2 = np.dot(dZ2, A1.T)/m
     db2 = np.sum(dZ2, axis=1, keepdims=True)/m
     dZ1 = np.multiply(np.dot(W2.T, dZ2), 1-np.power(A1, 2))
     dW1 = np.dot(dZ1, X.T)/m
     db1 = np.sum(dZ1, axis=1, keepdims=True)/m
 def predict(X, parameters):
    a2, cache = forward_prop(X, parameters)
    yhat = a2
    yhat = np.squeeze(yhat)
    if(yhat >= 0.5):
        y_predict = 1
        y_predict = 0
    return y_predict
np.random.seed(2)
X = \text{np.array}([[0, 0, 1, 1], [0, 1, 0, 1]])
Y = np.array([[1, 0, 0, 1]])
m = X.shape[1]
           #No. of neurons in first layer
#No. of neurons in hidden layer
n_x = 2
n_h = 2
n_y = 1
num_of_iters = 1000
learning_rate = 0.3
y_predict = predict(X_test, trained_parameters)
print('Neural Network prediction for example ({:d}, {:d}) is {:d}'.format(
    X_test[0][0], X_test[1][0], y_predict))
```

```
class Graph:
___def __init__(self):
            self.graph = {}
      def add_edge(self, u, v):
            if u not in self.graph:
    self.graph[u] = []
            self.graph[u].append(v)
      def depth_limited_dfs(self, node, goal, depth):
    if depth == 0 and node == goal:
            if depth > 0:
                  for neighbor in self.graph.get(node, []):
                         if self.depth_limited_dfs(neighbor, goal, depth - 1):
      def iddfs(self, start, goal):
            depth = 0
                  print(f"Depth: {depth}")
  if self.depth_limited_dfs(start, goal, depth):
                  depth += 1
# Example usage
if __name__ == "
g = Graph()
     g = Graph()
g.add_edge('A', 'B')
g.add_edge('A', 'C')
g.add_edge('B', 'D')
g.add_edge('B', 'E')
g.add_edge('C', 'F')
g.add_edge('C', 'G')
      start_node = 'A'
goal_node = 'E'
      if g.iddfs(start_node, goal_node):
    print(f"Goal {goal_node} found!")
            print(f"Goal {goal_node} not found.")
```

Depth: 0

Depth: 1

Depth: 2

Goal E found!