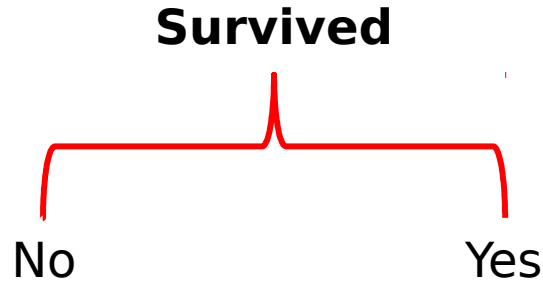


What is Multi Class Classification problem?

What is Multi Class Classification problem?

PassengerId	Sex	Age	Pclass	Survived
1	male	22.0	3	No
2	female	38.0	1	Yes
3	female	26.0	3	Yes
4	female	35.0	1	Yes
5	male	35.0	3	No

What is Multi Class Classification problem?

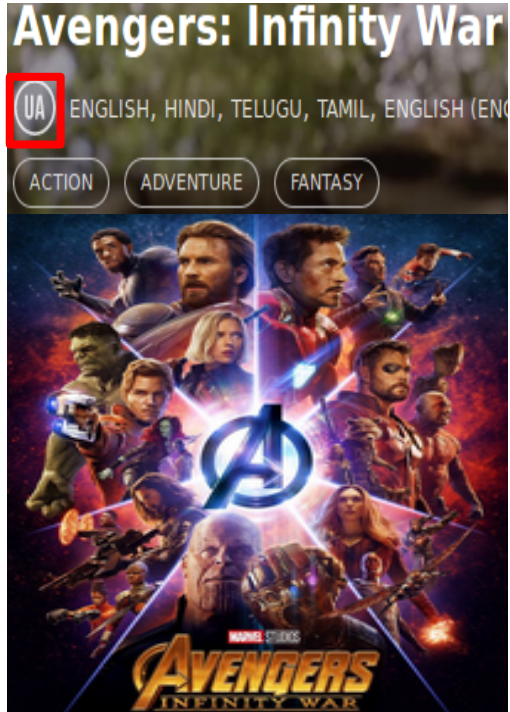


What is Multi Class Classification problem?

When we only have two classes to predict, such problems are known as **binary classification problem**.

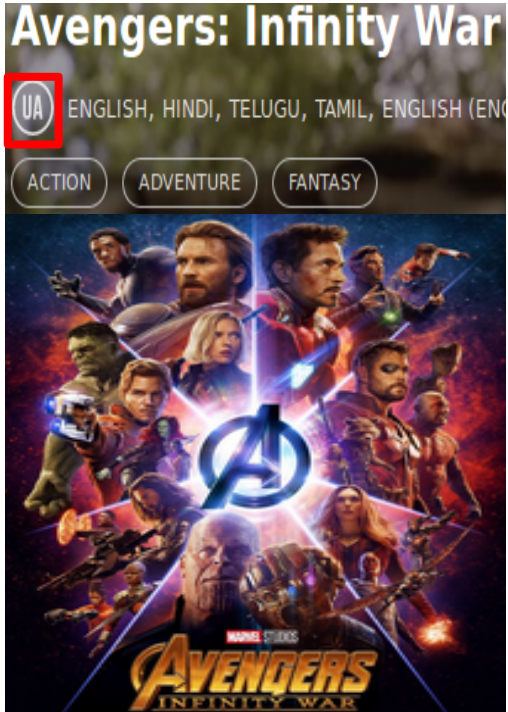
What is Multi Class Classification problem?

Predict the certification of movies



What is Multi Class Classification problem?

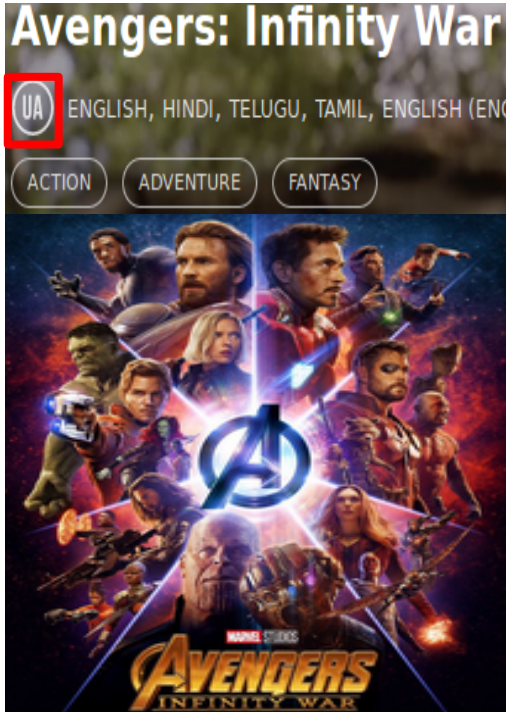
Predict the certification of movies



Movie	Certification

What is Multi Class Classification problem?

Predict the certification of movies



Movie	Certification
Avengers: Infinity War	UA

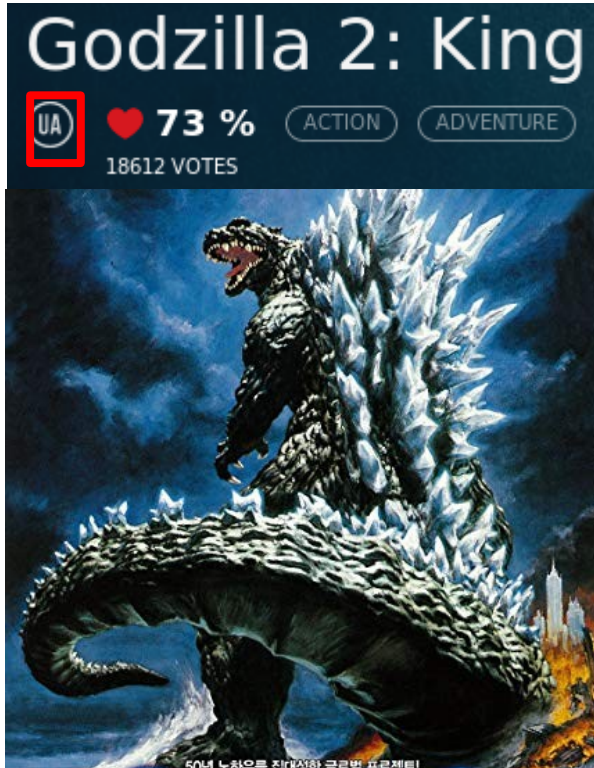
What is Multi Class Classification problem?



Predict the certification of movies

Movie	Certification
Avengers: Infinity War	UA
John Wick	A

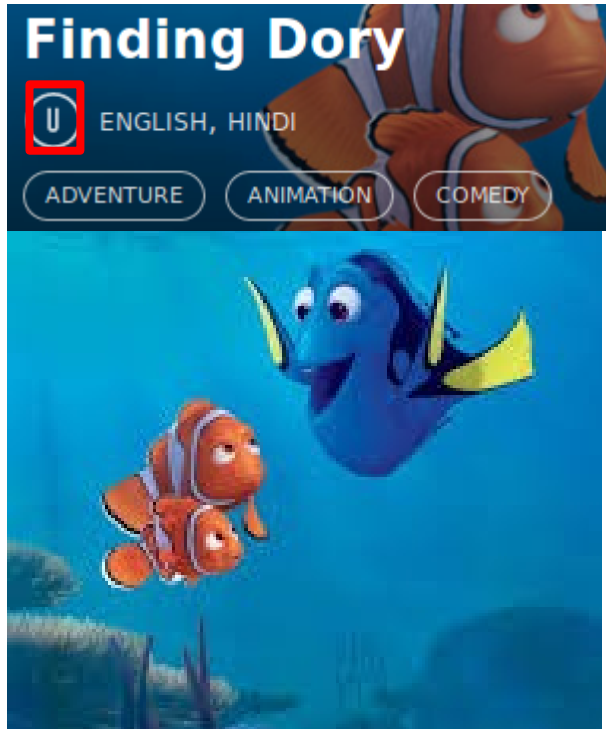
What is Multi Class Classification problem?



Predict the certification of movies

Movie	Certification
Avengers: Infinity War	UA
John Wick	A
Godzilla 2	UA

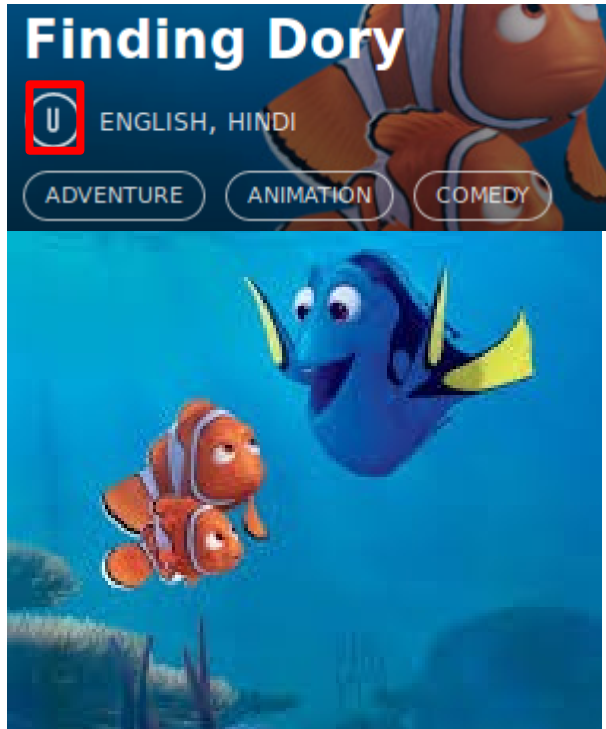
What is Multi Class Classification problem?



Predict the certification of movies

Movie	Certification
Avengers: Infinity War	UA
John Wick	A
Godzilla 2	UA
Finding Dory	U

What is Multi Class Classification problem?



Predict the certification of movies

Movie	Certification
Avengers: Infinity War	UA
John Wick	A
Godzilla 2	UA
Finding Dory	U

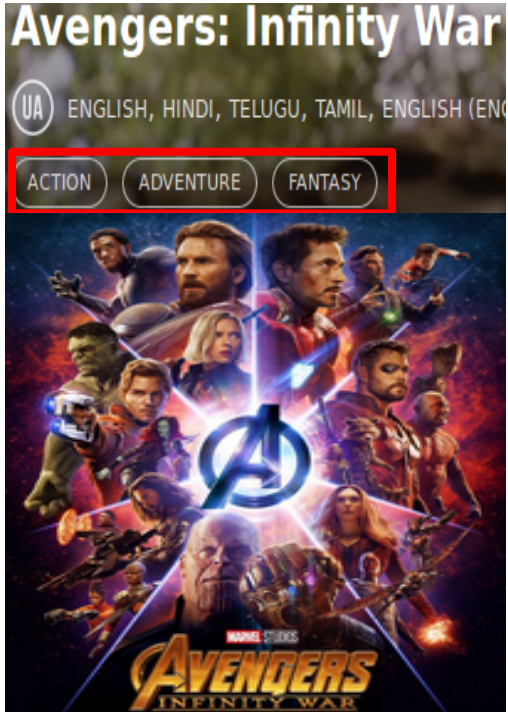
Multi Class Classification problem

What is Multi Class Classification problem?

1. There are more than two categories to predict
2. A single observation can only belong to a single category

What is Multi Class Classification problem?

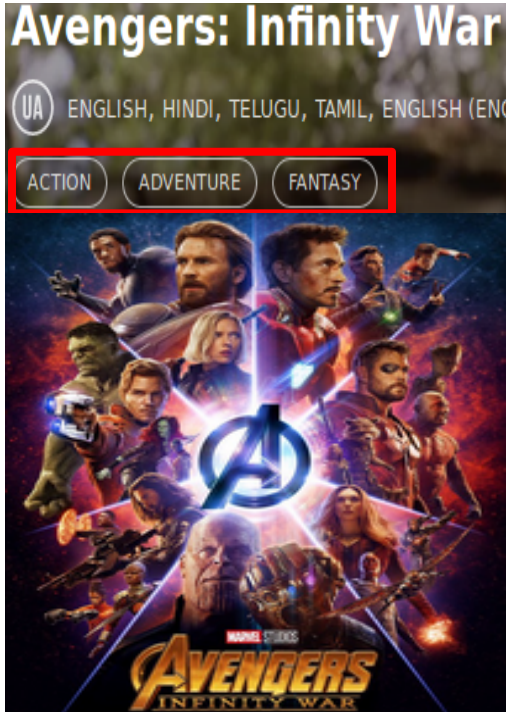
Predict the genre of movies



Movie	Certification	Genre
Avengers: Infinity War	UA	
John Wick	A	
Godzilla 2	UA	
Finding Dory	U	

What is Multi Class Classification problem?

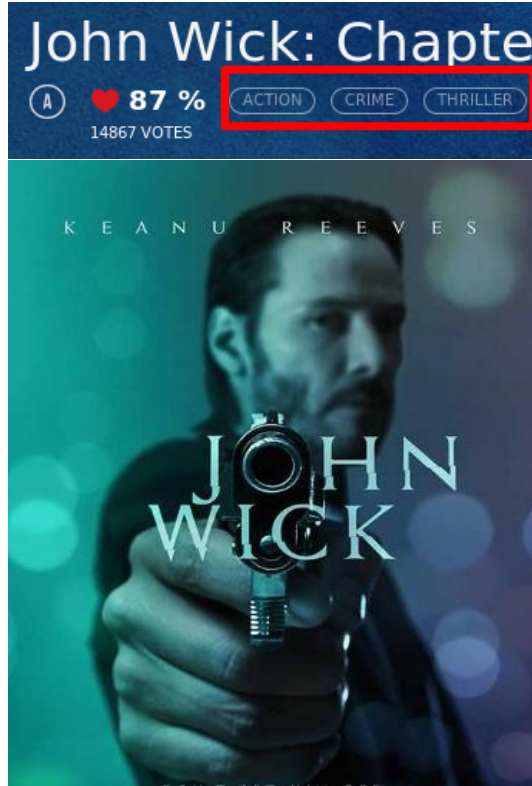
Predict the genre of movies



Movie	Certification	Genre
Avengers: Infinity War	UA	Action, Adventure, Fantasy
John Wick	A	
Godzilla 2	UA	
Finding Dory	U	

What is Multi Class Classification problem?

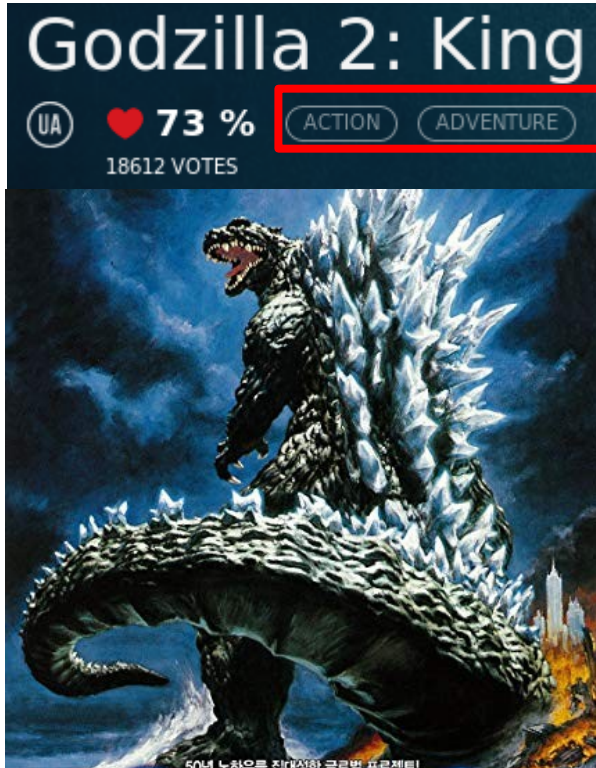
Predict the genre of movies



Movie	Certification	Genre
Avengers: Infinity War	UA	Action, Adventure, Fantasy
John Wick	A	Action, Crime
Godzilla 2	UA	
Finding Dory	U	

What is Multi Class Classification problem?

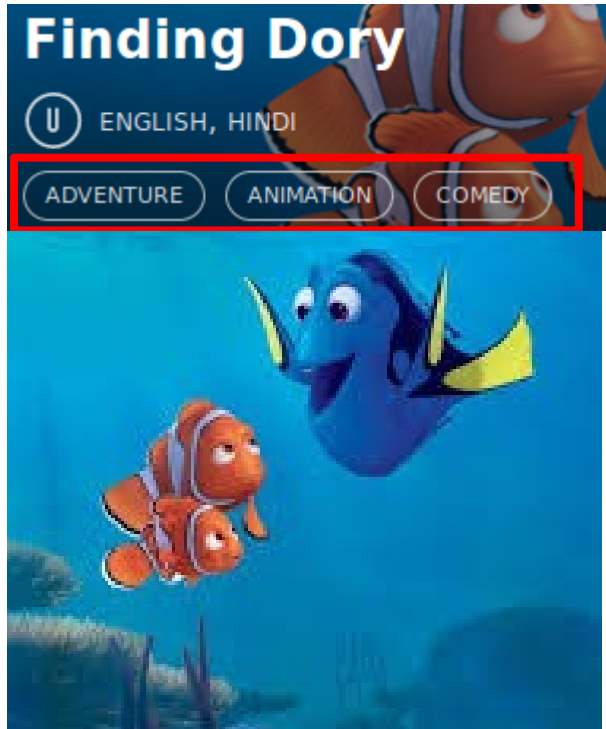
Predict the genre of movies



Movie	Certification	Genre
Avengers: Infinity War	UA	Action, Adventure, Fantasy
John Wick	A	Action, Crime
Godzilla 2	UA	Action, Adventure
Finding Dory	U	

What is Multi Class Classification problem?

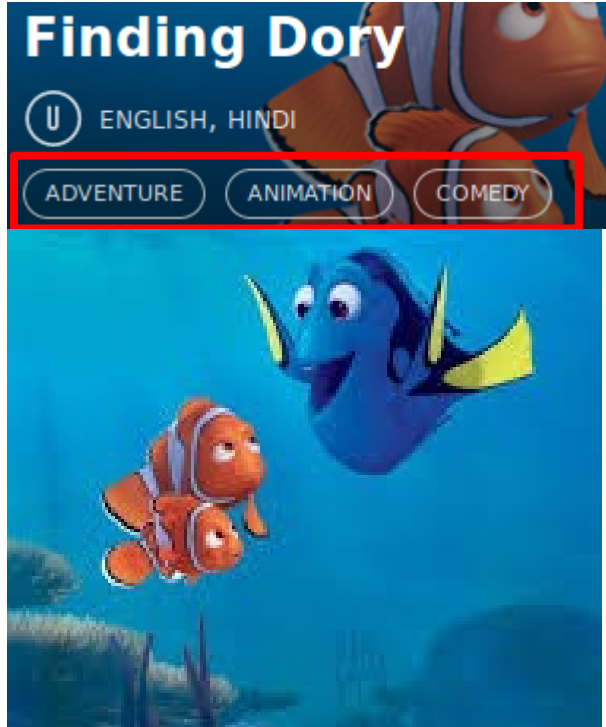
Predict the genre of movies



Movie	Certification	Genre
Avengers: Infinity War	UA	Action, Adventure, Fantasy
John Wick	A	Action, Crime
Godzilla 2	UA	Action, Adventure
Finding Dory	U	Adventure, Comedy

What is Multi Class Classification problem?

Predict the genre of movies



Movie	Certification	Genre
Avengers: Infinity War	UA	Action, Adventure, Fantasy
John Wick	A	Action, Crime
Godzilla 2	UA	Action, Adventure
Finding Dory	U	Adventure, Comedy

Multi Label Classification problem

Multi Label Classification

1. There are more than two categories to predict
2. A single observation can belong to more than one category

Types of Classification problems

1. Binary Classification
2. Multi Class Classification
3. Multi Label Classification

How to solve Multi Class Classification problems?

ID	AGE	Number of phones
1	2	A
2	33	C
3	7	A
4	25	C
5	4	A
6	48	B

How to solve Multi Class Classification problems?

ID	AGE	Number of phones
1	2	A
2	33	C
3	7	A
4	25	C
5	4	A
6	48	B

ID	AGE	Class A
1	2	1
2	33	0
3	7	1
4	25	0
5	4	1
6	48	0

ID	AGE	Class B
1	2	0
2	33	0
3	7	0
4	25	0
5	4	0
6	48	1

ID	AGE	Class B
1	2	0
2	33	1
3	7	0
4	25	1
5	4	0
6	48	0

How to solve Multi Class Classification problems?

ID	AGE	Number of phones	P(A)	P(B)	P(C)	Class
1	2	A	0.92	0.12	0.09	A
2	33	C	0.33	0.17	0.94	C
3	7	A	0.83	0.11	0.10	A
4	25	C	0.14	0.40	0.88	C
5	4	A	0.87	0.23	0.21	A
6	48	B	0.21	0.79	0.39	B

How to solve Multi Label Classification problems?

Movie	Certification	Genre
Avengers: Infinity War	UA	Action, Adventure, Fantasy
John Wick	A	Action, Crime
Godzilla 2	UA	Action, Adventure
Finding Dory	U	Adventure, Comedy

How to solve Multi Label Classification problems?

Movie	Certification	Genre	Action	Adventure	Fantasy	Crime	Comedy
Avengers: Infinity War	UA	Action, Adventure, Fantasy	1	1	1	0	0
John Wick	A	Action, Crime	1	0	0	1	0
Godzilla 2	UA	Action, Adventure	1	1	0	0	0
Finding Dory	U	Adventure, Comedy	0	1	0	0	1

How to solve Multi Label Classification problems?

Movie	Certification	Action	Adventure	Fantasy	Crime	Comedy
Avengers: Infinity War	UA	1	1	1	0	0
John Wick	A	1	0	0	1	0
Godzilla 2	UA	1	1	0	0	0
Finding Dory	U	0	1	0	0	1

How to solve Multi Label Classification problems?

Movie	Certification	P(Action)	P(Adventure)	P(Fantasy)	P(Crime)	P(Comedy)
Avengers: Infinity War	UA	0.93	0.87	0.92	0.21	0.17
John Wick	A	0.87	0.08	0.28	0.94	0.13
Godzilla 2	UA	0.96	0.83	0.29	0.15	0.25
Finding Dory	U	0.07	0.91	0.23	0.34	0.93

How to solve Multi Label Classification problems?

0.5

Movie	Certification	P(Action)	P(Adventure)	P(Fantasy)	P(Crime)	P(Comedy)	Genre
Avengers: Infinity War	UA	0.93	0.87	0.92	0.21	0.17	Action
John Wick	A	0.87	0.08	0.28	0.94	0.13	Action
Godzilla 2	UA	0.96	0.83	0.29	0.15	0.25	Action
Finding Dory	U	0.07	0.91	0.23	0.34	0.93	

How to solve Multi Label Classification problems?

0.5

0.5

Movie	Certification	P(Action)	P(Adventure)	P(Fantasy)	P(Crime)	P(Comedy)	Genre
Avengers: Infinity War	UA	0.93	0.87	0.92	0.21	0.17	Action, Adventure
John Wick	A	0.87	0.08	0.28	0.94	0.13	Action
Godzilla 2	UA	0.96	0.83	0.29	0.15	0.25	Action, Adventure
Finding Dory	U	0.07	0.91	0.23	0.34	0.93	Adventure

How to solve Multi Label Classification problems?

0.5

0.5

0.5

Movie	Certification	P(Action)	P(Adventure)	P(Fantasy)	P(Crime)	P(Comedy)	Genre
Avengers: Infinity War	UA	0.93	0.87	0.92	0.21	0.17	Action, Adventure, Fantasy
John Wick	A	0.87	0.08	0.28	0.94	0.13	Action
Godzilla 2	UA	0.96	0.83	0.29	0.15	0.25	Action, Adventure
Finding Dory	U	0.07	0.91	0.23	0.34	0.93	Adventure

How to solve Multi Label Classification problems?

		0.5	0.5	0.5	0.5		
Movie	Certificatio n	P(Action)	P(Adventur e)	P(Fantasy)	P(Crim e)	P(Comed y)	Genre
Avengers: Infinity War	UA	0.93	0.87	0.92	0.21	0.17	Action, Adventure, Fantasy
John Wick	A	0.87	0.08	0.28	0.94	0.13	Action, Crime
Godzilla 2	UA	0.96	0.83	0.29	0.15	0.25	Action, Adventure
Finding Dory	U	0.07	0.91	0.23	0.34	0.93	Adventure

How to solve Multi Label Classification problems?

Movie	Certification	0.5 P(Action)	0.5 P(Adventure)	0.5 P(Fantasy)	0.5 P(Crime)	0.5 P(Comedy)	Genre
Avengers: Infinity War	UA	0.93	0.87	0.92	0.21	0.17	Action, Adventure, Fantasy
John Wick	A	0.87	0.08	0.28	0.94	0.13	Action, Crime
Godzilla 2	UA	0.96	0.83	0.29	0.15	0.25	Action, Adventure
Finding Dory	U	0.07	0.91	0.23	0.34	0.93	Adventure, Comedy

How to solve Multi Label Classification problems?

Movie	Certification	0.5 P(Action)	0.5 P(Adventure)	0.5 P(Fantasy)	0.5 P(Crime)	0.5 P(Comedy)	Genre
Avengers: Infinity War	UA	0.93	0.87	0.92	0.21	0.17	Action, Adventure, Fantasy
John Wick	A	0.87	0.08	0.28	0.94	0.13	Action, Crime
Godzilla 2	UA	0.96	0.83	0.29	0.15	0.25	Action, Adventure
Finding Dory	U	0.07	0.91	0.23	0.34	0.93	Adventure, Comedy

Same threshold for each
category

How to solve Multi Label Classification problems?

Movie	Certification	0.9 P(Action)	0.8 P(Adventure)	0.8 P(Fantasy)	0.7 P(Crime)	0.8 P(Comedy)	Genre
Avengers: Infinity War	UA	0.93	0.87	0.92	0.21	0.17	Action, Adventure, Fantasy
John Wick	A	0.87	0.08	0.28	0.94	0.13	Crime
Godzilla 2	UA	0.96	0.83	0.29	0.15	0.25	Action
Finding Dory	U	0.07	0.91	0.23	0.34	0.93	Adventure, Comedy

Different threshold for each category

Thank
You!