

UROP report Jan 18

Credibility analysis in health communities

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Recap - Credibility analysis

About my project

- Explore online health communities such as healthboards, quora and analyse credibility of user posts
- Implement baselines and propose methods to classify user posts as credible or not



Dataset

724,916 posts from 14101 users in 87,287 threads about 1329 drugs

UMLS used to extract biomedical concepts and terms

Pre-trained word2vec model from Google with embedding dimension = 300

Ground truth obtained from Mayo Clinic portal as free text

A document is label “credible” (positive) if the similar between it and the actual side-effect greater than a certain threshold

03-27-2015, 06:20 PM

#2

Jumpingbeans
Junior Member
(female)

Join Date: Mar 2015
Location: Europe
Posts: 29

Re: Amitriptyline (Elavil) dangerous?

Amitriptyline is one of the most commonly used anti-depressive drugs used in the UK (along side dosulepin and imipramine). Side effects of all three of these drugs are; dry mouth, constipation, tremor, blurred vision, urinary retention, weight gain and sedation. It is also possible that you can have cardiovascular side effects, such as QT prolongation, arrhythmias or postural hypotension (feeling dizzy when standing up or leaning over).

In 1970 an article was published relating Amitriptyline with sudden cardiac death. This is only valid in a small number of cardiac patients. So if you have no reason to think that you have something wrong with your heart, this is not a side effect. Of course, be cautious of any changes (palpitations, dizziness and/or chest pain). The chances of this is extremely rare.

As a concluding remark, I'd say if it is one of the top three drugs in the UK, and you have no cardiac condition, you don't need to worry.

Hope this gives you peace of mind

Last edited by moderator2; 03-27-2015 at 06:21 PM.

[Quote Reply](#)

03-27-2015, 08:34 PM

#3

kimber6821
Newbie
(female)

Join Date: Mar 2015
Posts: 4

Re: Amitriptyline (Elavil) dangerous?

Thank you for the feedback. I don't have any real heart problems that I'm aware of - have had EKGs and heart sonograms in the past out of fear/anxiety but they always come back normal. My most recent EKG was this past November after a bad panic episode - it was normal. Heart failure is an irrational fear that I've always had - my father has had two heart attacks and the first one happened when I was very young....it left a mark on me for sure.

[Quote Reply](#)

03-28-2015, 05:37 AM

#4

Jumpingbeans
Junior Member
(female)

Join Date: Mar 2015
Location: Europe
Posts: 29

Re: Amitriptyline (Elavil) dangerous?

I can imagine that leaves you feeling very anxious! Just be aware that it can happen and if you are taking the pills long term, make sure you get checked (blood pressure, listen to your heart rhythm and if you really feel that there's something wrong get another EKG)

[Quote Reply](#)

10-02-2017, 06:16 PM

#5

RUFUS100
Senior Member
(female)

Join Date: Mar 2009
Location: OHIO
Posts: 116

Re: Amitriptyline (Elavil) dangerous?

How are you doing now with the Elavil and are you still on it? Just curious as my doctor just perscribed me 25mg for insomnia.

[Quote Reply](#)

Side Effects

Drug information provided by: [Micromedex](#)

Along with its needed effects, a medicine may cause some unwanted effects. Although not all of these side effects may occur, if they do occur they may need medical attention.

Check with your doctor immediately if any of the following side effects occur:

Incidence not known

- Abdominal or stomach pain
- agitation
- black, tarry stools
- bleeding gums
- blood in urine or stools
- blurred vision
- burning, crawling, itching, numbness, prickling, "pins and needles", or tingling feelings
- change in consciousness
- changes in patterns and rhythms of speech
- chest pain or discomfort
- chills
- cold sweats
- coma
- confusion
- confusion about identity, place, and time



Updates

- Re-propose methodology
- Compute mathematics derivation
- Include charts and graphs



1) Re-propose methodology

a) On ground-truth annotation

- The dataset from original paper was not annotated by experts
- There's no feature that is directly correlated with a post credibility (such as the number of likes) to determine its label.
- However, actual side effects of drug exist, and I wish to measure the similarity between them and the post in question to infer the correct label for training
- 2 questions:
 - What type of similarity to use?
 - How to determine the cut-off threshold?



Jaccard similarity

- A sensible way
- Defined as

$$J(A, B) = \frac{|A \cap B|}{|A \cup B|}$$

- However, it does not take into account semantics
- E.g. *heart* and *cardiac* have great similarity

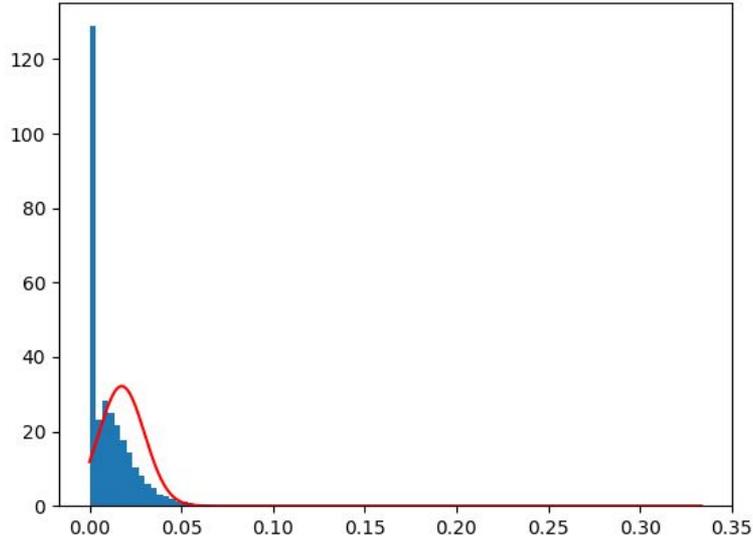


Word embedding with tf-idf weighted

- The summation of words in a post and the corresponding side effects (truth), weighted by the word's tf-idf.
- Similarity is measured by cosine similarity between post and truth vectors
- Takes into account semantics



Jaccard distribution



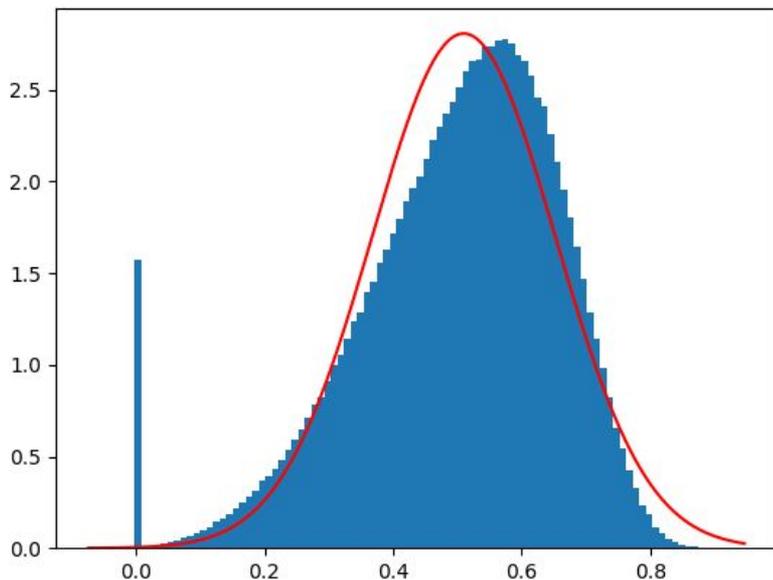
I fit a random distribution to the data after omitting data points with 0 similarity

Mean: 0.01753

Standard deviation: 0.012



Word-embedding with tf-idf weighted distribution



I fit a random distribution to the data after omitting data points with less than 0.01 similarity

Mean: 0.50973

Standard deviation: 0.142

=> I decided to choose word-embedding with tf-idf, cut-off threshold = mean, to annotate my dataset



b) On architecture and loss function

- For supervised learning and binary classification, I decided to adopt logistic loss with maximum likelihood estimation

$$\max \prod_{i=0}^N \theta(s) \quad \text{where} \quad \theta(s) = \frac{1}{1+e^{-s}}$$

- Total signal

$$s = y_n(\alpha W_u r_u + \beta \text{sim}(x_p W, x_t W) + (1 - \alpha - \beta) \text{sim}(x_t W, v_u))$$

- Where $\text{sim}(x, y) = x^T y$ (dot product)
- The signal is a linear combination of 3 components:
 - User feature signal $W_u r_u$
 - Similarity between post vector and thread vector $\text{sim}(x_p W, x_t W)$
 - Similarity between user expertise vector and thread vector $\text{sim}(x_t W, v_u)$

b) On architecture and loss function

Symbol	Description	Dimension
V	Number of vocabulary	Scalar
D	Word embedding dimension	Scalar
U	Number of user	Scalar
F	Number of user feature	Scalar
W_u	User feature weight vector	R^F
x_p, x_t	Document matrix of a post and a thread	$R^{D \times V}$
W	Word weight vector	R^V
v_u	User embedding	R^D



b) On architecture and loss function

Document matrices x_p, x_t are formed by

$$[f_1 \times x_1, \dots, f_i \times x_i, \dots, f_V \times x_V]$$

Where x_i is the word embedding from our pre-trained model

f_i Is the word frequency in document



2) Mathematics derivation

By maximizing log likelihood, we minimize the following loss function

$$E_{in} = -\frac{1}{N} \sum_{n=1}^N \ln(1 + e^{-s})$$

Where $s = y_n(\alpha W_u r_u + \beta \text{sim}(x_p W, x_t W) + (1 - \alpha - \beta) \text{sim}(x_t W, v_u))$



2) Mathematics derivation

Derivative w.r.t W_u

$$\frac{\partial E_{in}}{\partial W_u} = -\frac{1}{N} \sum_{n=1}^N \frac{\partial s}{1+e^s} = -\frac{1}{N} \sum_{n=1}^N \frac{y_n \alpha f_u}{1+e^s}$$

With gradient descent based optimization

$$W_u(t+1) = W_u(t) + \eta \frac{1}{N} \sum_{n=1}^N \frac{1}{1+e^s} y_n \alpha f_u$$

When there's misclassification, \mathcal{S} is negative $\frac{1}{1+e^s} \rightarrow 1$

W_u is updated according to f_u



2) Mathematics derivation

Derivative w.r.t W

$$\frac{\partial E_{in}}{\partial W} = -\frac{1}{N} \sum_{n=1}^N \frac{\frac{\partial s}{\partial W}}{1+e^s} = -\frac{1}{N} \sum_{n=1}^N \frac{y_n \beta(2x_p x_t^T W + x_t v_u)}{1+e^s}$$

With gradient descent based optimization

$$W(t+1) = W(t) + \eta \frac{1}{N} \sum_{n=1}^N \frac{1}{1+e^s} y_n \beta(2x_p x_t^T W + x_t v_u)$$

When there's misclassification, s is negative $\frac{1}{1+e^s} \rightarrow 1$

W is updated according to $x_p x_t^T W$ (approximate similarity between post vectors and the thread vectors) and $x_t v_u$ (approximate similarity between thread vectors and user expertise vector)



2) Mathematics derivation

Derivative w.r.t v_u

$$\frac{\partial E_{in}}{\partial v_u} = -\frac{1}{N} \sum_{n=1}^N \frac{\partial s}{\partial v_u} = -\frac{1}{N} \sum_{n=1}^N \frac{y_n(1-\alpha-\beta)x_t W}{1+e^s}$$

With gradient descent based optimization

$$v_u(t+1) = v_u(t) + \eta \frac{1}{N} \sum_{n=1}^N \frac{1}{1+e^s} y_n(1-\alpha-\beta)x_t W$$

When there's misclassification, \mathcal{S} is negative $\frac{1}{1+e^s} \rightarrow 1$

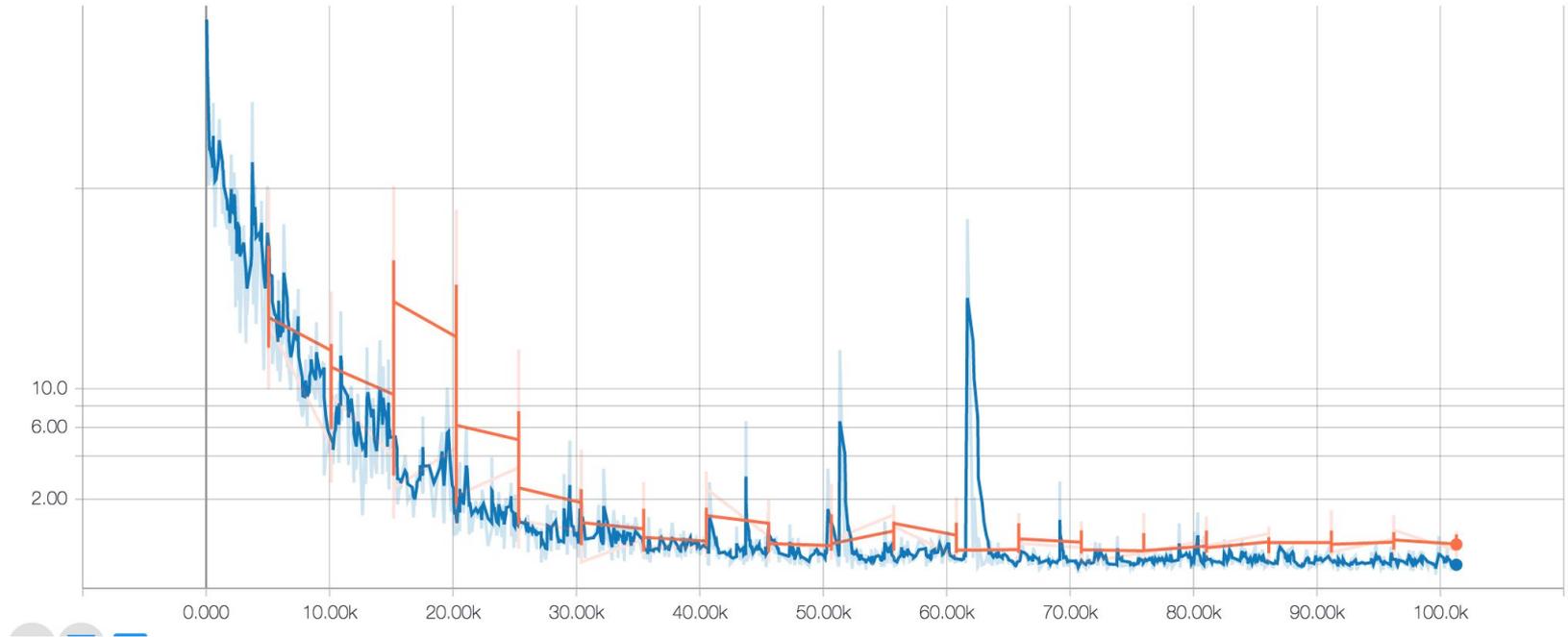
v_u is updated according to $x_t W$ or the average of all thread vectors



3) Chart and graph

a) Loss

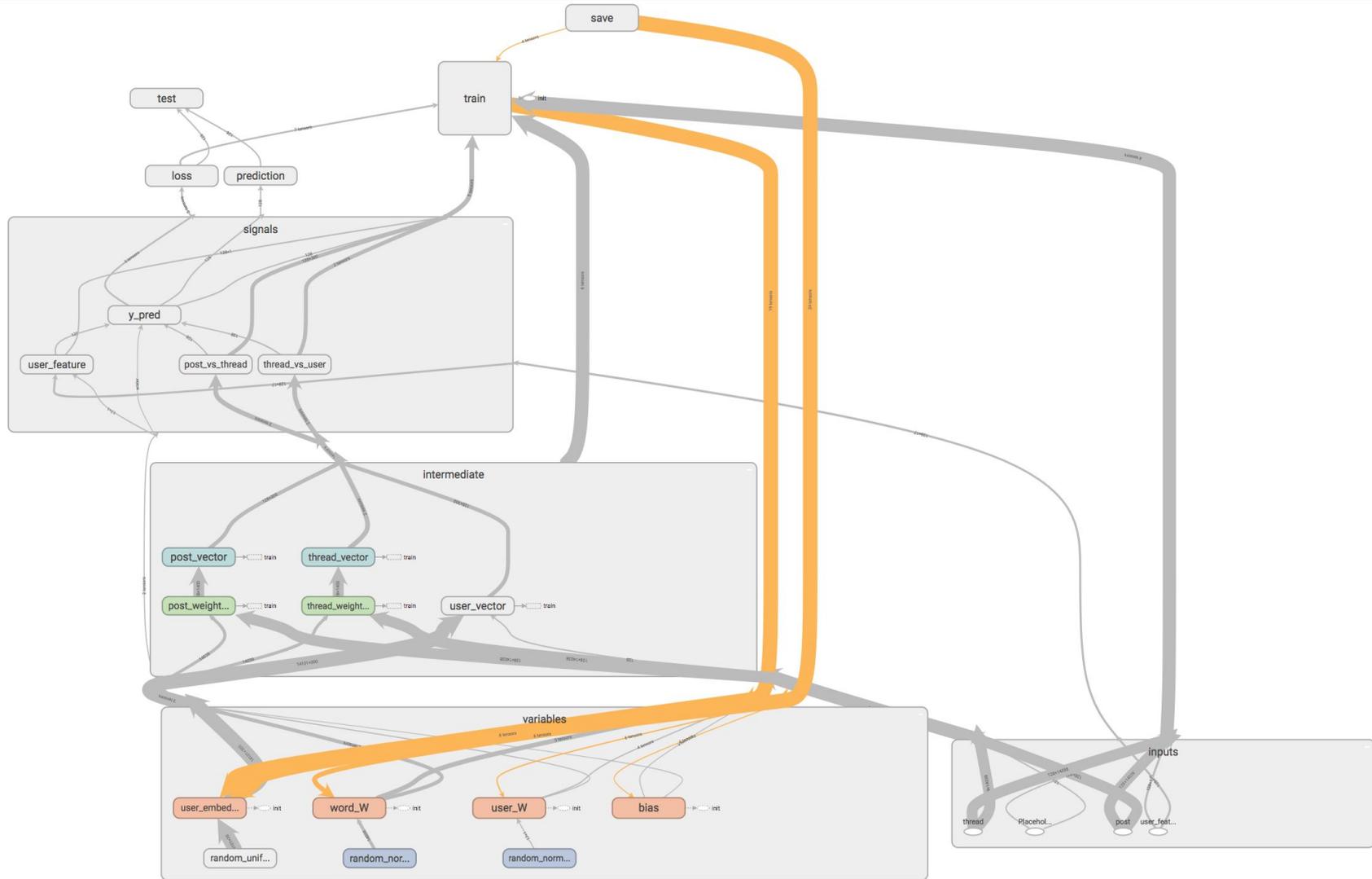
loss/loss





3) Chart and graph

b) Tensorflow computation graph





4) Results

	Proposed method	MLP	W_{ur_u}	$sim(x_p W, x_t W)$	$sim(x_t W, v_u)$
Area under the curve	0.8173				
Accuracy	75.08	78.08	0.5411	0.7109	0.6157
Recall	74.59	66.42			
Precision	77.62	89.68			
F1 score	76.08	76.32			