Example of an application: machine translation

From http://papetziz.attavista.com/

They acquire this knowledge in the first place: What do they do when they use this knowledge? How do they acquire this knowledge? In the second place: What do people know when they know a natural language? Questions that are traditionally addressed by linguistics: formal theories, compositionality based investigation of language, problems of the understanding of language, and the development and implementation of computer science. A new field: Computational Linguistics. An approach to linguistics that is computational rather than empirical.

Natural language processing: A subfield of computer science, and in particular artificial intelligence. This is concerned with computational processing of natural languages, rather than simulation of cognitive processes on computers. In order to provide such novel products as computers that can understand everyday human speech, translate between different human languages, and otherwise interact intelligently with people in ways that suit people rather than computers.
human behavior is a crucial component of our lives and is a crucial member of our language is one of the fundamental functions of language is one of the fundamental aspects of language

Example of an application: machine

Production work.

Example of an application: machine

Production work.
Many of the algorithms are computationally intractable.

Most stages of the process involve ambiguity.

The necessary knowledge is enormous.

Language understanding is complicated.

Why are the results so poor?

Example of an application: question answering

Generation to following

Generation to the next

record of long duration of acquisition from one

a long-term record of knowledge from one

In the written form it serves as

Comparison

Comparison
Phonetic and phonological knowledge

Different subfields of linguistics study these areas.

- World knowledge
- Discourse knowledge
- Pragmatic knowledge
- Semantic knowledge
- Syntactic knowledge
- Morphological knowledge
- Phonetic and phonological knowledge

What kind of knowledge is required?
Different subfields of Linguistics study these areas:

- World knowledge
- Discourse knowledge
- Pragmatic knowledge
- Semantic knowledge
- Syntactic knowledge
- Morphological knowledge
- Phonetic and phonological knowledge

What kind of knowledge is required?

Ambiguity: (2)<

Inferential morphology: Inferred forms are constructed from base forms and inferential affixes: 2Δ Δ 1 + Δ 1 + Δ 1 → Δ 1 + Δ 1

Inferential affixation ← Inferentialization

Inferential + r-ferential ← Inferential

(Or stems) and derivational affixes:

Derivational morphology: Words are constructed from roots

Problems in morphological processing

Inferential affixes are inserted into the root/stem

Prefixes precede the root/stem

Suffixes follow the root/stem

Especially roots or stems.

A root: a morpheme which is added to other morphemes.

Bound morphemes: book, DICTIONARY

Free morphemes: book, DICTION

Root (not a word) or free (word).

A morpheme is a minimal sound-meaning unit. Can either be

Morphology studies the structure of words.

Morphology
This book describes research about how language comprehension and production work.

Coordination:

Kim promised Sandy to call the plumber.

Kim asked Sandy to call the plumber.

Control:

I saw the bird with the telescope.

I saw the man with the telescope.

Ambiguity:

Problems of syntactic processing:

Syntax

Ungrammatical ones:

Parsing: assigning structure to grammatical strings. Refracting

Expressiveness: what formalism is required for describing

Syntax

Natural language sentences have structure:

Furiously sleep ideas green colorless

Colorless green ideas sleep furiously

Young green frogs sleep quickly
VP anaphora: Kim loves his wife and so does Sandy.

Record of knowledge:

Behavior in written form is served as a long-term language is one of the fundamental aspects of human discussed.

Constraints are suggested and problems with them are in the next few paragraphs, some preliminary.

After she robbed the bank, Kim went home.

KIM went home after she robbed the bank.

Co-reference and anaphora:

Problems of semantic processing

Different subfields of linguistics study these areas:

- World knowledge
- Discourse knowledge
- Pragmatic knowledge
- Semantic knowledge
- Syntactic knowledge
- Morphological knowledge
- Phonological knowledge

What kind of knowledge is required?
I'm really sorry!
I swear that I didn't do it
sentence you to six months in prison

**Warning:** I warn you that I will see you later
**Promise:** I promise that I will see you later
**Prediction:** I predict that I will see you later

I'll see you later

with it:

force of an utterance resulting from the function associated

**Speech acts:** The illocutionary force, the communicative

**Pragmatics**

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Could you pass me the salt?
I have two children.

— How old are you? — Closer to 30 than to 20.

*Explicitly uttered:

*Implicitly uttered: what is conveyed by an utterance that was not

**Pragmatics**

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Different subfields of pragmatics study these areas:

- World knowledge
- Discourse knowledge
- Pragmatic knowledge
- Semantic knowledge
- Syntactic knowledge
- Morphological knowledge
- Phonological knowledge

What kind of knowledge is required?

Pragmatics is the study of how more gets communicated than

**Pragmatics**

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It was summer then.
It really surprised Sandy.
She does it every year.
It changed her life.

Reference to non-NPs: Kim visited the University of Hira.

Cross-sentential anaphora
Non-sentential utterances: she, to Hira; the last one

Problems of discourse processing

Different subfields of linguistics study these areas:

- World knowledge
- Discourse knowledge
- Pragmatic knowledge
- Semantic knowledge
- Syntactic knowledge
- Morphological knowledge
- Phonemic and phonological knowledge

What kind of knowledge is required?

Give me two tickets for the earlier one, please.

There is one at 2:00 and one at 2:30.

When does the train to Hira leave?

An example dialogue:

Extremely important for dialogue systems.

A discourse is a sequence of sentences. Discourse has structure

Discourse

Non-internal use of language: metaphor, irony etc.

Pragmatics
Applications

Semantics

Montague Grammars

Unification Grammars: Feature structures and unification

The limitations of CFGs

Bottom-up chart parsing


Trees, languages

Context-free Grammars: Grammars. Forms, derivations.

Introduction to syntax: The structure of natural languages

Syntax

Morphology

Structure of the course

Different subfields of Linguistics study these areas.

World knowledge

Discourse knowledge

Pragmatic knowledge

Semantic knowledge

Syntactic knowledge

Phonological knowledge

What kind of knowledge is required?

Visit of the American president.

Bill Clinton left for Vietnam today. This is the last foreign

- Is the train to Harlem later? If I get Tel Aviv at 8:30.

World knowledge
Attendance: Optional but recommended.

Grading: 4-6 homework assignments (approximately 20% of the final grade); mid-term exam (30%); final exam (50%)

Textbook: James Allen, Natural Language Understanding

Practicalities