Recognizing Images of Eating Disorders in Social Media (Abstract)

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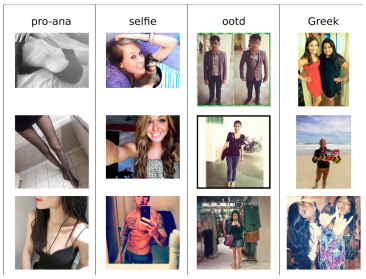
Eating disorders (ED) are pervasive and do not discriminate based on race, religion, gender, or SES. Comorbidities include anxiety, depression, substance abuse, self-injurious behaviors, and history of trauma. ED is often a lifelong struggle with approximately ⅔ of patients never achieving a full and sustained remission.

ED are the product, in part, of increased societal pressures to fit "the thin ideal". These pressures come in the form of repeated advertisements on various media platforms, messages from the diet and exercise industries, fashion industry "norms", etc. Individuals who suffer from ED may have experienced trauma and/or have difficult home lives. The ED can provide a sense of control over these factors, albeit an invalid one.

Exposure to media expressing "the thin ideal" can be triggering to individuals with ED as well as those at risk for developing them. Social media platforms are especially rife with these triggers. Concurrent with the rise of social media, individuals with ED have created communities[1] in which they support one another in the dangerous pursuit of this illness' elusive goal: to be "thin enough". Websites promoting anorexia (pro-ana) and bulimia (pro-mia) as lifestyle choices valorize acting on ED symptoms. Such sites teach those suffering or at risk from ED how to develop, act on, and hide the illness, and support them in doing so, putting them at risk for serious physical and mental health complications, including death.

The impact of images in this community far exceeds that of other communities surrounding physical and mental health issues. Therefore, it is important that clinicians and family members be able to identify websites containing images that are associated with promotion of anorexia and bulimia in order to prevent accidental or intentional exposure to these triggers. This research aims to automatically identify such triggering material, with the ultimate goal of designing parental and clinical controls.

We report on a proof of concept, machine learning approach to identify pro-ana content, trained on example data from online social media searches. The training data is chosen to compare pro-ana content with other content similar in demographics and photographic style:



- "pro-ana": 16,000 images from a collection of Tumblr blogs including best-thinspo, thinniest, wanna-be-skinnyminnie.
- "selfie": 4,500 Tumblr images tagged "selfie".
- "ootd": 7,000 Tumblr images tagged "ootd" (outfit of the day).
- "Greek": 5,000 images from Tumblrs of Greek-letter college organizations.

We train a Resnet Deep Learning network[2] to classify images into these categories. On validation data not included in training, this network gives 78% accuracy -- a significant improvement over chance (25%). To explore a possible application, we identify 10 additional tumblr accounts, five that we judged to have high pro-ana content, 4 blogs without pro-ana content, and 1 fitness inspiration (fitspo) blog that we judged to be contain a mix of content. The table below shows the percentage of images classified as pro-ana in each blog:

Blog Type	Title,	%pro-ana	Blog type	Title	%pro-ana
pro-ana	oh2be-skinny	73	not pro-ana	abelmvada	7
pro-ana	thinninglittle	88	not pro-ana	roommysocks	21
pro-ana	think-skinny-th0ughts	89	not pro-ana	mathematicalmemer	4
pro-ana	oh2beskinny	83	not pro-ana	satoshikurosaki	10
fitspo	veganpilatesangel	53	not pro-ana	traitspourtraits	9

These proof of concept results suggest that it is feasible to automatically detect social media sources with triggering material, informing the creation of tools that can assist clinicians and family members to improve health outcomes.

1. Oksanen A, Garcia D, Räsänen P. Proanorexia communities on social media. Pediatrics. 2016 Jan 1;137(1):e20153372.
2. He K, Zhang X, Ren S, Sun J. Deep residual learning for image recognition. In Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition 2016 (pp. 770-778).