DANTE: a New Resource for Research at the Syntax-Semantics Interface

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Overview

Background

- Lexical Information for Computational Linguistics
- Automatic Lexical Acquistion
- Existing Resources

Dante

- Lexical Information in Dante
- Demo
- A New Resource for Syntax-Semantics Research

Lexical Information: Subcategorisation

She	*loaded*	*the bag*	*with chicken*
NP	V	NP	PP

Lexical Information: Subcategorisation

She	*loaded*	*the bag*	*with chicken*
NP	V	NP	PP_with

Lexical Information: Subcategorisation

She	*loaded*	*the bag*	*with chicken*
NP	V	NP	PP_with
He	*loaded*	*chicken*	*into the bag*
NP	V	NP	PP_into

Lexical Information: Selectional Preferences

She	*loaded*	*the bag*	*with chicken*
NP	V	NP	PP

Lexical Information: Selectional Preferences

She	*loaded*	*the bag*	*with chicken*
NP	V	NP	PP
	load		with ?

Lexical Information: Selectional Preferences

She	*loaded*	*the bag*	*with chicken*
NP	V	NP	PP
	load		with ?
	load	NP	with ?

Lexical Information: Selectional Preferences

She	*loaded*	*the bag*	*with chicken*
NP	V	NP	PP
	load		with ?
	load	NP	with ?

explosive ammunition scrap fish supplies brick fat food water . . .

Lexical Information: Diathesis Alternations

She loaded the bag with chicken
She loaded chicken into the bag

Lexical Information: Verb Class

Pour Verbs: *dribble, drop, pour, slop, slosh, spew, spill, spurt*

Causative Alternation:
I pour water into the pot $\leftrightarrow$ *Water poured into the pot*
*Locative Alternation:
I pour water into the pot $\leftrightarrow$ **I poured the pot with water*
*Conative Alternation:
I pour water into the pot $\leftrightarrow$ **I poured at water into the pot*

Lexical Acquisition

SYNTAX

parsing

subcategorisation
&
argument slots

diathesis alternations

SEMANTICS

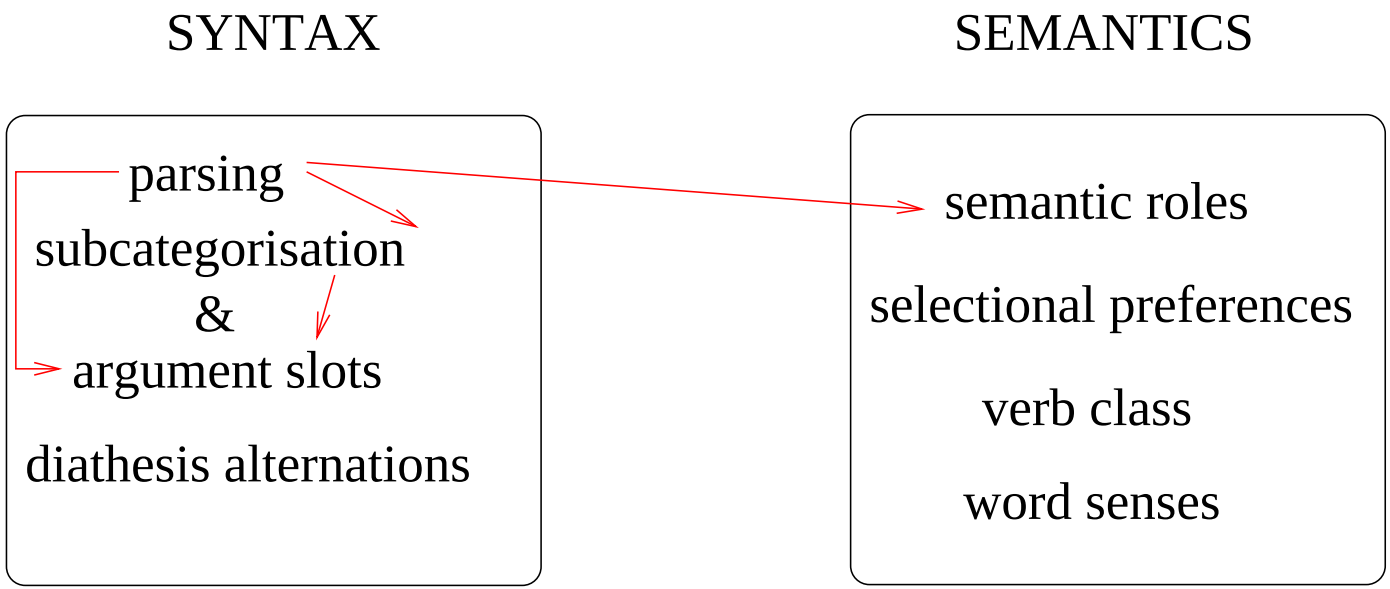
semantic roles

selectional preferences

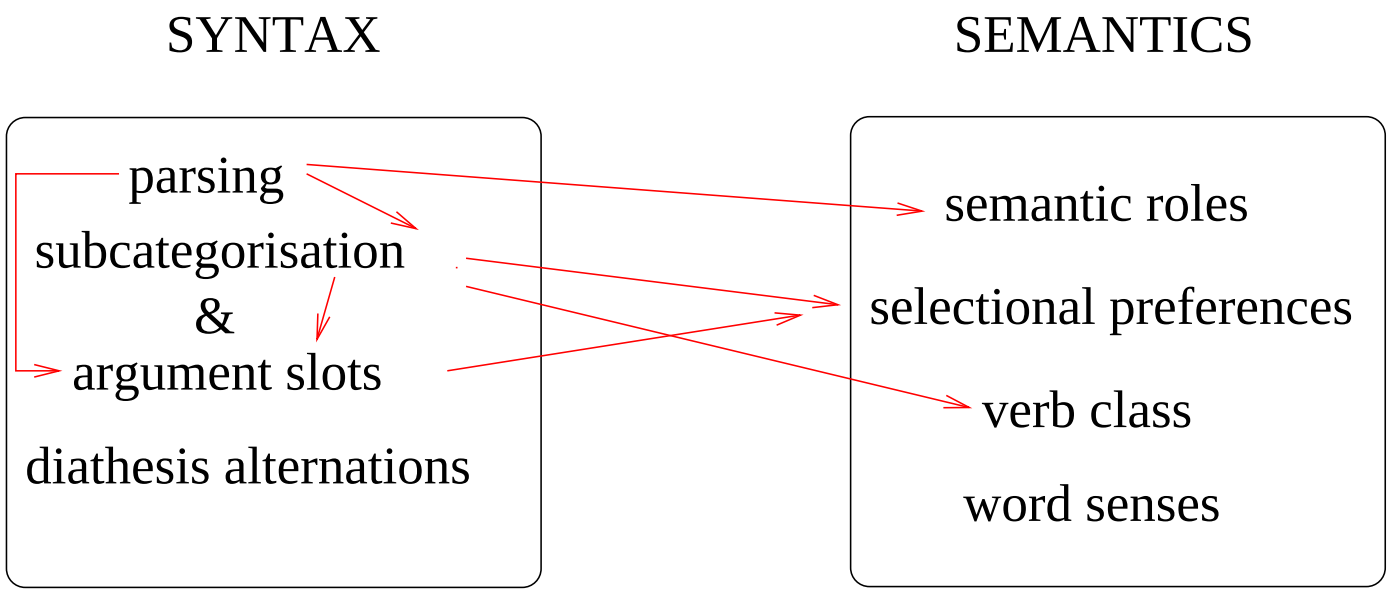
verb class

word senses

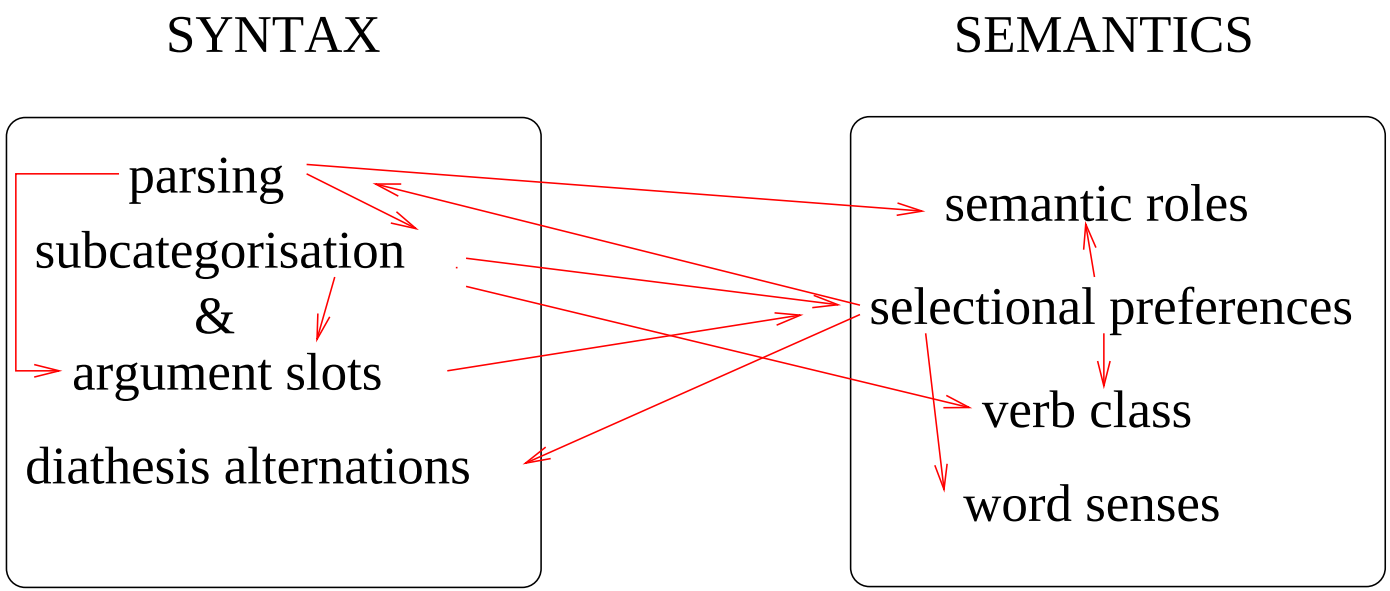
Lexical Acquisition



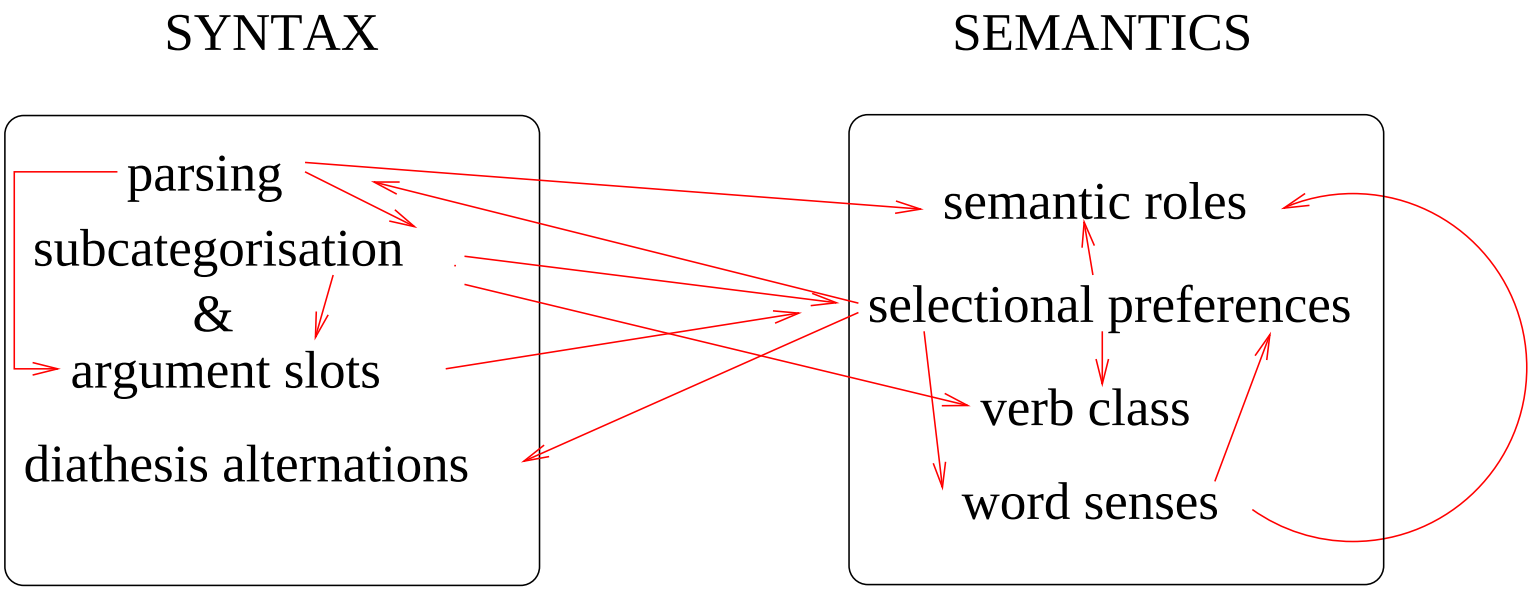
Lexical Acquisition



Lexical Acquisition



Lexical Acquisition



Subcategorisation Acquisition

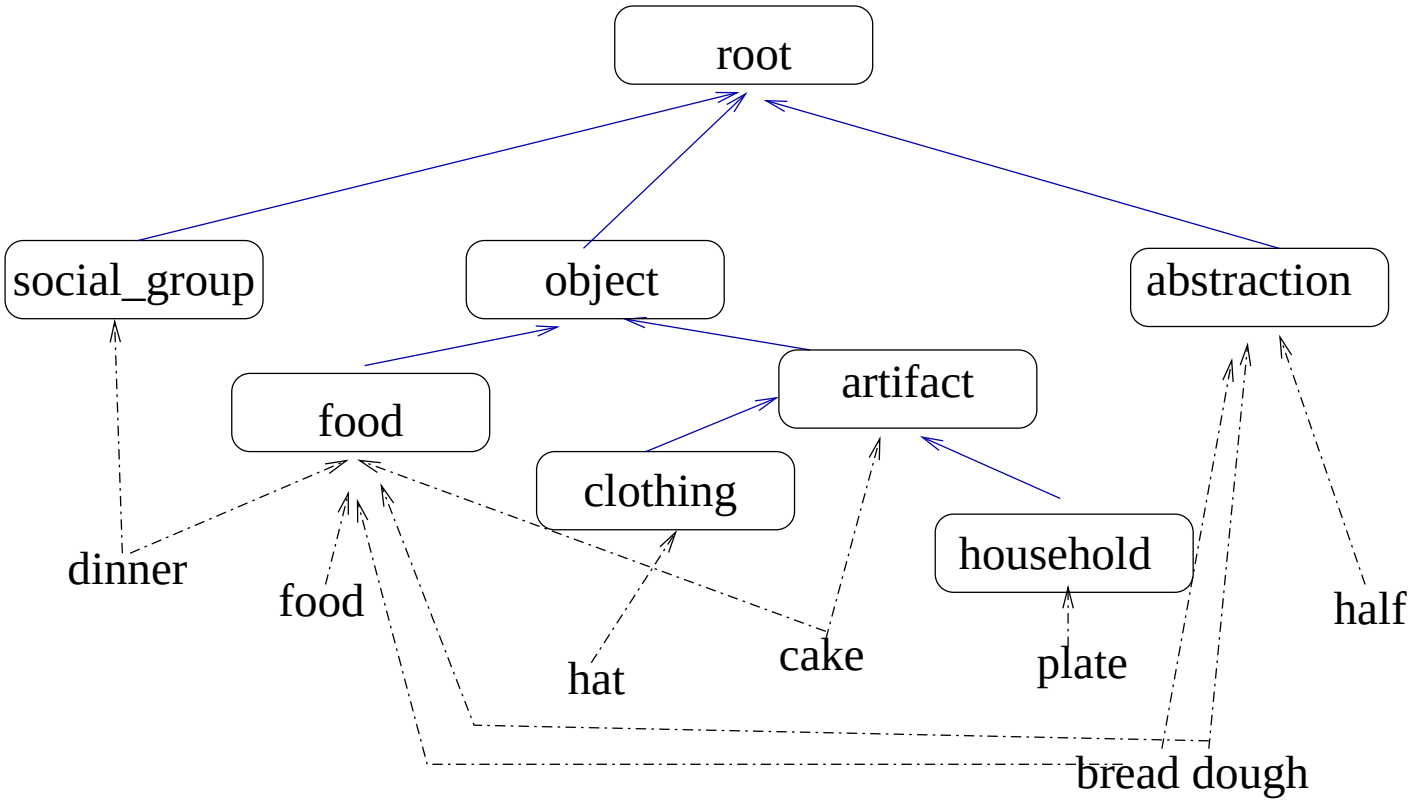
- unambiguous instances [Brent, 1991]
- parsing [Briscoe and Carroll, 1997]
- statistical filtering [Briscoe and Carroll, 1997]
- use of semantic classes for generalising [Korhonen, 2002]

Selectional Preference Acquisition

- use:
  - slots e.g. direct object [Resnik, 1993] or
  - slots in SCF [McCarthy, 2001]
- generalise argument heads with
  - WordNet [Resnik, 1993, Li and Abe, 1998]
  - distributional similarity [Erk, 2007, McCarthy et al., 2007]

WordNet Based Models: example *eat*

food 7, bread 5, cake 4, hat 3, dinner 2, dough 2, plate 2, half 1



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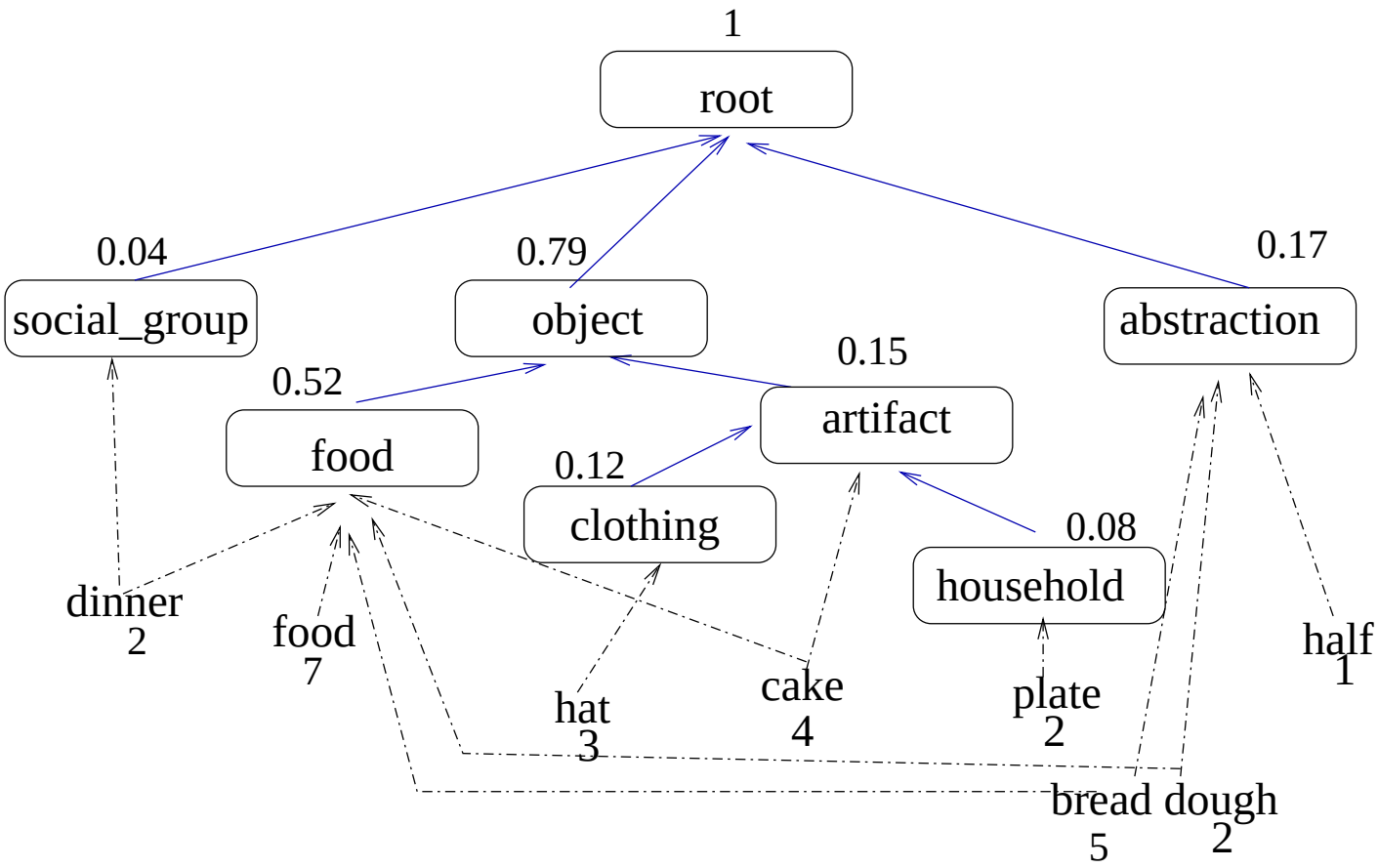
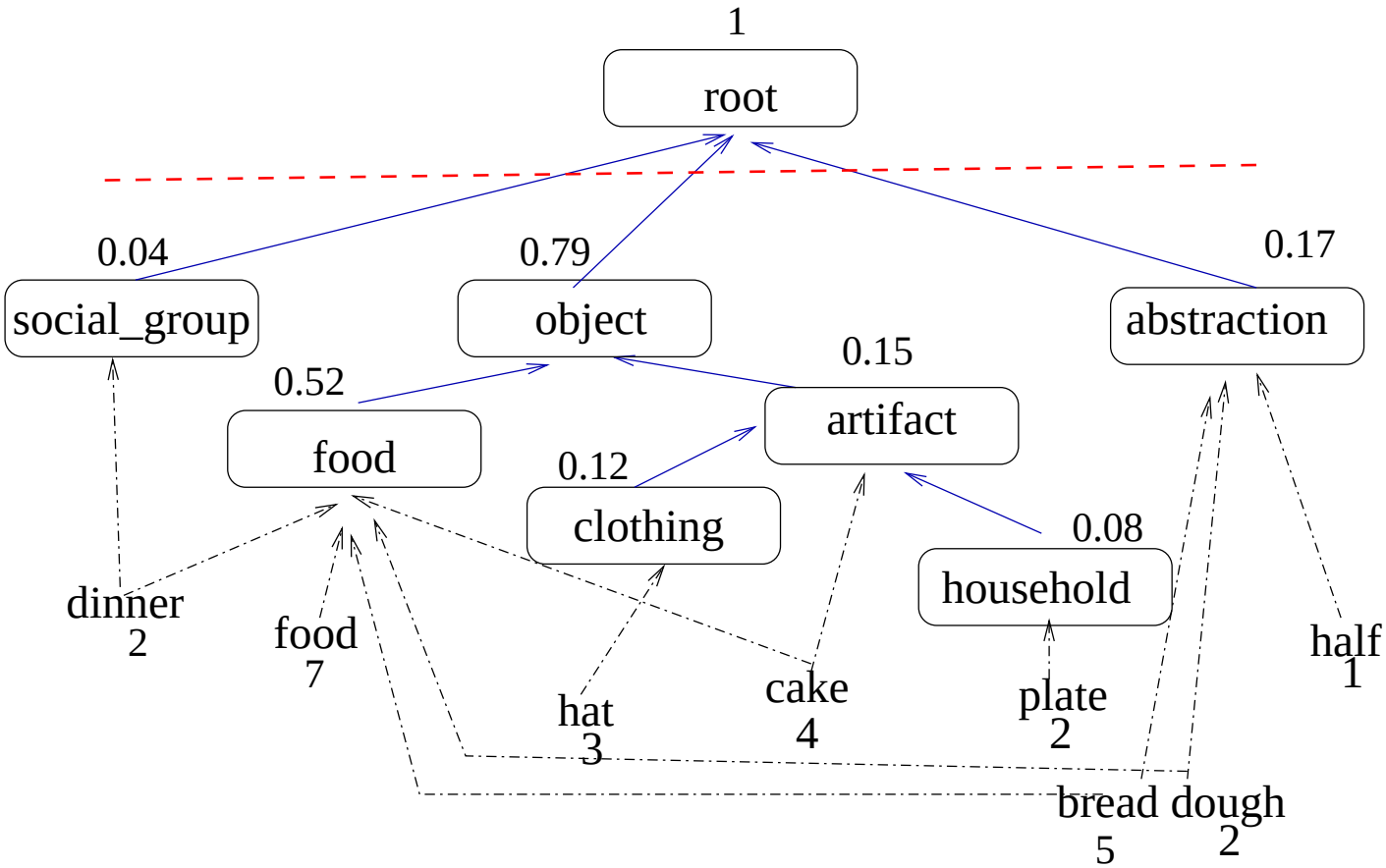


noise from polysemous words, multiwords and other sources

WordNet Based Models: example *eat*

food 7, bread 5, cake 4, hat 3, dinner 2, dough 2, plate 2, half 1



Use frequency to find classes for representing preference and calculate probability distribution over these classes

Distributional Models

Find distributionally similar words:

bread: loaf 0.195, cheese 0.179, cake 0.169, potato 0.158, butter 0.155, meat 0.153, toast 0.148, flour 0.143, bean 0.139, vegetable 0.138

van: truck 0.230, lorry 0.229, car 0.222, vehicle 0.196, bus 0.191, taxi 0.172, train 0.160, tractor 0.150, boat 0.148, cab 0.147

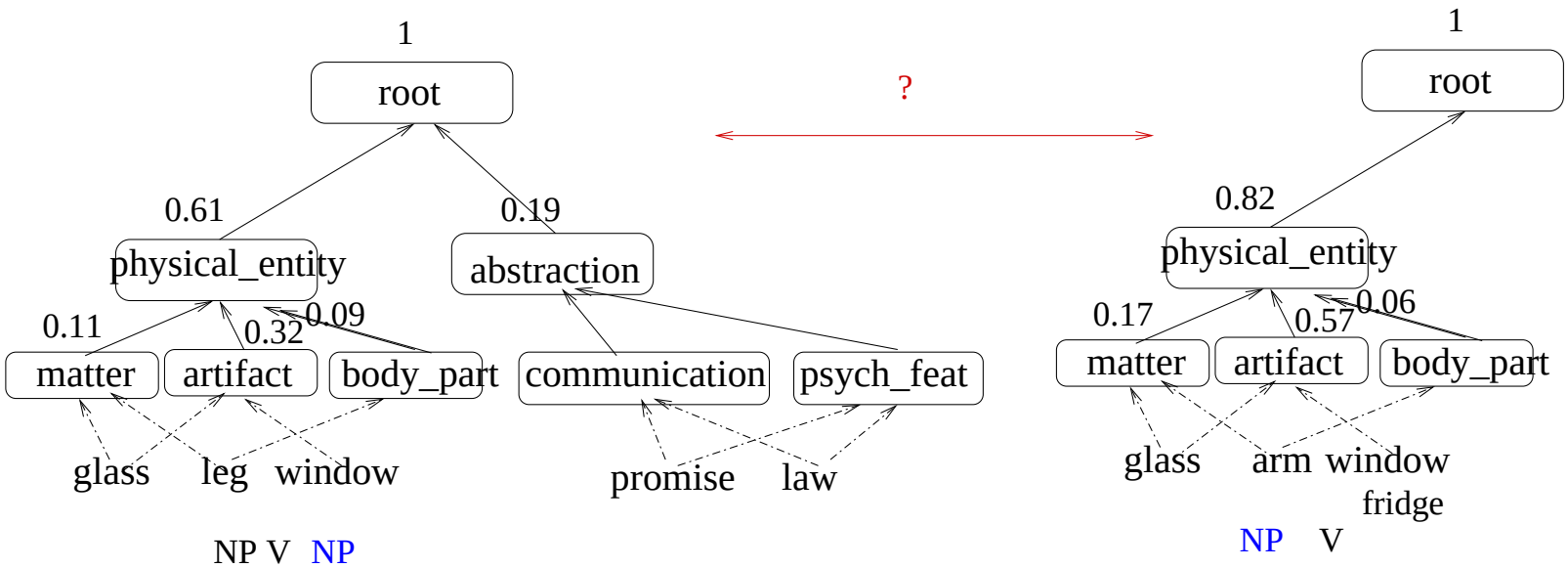
use these directly [Erk, 2007]

or build prototypical classes [McCarthy et al., 2007]

example: object slot of *park*

class ($p(c)$)	disambiguated objects (freq)
van (0.86)	car (174) van (11) vehicle (8) ...
backside (0.02)	backside (2) bum (1) butt (1) ...

Diathesis Alternation Detection: example *break*



Verb Class Acquistion

- decision trees using syntactic and semantic features [Merlo and Stevenson, 2001]
- clustering SCF [Schulte im Walde, 2006]
- clustering SCF and selectional preferences [Sun and Korhonen, 2009]

Verb Resources for Computational Linguistics

- WordNet [Fellbaum, 1998] 11529 verbs with verb senses and semantic relations
- Levin's classification: [Levin, 1993] 3100 verbs into 193 classes
- VerbNet [Kipper-Schuler, 2005] 3769 lemmas with 5257 senses, WordNet classes + syntactic info, roles and selectional restrictions
- ProbBank [Palmer et al., 2005] 1M WSJ corpus predicate-argument and verb specific role information
- Valex [Korhonen et al., 2006] automatically produced SCF lexicon of 6397 verbs
- FrameNet [Ruppenhofer et al., 2010] classifies verbs into approx 800 frames. Currently 135K examples (BNC and American newswire)

DANTE: Database of Analysed Texts of English

- commissioned by Foras na Gaeilge for production of New English Irish Dictionary
- lexical resource as monolingual analysis of English
- corpus based. Lexicographers produced using Word Sketches from a corpus of 1.7 billion words (UKWaC, American newspaper, Irish English data)
- concordance sorted according to the 'GDEX' program
- containing entries for:
  - 42,000 headwords (6,300+ verbs)
  - 27,000 idioms and phrases
  - 20,500 compounds
  - just under 3,000 phrasal verbs

Dante: Contents

- meanings with definitions
- over 622,000 examples from the corpus,
- argument structure (valency) e.g. NP-Vinf *let him go* (42 frames for verbs, further specified by preposition)
- attitude e.g. *meddle* (pejorative)
- regional e.g. *nick* (British) as in *you're nicked*
- style e.g. *oxidise* (technical) *perambulate* (humorous)
- register e.g. *ameliorate* (formal) *go ape* (informal)
- subject e.g. *multiply* (maths)
- time e.g. *punch* (cattle: dated) or *quoth* (obsolete)
- inherent grammar e.g. reciprocal
  John marries Mary $\leftrightarrow$ *Mary and John marry*
- support verbs e.g. *make an appeal*

see webdante.com

Outline

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Dante
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DANTE (Database of ANalysed Texts of English)

blend: (PoS: v)
meaning: combine
SCF: NP
corpus pattern: with plural noun as object
example: *I have very little idea of how to* **blend** *colour.*
corpus pattern: blend sth and sth
example: *High Points : The attempt to* **blend** *melodrama comedy and horror is a worthy if failed effort.*
SCF: NP_PP_X with
example: *Kazakhstan was interested in* **blending** *palm oil with its own cotton seed and sunflower seed oils for industrial application , officials said.*
...
SCF: NP_PP_X into
example: *I* **blend** *different colours into the background of my paintings to evoke sections of light .*

DANTE: for Research at the Syntax-Semantics Interface

Advantages:

- coverage
  - 6,300 head word verbs
  - 3000 phrasals
- 300,000 corpus examples for verbs (630,000 all PoS)
- varied corpus (1.7 billion words)
- syntax and semantics, attested in corpus and manually validated

DANTE: for Research at the Syntax-Semantics Interface

Potential:

- subcategorisation acquisition
- selectional preference acquisition
- word sense disambiguation and word sense induction
- diathesis alternation detection
- merging
  resources [Merlo and van der Plas, 2009, Atkins, 2010]

DANTE for Subcategorisation Frame Acquisition

As a gold standard

- examples as input data
- further examples of these DANTE SCF in sketch engine
- did system find the **same** frames in this data?
- did the system find erroneous frames?
- combine with verb sense

DANTE for Selectional Preference Acquisition

- reduce noise from parser stage,
- collect argument heads from examples
- collect further examples from DANTE corpus in sketch engine
- combine with SCF
- combine with verb sense (input data or detection)

DANTE for Word Sense Experiments

- word sense disambiguation
  inital experiments using:
  - collocates : match with context
  - SCF match with context: particularly promising for verbs
  - definitions : overlap with definitions of words in context
  - domain: overlap with domain of words in context
- word sense induction:
  - DANTE senses from contexts of examples
  - or classes based on SCF

DANTE for Diathesis Alternation Detection

- use SCF from same sense as input
- data at candidate slots from examples in sketch engine
- similarity of argument heads using distributional thesaurus
- use for verb class induction

Merge DANTE with Other Resources

- SCF (FrameNet, VerbNet)
- use distributional thesaurus to link collocates in different resources [Atkins, 2010]
- similarity of definitions, and collocates (WordNet)
- apply DANTE grammar to corpus (PropBank, FrameNet)
- disambiguate corpus by DANTE sense

Summary

- Verbal Lexical Acquisition for Comp. Ling.
  - SCF
  - selectional preferences
  - diathesis alternations
  - verb class

Summary

- Verbal Lexical Acquisition for Comp. Ling.
  - SCF
  - selectional preferences
  - diathesis alternations
  - verb class
- resources: VerbNet FrameNet PropBank ...
- DANTE: wide variety syntax and semantics phenomena associated with examples from 1.7 billion word corpus

Finally . . .

Finally . . .

COMPOUND

thank you

1 interj *[spok]* used to acknowledge sth sb has done for you/given you/said to you

- *' Are you cold ? ' ' No . ' ' Yes , you are , ' and he wrapped a warm rug around my legs and slung a coat behind my shoulders . '* **Thank you** *, ' I said .*
- *Normally we do n't like the training programme interrupted , but in view of the circumstances you may take a week 's compassionate leave . " "* **Thank you** *very much , sir . "*
- *"* **Thank you** *, thank you , thank you , " she said . " I 'll miss the game but I 'm ready for my new life . "*
- *What do you say?* **Thank you** *, Granny.*
- *.' I love your dress; it's fantastic."* **Thank you** *,' Aoife said.*
- *Is your back better? " "Improved,* **thank you** *. "*

CHUNK say thank you

- *It will be an opportunity for the Irish people to say* **thank you**.
- *They always said `* **Thank you** *' and smiled at me.*

CHUNK thank you for sth

- **Thank you** *for the grapes - presumably your own and the jam.*
- *David, a chara.* **Thank you***for your letter, which I received last Wednesday, and for the article which you enclosed.*

And Thanks to Colleagues on DANTE

- Sue Atkins
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- Cathal Convery
- Michael Rundell
- Diana Rawlinson
- Valerie Grundy


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