# FeelingBlue: A Corpus for Understanding the Emotional Connotation of Color in Context

1 - Background

- Existing work focuses on art/color and the **presence** of emotion; our work is the first to look at **intensity**

- Answer questions like: does the mere presence of blue make an image feel sad? if it's made bluer, does it feel sadder? is it dependent on its associated form or its surrounding color context? and, if the change is reflected in an accompanying textual rationale, is it more effective?

2 - Contributions

- 19,788 4-tuples of abstract art **ranked** by **three** annotators according to their evoked emotions, paired with textual **rationales** for the annotations

- Baseline system for the novel task of **justified affect transformation** – conditional on an image I_o and an emotion e, 1) recolor I_o to produce an image I_e that evokes e more intensely and 2) provide rationales for why I_o evokes e less intensely and why I_e evokes e more intensely
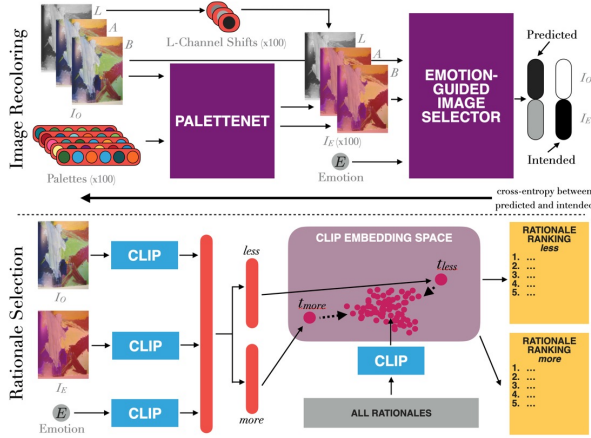
5 - Results

Human evaluation results for our rationale selector using *distinct* images and *recolored* images (I_o and I_e). Scores are IR precisions (@k and within-k) using rationales that are randomly sampled from the intended emotion class as a baseline (C). The bottom table shows that our model selects good, specific rationales.

| | Distinct Image | | | Recolored Image | | |
	Descriptive	Justifying	Both	Descriptive	Justifying	Both
k	@k, wi-k	@k, wi-k	@k, wi-k	@k, wi-k	@k, wi-k	@k, wi-k
1	0.716, 0.716	0.577, 0.577	0.469, 0.469	0.845, 0.845	0.761, 0.761	0.692, 0.692
2	**0.717**, 0.897	**0.587**, **0.801**	**0.475**, **0.683**	**0.842**, **0.963**	**0.753**, **0.908**	**0.682**, **0.851**
5	0.719, 0.989	0.596, 0.968	0.489, 0.908	0.845, 0.999	0.749, 0.995	0.683, 0.971
C	0.683, **0.904**	0.555, 0.779	0.441, 0.655	0.826, 0.952	0.734, 0.905	0.655, 0.839
1	0.729, 0.729	0.669, 0.669	0.545, 0.545	0.796, 0.796	0.694, 0.694	0.614, 0.614
2	**0.726**, **0.912**	**0.650**, **0.852**	**0.527**, **0.738**	0.789, 0.935	0.703, 0.877	0.613, 0.792
5	0.733, 0.990	0.644, 0.979	0.524, 0.920	0.794, 0.994	0.698, 0.979	0.613, 0.946
C	0.662, 0.866	0.580, 0.798	0.448, 0.660	**0.816**, **0.954**	**0.704**, **0.884**	**0.630**, **0.818**

| | Our Model ($k = 2$) | | | Class-Sampled (C) | | | |
Feature	%	Descriptive	Justifying	Both	%	Descriptive	Justifying	Both
has color	60.3	**0.765**	0.665	0.564	54.9	0.724	0.626	0.523
no color	39.7	0.773	**0.686**	0.590	45.1	**0.774**	0.664	0.569
is concrete	**72.7**	**0.760**	0.665	0.565	64.2	0.732	0.630	0.529
not concrete	27.3	**0.792**	0.695	0.599	35.8	0.773	0.667	0.569
simile	27.8	**0.764**	0.655	0.566	23.1	0.727	0.637	0.537
no similar	72.2	**0.770**	0.680	0.578	76.9	0.752	0.645	0.546

"Less" Rationale / "More" Rationale

Anger — the colors are bright and happy like a rainbow / the swirls imply turmoil

Disgust — feminine sexy girlish / it looks filthy, dirty, like a piece of diseased lung someone coughed up

Fear — looks likes colorful bowling pins / the dark image looks like a bleeding crucified man

Happiness — the squares and rectangles look mechanical and boring / looks like one of those happy indian mandala wheels

Sadness — the smoothness and all white with highlights make this look like a technical drawing / the big black shape resembles a dark, sad flower of depression
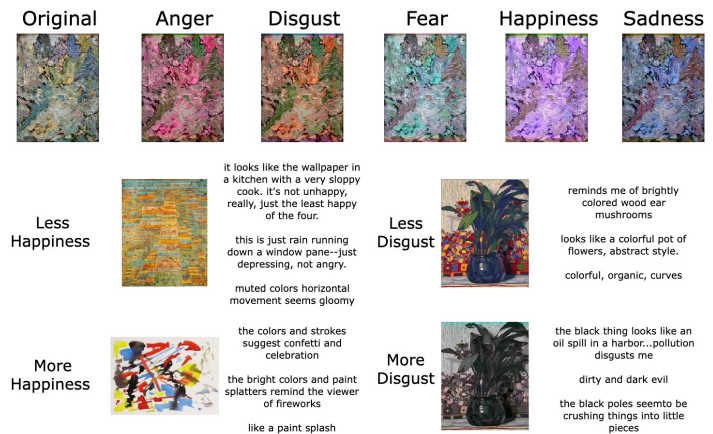
3 - Dataset Details

- Collected via *Best-Worst Scaling* on Mechanical Turk

- **Ordered** pairs and **continuous scores** for the **intensity** of each emotion

- **Good agreement** when compared to other subjective annotation tasks

- 69.3% of rationales reference color (51.2% explicitly, 36.1% implicitly); 52.4% of rationales were 'concrete' (with 17.9% containing simile)

4 - Justified Affect Transformation

Two step approach: 1) an **image recoloring** component that backpropagates through a pretrained & frozen emotion-guided image selector and palette applier to generate a recolored image I_e that better evokes a specified emotion e and 2) a CLIP-based **rationale selector** that outputs a ranked list of rationales for justifying both I_o and I_e

Original / Anger / Disgust / Fear / Happiness / Sadness

Less Happiness — it looks like the wallpaper in a kitchen with a very sloppy cook. it's not unhappy, really, just the least happy of the four. / this is just rain running down a window pane--just depressing, not angry. / muted colors horizontal movement seems gloomy

More Happiness — the colors and strokes suggest confetti and celebration / the bright colors and paint splatters remind the viewer of fireworks / like a paint splash

Less Disgust — reminds me of brightly colored wood ear mushrooms / looks like a colorful pot of flowers, abstract style. / colorful, organic, curves

More Disgust — the black thing looks like an oil spill in a harbor...pollution disgusts me / dirty and dark evil / the black poles seemto be crushing things into little pieces

Our paper, code, dataset and models are on Github!
https://github.com/amith-ananthram/feelingblue

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Some references (more in the paper!):

Artwork on this poster: https://github.com/amith-ananthram/feelingblue/blob/main/fixtures/corpus_sample_artists.txt

Cho et al., 2017: PaletteNet: Image recolorization with given color palette.

Kiritchenko & Mohammad, 2016: Capturing reliable fine-grained sentiment associations by crowdsourcing and Best-Worst Scaling.

Mohammad, 2011: Even the abstract have color: Consensus in word-colour associations.

Mohammad & Kiritchenko, 2018: WikiArt Emotions: An annotated dataset of emotions evoked by art.

Radford et al., 2021. Learning transferable visual models from natural language supervision.