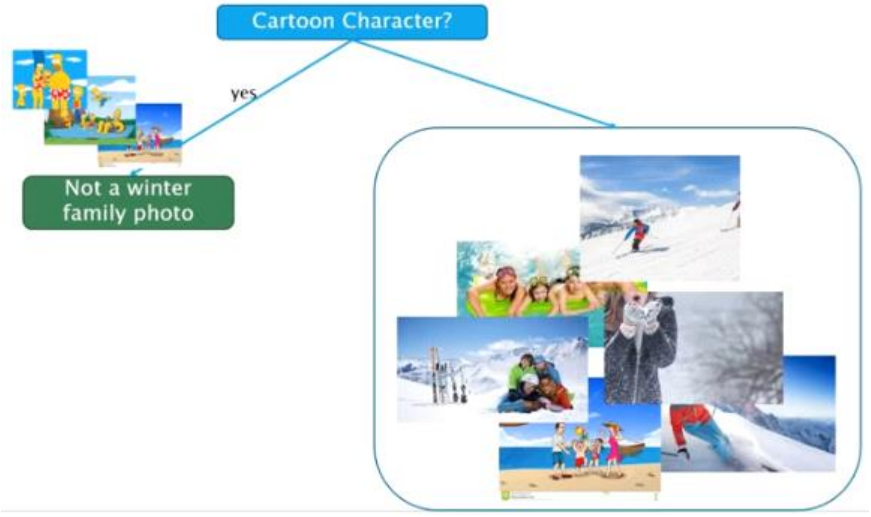
의사결정나무(배포용)

2019년 1월 23일 수요일 오전 11:23

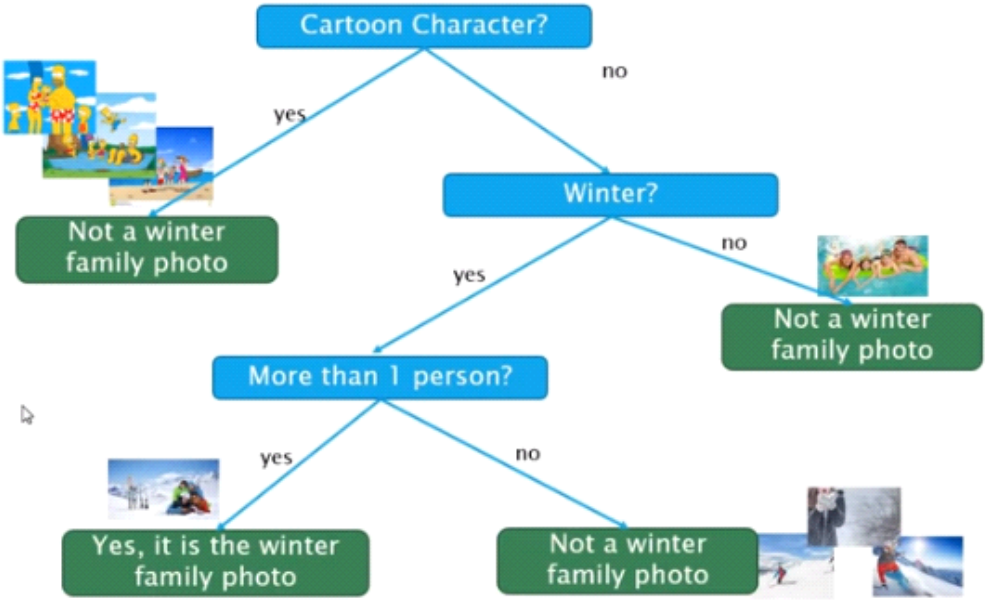
How Decision Tree works

How do you teach your baby to pick winter family vacation photo?

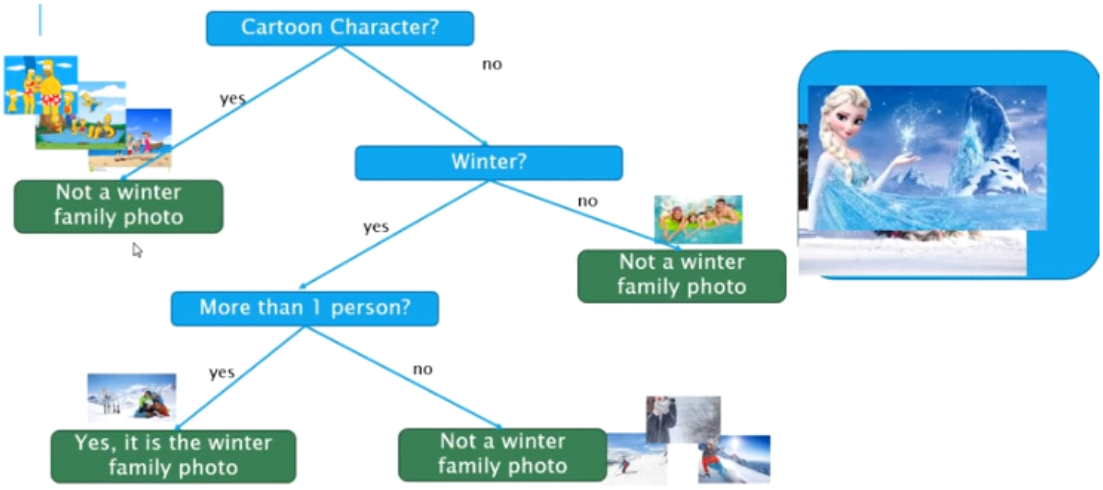
We definitely know the cartoon is not a family photo

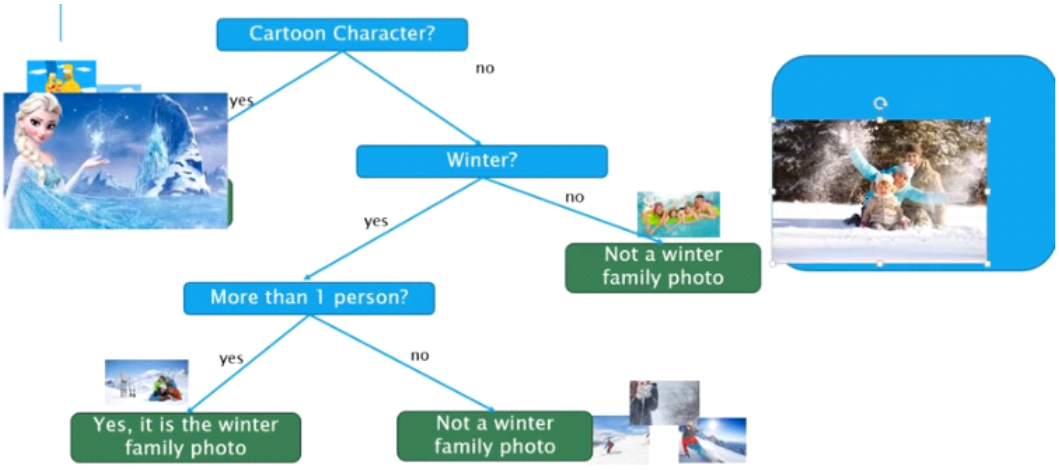


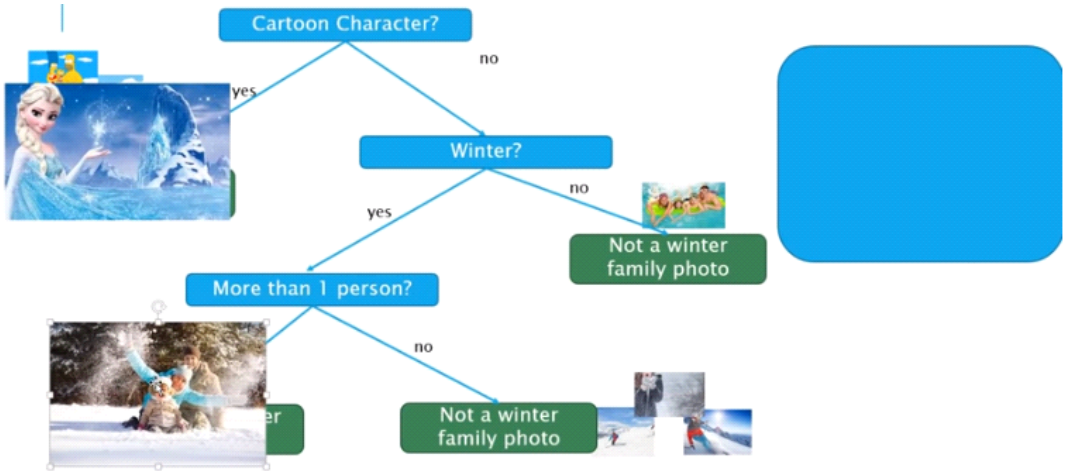
We definitely know summer is not a winter photo



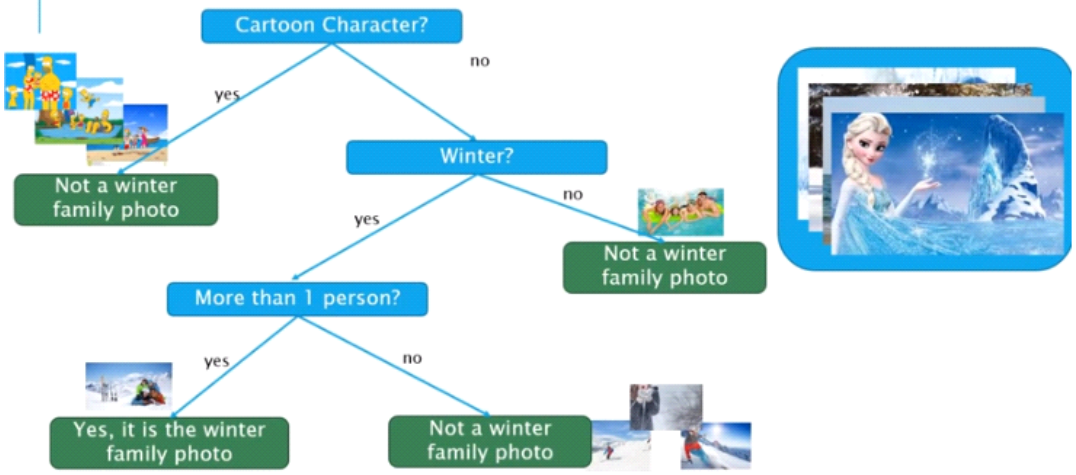
Now, your baby can recognize more pictures using this decision tree


Cartoon Character?
yes
no
Not a winter family photo
Winter?
yes
no
Not a winter family photo
More than 1 person?
yes
no
Yes, it is the winter family photo
Not a winter family photo

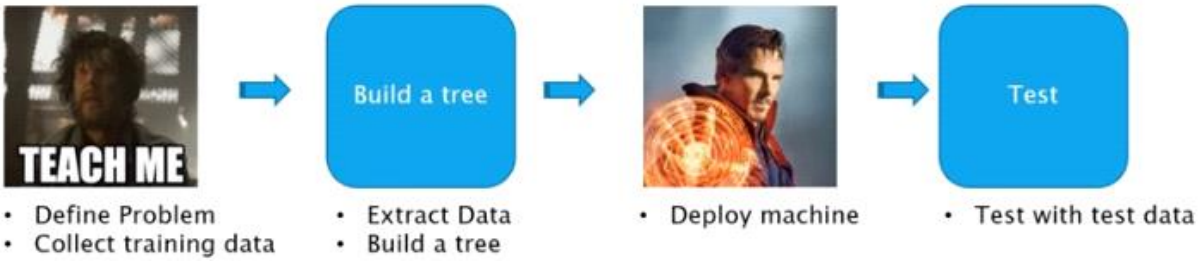

Cartoon Character?
yes
no
Winter?
yes
no
Not a winter family photo
More than 1 person?
yes
no
Yes, it is the winter family photo
Not a winter family photo


Cartoon Character?
yes
no
Winter?
yes
no
Not a winter family photo
More than 1 person?
no
Not a winter family photo

Yes, the baby is the machine, and the machine learned from you

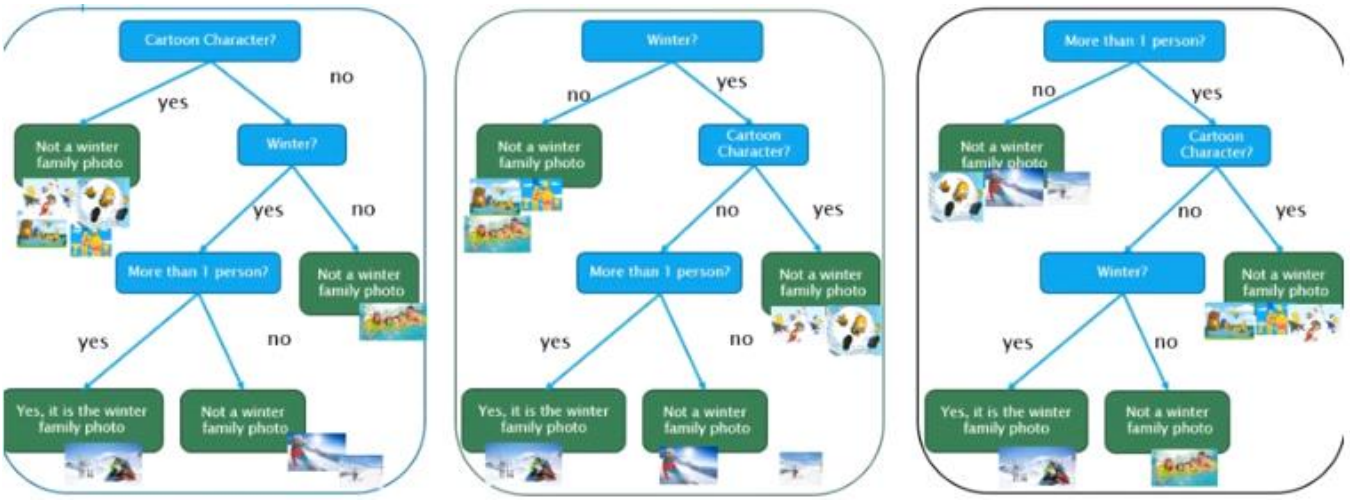


Decision Tree, tow main conceps

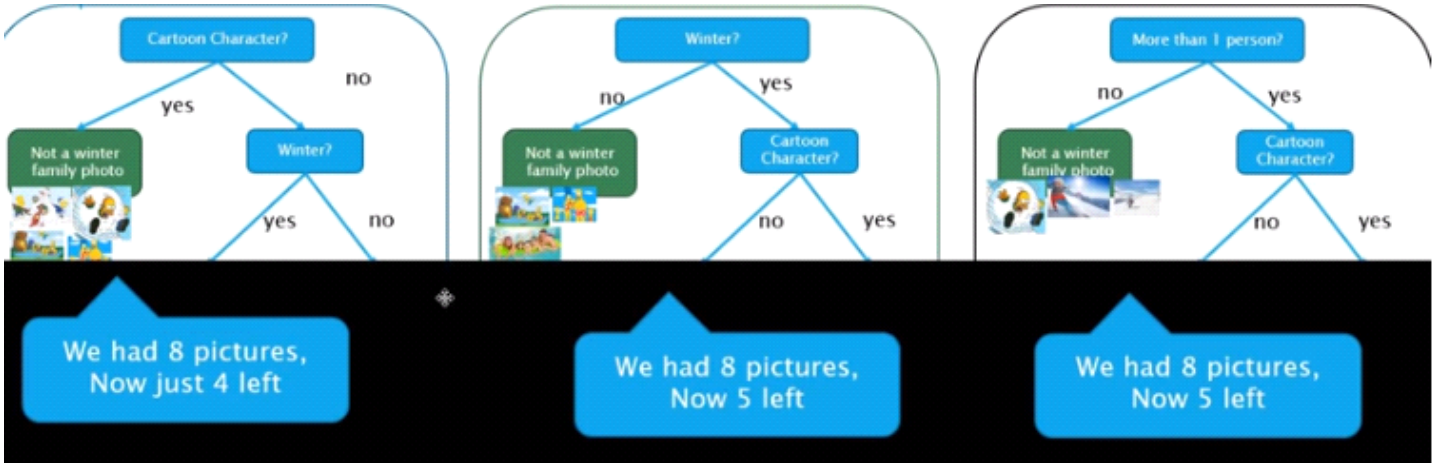


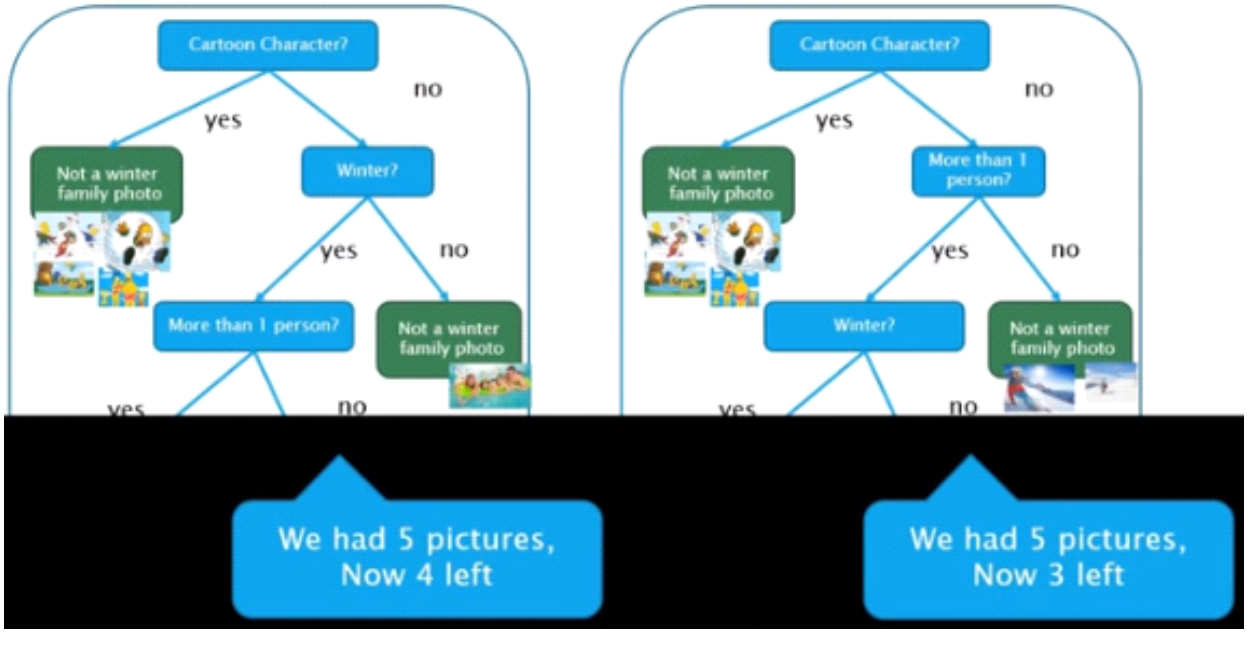
img	cartoon	winter	> 1	Family winter photo
	No	Yes	Yes	Yes
	No	Yes	No	No
	Yes	No	Yes	No
	Yes	Yes	Yes	No
	No	Yes	No	No
	No	No	Yes	No
	Yes	No	Yes	No
	yes	yes	no	no

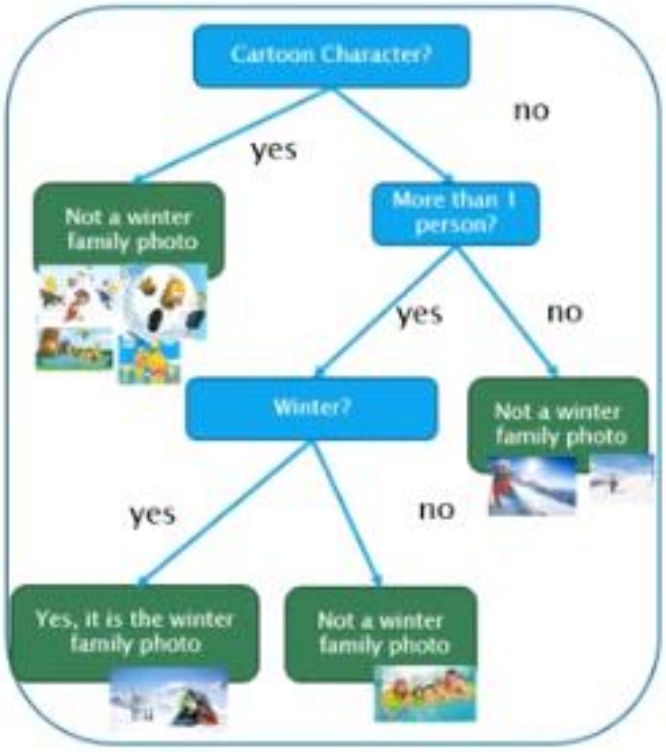
Build a Decision Tree



Choose best feature to split







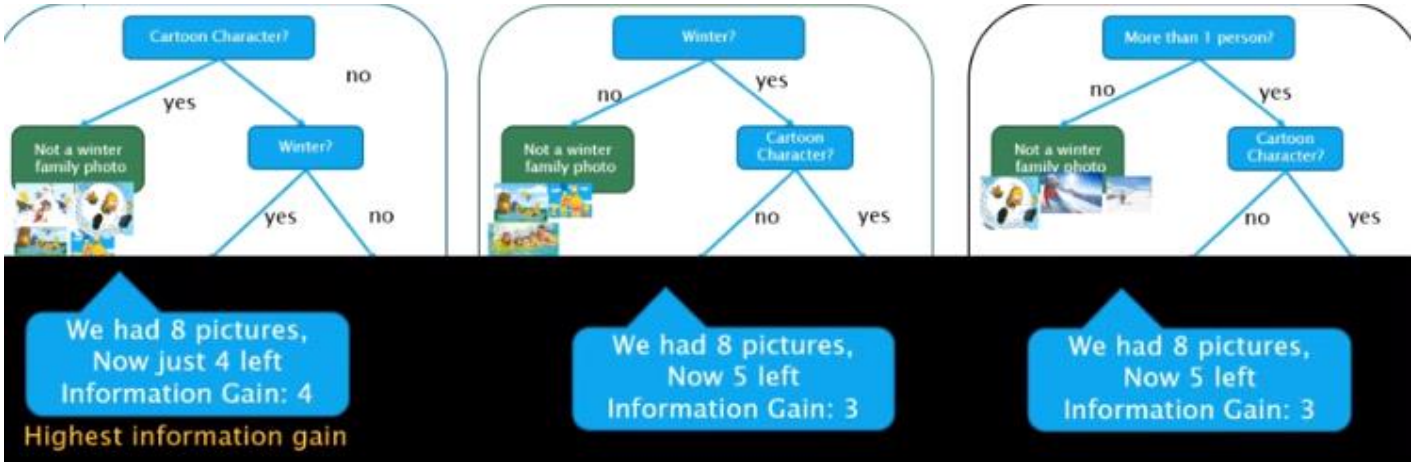
Entropy

High Entropy (messy)

Low Entropy (Clean)

Infomation Gain

(base entropy - new entropy)



ID3 Algorithm (Entropy and Information Gain)

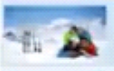
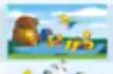
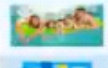
img	cartoon	winter	> 1	Family winter photo
	No	Yes	Yes	Yes
	No	Yes	No	No
	Yes	No	Yes	No
	Yes	Yes	Yes	No
	No	Yes	No	No
	No	No	Yes	No
	Yes	No	Yes	No
	yes	yes	no	no

Calculate Entorpy to find family photo of 8 photos








img	cartoon	winter	> 1	Winter family photo
	No	Yes	Yes	Yes
	No	Yes	No	No
	Yes	No	Yes	No
	Yes	Yes	Yes	No
	No	Yes	No	No
	No	No	Yes	No
	Yes	No	Yes	No
	yes	yes	no	no

Total 8 photos
1 photo winter family photo
7 photos Not winter family photo
= Entropy([1+, 7-])
= -(1/8)*log(1/8) - (7/8)* log(7/8)
= 0.543

```
Entropy = - p(+)*log(p(+)) - p(-)*log(p(-))
```

Information Gain

(decrease in entropy after a dataset is split on an attribute)

img	cartoon	winter	> 1	Winter family photo
	No	Yes	Yes	Yes
	No	Yes	No	No
	Yes	No	Yes	No
	Yes	Yes	Yes	No
	No	Yes	No	No
	No	No	Yes	No
	Yes	No	Yes	No
	yes	yes	no	no

```
Information Gain(winter family photo, cartoon)
= E(winter family photo) - E(winter family photo, cartoon)
= 0.543 - (4/8 * E([0+,4-])+ 4/8 * E([1+, 3-]))
=0.138
```

```
Information Gain(winter family photo, winter)
= E(winter family photo) - E(winter family photo, cartoon)
= 0.543 - (5/8 * E([1+,4-])+ 3/8 * E([0+, 3-]))
=0.093
```

```
Information Gain(winter family photo, >1)
= E(winter family photo) - E(winter family photo, cartoon)
= 0.543 - (5/8 * E([1+,4-])+ 3/8 * E([0+, 3-]))
=0.093
```