Interset: Reusable Tagset Conversion
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Part-of-Speech Tagset Conversion

• See also NPFL094 (Computational Morphology and Syntax) in Winter
• There: focus on linguistic diversity
• Here: focus on
  • Technical aspects
  • Different expressivity
  • Different granularity
Why Convert Tags?

- For a tool that uses tags (parser)
  - The meaning of the tags is significant (they are not just strings)
  - Or the tool has been trained on a particular tagset

- For a linguist who works with corpora
  - Reduce need to learn new tags
• Look at source tags only
How to Convert Tags?

• Look at source tags only
  • Conversion tailored to a pair of tagsets
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  • Reusable “interlingua” (Interset, Universal Dependencies)
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  - Reusable “interlingua” (Interset, Universal Dependencies)
- Look at source tags + words
- Look at source tags + words + context
Related Work

- EAGLES, PAROLE, MULTEXT
  - Rather wanted to standardize tags
  - Not to work with the tags that are already there
  - Very euro-centric
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- IIIT Hyderabad: all Indian languages
  - Indo-Aryan
  - Dravidian
  - English!

Gold Ontology
- Defines linguistic terms
- The same term may denote different things in different languages

Interset, Google UPOS, Universal Dependencies
- Papers claiming that universal tagset does not exist
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Prague Tags for Czech

NNMS1------A----- Josef
AGFS3------A----- následující
P1ZS3FS3------ jejímuž
ClXP3---------2 stě
VB-S---1P-AA--- jsem
Dg--------3A---- nejméně
RR--6-------- v
J,-X---3-------- aby
TT------------- jen
II------------- ejhle
X@------------- noor
Z:------------- ,

Interset: Reusable Tagset Conversion
### Prague Tags for Czech

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<tr>
<th>Tag</th>
<th>Conversion</th>
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<td>X@----------</td>
<td>NOMORPH</td>
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<td>Z:----------</td>
<td>ZIP</td>
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</table>
Prague Tags for CoNLL 2006 Shared Task

NNMS1-----A---- N N Gen=M|Num=S|Cas=1...
AGFS3-----A---- A G Gen=F|Num=S|Cas=3...
P1ZS3FS3------- P 1 Gen=Z|Num=S|Cas=3...
ClXP3----------2 C 1 Gen=X|Num=P|Cas=3...
VB-S---1P-AA--- V B Num=S|Per=1|Ten=P...
Dg--------3A---- D g Gra=3|Neg=A
RR--6--------- R R Cas=6
J,-X---3------- J , Num=X|Per=3
TT---------- T T _
II--------- I I _
X@---------- X @ _
Z:---------- Z : _
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<td>X@-------------</td>
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</table>
Majka Tagset from Brno

NNMS1-----A----- k1gMnSc1eA
AGFS3-----A----- k2gFnSc3eA
P1ZS3FS3------- k3gUnSc3p3hFxR
ClXP3-----------2 k4gXnPc3xC
VB-S---1P-AA--- k5gXnSp1mIaIeA
Dg----------3A---- k6d3eAxD
RR--6---------- k7c6
J,-X---3------- k8p3xS
TT------------- k9
II------------- k0
X:-------------
Z:-------------
Penn Treebank Tags for English

CC CD DT EX FW IN JJ JJR JJJS LS MD NN NNS NNP NNPS PDT POS PRP PRP$ RB RBR RBS RP SYM TO UH VB VBD VBG VBN VBP VBZ WDT WP WP$ WRB . , : $ # ` ` ' ' -LRB- -RRB- 

• EX = existential *there*
• FW = foreign word
• IN = preposition or subordinating conjunction
• TO = *to*
• UH = interjection...
<table>
<thead>
<tr>
<th>Tags</th>
<th>Examples</th>
</tr>
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</table>
SynTagRus Tags for Russian

S ЕД МУЖ ИМ
S МН РОД ОД
A МН ИМ
NUM ВИН
V НЕСОВ ИЗЪЯВ НЕПРОШ МН З-Л
ADV СПАВ
PR
CONJ
PART
INTJ

NNMS1------A------
PSXXXXP3--------
AAXP1------1A----
ClXX4----------
VB-P---3P-AA---
Dg---------2A----
RR--6----------
J^-------------
TT------------
II-------------
Like in Penn TB: parts of speech only, but slightly more fine-grained
No morphology (German has gender, number, case, degree, person…)
“Substantive” vs. “attributive” pronouns (S vs. AT)
Adposition = Präposition, Postposition, Zirkumposition
• Ambition: common tagset for all Indian languages (IE and Dravidian!)
• No morphology (although the languages are rich on morphology)
  • Hierarchical tagset, morphology can be added at the end
  • And they “do not want to decrease tagging accuracy” (!)
• Cloned from Penn tagset and modified
  • New categories, e.g. postposition, “quotative”
  • Removed traces of morphology, e.g. plural, comparative, superlative
Tagging is interwined with tokenization.

<token_Arabic>
  <voc>wabiAlfAlwjp</voc>
  <pos>wa/CONJ+bi/PREP+AlfAlwjp/NOUN_PROP</pos>
</token_Arabic>

<token_Arabic>
  <voc>mivAlu</voc>
  <pos>mivAl/NOUN+u/CASE_DEF_NOM</pos>
</token_Arabic>
ElixirFM (PADT) Arabic Tags by Ota Smrž

N-------1D    NNXX1------A-----
Z-------1-    NNXX1------A-----
A-------FP2D   AAFP2------1A-----
S------3MP1-   PPMP1--3--------
VIS--------   VcXX---XP-AA-----
Rocling / Sinica Tagset for Chinese

Na = common noun
Nb = proper noun
Nc = location noun
Nd = time noun
Nf = classifier
Nh = pronoun
Ne = determiner or cardinal number
Ng = postposition
P = preposition
P01 = 為 wèi, 承蒙 chéngméng, 深為 shēnwèi
P02 = 被 bèi
P03 = 為了 wèile, 為 wèi
P04 = 給 gěi
P06 = 由 yóu
P07 = 把 bǎ, 將 jiāng
NCCPU==I ... *historikere*

NCNPU==D ... *Charta_77-folkene*

ANP(CN)PU=(DI)U ... *russiske*

AC---U--- ... 5.000

VADR=-----A- ... *har*

VAPR=(SP)(CN)(DI)A-U ... *gældende*

RGU ... *af*

PP3(CN)(SP)U-YU ... *sig*

NCUPN@DS ... *konflikterna*

(substantiv utrum pluralis bestämd nominativ)

AQP0PN0S ... *politiska*

MC00GOS ... *fyras* (gt. gen.)

V@IPAS ... *har*

AP000N0S ... *oberoende*

RGOS ... *inte*

PF@000@S ... *sig*
MAMBA and PAROLE Tagsets for Swedish

NN ... noun
PN ... proper noun
VN ... gerund
AJ ... adjective
AV BV FV GV HV KV
MV QV SP SV VV WV ... verbs
HV ... the verb *hava*
I? IC IG IK IP IQ
IR IS IT IU ... punctuation

NCUP@DS ... *konflikterna*
(substantiv utrum pluralis bestämd nominativ)
AQPOP@NS ... *politiska*
V@IPAS ... *har*
AP0@NS ... *oberoende*
RG@S ... *inte*
PF@00@S ... *sig*
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Interset

- Reference:

- CPAN Perl libraries:
  - cpanm install Lingua::Interset

```perl
use Lingua::Interset::Converter;
my $c = new Lingua::Interset::Converter ('from' => 'cs::multext', 'to' => 'cs::pdt');
...
my $target_tag = $c->convert ($source_tag);
```
Tagset Drivers

- A (Perl) module with the following functions:
  - `decode()` ... converts a tag to Interset
  - `encode()` ... generates a tag from Interset
  - `list()` ... lists known tags in the tagset (optional)
Not Everything Fits in the Target Tagset

- Throw away information that cannot be represented
- Warning! May generate “unexpected” tag
  - Swedish knows: noun, gender=com|neut
• Throw away information that cannot be represented
• Warning! May generate “unexpected” tag
  • Swedish knows: **noun, gender=com|neut**
  • and also: **personal pronoun, gender=masc|fem|com|neut**
Not Everything Fits in the Target Tagset

- Throw away information that cannot be represented
- Warning! May generate “unexpected” tag
  - Swedish knows: noun, gender=com|neut
  - and also: personal pronoun, gender=masc|fem|com|neut
  - From Czech: noun, gender=masc
• Throw away information that cannot be represented
• Warning! May generate “unexpected” tag
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  • and also: personal pronoun, gender=masc|fem|com|neut
  • From Czech: noun, gender=masc
  • Either change noun to pronoun
  • or change gender=masc to gender=com
Not Everything Fits in the Target Tagset

- Throw away information that cannot be represented
- Warning! May generate “unexpected” tag
  - Swedish knows: noun, gender=com|neut
  - and also: personal pronoun, gender=masc|fem|com|neut
  - From Czech: noun, gender=masc
  - Either change noun to pronoun
  - or change gender=masc to gender=com
  - What has higher priority?
Does It Matter?

- Atomic tagsets (Penn): no choice
- Positional tagsets can encode “impossible” combinations, e.g. a plural accusative adverb

- What is our goal?
Does It Matter?

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- Positional tagsets can encode “impossible” combinations, e.g. a plural accusative adverb

- What is our goal?
- Just querying attributes? ⇒ Preserve as much info as possible!
• Atomic tagsets (Penn): no choice
• Positional tagsets can encode “impossible” combinations, e.g. a plural accusative adverb

• What is our goal?
• Just querying attributes? ⇒ Preserve as much info as possible!
• Use a pre-trained black-box tool? ⇒ Don’t give it data that it doesn’t expect!
Enforcing Defaults

- Need the list of known target tags
- Centrally for all tagsets:
  - Priorities of features
  - For every feature value, ordered list of substitutes
    - Typically, empty value is the best substitute
    - But: number = dual is better substituted by plural!

```python
'number' =>
{
  'priority' => 320,
  'values' => ['sing', 'dual', 'tri', 'pauc', 'grpa', 'plur'],
  'replacements' => [
    ['sing'],
    ['dual', 'plur'],
    ['tri', 'plur'],
    ['pauc', 'plur'],
    ['grpa', 'plur'],
    ['plur'],
    ['grppl', 'plur'],
    ['inv'],
    ['ptan', 'plur'],
    ['coll', 'sing'],
    ['plur']
  ],
  0 → sing, dual, tri, pauc, ...
  sing → 0, dual, tri, pauc, ...
  dual → plur, 0, sing, tri, ...
  tri → plur, 0, sing, dual, ...
  pauc → plur, 0, sing, ...
  grpa → plur, 0, sing, ...
  plur → 0, sing, dual, tri, ...
  grppl → plur, 0, sing, ...
  inv → 0, sing, dual, tri, ...
  ptan → plur, 0, sing, ...
```
Enforcing Defaults

- Decode all known target tags
- Construct trie for known feature-value combinations
- Follow path in trie when encoding
- If a value is not allowed, find the best substitute

(It is more complex when multi-values come into play.)
Substitution Trie

NNMS1-----A----

pos noun

Interset: Reusable Tagset Conversion
Substitution Trie

- **pos**
  - noun
  - adj
  - num
  - verb
  - adv
  - adp
  - conj
  - part
  - int
  - punc

- **prontype**
  - prs
  - int
  - ind

- **definiteness**
  - ind
  - def

- **gender**
  - com
  - neut
  - masc
  - anim

- **number**
  - sing
  - plur

NNMS1-----A----

- pos
- polarity
- gender
- animacy
- number

Interset: Reusable Tagset Conversion
Substitution Trie

NNMS -----A-----

pos   noun
polarity pos
gender masc
animacy anim
number sing
case nom

pos
noun
adj
num
verb
adv
adp
conj
part
int
punc

prontype
prs
int
ind

definiteness
ind
def

gender
com
neut
masc
com
neut

number
sing
plur

case
nom
gen

Interset: Reusable Tagset Conversion
Google Universal Part-of-Speech Tags

Google Universal Part-of-Speech Tags

- Just the POS category. No morphology
- For many tools this is enough
• Just the POS category. No morphology
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• Good idea
• But it must be applied well!
Just the POS category. No morphology

For many tools this is enough

Good idea

But it must be applied well!

pronoun → PRON
  • determiners, numerals, adverbs
Google Universal Part-of-Speech Tags

- Just the POS category. No morphology
- For many tools this is enough

- Good idea
- But it must be applied well!

- pronoun $\rightarrow$ PRON
  - determiners, numerals, adverbs
- similar for numerals in Danish
- similar for nominal/adjectival verb forms
Lemma-based Re-tagging

```perl
my $lemma = $node->lemma();
# Fix Interset features of pronominal words.
if ($node->is_pronominal())
{
    # Indefinite pronouns and determiners cannot be distinguished by their PDT tag (PZ
    if ($lemma =~ m/([^ně|lec|ledas?|kde|bůhví|kdoví|nevím|málo|sotva)?(kdo|cos?)(si|ko
    {
        $node->iset()->set('pos', 'noun');
    }
    elsif ($lemma =~ m/([^jaký|který]|jaký|který)$|^((každý|všechnen|sám|žádný|some|taký
    {
        $node->iset()->set('pos', 'adj');
    }
    # Pronouns: čí, něčí, čísí, číkoli, ledačí, kdečí, bůhvíčí, nevímčí, ničí should have
    elsif ($lemma =~ m/([^ně|lec|ledas?|kde|bůhví|kdoví|nevím|ni)?čí|čí(si|koliv?))/
    {
        $node->iset()->set('pos', 'adj');
        $node->iset()->set('poss', 'poss');
    }
```
Universal Dependencies: UPOS and Features

• UPOS = extended version of Google universal tags

• Features = extended Interset
  • (now it is the target representation rather than something intermediate)

  • “Universal” feature + set of values
  • Language-specific value of universal feature
  • Language-specific (or treebank-specific) feature + set of values
A Grain of Salt: Even UD Can Be Used Inconsistently!

- https://lindat.mff.cuni.cz/services/pmltq/
  - Find two UD treebanks of related languages
  - Where the “same word” does not get the same UPOS category
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