REAL EYES REALIZE REAL LIES (OR MAYBE NOT):
THE THRILLING STUDY OF DECEPTION AND
SOME TOOLS FOR ITS DETECTION

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Why is deception such an appealing topic?
COMPUTATIONAL LINGUISTICS

Search of linguistic patterns

Certain specific phenomena

Interdisciplinary study

Linguistics  Psychology  Natural language processing
DECEPTION IN POPULAR CULTURE
AN EXAMPLE OF PSEUDOSCIENCE

- Neuro-linguistic programming (NLP) claim there is a connection between neurological processes, language and behavioral patterns learned through experience (*programming*).

- No scientific evidence supporting the claims made by NLP advocates about the relation between eye movements and deception.
ORIGIN OF DECEPTION: THEORY OF MIND, EMPATHY AND LIES

Empathy

Cognitive
The subject understands the others' thoughts and feelings and is able to adopt their perspective

Emotional
Emotional response fit for the others' emotional state
ORGIGIN OF DECEPTION: THEORY OF MIND, EMPATHY AND LIES

Theory of mind

- Empathy
- Cognitive: The subject understands the others’ thoughts and feelings and is able to adopt their perspective
- Emotional: Emotional response fit for the others’ emotional state
THEORY OF MIND

- Ability to attribute mental states—beliefs, intents, desires, emotions, knowledge, etc.—to oneself, and to others, and to understand that others have beliefs, desires, intentions, and perspectives that are different from one's own.

- Crucial for everyday social interactions and is used when analyzing, judging, and inferring others' behavior (Perner et al., 1987).
ORIGIN OF DECEPTION: THEORY OF MIND, EMPATHY AND Lies

Theory of mind

Empathy

Cognitive
  The subject understands the others' thoughts and feelings and is able to adopt their perspective

Emotional
  Emotional response fit for the others' emotional state

Simulation theory of empathy
Humans anticipate and make sense of the behavior of others by activating mental processes that, if carried into action, would produce similar behavior. It includes…
- intentional behavior
- expression of emotions

Children use their own emotions to predict what others will do
- We project our own mental states onto others

Ethnocentrism
- Our own group is the center of everything, so I’ll be a better simulator with individuals from my own group.
THE PROCESS OF LYING

LYING

EMOTIONAL ACTIVITY

BEHAVIOR MANAGEMENT

COGNITIVE ACTIVITY

EXCITEMENT

FEAR / GUILT

OVERCONTROL OF BEHAVIOR

- Think of possible answers
- Avoid self-contradiction
- Tell the lie coherently according to what the recipient knows

BAS

BIS / FFFS

STIFFNESS, LACK OF SPONTANEITY

OVERLOAD
REINFORCEMENT SENSITIVITY THEORY (RST)

- Gray (2000)
  - Major biological model of individual differences in emotion, motivation, and learning
  - Distinction between fear and anxiety, and links reinforcement processes to personality
AROUSAL

Source: High & Solomon (2014)
AROUSAL

(a) BAS
- Sensitivity to rewards
- Pleasure seeking
- Positive affect
- Linked to extraversion

(b) BIS
- Sensitivity to punishment or rejection
- Increase in anxiety
- Negative affect
- Linked to neuroticism

Source of the image: https://digital.wwnorton.com/ebooks/epub/psychsci5/OPS/xhtml/Chapter13-2.xhtml
# METHODS OF DECEPTION

*(JENSEN, 2007)*

<table>
<thead>
<tr>
<th>Methods of deception</th>
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</thead>
<tbody>
<tr>
<td>Fabrications</td>
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<tr>
<td>Evasions</td>
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<td>Equivocation</td>
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<td>Concealments</td>
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<td>Omissions</td>
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<td>Camouflage</td>
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<td>Misdirection</td>
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<td>Strategic ambiguity</td>
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<td>Bluffs</td>
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<td>Hoaxes</td>
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<td>Tall tales</td>
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<td>Charades</td>
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<tr>
<td>White lies</td>
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<tr>
<td>Sophistry</td>
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<td>Half-truths</td>
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</tbody>
</table>
## PROFESSIONAL METHODS OF DECEPTION DETECTION

<table>
<thead>
<tr>
<th>Physiological methods</th>
<th>Behavioural methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polygraph</td>
<td>Nonverbal assessment tools</td>
</tr>
<tr>
<td>Brain activity analysis</td>
<td>The most frequently used as evidence in criminal courts in several European countries (child witnesses’ testimonies in trials for sexual offences)</td>
</tr>
<tr>
<td>Thermal analysis</td>
<td>Statement Validity Assessment (70% accuracy)</td>
</tr>
<tr>
<td>Voice stress analysis</td>
<td>Reality Monitoring (70% accuracy)</td>
</tr>
<tr>
<td></td>
<td>Scientific Content Analysis</td>
</tr>
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<td></td>
<td>Not used in real life, but popular amongst scholars</td>
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<tr>
<td></td>
<td>Popular in the field, but hardly been researched (it lacks standardization, subjective)</td>
</tr>
</tbody>
</table>
PROFESSIONAL METHODS OF DECEPTION DETECTION

“A verbal cue uniquely related to deception, akin to Pinocchio’s growing nose, does not exist. However, some verbal cues can be viewed as weak diagnostic indicators of deceit.”

Vrij (2010: 103)
COGNITIVE APPROACH TO LIE DETECTION

- Starting point: lying can be more mentally taxing/cognitively demanding than telling the truth (Zuckerman et al., 1981; Vrij, 2008)

- New aspect (Anders et al., 2015)
  - Investigators can enhance the difference in cognitive load that liars and truth tellers experience through specific interventions

- 2 main elements
  - Imposing cognitive load
  - Asking unanticipated questions

- Outcome
  - It results in more cues to deceit
  - It facilitates lie detection
COGNITIVE APPROACH TO LIE DETECTION: SPATIAL QUESTIONS, TEMPORAL QUESTIONS AND PLANNING

- Vrij et al. (2009): liars and truth tellers interviewed individually about having lunch together at a restaurant


2 volunteers?
COGNITIVE APPROACH TO LIE DETECTION: SPATIAL QUESTIONS, TEMPORAL QUESTIONS AND PLANNING

- Vrij et al. (2009): liars and truth tellers interviewed individually about having lunch together at a restaurant
  - Liars instructed to pretend that they had
  - Interviewer: typical opening questions anticipated by the interviewees
    - e.g. “What did you do in the restaurant?”
  - Followed by unanticipated questions (increasing liars’ cognitive load)
    - Spatial details, e.g. “In relation to the front door and where you sat, where were the closest diners?” (72% accuracy)
    - Temporal details, e.g. “Who finished their food first, you or your friend?”
  - Also asked to draw the layout of the restaurant (78%)
WHAT DO LAW ENFORCEMENT AUTHORITIES DO IN SPAIN?

- Protocol used by National Police and Guardia Civil

1. Validity test (e.g. of the interview)
2. Indicators of deceptive accounts
3. Indicators of truthful accounts
CASE STUDY: CHRIS WATTS

- The Watts family homicides occurred on the night of August 12/13, 2018, where Chris Watts murdered his pregnant wife Shanann and their two young daughters, Bella, 4 and Celeste, 3 in their home in Colorado.

- [https://www.youtube.com/watch?v=nCE4T2-umiE](https://www.youtube.com/watch?v=nCE4T2-umiE)

- Can you spot any cues to deception in this interview? (from 1:36)
RELATION BETWEEN DECEPTION AND PSYCHOTICISM

- Narcissism is one of the traits usually associated to psychopathy (psychiatrists confirmed the diagnosis for Watts).
- Influence on the use of first person in lies
  - Almela et al. (2015)
NON-VERBAL INDICATORS USED BY LAW ENFORCEMENT

- 7 basic facial expressions (Ekman, 2009)
  - Associated to basic emotions, universal
  - Humans are born with 6 of them
    - Happiness
    - Surprise
    - Anger
    - Disgust
    - Fear
    - Sadness

- The most interesting expression for deception detection
- People commit terrible crimes, and they smile at the delight in getting away with it (BAS)
  - “Duping delight”
AMANDA KNOX

- American woman who spent almost four years in an Italian prison following her conviction for the 2007 murder of Meredith Kercher, a fellow exchange student who shared her apartment.
  - In 2015, Knox was definitively acquitted by the Italian Supreme Court of Cassation.

- [https://www.youtube.com/watch?v=a0o5qrEZfuc](https://www.youtube.com/watch?v=a0o5qrEZfuc)
  - 2:39
  - 3:47
NON-VERBAL INDICATORS USED BY LAW ENFORCEMENT

- Movements, paralinguistic (non-verbal features speech), physiology, e.g.
  - Out-of-synchrony affirmation/negation
  - Clenching their lips
  - Swallowing
  - Tight mouth
  - Blinking (protecting themselves from aggression)
  - Moving their head back
  - Shrugging their shoulders
  - Longer periods of latency
  - Higher pitch
  - Staring at their interlocutor
SOME ACADEMIC RESEARCH ON DECEPTION WITH PSYCHOLINGUISTIC CATEGORIES

- Study of oral language
  - Bond & Lee (2005)
  - Hirschberg et al. (2005)
  - Fuller et al. (2006)
  - Vrij et al. (2007)
  - Fornaciari & Poesio (2011)

- Study of written language
  - Mihalcea & Strapparava (2009)
  - Ott et al. (2011)
  - Almela et al. (2012)
  - Masip et al. (2012; 2014)

- Synchronous CMC
  - Hancock et al. (2004; 2008)
MAJOR SHORTCOMINGS

- Small corpora
  - e.g. Picornell (2012)

- Written transcripts of oral language
  - e.g. Fornaciari & Poesio (2011)

- Redundant variables in the analysis
  - e.g. Newman et al. (2003)
High-stakes deception in forensic contexts

Traditional cue to deception: anxiety or nervousness
- e.g. interrogated suspect displaying anxious behaviour is deemed likely to have something to hide
- BUT nervousness often arises from the stressful situation of a police interview (Bull et al., 2006)
- Anxiety does not play such a key role in deception as generally believed (Mann et al., 2002)

Differences between Common Law and Civil Law
- Spanish legal system cannot punish the defendant for lying if the lies have been told in the exercise of the privilege against self-incrimination (tutela judicial efectiva, effective protection of the court)
- 2 fundamental rights
  - Privilege against self-incrimination
  - Right not to plead guilty
AN EXAMPLE OF DECEPTION ANALYSIS WITHIN COMPUTATIONAL LINGUISTICS: LIWC CATEGORIES

- 4 broad dimensions (Pennebaker et al., 2001)
  - Linguistic processes
  - Psychological processes
  - Relativity
  - Personal concerns

- Relationship between language and...
  - State of mind
  - Mental health
  - Truth value
Hierarchical structure

- Total pronouns
  - Total 1st person
    - 1st person sing.
    - 1st person plur.

Mixing categories with redundant information
# LIWC: DIMENSION 1 - LINGUISTIC PROCESSES

<table>
<thead>
<tr>
<th>Category</th>
<th>Abbrev.</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Word count</td>
<td>WC</td>
<td></td>
</tr>
<tr>
<td>Words per sentence</td>
<td>WPS</td>
<td></td>
</tr>
<tr>
<td>Sentences ending with ?</td>
<td>Qmarks</td>
<td></td>
</tr>
<tr>
<td>% words longer than 6 letters</td>
<td>Sixltr</td>
<td></td>
</tr>
<tr>
<td><strong>Total pronouns</strong></td>
<td><strong>Pronoun</strong></td>
<td><strong>I, our, they, you’re</strong></td>
</tr>
<tr>
<td>Total first person</td>
<td>Self</td>
<td>I, we, me</td>
</tr>
<tr>
<td>1st person singular</td>
<td>I</td>
<td>I, my, me</td>
</tr>
<tr>
<td>1st person plural</td>
<td>We</td>
<td>we, our, us</td>
</tr>
<tr>
<td>Total second person</td>
<td>You</td>
<td>you, you’ll</td>
</tr>
<tr>
<td>Total third person</td>
<td>Other</td>
<td>she, their, them</td>
</tr>
<tr>
<td>Negations</td>
<td>Negate</td>
<td>no, never, not</td>
</tr>
<tr>
<td>Assents</td>
<td>Assent</td>
<td>yes, OK, mmhmm</td>
</tr>
<tr>
<td>Articles</td>
<td>Article</td>
<td>a, an, the</td>
</tr>
<tr>
<td>Prepositions</td>
<td>Preps</td>
<td>on, to, from</td>
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<tr>
<td>Numbers</td>
<td>Number</td>
<td>one, thirty, million</td>
</tr>
<tr>
<td>Category</td>
<td>Abbrev.</td>
<td>Examples</td>
</tr>
<tr>
<td>------------------------------</td>
<td>---------</td>
<td>------------------------</td>
</tr>
<tr>
<td><strong>Affective Processes</strong></td>
<td>Affect</td>
<td><em>happy, ugly, bitter</em></td>
</tr>
<tr>
<td>Positive Emotions</td>
<td>Posemo</td>
<td><em>happy, pretty, good</em></td>
</tr>
<tr>
<td>Positive feelings</td>
<td>Posfeel</td>
<td><em>happy, joy, love</em></td>
</tr>
<tr>
<td>Optimism and energy</td>
<td>Optim</td>
<td><em>certainty, pride, win</em></td>
</tr>
<tr>
<td><strong>Negative Emotions</strong></td>
<td>Negemo</td>
<td><em>hate, worthless, enemy</em></td>
</tr>
<tr>
<td>Anxiety or fear</td>
<td>Anx</td>
<td><em>nervous, afraid, tense</em></td>
</tr>
<tr>
<td>Anger</td>
<td>Anger</td>
<td><em>hate, kill, pissed</em></td>
</tr>
<tr>
<td>Sadness or depression</td>
<td>Sad</td>
<td><em>grief, cry, sad</em></td>
</tr>
<tr>
<td><strong>Cognitive Processes</strong></td>
<td>Cogmech</td>
<td><em>cause, know, ought</em></td>
</tr>
<tr>
<td>Causation</td>
<td>Cause</td>
<td><em>because, effect, hence</em></td>
</tr>
<tr>
<td>Insight</td>
<td>Insight</td>
<td><em>think, know, consider</em></td>
</tr>
<tr>
<td>Discrepancy</td>
<td>Discrep</td>
<td><em>should, would, could</em></td>
</tr>
<tr>
<td>Inhibition</td>
<td>Inhib</td>
<td><em>block, constrain</em></td>
</tr>
<tr>
<td>Tentative</td>
<td>Tentat</td>
<td><em>maybe, perhaps, guess</em></td>
</tr>
<tr>
<td>Certainty</td>
<td>Certain</td>
<td><em>always, never</em></td>
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<tr>
<td>...</td>
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</tr>
<tr>
<td>Category</td>
<td>Abbrev.</td>
<td>Examples</td>
</tr>
<tr>
<td>-------------------</td>
<td>---------</td>
<td>------------------------</td>
</tr>
<tr>
<td><strong>Time</strong></td>
<td>Time</td>
<td>hour, day, o'clock</td>
</tr>
<tr>
<td>Past tense verb</td>
<td>Past</td>
<td>walked, were, had</td>
</tr>
<tr>
<td>Present tense verb</td>
<td>Present</td>
<td>walk, is, be</td>
</tr>
<tr>
<td>Future tense verb</td>
<td>Future</td>
<td>will, might, shall</td>
</tr>
<tr>
<td><strong>Space</strong></td>
<td>Space</td>
<td>around, over, up</td>
</tr>
<tr>
<td>Up</td>
<td>Up</td>
<td>up, above, over</td>
</tr>
<tr>
<td>Down</td>
<td>Down</td>
<td>down, below, under</td>
</tr>
<tr>
<td>Inclusive</td>
<td>Incl</td>
<td>with, and, include</td>
</tr>
<tr>
<td>Exclusive</td>
<td>Excl</td>
<td>but, except, without</td>
</tr>
<tr>
<td><strong>Motion</strong></td>
<td>Motion</td>
<td>walk, move, go</td>
</tr>
</tbody>
</table>
# LIWC: DIMENSION IV – PERSONAL CONCERNS

<table>
<thead>
<tr>
<th>Category</th>
<th>Abbrev.</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Occupation</strong></td>
<td>Occup</td>
<td>work, class, boss</td>
</tr>
<tr>
<td>School</td>
<td>School</td>
<td>class, student, college</td>
</tr>
<tr>
<td>Job or work</td>
<td>Job</td>
<td>employ, boss, career</td>
</tr>
<tr>
<td>Achievement</td>
<td>Achieve</td>
<td>try, goal, win</td>
</tr>
<tr>
<td><strong>Leisure activity</strong></td>
<td>Leisure</td>
<td>house, TV, music</td>
</tr>
<tr>
<td>Home</td>
<td>Home</td>
<td>house, kitchen, lawn</td>
</tr>
<tr>
<td>Sports</td>
<td>Sports</td>
<td>football, game, play</td>
</tr>
<tr>
<td>Television and movies</td>
<td>TV</td>
<td>TV, sitcom, cinema</td>
</tr>
<tr>
<td>Music</td>
<td>Music</td>
<td>tunes, song, CD</td>
</tr>
<tr>
<td><strong>Money and financial issues</strong></td>
<td>Money</td>
<td>cash, taxes, income</td>
</tr>
<tr>
<td><strong>Metaphysical issues</strong></td>
<td>Metaph</td>
<td>God, heaven, coffin</td>
</tr>
<tr>
<td>Religion</td>
<td>Relig</td>
<td>God, church, rabbi</td>
</tr>
<tr>
<td>Death and dying</td>
<td>Death</td>
<td>dead, burial, coffin</td>
</tr>
<tr>
<td>...</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### V - STYLOMETRIC DIMENSION
(Almela et al., 2012)

<table>
<thead>
<tr>
<th>Standardised type/token ratio</th>
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</thead>
<tbody>
<tr>
<td>Mean word length</td>
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<tr>
<td>Sentences/WC</td>
</tr>
<tr>
<td>1-letter words/WC</td>
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<tr>
<td>2-letter words/WC</td>
</tr>
<tr>
<td>3-letter words/WC</td>
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<tr>
<td>4-letter words/WC</td>
</tr>
<tr>
<td>5-letter words/WC</td>
</tr>
<tr>
<td>6-letter words/WC</td>
</tr>
<tr>
<td>7-letter words/WC</td>
</tr>
<tr>
<td>Complex words/WC</td>
</tr>
</tbody>
</table>
VARIABLES IN THE STUDY

- **Dependent variable**
  - Likelihood of veracity or deception
    - Nominal/binary

- **Independent variables**
  - 65 out of 84 LIWC categories
  - 11 stylometric categories
    - Ratio
RESEARCH QUESTIONS

Classification success

LIWC and stylometric dimensions

Bag-of-Words model

Individual LIWC and stylometric categories
RESEARCH QUESTIONS

Linguistic cues

- Across the whole corpora
- Specific to English
- Specific to Spanish
- Discursive differences
CORPORA DESCRIPTION

- **English**
  - Mihalcea & Strapparava (2009)
  - 100 participants
    - Native speakers of English
    - Amazon Mechanical Turk

- **Spanish**
  - 100 participants
    - Native speakers of European Spanish
    - University students

- **85 words/statement**
  - 51,204 words

- **94 words/statement**
  - 56,882 words
TECHNIQUES USED IN THE DATA ANALYSIS

<table>
<thead>
<tr>
<th>Technique</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Support vector machine algorithm</td>
<td>English and Spanish corpora</td>
</tr>
<tr>
<td>Support vector machine algorithm</td>
<td></td>
</tr>
<tr>
<td>Discriminant function analysis and binary logistic regression</td>
<td></td>
</tr>
</tbody>
</table>
**METHOD**

- Machine Learning experiment
  - Goal of automatic classification
    - To use an object's characteristics to identify which class it belongs to
    - Classification decision based on the value of a linear combination of the characteristics

- SVM
  - Representation of examples as points in space
METHOD

- 10-fold cross-validation

Training examples marked as belonging to one of two categories (true/false)

Raw Corpus → Analysed Corpus → Build model (Training set) → Validate (Validation set) → Results

Building of a model assigning new examples to categories
**METHOD**

- **ML experiment**
  - Feature vectors = 31 classifiers
    - LIWC dimensions including terminal categories
    - Stylometric dimension

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<table>
<thead>
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<tbody>
<tr>
<td>1</td>
<td>1+ styl.</td>
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<tr>
<td>2</td>
<td>2+ styl.</td>
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<tr>
<td>3</td>
<td>3+ styl.</td>
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<td>4</td>
<td>4+ styl.</td>
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<tr>
<td>1_2</td>
<td>1_2+ styl.</td>
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<td>1_3</td>
<td>1_3+ styl.</td>
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<td>1_4</td>
<td>1_4+ styl.</td>
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<td>3_4</td>
<td>3_4+ styl.</td>
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<td>1_2_3</td>
<td>1_2_3+ styl.</td>
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<tr>
<td>1_2_4</td>
<td>1_2_4+ styl.</td>
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<tr>
<td>1_3_4</td>
<td>1_3_4+ styl.</td>
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<tr>
<td>2_3_4</td>
<td>2_3_4+ styl.</td>
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<tr>
<td>1_2_3_4</td>
<td>1_2_3_4+ styl.</td>
</tr>
<tr>
<td>Styl.</td>
<td></td>
</tr>
</tbody>
</table>
METHOD

- BoW model

LIWC and stylometric dimensions

Classification success

Bag-of-Words model

Individual LIWC and stylometric categories

Truthful statements

Filtering: removing stop words, stemming.

Untruthful statements

abortion, child, God, ethics, right, mother…

fiesta, animal, arte, salvaje, tradición, maestro…
METHOD

- Statistical classification

- 2 classification methods
  - Discriminant function analysis
    - Whole English and Spanish corpora
  - Binary logistic regression
    - Individual subcorpora

- Classification success
  - LIWC and stylometric dimensions
  - Bag-of-Words model
  - Individual LIWC and stylometric categories
RESULTS FROM ML EXPERIMENT

1. Linguistic processes

4. Personal concerns

“Function words can provide powerful insight into the human psyche.”

Chung & Pennebaker (2007: 344)
RESULTS FROM ML EXPERIMENT IN ENGLISH
RESULTS FROM ML EXPERIMENT IN SPANISH
RESULTS FROM BOW MODEL

Comparatively better performance in English
RESULTS FROM STATISTICAL CLASSIFICATION
COMMON PREDICTORS

Linguistic cues

Across the whole corpora

Specific to English

Specific to Spanish

Discursive differences

English corpus

Spanish corpus

Discrep Incl.

WC
1st pers. sg.
Insight
Excl
Friends

2nd pers.
3rd pers.

Number
SemiC
Past
Future
Anxiety
Tentat
Sexual
Certain
Assent
Humans

19 predictors out of 76 in the model
COMMON PREDICTORS OF TRUTHFUL STATEMENTS

- Text length
  - Differences across languages
  - Previous findings
    - Soother responses: oral and CMC
    - Written (Anolli et al., 2002)

- Insight
  - No significant differences (e.g. Sporer, 1997)
  - Reality Monitoring
    - More cognitive operations by truth-tellers

Cognitive demand (DePaulo et al., 2003)
COMMON PREDICTORS OF TRUTHFUL STATEMENTS

- Exclusive words

- Distinction markers = lexical correlates of cognitive complexity (Tausczik & Pennebaker, 2010)

Increased risk of contradiction
COMMON PREDICTORS OF TRUTHFUL STATEMENTS

“The process of creating a false story should consume cognitive resources, leading liars to tell less complex stories.”

COMMON PREDICTORS OF TRUTHFUL STATEMENTS

- 1st person singular
  - Identification with one’s own speech
  - Differences across languages (cf. Masip et al., 2012)

- Friends
  - Human-related group of words

- e.g. fellow, colleague, mate
COMMON PREDICTORS OF UNTRUTHFUL STATEMENTS

- 2nd person
  - Indefinite ‘you’

- 3rd person
  - He
  - She
  - They

Detachment from the self
Differences across languages

Indicators of cognitive complexity

- Discrepancy
  - e.g. should would could
- Indicators
  - e.g. with and including

Indicators of cognitive complexity

Differences across languages
PREDICTORS OF TRUTHFUL STATEMENTS SPECIFIC TO SPANISH

- Numbers
  - Differences across languages
  - Specificity

- Semicolon
  - Related to sentence length

  e.g. double half once
PREDICTORS OF TRUTHFUL STATEMENTS SPECIFIC TO SPANISH

- Tentative words
  - Related to insight
  - Opposite to certainty

- Past and future
  - Cognitive complexity (Smith, 2005)

E.g. maybe guess
PREDICTORS OF TRUTHFUL STATEMENTS SPECIFIC TO SPANISH

- Anxiety
  - Law enforcement contexts
    - Adams (2001)
    - Watson (1981)
  - Sanctioned deception
- Topic
  - DePaulo et al. (2003)
  - Ekman (1992)
  - Knapp & Comadena (1979)
  - Vrij (2000)
PREDICTORS OF TRUTHFUL STATEMENTS SPECIFIC TO SPANISH

- Sexuality
  - Related to homosexual adoption
PREDICTORS OF UNTRUTHFUL STATEMENTS SPECIFIC TO SPANISH

- Certainty
  - Speaker’s need to use truth-related words
    - Bond & Lee (2005)
    - Newman et al. (2003)

- Assent
  - Not previously explored

- e.g. assure, certainty, always
- e.g. agree, accept, admit
PREDICTORS OF UNTRUTHFUL STATEMENTS SPECIFIC TO SPANISH

- Humans
  - References to others
  - Detachment from the self

e.g. adult people society
IN A NUTSHELL: NEW FINDINGS

- Common
  - Truthfulness
    - Friends

- Spanish
  - Truthfulness
    - Numbers
    - Semicolon
    - Past and future
    - Sexuality
  - Untruthfulness
    - Assent
    - Humans
Linguistic cues

Across the whole corpora

Specific to English

Specific to Spanish

Discursive differences
**DISCURSIVE DIFFERENCES**

- Unique predictors for **English**

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- Disclaiming responsibilities
- Related to anxiety / discomfort
- Individual exploration of cognitive processes
### DISCURSIVE DIFFERENCES

- Unique predictors for **English**

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- Identification of friends with relatives
- **FRIENDSHIP IS A VALUABLE COMMODITY** (Kövecses, 2000)
- Metaphorical language: disclaiming responsibility (Gibbs, 1994)
**DISCURSIVE DIFFERENCES**

- Unique predictors for **Spanish**

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Emotional identification of speakers with real opinions

“Motion verbs (e.g. walk, go, carry) provide simple, concrete descriptions and are more readily accessible than words that focus on evaluations and judgments (e.g. think, believe).”

Newman (2003: 672)
### DISCURSIVE DIFFERENCES

- **Unique predictors for Spanish**

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- Lakoff’s EVENT STRUCTURE metaphor
  - PURPOSES ARE DESTINATIONS

- Cognitive process – Restraint on the direct expression of an instinct
SOME REMARKS ON THE EXPERIMENT

- Stylometric dimension
  - Positive effect in combination in English

- Discursive differences
  - Emotional involvement
  - Contextualised study of deception

- Individual study of cognitive processes

- Spanish corpus
  - Best discrimination of deception on the basis of LIWC and stylometric categories

- Certain common predictors in both languages

- Importance of the baseline for individuals
LIMITATIONS OF THE STUDY

- Laboratory-produced lies
- Age/cultural factor
- No syntactic information included
FURTHER RESEARCH

- Syntactic method (currently applied to authorship identification by Chaski)

- Contrastive study with other pairs of languages
  - Identification of possible structural and lexical differences

- Discursive analysis
  - Different discriminatory variables
ILE PARADIGM

- 1. Empirical testing of method independent of litigation
- 2. Method is grounded in linguistics
- 3. Method is tested on ground truth data that are forensically feasible
- 4. All known and all questioned texts are analyzed the same way, by computer software whenever possible, or protocol
- 5. Data are not contaminated
- 6. Statistical procedures are in method, and follow standard principles of statistics including cross-validation
- 7. A conclusion/prediction from testing the forensic data is stated in the report and in testimony

https://tale-forensiclinguistics.org/leadership-circle/
ILE PARADIGM

PhD level work in linguistics with publications in a primary field of linguistics before forensic work (Chaski)
FORENSIC COMPUTATIONAL APPROACH (WITHIN ILE PARADIGM)

- [https://aliastechnology.com/ali/](https://aliastechnology.com/ali/)
- **WISER1: Witness Statement Evaluation Rank**, devised by Carole E. Chaski PhD
  - **Task:** Does this text contain deceptive language?
  - **Uses:** it can help investigators prepare for interrogations by analyzing witness statements after the interview but before the interrogation.
  - **Speed:** WISER1 runs very quickly, in minutes.
  - **Notes:** Law enforcement agencies who enter into a research relationship with the Institute for Linguistic Evidence (ALIAS Technology’s sister for R&D) can obtain access to WISER1 without cost for a negotiated period of time.
  - **Accuracy:** It currently attains over 90% accuracy distinguishing truthful from false witness statements from actual criminal investigations. However, the Institute for Linguistic Evidence is conducting ongoing research on new text collections to determine under what conditions WISER can continue this high level of accuracy.
  - **Current languages:** English
  - **Research-in-progress languages:** Spanish
FORENSIC COMPUTATIONAL APPROACH (WITHIN ILE PARADIGM)

- WISER1: method
  - Syntactic analysis involves identifying the roles that words and punctuation play in a given phrase structure or set of phrase structures, as well as the relationships between them. Syntactic analysis also takes into account the complexity of phrase structures: markedness.
  - An unmarked phrase is simply constructed and uses words in their default, neutral form (e.g., “the chair”), while a marked phrase is more complicated, requires a better grasp of the language to construct and is acquired later in language development (e.g., “the antique chairs which you found for your aunt”).
  - Syntactic structures have long been a focus of research in authorship identification, proven reliable (Chaski 2001)
- Our research agenda:
  1. Getting Spanish translations of ALIAS categories (like LIWC categories, as well as syntax)
  2. Getting enough witness statements. If we can get 100 witness statements where we know from the police’s other evidence they are true or false then we could build a really strong model and method (currently only 31 witness statements known truth or falsehood in English)
THE REALITY OF PHRASE STRUCTURE IN OUR COGNITION

- Common experience of being able to finish another person’s sentence
- Reality of phrase structure in our cognition
  - demonstrated neurologically and accepted by linguists of all schools
- Another common experience: not being able to repeat verbatim what has been said
  - Phrase structure degrades in memory within milli-seconds: we remember the meaning instead of the form, since the purpose of language is communication of meaning
  - Syntactic structures are not easy to imitate, because they are not easy to remember
    - They can be measured in all authors, since they must be used in producing language
REAL LIFE APPLICATIONS

- VeriPol (Quijano et al., 2018)
  - Assessment of false violent robbery cases for CNP
IN A NUTSHELL...

- Importance of contextualised study of deception
- Ground-truth data (collaboration with law enforcement)
- Importance of the baseline for individuals
- Existing tools = NOT INFALLIBLE
- As linguists, we should keep on testing what is used in real life and trying to improve it with our linguistic knowledge.
Mundus vult decipi, ergo decipiatur
[The world wants to be deceived, so let it be deceived]

Latin proverb
REFERENCES

Thanks for listening!