Linguistic annotation

Mark up, XML, DTD, TEI

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Outline

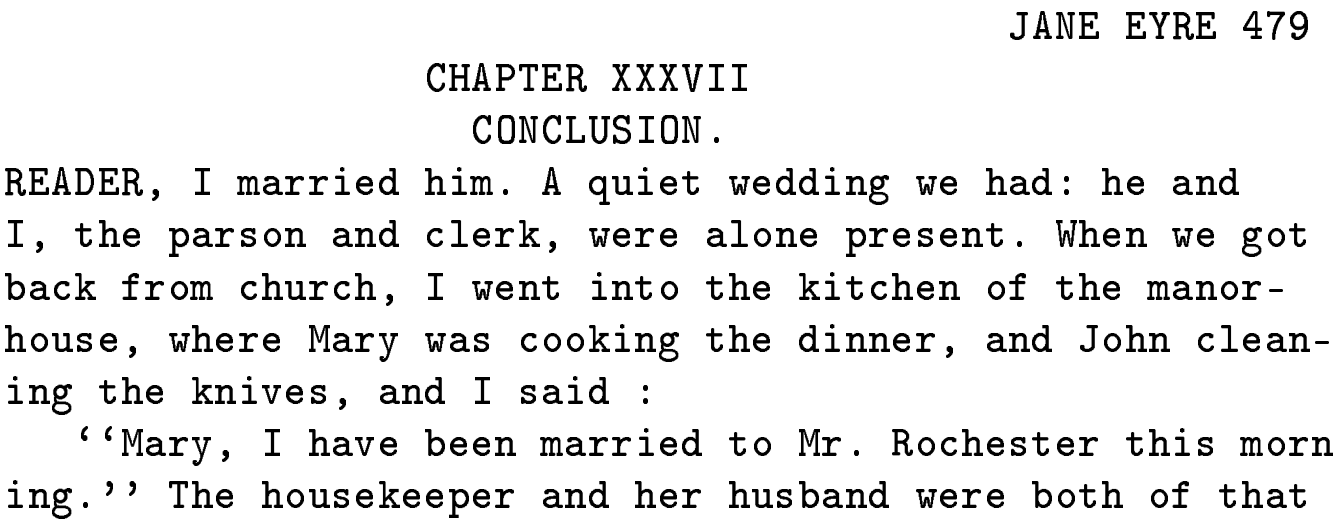
CHAPTER XXXVIII.

CONCLUSION.

READER, I married him. A quiet wedding we had; he and I, the parson and clerk, were alone present. When we got back from church, I went into the kitchen of the manor-house, where Mary was cooking the dinner, and John cleaning the knives, and I said:

"Mary, I have been married to Mr. Rochester this morning." The housekeeper and her husband were both of that decent, phlegmatic order of people, to whom one may at any

Why annotation?



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CHAPTER XXXVII
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‘‘Mary, I have been married to Mr. Rochester this morning.’’ The housekeeper and her husband were both of that

Any problems with OCR?

What is annotation?

- Data vs. interpretation
- Markup contributes towards explicit interpretation of a text
- Early examples of markup: alphabet, punctuation, typographic setup
- Different annotations for different interpretations:
  Chomsky set out his theory in *Syntactic Structures* (1957)

→ `Chomsky set out his theory in <i>Syntactic Structures</i> (1957)`

`Chomsky set out his theory in <cite type="title" ref="Chomsky1957"/>`

XML: example of code

```
<pb n="479"/>
<div1 type="chapter"   n="38">
<h>Conclusion .</h>
<p><s>Reader , I married him .</s>
<s>A quiet wedding we had : he and I , the parson and clerk ,
were alone present . </s>
<s>When we got back from church , I went into the kitchen of
the manor-house , where Mary was cooking the dinner , and John
cleaning the knives, and I said : </s></p>
<p><q><s> Mary, I have been married to Mr. Rochester this morning . </s> </q>
...
</p>
```

Markup languages

- XML: eXtensible Markup Language (1999)
  Representing the logical structure of data
- XSL(T)= style sheet and transformation language
- HTML: HyperText Markup Language
  a relative of XML, xHTML
- TMX: Translation Memory eXchange format
- TBX: TermBase eXchange format
- SRX: Segmentation Rules eXchange format
- XML for dictionary entries

XML basics

- tags, words in angular brackets: `<p>` `<div1>`
- elements, the content within a tag
- attributes and values: `<div1 type="chapter" n="38">`
- empty elements: `<pb n="474"/>`
- entities: `&mdash;` (—), `&amp;` (&), `&auml;` (ä)
- DTD (Document Type Definition) — definition of all the elements, attributes and entities

Well-formed XML document

- every tag which is opened has to be closed
* `<p> text <p> new paragraph`
- The only exception is for empty elements:
  `<pb n="474"/>` $\mapsto$ `<pb n="474"></pb>`
- tags are properly embedded:
* `<p> <q> quote </p></q>`
- Tags are case-sensitive:
  `<publicationStmt>` `<gramGrp>`

Outline

Formats of annotation

- Tab-separated format

```
N12:0510    VVD    studied    study    [Coord.N12:0504]
```

- COCOA: `<w VVD>studied`
- XML:

```
<s n="12">
        ...
<w id="N12:0510">studied
<ana lemma="study" pos="VVD" />
</w>
</s>
```

Types of annotation

- Metatext annotation (author, audience, domain, genre)
- Text annotation (quotes, comments, page breaks)
- Typographic annotation (fonts, headings, text alignment)
- Linguistic annotation:

  Part-of-speech (POS): `<w pos="VVZ">studies</w>`

  Lemmatisation: `He <w lemma="leave">left</w>`

  Functional relationships, e.g., coreference:
  `<w ref="X1" lemma="he">He</w>`

  Word senses: power$_1$ →énergie, power$_2$ →pouvoir

The owner	of	the company	has	the power	to fire
Le propriétaire	de	la société	a	le pouvoir	de licencier

Other kinds of annotation

- Named Entities
  Mark boundaries of names of type PERson, ORGanization, GPE, LOCation,...
  <enamex type="ORGANIZATION">FBI</enamex> agents arrested <enamex type="PERSON">Kaczynski</enamex> on <enamex type="DATE">April 3, 1996</enamex>, at his remote cabin outside <enamex type="LOCATION">Lincoln</enamex>
- Gazetteers, normalisers, disambiguation
  Lech Kaczynski vs *Jaroslaw Kaczynski* vs *Ted Kaczynski*
  Lincoln, US vs *Lincoln, UK*
- Terminology annotation: Identify terms, detect their canonical form and link to their database records
  <te id="1123">Fast Breeder Reactors</te> (<te id="1123" type="abbr">FBR</te>) can produce more <te id="1134">fissile fuel</te> than <te id="1123" type="ana">they</te> consume.

Standards of annotation

- TEI (Text Encoding Initiative), TEI-Lite (a subset) — for text and metatext annotation
- EAGLES (European Advisory Group on Language Engineering Standards) — for linguistic annotation
- *The man still saw her*

  The (AT) man ($NN|VV$) still ($NN|VV|RB$) saw ($NN|VVD$) her ($PP|PP\$$) . ($SENT|PUN$)
- Rules vs statistical training
- Statistical hidden Markov model: $p(t_i|w_i) \times p(t_i|t_{i-1})$

$$p(PP|her) = 0.3; \quad p(PP|SENT) = 0.0022; \quad =0.000654$$
$$p(PP\$|her) = 0.7; \quad p(PP\$|SENT) = 0.000019 \quad =0.000013$$

POS tags

- The standard inventory for English (the Penn set):
  VV – base verb, VVD – past tense, VVN – pp (taken)
  NN – common noun, singular; NNS – common noun, plural;
  CS – conjunction, subordinative, *so that*: so_CS21
  that_CS22

  Penn set: 55 tags; Lancaster set: 146 tags
- Specific sets for languages and taggers:
  German STTS: VVFIN – finite verb, VVINF – infinitive,
  VVIZU – infinitive with "zu",
  NN – common noun (50 tags)

  Japanese mecab tagset: 16 tags

  Russian tagset: 1066 tags

  Ncmsan : Noun, Type = common, Gender = masculine,
  Number = singular, Case = accusative, Animate = no

Accuracy of tagging

- Accuracy – the percentage of words (i.e. word tokens) which are correctly tagged

  95% accuracy: one in 20 is wrong

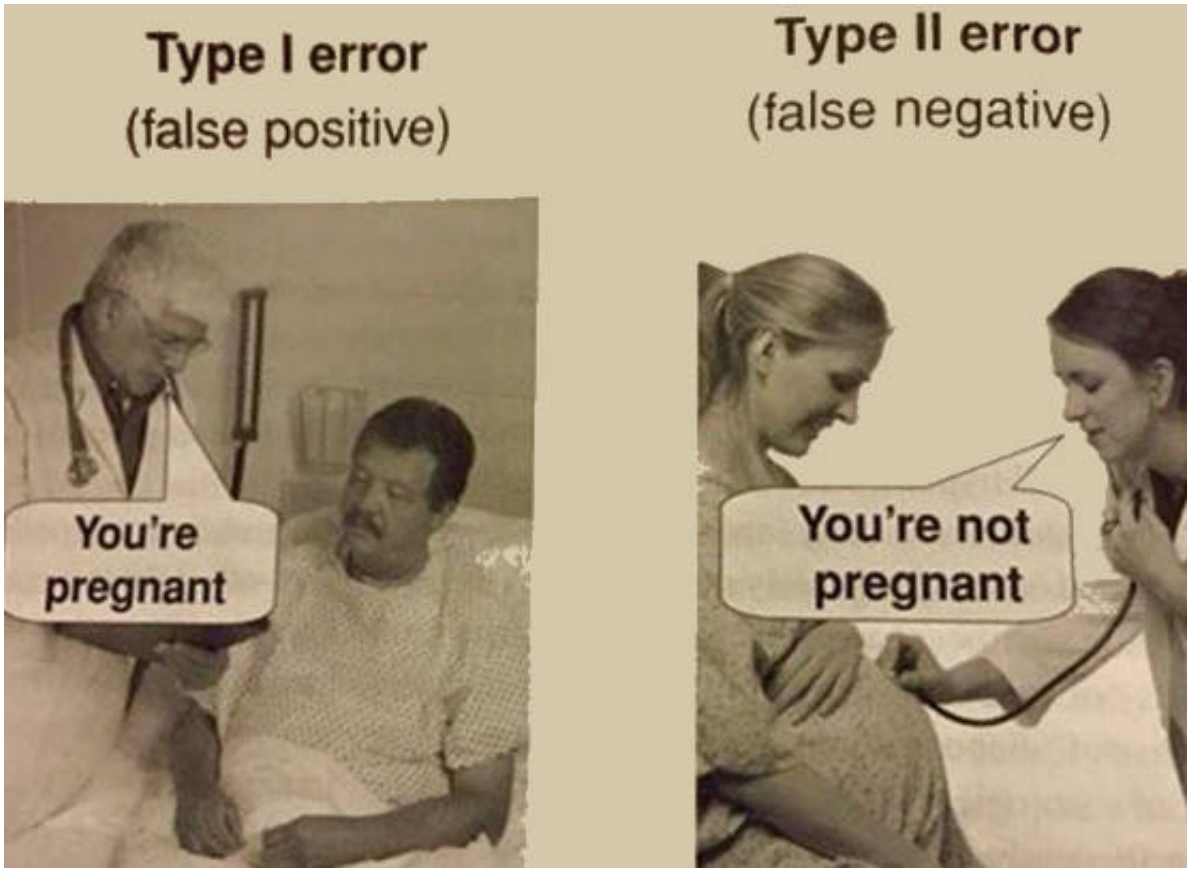
  96% accuracy: one in 25 is wrong

  an improvement of 25% from 95% to 96% ???
- Domain and genre influence:
  newspapers for training (Wall Street Journal in Penn Treebank)

Types of errors

- *I can light a fire. You can open a can.*

→ PP VV NN DT NN. PP VV VV DT VV.



- Precision = TP/(TP+ FP) vs
  Recall = TP/(TP + FN)

Text level annotation

- Linguistic features which can be counted

  Lexical features:
  publicVerbs = *acknowledge*, *admit*, *agree*, *assert*, *claim*...
  amplifiers = *absolutely*, *altogether*, *completely*, *enormously*, ...

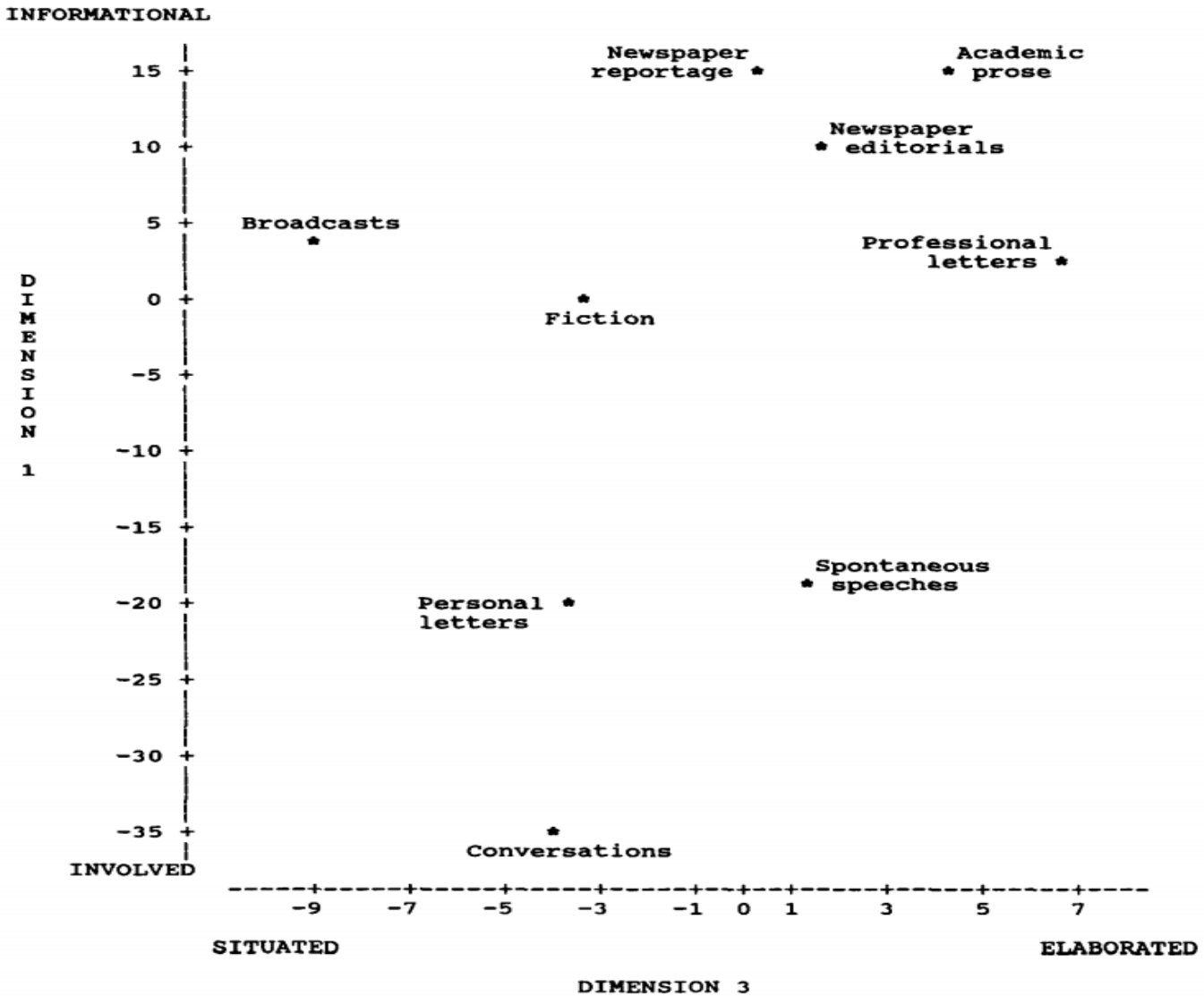
  Part-of-speech features:
  Nominalisations (nouns ending in −*tion*, −*ness*, −*ment*)
  main POS tags
  Past tense verbs (VVD)

  Syntactic features:
  that deletions
  pied piping (*Which house did she buy ...?*)

  Text-level features, such as:
  Average word length
  Average sentence length

- Factor analysis: which features group with each other

Multi-dimensional analysis (Biber, 1988)



Multi-dimensional analysis (Biber, 1988)

Functions	Linguistic features	Characteristic genres
Dimension 1		
Monologue Careful production Faceless	nouns, adjectives prepositional phrases long words	informational exposition e.g., official documents academic prose
Interactive Personal focus Involved Online production	1^{st} and 2^{nd} PPs questions, reductions stance verbs, hedges emphatics	conversations (public and private)
Dimension 3		
Elaborated	wh-relative clauses pied-piping phrasal coordination	official documents professional letters (exposition)
Situation-dependent	time and place adverbials	broadcasts (fiction)

Basic points

- Raw texts vs. annotated texts
- Annotation formats and standards: XML, TEI, EAGLES
- Metatextual annotation
- POS tagging
- Higher-level annotation

For the next seminar

Prepare for a short presentation of the most exciting findings in your projects to discuss them with another student in the group