

# Are Online Reviews of Physicians Biased Against Female Providers?

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## TL; DR

We analyzed around 45000 online ratings and reviews of physicians across the United States, and found that females consistently receive less favorable numerical ratings than males. Reviews about females tend to discuss how **sweet** and **beautiful** they are.

We used lexical regression for rating analysis. For lexical analyses, we use a regression count-based approach as well as neural word vectors, in particular by learning word2vec and class embeddings over our corpora. The datasets and exploratory scripts are available to fiddle around with, at our project repository: <https://github.com/avi-jit/RateMDs>

## Data & Methods

	Description	Example	Statistics
Doctor Name	Name of physician	'FIRSTNAME-LASTNAME.html'	6945 unique docs
Specialty	Specialty of physician	'Gynecologist'	57 specialties
Gender	Gender of physician	'f'	2 genders
Text	Review text	"She is a life-saver! From my... "	48567 reviews
Scores	[S,P,H,K] <sup>1</sup>	[4,5,3,5]	-
Upvotes	# times upvoted	0	-
Date	Review publish date	December 6, 2017	-

<sup>1</sup> Staff, Punctuality, Helpfulness, Knowledgeability

Table 1: Sample data scraped from RateMDs.com

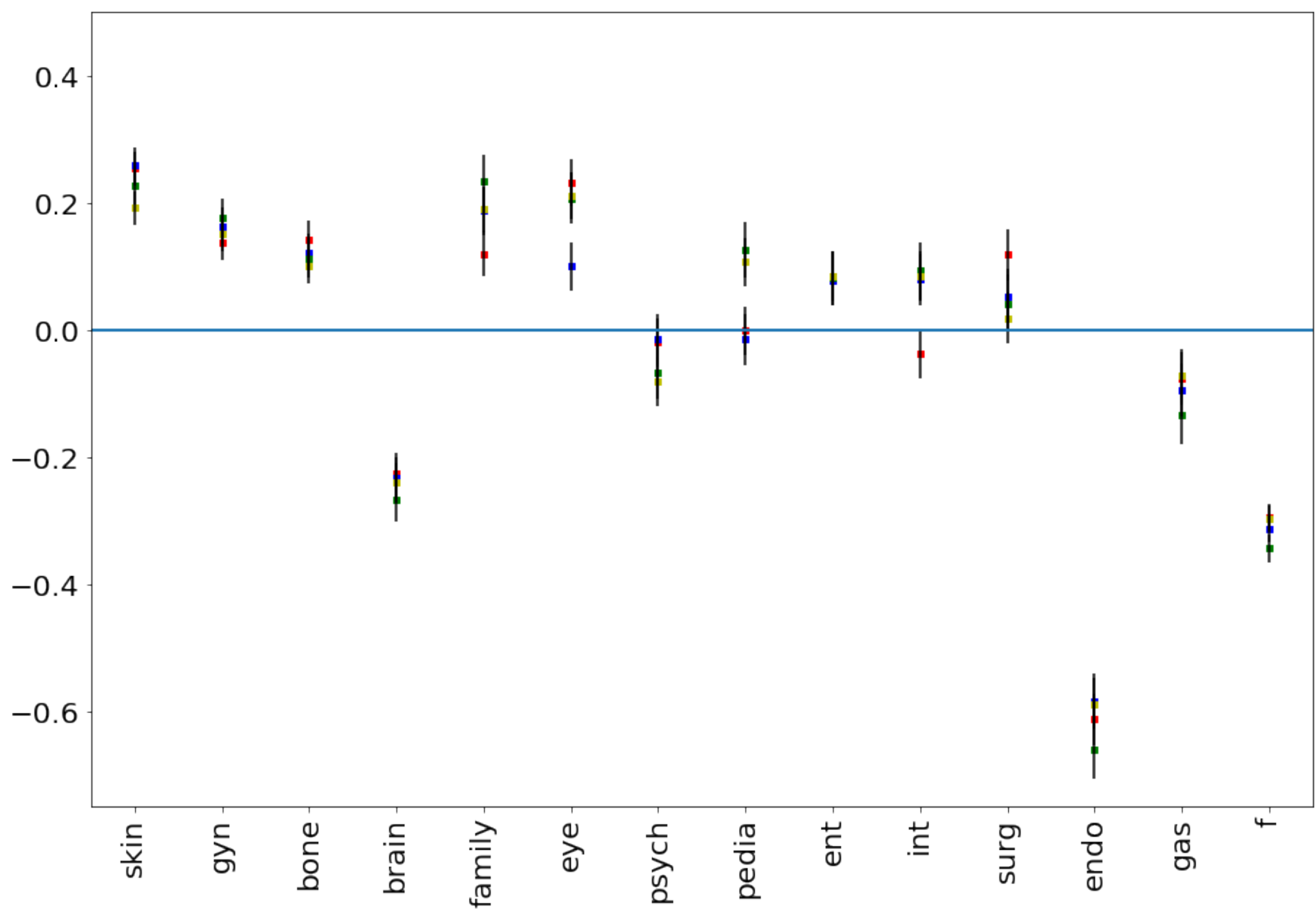
- > Rating Regression: for the four aspect ratings (factors like gender and specialty)
- > Lexical regression: over counts of words with respect to gender and specialty variables.
- > Word Embeddings: state-of-the-art neural distributed representations of text
- > Algebra over Word Vectors: to explore the differential use of vocabulary.

## Results

Adjoining plot shows regression coefficients (for 13 specialties and the female coefficient) learnt over ratings for the four aspects:

- Staff: **R**
- Helpfulness: **B**
- Punctuality: **G**
- Knowledgeability: **Y**

Note: Constant coefficients are: [4.64, 4.65, 4.60, 4.69]



$$1 + f - m$$

(positive words for female physicians)

Greatest  
Awesome  
Sweet  
Skilled  
Considerate  
Caring  
Personable  
Compassionate  
Fabulous

$$1 + m - f$$

(positive words for male physicians)

Great  
Professional  
Best  
Knowledgeable  
Kind  
Helpful  
Amazing  
Thorough  
Excellent

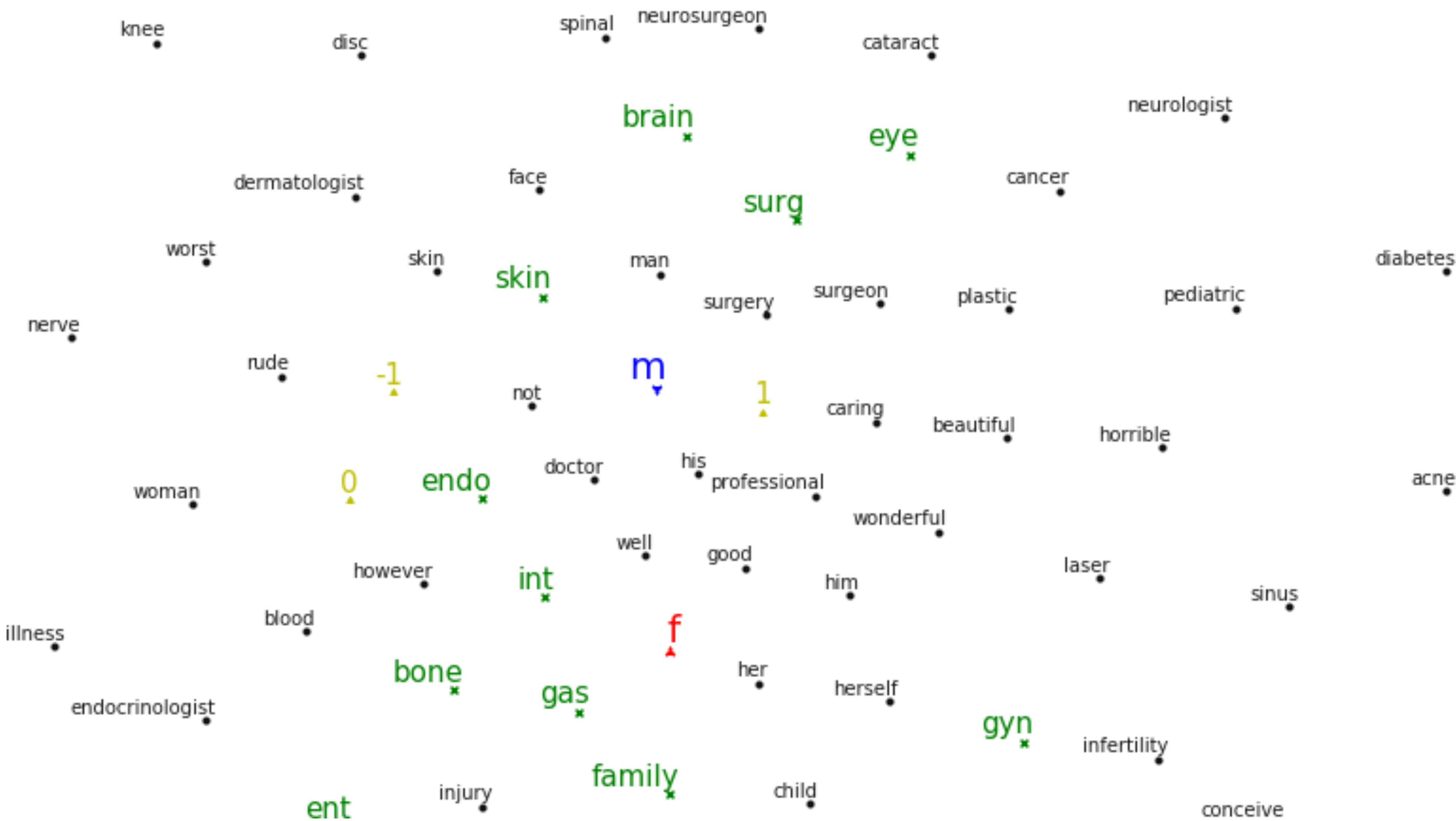


Figure 1: t-SNE plot of the learned word and class embeddings over online reviews of physicians.