Are Online Reviews of Physicians Biased Against Female Providers?

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Motivation

72% of internet users have looked **online** for health information in the past year.

One in five of these users have looked for **reviews** of either particular treatments or doctors.

pewinternet.org/wp-content/uploads/sites/9/media/Files/Reports/PIP_HealthOnline.pdf

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2. Find a Doctor Near Me   >
3. Best Local Doctors   >
4. Primary Care Doctors   >

local

Search over 2 million Doctor reviews and ratings.

Specialty: Family Doctor / G.P.   ▼

City Name

Doctor Name

○ All   ○ Male   ○ Female

🔍 Find a Doctor

The Best Doctors near Ann Arbor, MI

Family Doctor / G.P.
Gynecologist (OBGYN)
Dentist
Orthopedic Surgeon
Internist / Geriatrician
Plastic / Cosmetic Surgeon, P...
Dermatologist
Psychologist
Psychiatrist
Chiropractor
General Surgeon

Family Doctor / G.P.   View All

Dr. Steven J. Thiry
★★★★★ 10 reviews
"Excellent 5 🎈 calls me wherever I am. May not be taking new pge."

Dr. Vaishali Katial
★★★★½ 12 reviews
"Dr. Katial is not only knowledgeable, but genuinely kind, caring, and ..."

Dr. Roger H. Chen
★★★★½ 11 reviews
"I have been very pleased with Dr. Chen. He is friendly, respectful, ..."

Dr. Denise L. Campbell-Scherer
★★★★★ 6 reviews
"She is an amazing doctor who is

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Ratings for Dr. Steven J. Thiry

5 Staff | **4** Punctuality | **5** Helpfulness | **5** Knowledge ★★★★★

Excellent 5 🎈 calls me wherever I am. May not be taking new pge.

Was this rating useful? 0 👍   flag | Submitted October 11, 2014

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5 Staff | **5** Punctuality | **5** Helpfulness | **5** Knowledge ★★★★★

Great Doctor. I always feel has a quick insight and a good treatment plan for any afflictions. If he is not sure he can diagnose, he is able to make very confident referrals, but most of the time his advice and treatment at spot on. Much more attentive, accessible and responsive than my last physician.

Was this rating useful? 1 👍   flag | Submitted March 25, 2013

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4 Staff | **4** Punctuality | **5** Helpfulness | **5** Knowledge ★★★★½

I wouldn't switch for any other doctor. He does what most doctors don't. Takes time with his patients.

Was this rating useful? 1 👍   flag | Submitted January 13, 2012

★ Rate This Doctor

Our Dataset

- 48,567 Reviews
- 6,945 Physicians
- 57 Specialties

Male v/s Female physicians

This doctor is fantastic and she's beautiful. Surgery was smooth and actually painless. And I've never been to a doctor that looks like this before.
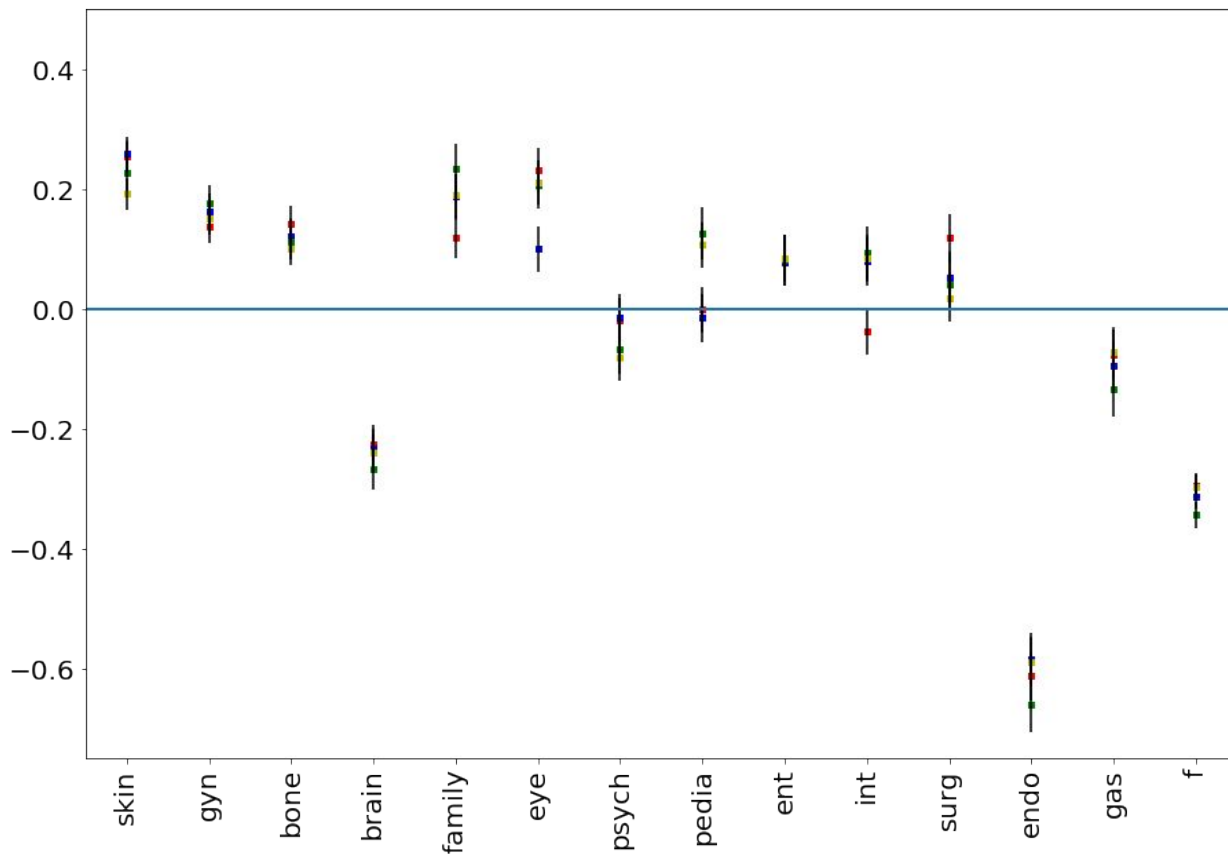
… She does meticulous work; she is wonderful, caring, and very knowledgeable, confident, available, and just beautiful! The staff is very pleasant also.

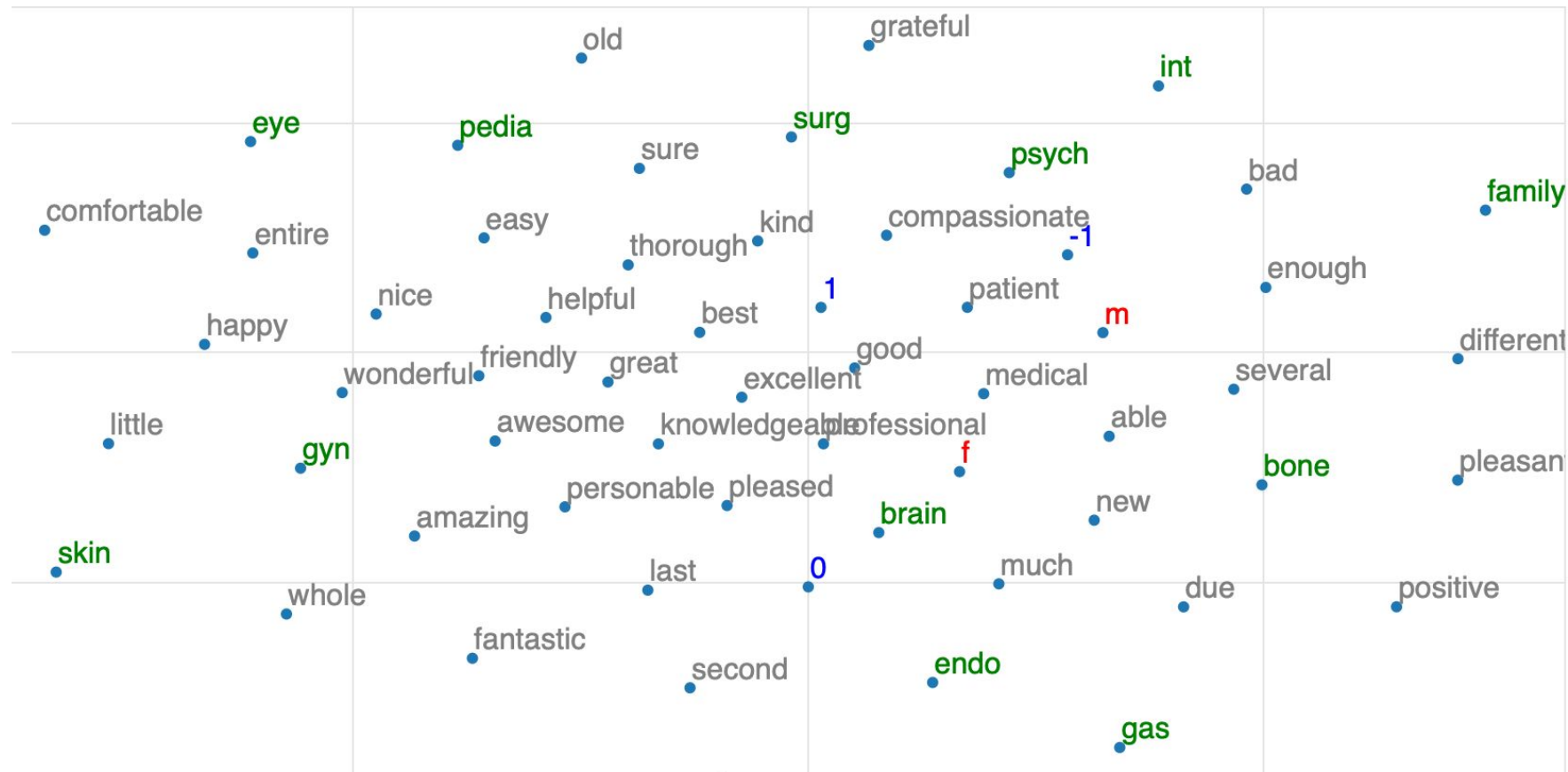One of the most beautiful doctors you'll ever see.

Male v/s Female physicians

Linear Regression
model over the Ratings
(out of 5) for physicians.

Female coefficient:

- 0.3

Male v/s Female physicians

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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

Table 1: Sample data scraped from RateMDs.com
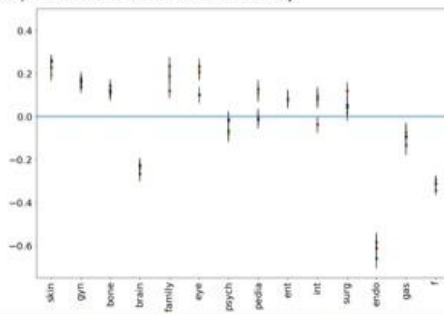
-> <u>Rating Regression</u>: for the four aspect ratings (factors like gender and specialty)
-> <u>Lexical regression</u>: over counts of words with respect to gender and specialty variables.
-> <u>Word Embeddings</u>: state-of-the-art neural distributed representations of text
-> <u>Algebra over Word Vectors</u>: 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.