

# Linguistic-based Sentiment Analysis: Problems, Lexical Resources and Evaluation

Rodrigo Agerri

# Outline

## 1 E-Drama

- Emotion Detection

## 2 Implicit Expression of Affect: Stereotypes

- Affect via Metaphor from E-Drama transcripts
- Figurative Categorization for detection of emotion
- Sentiment Analysis
- Some Examples

## 3 Concluding Remarks

# Disclaimer

- The E-Drama section is provided in this presentation to contextualize section 2. For references to E-Drama described in section 1 of this presentation, please go to Zhang et al. (2007).
- The tool E-Drama is property of Hi8tus:  
<http://www.edrama.co.uk>
- (Part of) the content of section 2 onwards can be found in Wallington et al. (2009).
- Any opinion (scientific or otherwise) expressed in this presentation can only be attributed to Rodrigo Agerri (not to every author of Wallington et al. (2009)).

# Urban Dictionary: E-drama#1

- 1 To have a Real Life Drama on The Internet with someone else.

*"shawn hasnt been online in 5 days now i think hes dating someone else!! or hes **blocked** me from msn, i think im going to **rid myself** from this **horrible world**, i HATE my life".*

<http://www.urbandictionary.com/define.php?term=e-drama>

## Urban Dictionary:E-drama#2

- 2 Frequently used during online gaming and MMORPG'S such as; World of Warcraft. E-Drama describes a moment in time when something is going on and alot of **drama and fuss** is being caused.

*-Erenion has left the guild-*

*Korfax:Dude, Erenion ninjaed the guild bank!*

*Rital: No way, dude we had 9000 gold in there!*

*Carion: **WTF** E-DRAMA*

<http://www.urbandictionary.com/define.php?term=e-drama>

## Urban Dictionary:E-drama#3

- 3 To be constantly getting into meaningless fights upon the Internet, and experiencing emotions from it: Fear, Regret, Sadness, Anger.

*Random Dude: **OMG** man...I just got into a **fight** with my girlfriend....She was **mad** that she wasnt in my myspace! Y\_Y*

*You: You have a girlfriend?*

*Random Dude: Yes, she lives in Florida. Ive been talkin to her on Myspace for 6 months and im like, seriously **crying**...*

*You: E-drama...*

<http://www.urbandictionary.com/define.php?term=e-drama>

# WordNet: N(drama)

- 1 a dramatic work intended for **performance by actors on a stage**.
- 2 an episode that is turbulent or **highly emotional**
- 3 the literary genre of works intended for the **theater**
- 4 the quality of being arresting or **highly emotional**

## E-drama: E-Drama

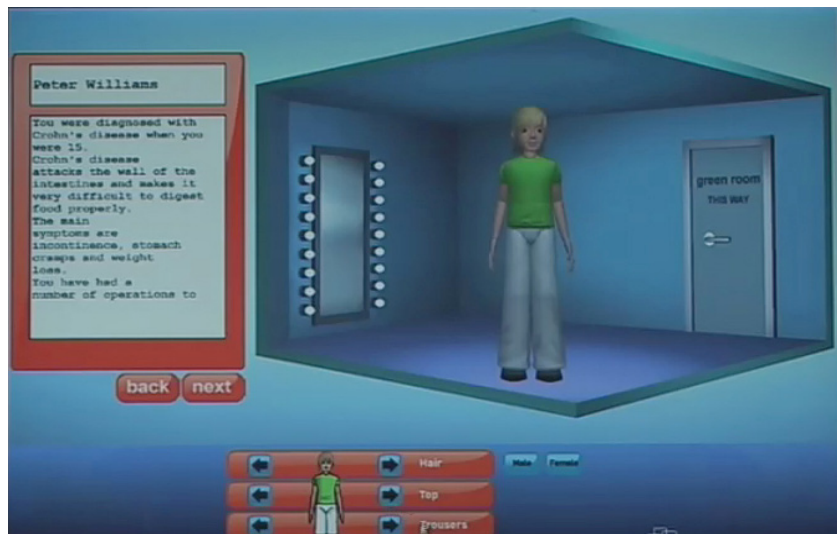




## Background:E-Drama

- Virtual Improvised drama in education.
- Virtual characters (avatars) interact under human control.
- E-Drama helps students lose their usual inhibitions.

# Background:E-Drama



## Background:E-Drama



# Human Director

- Monitoring actors' interactions.
- Intervention by sending messages to actors.
- Control a bit-part character.

Heavy burden on novice teachers-directors

# Automate Director Functions

- Fully automated control of an optionally-included bit-part character
- Sending automated suggestions to the human director

Our work focused on point 1

# Automated Actor

- Intelligent Conversational Agent (ICA) controls a character in the edrama (Dave Atkins).
- Dave makes (contentless) emotionally appropriate responses to keep the conversation flowing and stimulate improvisation.
- It saves work to human directors.
- Dave does not aim to extract full meaning of characters' interventions, but to detect emotions that will allow it to generate appropriate responses.
- User-centred evaluation suggests that this is sufficient to stimulate improvisation and keep edrama on topic.

# Dave's Merits

Not just the positive first person case, but also

- 1 Affect that X implies it lacks
- 2 affect that X implies that other characters have/lack
- 3 Questions, commands, injunction, implicit conveyance of affect (metaphor), etc.
- 4 Affect labels (Ortony et al., 1988; Ekman, 1992), P/N polarity (Watson and Tellegen, 1985), intensity (Ortony et al., 1988).

Emotions involved in edrama furthered by the themes (school bullying and Crohn's disease).

# Emotions Granularity

- **Fine-grained:** Emotion label + intensity if strong text clue detected.
- **Coarse-grained:** Polarity + intensity if weak text clue

Other approaches (WordNet-Affect, SentiWordNet) also varied granularity in detecting and/or labelling emotions.

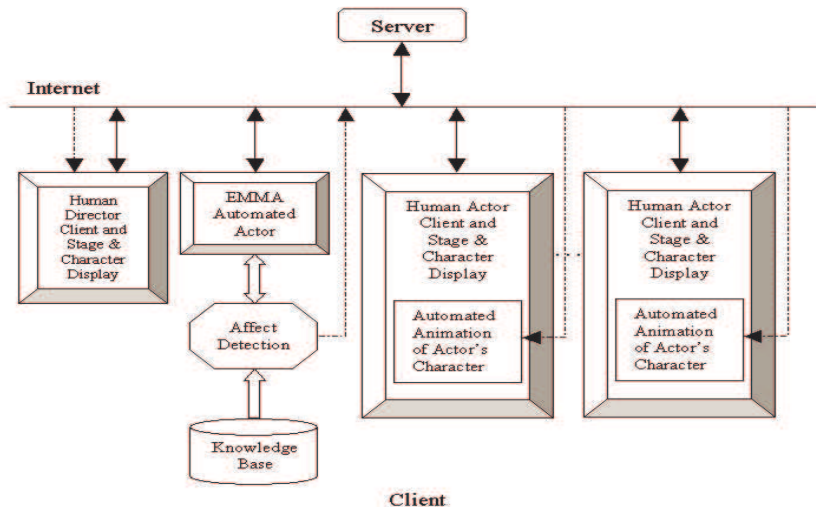


# Data Collections: What do they tell us?

Transcripts automatically recorded during user-testing.

- Language is complex and idiosyncratic: Ungrammatical, abbreviations, mis-spellings, textese.
- Detecting affect and building representation of affective connotations more important than building an interpretation of text (for the application).

# Overview



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# Emotion/Polarity Detection

Polarity, Emotion, and Politeness.

Approach	Features
<b>Pattern-Matching</b>	Keywords Punctuation/Capitalisation Specific expressions/idioms Imperatives
<b>Linguistic Techniques</b>	Robust Parsing for sentence types Lexical Resources: Synonyms Implicit Expressions of Affect <b>Stereotypes and Figurative Language</b>

# Pre-processing: Non-trivial problems

- Slang: Brummie screwdriver (stupid).
- Abbreviation: C u l8r
- Ambiguity: I am 2 hungry 2 walk
- Upper case: SHUDUP!
- Special punctuation: Repeated exclamation/interrogation marks, etc. (Metaphone spelling-correction algorithm and dictionary).
- Open-ended interjective and onomatopoeic elements: Hm, ow, grrr, oh, errr, agghhh.

# Emotional Brummy Slang

- Wench: Girl.
- Ar'l goo tClent: Expression of surprise.
- Bint: Slightly derogatory term for a young woman.
- Bloke: A gentleman.
- Gorra cobb on: in a bad mood.
- On a Loin: Annoyed, angry

# Brummy Idioms Carry Affect

- Larkin around: being silly/stupid.
- Getin on a line: On the verge of loosing your temper.
- Shut yer gob, there's a buzz comin': Your mouth is too large.
- He's got a bob on hisself: He thinks a lot of himself.

# Emotion Detection: Pattern Matching

- Explicitly deals with slang, idioms, punctuation.
- Simple explicit expressions.
- First person with future tense (threatening emotional state).



# Imperatives

Useful pointer of affect.

- Repetitive forms: “Shut up” (shutup) or “mind your own business”.
- Rasp parser recognized many imperatives as declarative sentences (“please leave me alone”).
- Heuristic approach based on Rasp output: “you go away”, “dave get lost”, etc.
- Exception in pattern “name verb me” as in “Lisa hit me”, if verb is negative, then the sentence is declarative.
- “do not you + base form of a verb”: Rasp considers it to be interrogative.

# Simple use of Robust Parsing

- Sentence type information with affective keywords: “I like the place when is quiet”.
- Imp+please (polite).

# Simple use of WordNet

- I want my mum (fear), I hate you (dislike), I like you (liking).
- Pattern matching rules to obtain emotion state and Dave's response.
- If not result, then WN is used to retrieve synonyms of the verb, replace the original verb and sent to the pattern matching module.
- Disambiguation of WN senses is done against Heise's 1000 most frequently used words (labelled by polarity).

# User-based Evaluation

- 2 day pilot user test, 39 students.
- Aim: Measuring the extent to which having Dave as opposed to a person changes users' experience while using edrama.
- No statistical difference to measures of user engagement and enjoyment, or with respect to the contributions of Dave.
- Frequencies of Dave (program) and Dave (person) (and other characters in the edrama) being responded were roughly around 30%.

# System-based Evaluation

- Human annotation of transcripts (gold-standard) by two annotators.
- Kappa =  $P(A) - P(E) / 1 - P(E)$  (Carletta, 1996).

	Inter-Annotator	Human1-Dave	Human2-Dave
25 Labels	0.32	0.32	0.23
3 Labels	0.65	0.55	0.42

# The importance of stereotypes

A study was conducted in 2008 where people were asked to grade the intelligence of a person based on their accent and the Brummie accent was ranked as the least intelligent accent.

**It even scored lower than being silent**, an example of the stereotype attached to the Brummie accent.

[Wikipedia]

# Expressing Emotion via Stereotypes

- Folk knowledge expressed via stereotypes.
- 36% of animal patterns on the Web describe a kind of Person, more than other kinds of Animal (32%).
- Implicit Expression of Emotion via Figurative Categorization.
- Note that polarity can be assigned to objective senses too, not only subjective (tuberculosis, etc.).

└ Implicit Expression of Affect: Stereotypes

└ Affect via Metaphor from E-Drama transcripts

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# Affect via Figurative Categorization

Detection and analysis of polarity via figurative categorization:  
e.g., when a human is cast as a non-human of various sorts:

- **As an animal:** Words with a conventional and non-conventional sense. **Adults** convey **negative affect**, **young** conveys **positive** (pig:piglet, dog:puppy, etc.).
- **Monster, mythical creature or supernatural being:** monster, dragon, angel, devil.
- **Artefact, substance or natural object:** Sewer, real diamond, rock.
- **Size adjectives** 'adj X' also convey affect: negative (little devils), positive (little angel), contempt (little rat), importance and/or intensity (big event, big bully).
- **X** can itself be figurative: big baby.

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# Signals

<http://www.cs.bham.ac.uk/jab/ATT-Meta/metaphoricity-signals.html>

- Metaphoricity signals that often have metaphors as collocates.
- 3 syntactic structures: 'X is/are Y', 'You Y' and 'like [a] Y'.
- 3 lexical strings: 'a bit of a', 'such a', 'look[s] like'.

Similes are considered crucial to figurative categorization and a stereotypical way of expressing implicit opinion.

# Proportion of Cases

Signal	Proportion of cases
X is/are a Y	38%
You Y	61%
a bit of a/such a	40%
looks like/like	81%

# Signals Detection

The Grammatical Relations (GRs) output of RASP (Briscoe et al.,2006) are used.

- 1 A list of signals.
- 2 The X and Y nouns from the syntactic signals.
- 3 A list of words modifying that noun.

# Detection of X is a Y

|ncsubj| |be+\_vbr| |you\_ppy|

**(the subject of 'are' is 'you')**

|xcomp| |be+\_vbr| |pig\_nn1|

**(the complement of 'are' is 'pig')**

|det| |pig\_nn1| |a\_at1|

**(the determiner of pig is a)**

Output of vbr and ppy are specific to 'are' and 'you' which also allows to detect tags for 'is', 'she', 'he', 'it' and for proper and common nouns too.

# Detection of 'You Y'

|ncmod| |you\_ppy| |idiot\_nn1|

**Y= 'idiot'**

**Problem:** POS tagger favours tagging Y as a verb (as in 'you cow').

- Our system looks the word up in the list of tagged words of RASP tagger.
- If the verb can be tagged as a noun, the tag is changed, and the metaphoricity signal is detected.
- GRs between the verb and Y are the same regardless of the Y having adjectival modifiers.

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# General Approach

X and Y: WordNet to analyze them.

- 1 **X:** Edrama proper names and WordNet.
- 2 **Y:** Analyzed using WordNet's taxonomy looking for **hyponyms** of animals, supernatural beings, artifacts or natural objects.

# Analyzing Y

- 1 Look for senses that are hyponyms of Person, as some metaphors are in the synsets already.
- 2 If a word contains different synsets that are hyponym of both Animal and Person, then we search for evaluative content about the metaphor.
- 3 It looks down the various hyponym chains of the term looking for instances with Person hypernym. All the terms are polarity-labelled and the polarity taking if ratio of 3 to 1.
- 4 If 4 fails, then the hypernym chain of the term is retrieved up to "Person, Animal, Artefact, etc." and their polarities evaluated.

# Assigning polarity to senses in WN

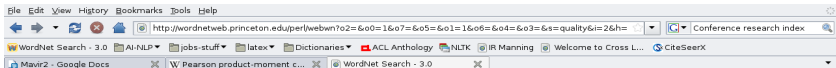
Intermediate synsets between the metaphorical sense of a term and Person contain glosses (description of semantic content of a synset).

- 1 **Shark** (hyponym of person): “a person who is ruthless and greedy and dishonest”.
- 2 **Fox**: “Shifty deceptive person”.
- 3 Search the glosses for words that indicate affective evaluation.
- 4 Crude method (not parsing of glosses so far).

# Auto-PNWN vs SentiWordNet

- **SentiWordNet**: Numerical scores for positive, negative or objective.
- **However**, most of the terms were assigned an objective score.
- **Instead** we created a small list (over 100 words) from WordNet itself using the 'quality' synset which has attribute links to four other synsets (good, bad, positive and negative) and performing 4 iterations through the “see also” links.

# Quality



## WordNet Search - 3.0 - [WordNet home page](#) - [Glossary](#) - [Help](#)

Word to search for:

Display Options:

Key: "S:" = Show Synset (semantic) relations, "W:" = Show Word (lexical) relations

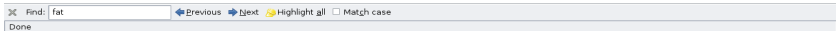
### Noun

- **S: (n) quality** (an essential and distinguishing attribute of something or someone) *"the quality of mercy is not strained"--Shakespeare*
  - [direct hyponym](#) / [full hyponym](#)
  - [attribute](#)
    - **S: (adj) good** (having desirable or positive qualities especially those suitable for a thing specified) *"good news from the hospital"; "a good report card"; "when she was good she was very very good"; "a good knife is one good for cutting"; "this stump will make a good picnic table"; "a good check"; "a good joke"; "a good exterior paint"; "a good secretary"; "a good dress for the office"*
    - **S: (adj) bad** (having undesirable or negative qualities) *"a bad report card"; "his sloppy appearance made a bad impression"; "a bad little boy"; "clothes in bad shape"; "a bad cut"; "bad luck"; "the news was very bad"; "the reviews were bad"; "the pay is bad"; "it was a bad light for reading"; "the movie was a bad choice"*
    - **S: (adj) positive** (characterized by or displaying affirmation or acceptance or certainty etc.) *"a positive attitude"; "the reviews were all positive"; "a positive benefit"; "a positive demand"*
    - **S: (adj) negative** (characterized by or displaying negation or denial or opposition or resistance; having no positive features) *"a negative outlook on life"; "a colorless negative personality"; "a negative evaluation"; "a negative reaction to an advertising campaign"*
    - [direct hypernym](#) / [inherited hypernym](#) / [sister term](#)
    - [derivationally related form](#)
- **S: (n) quality, caliber, calibre** (a degree or grade of excellence or worth) *"the quality of students has risen"; "an executive of low caliber"*
- **S: (n) quality, character, lineament** (a characteristic property that defines the apparent individual nature of something) *"each town has a quality all its own"; "the radical character of our demands"*
- **S: (n) timbre, timber, quality, tone** ((music) the distinctive property of a complex sound (a voice or noise or musical sound)) *"the timbre of her soprano was rich and lovely"; "the muffled tones of the broken bell summoned them to meet"*
- **S: (n) quality** (high social status) *"a man of quality"*

### Adjective

- **S: (adj) choice, prime, prize, quality, select** (of superior grade) *"choice wines"; "prime beef"; "prize carnations"; "quality paper"; "select peaches"*
- **S: (adj) quality** (of high social status) *"people of quality"; "a quality family"*

[WordNet home page](#)



# Extracting Bad-Attributed Terms

File Edit View History Bookmarks Tools Help

http://wordnetweb.princeton.edu/perl/webwn?o2=6o0=16o7=6o5=6o1=16o6=6o4=6o3=6s=quality6i=56h= Conference research index

WordNet Search - 3.0 AI-NLP jobs-stuff latex Dictionaries ACL Anthology NLTK IR Manning Welcome to Cross L... CiteSeerX

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      - [see also](#)
        - S: (adj) disobedient** (not obeying or complying with commands of those in authority) *"disobedient children"*
        - S: (adj) evil** (morally bad or wrong) *"evil purposes"; "an evil influence"; "evil deeds"*
        - S: (adj) unfavorable, unfavourable** (not encouraging or approving or pleasing) *"unfavorable conditions"; "an unfavorable comparison"; "unfavorable comments"; "unfavorable impression"*
        - S: (adj) worse** (comparative of 'bad') inferior in quality or condition or desirability) *"this road is worse than the first one we took"; "the road is in worse shape than it was"; "she was accused of worse things than cheating and lying"*
        - S: (adj) worst** ((superlative of 'bad') most wanting in quality or value or condition) *"the worst player on the team"; "the worst weather of the year"*
      - [similar to](#)
      - [attribute](#)
      - [antonym](#)
      - [derivationally related form](#)
    - S: (adj) positive** (characterized by or displaying affirmation or acceptance or certainty etc.) *"a positive attitude"; "the reviews were all positive"; "a positive benefit"; "a positive demand"*
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Find: fat Previous Next Highlight all Match case

Done

# Assigning Affective Evaluation

- Tallying positivity and negativity indicators.
- If the numbers are equal, term is labelled positive or negative (not possible to establish the affective quality).
- This method is also used in examples in which an animal does not have metaphorical sense as a kind of person (You elephant, You toad, etc.).

# Negation

- **Problem:** Persona non grata: “A person who for some reason is not wanted or welcome”.
- “is not X”, we look for antonyms of “X”, and for antonyms of antonyms.



# Modifiers

- 1 **Big**: More emphatic.
- 2 **Little**: If negative, then it expresses contempt. If positive, expresses affection.

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# You piglet

- 1 'You Y' signal and puts the noun 'piglet' on the blackboard.
- 2 'Piglet' hyponym of 'animal'.
- 3 'Person' not a hypernym, so gloss is retrieved.
- 4 'Young pig' found.
- 5 Words and glosses between in nodes between pig and person produces 5 negativity indicating words.
- 6 **Result:** Negative polarity with an affectionate sense.

# Mayid is a rock

- 1 'X is a Y' signal; 'rock' put on the blackboard.
- 2 'Mayid' is a person in edrama.
- 3 'Rock' hyponym of natural object.
- 4 Words and glosses of intermediate nodes between 'rock' and 'person' produce 1 negativity and 4 positivity indicating words.
- 5 Positive polarity of natural object.

## Other Examples

- little rat: negative polarity with added contempt.
- cow: Negative polarity.
- monster: 'positive or negative' polarity.
- feather: 'positive or negative' polarity.

# Evaluation

- 1 Gold-standard created by manually extracting 141 negative and 63 positive terms (two annotators, disagreements filtered out), from Animal, Artefact, Natural Object, Substance and Spiritual Being hyponym chains.
- 2 Using iteration over see-also from Quality attributes (previously described), evaluate the result against gold-standard.
- 3 Comparison to SentiWordNet.

	Accuracy
SeeAlso-PNWN	Pos 65.1, Neg 42.0
SentiWordNet	Pos 22.2, Neg 42.0

SeeAlso-PNWN: 3832 Pos, 1128 Neg (out of 27053 synsets).

SentiWN: 0.79% Pos, 0.96% Neg (out of 115424 synsets).

## Concluding Remarks

- Current Lexical resources do not contain enough relevant knowledge for sentiment analysis. Move to extracting knowledge from the Web, using specific signals.
- User-based vs system-based evaluations.
- System-based results for detection and analysis poor (as it shown in similar work: SemEval and SentiWN).
- Lack of resources related to Figurative Categorization.

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