

NLP and Language Learning

On Analyzing Learner Language and Analyzing Language for Learners

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Introduction

- ▶ Computers are widely used in foreign language teaching to help learners experience a foreign language & culture.
 - ▶ multimedia presentations, web-based TV/radio/news, email/chat with native speakers, ...
- ▶ At the same time, **awareness of language categories and forms** is important for an adult learner to successfully acquire a foreign language.
 - ▶ (cf., e.g., Long 1991, 1996; Ellis 1994; Schmidt 1995; Lyster 1998; Lightbown & Spada 1999; Norris & Ortega 2000)

⇒ NLP can be used to in support of language awareness

- ▶ analyze *learner* language to provide individual feedback on errors and other language properties
- ▶ analyze *native* language to support enhanced presentation and interaction with language

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This talk: explore the two research directions

Individualized feedback in an Intelligent Tutoring System

- ▶ TAGARELA: An intelligent, web-based workbook in support of traditional teaching of Portuguese (Amaral 2007; Amaral & Meurers 2006, 2008, 2009, 2011; Amaral, Meurers & Ziai 2011; Ziai 2009)
- ▶ Evaluating meaning (Bailey & Meurers 2006, 2008) and project A4 in SFB 833

Visual input enhancement

- ▶ Automatic enhancement of learner selected web pages in WERTI: Working with English Real Texts interactively (Metcalfe & Meurers 2006; Meurers et al. 2010)

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Starting point for TAGARELA: Real-life needs

In a series of interviews with Spanish/Portuguese language instructors at OSU we found that

- ▶ it can be difficult to achieve the communicative goal of an activity when students have problems using the appropriate language forms and sentence patterns.
- ▶ But class activities that focus on form or grammar patterns are perceived as problematic since
 - ▶ they reduce the pace of a lesson, and
 - ▶ individual differences make it impossible to have all students do the same tasks at exactly the same time.
- ▶ Work on form and grammar is deemphasized and confined to homework
 - ⇒ Learners have few opportunities to receive immediate, individual feedback

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An opportunity for CALL

- ▶ Good opportunity for developing CALL tools to
 - ▶ practice receptive skills
 - ▶ reinforce acquisition of forms
 - ▶ raise linguistic awareness in general
- ▶ But existing CALL systems typically offer limited exercise types such as multiple choice, point&click, form filling
 - ▶ feedback usually is limited to yes/no or letter-by-letter matching of the string with pre-stored answers.

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Making CALL tools aware of language: NLP

- ▶ String matching as the general technique used in CALL to analyze student answers is effective when
 - ▶ correct answers and potential errors are predictable and listable (i.e., little well-formed or ill-formed variation)
 - ▶ listable answers correspond to intended feedback
 - ▶ Linguistic analysis must be added when
 - ▶ all possible correct and incorrect answers are not (conveniently) listable for a given activity
 - ▶ individualized feedback is desired which requires information about the learner language that can only be obtained through linguistic analysis
- ⇒ Use NLP to analyze learner answer (→ Intelligent CALL)

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A concrete example for an ICALL nlp system

TAGARELA: Teaching Aid for Grammatical Awareness, Recognition and Enhancement of Linguistic Abilities

- ▶ An intelligent web-based workbook for beginning learners of Portuguese: <http://purl.org/icall/tagarela>
- ▶ Self-guided activities accompanying teaching
 - ▶ ideally involving both form and meaning
- ▶ TAGARELA offers six types of activities:
 - ▶ listening comprehension
 - ▶ reading comprehension
 - ▶ picture description
 - ▶ fill-in-the-blank
 - ▶ rephrasing
 - ▶ vocabulary

Similar to traditional workbook exercises, plus audio.

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THE TAGARELA SYSTEM THE OHIO STATE UNIVERSITY ICALL EDUCATIONAL GROUP

Listening Reading Description Fill-in-blanks Rephrasing Vocabulary Home Logout

PROGRESS: 1 2 3 4 Atividades: 1 2

Compreensão Auditiva

Instrução

Ouve o áudio e responde às perguntas abaixo.

Questão: 1

Qual bebida ela pede?

Enviar

Report Errors & Suggestions

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THE TAGARELA SYSTEM @ THE OHIO STATE UNIVERSITY CALL RESEARCH GROUP

Listening Reading Description Fill-in-Blanks Rephrasing Vocabulary Home Logout

Módulo: 1 2 3 4 5 Atividades: 1

Leitura

Instrução

Leia o texto e responda às questões usando frases completas e o vocabulário apresentado no texto. Evite as opções por extenso.



Regiões do Brasil

O Brasil está política e geograficamente dividido em cinco regiões. Os limites de cada região (Norte, Nordeste, Sudeste, Sul e Centro-Oeste) coincidem sempre com as fronteiras dos estados que as compõem.

A região Norte ocupa a maior parte do território brasileiro, com uma área que corresponde a 46,2% da área total do País. Formada por sete Estados, tem sua área quase totalmente dominada pela bacia do Rio Amazonas.

A região Nordeste pode ser considerada a mais homogênea do País. Delimita em quatro grandes zonas - médio-norte, zona da mata, agreste e sertão - ocupa 18,20% do território nacional e tem nove estados.

O Sudeste é formado por quatro Estados. Dada a a região de maior importância econômica do País, onde está concentrado também a maior índice populacional - 46,83 do brasileiro.

Já o Sul, região mais fria do País, com ocorrência de geadas e neve, é a que apresenta menor área, ocupando 6,70% do território brasileiro e com apenas três Estados. Os rios que correm sua área formam a bacia do Paraná em quase toda sua totalidade e são de grande importância para o País, principalmente pelo seu potencial hidroviário.

Finalmente, a região Centro-Oeste tem sua área dominada basicamente pelo Planalto Central Brasileiro e pode ser dividida em três grandes regiões administrativas: bacia do sedimentação Rio Paraná e a do Tocantins. Ela é formada por quatro Estados e nela está a capital do Brasil.

Questão 1

Quantas regiões tem o Brasil?

Resposta:

Report Errors & Suggestions

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TAGARELA Feedback

- ▶ What should we provide feedback on?
 - ▶ TAGARELA provides on-the-spot feedback on
 - ▶ orthographic errors (spelling, spacing, punctuation)
 - ▶ syntactic errors (nominal and verbal agreement)
 - ▶ semantic errors (missing or extra concepts, word choice)
- ▶ Which form of feedback is effective?
 - ▶ Meta-linguistic feedback, highlighting (cf. Heift 2004)
 - ▶ More research needed, including transfer of SLA insights (cf. Sachs & Suh 2007; Petersen 2010)

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526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 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2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036 2037 2038 2039 2040 2041 2042 2043 2044 2045 2046 2047 2048 2049 2050 2051 2052 2053 2054 2055 2056 2057 2058 2059 2060 2061 2062 2063 2064 2065 2066 2067 2068 2069 2070 2071 2072 2073 2074 2075 2076 2077 2078 2079 2080 2081 2082 2083 2084 2085 2086 2087 2088 2089 2090 2091 2092 2093 2094 2095 2096 2097 2098 2099 2100 2101 2102 2103 2104 2105 2106 2107 2108 2109 2110 2111 2112 2113 2114 2115 2116 2117 2118 2119 2120 2121 2122 2123 2124 2125 2126 2127 2128 2129 2130 2131 2132 2133 2134 2135 2136 2137 2138 2139 2140 2141 2142 2143 2144 2145 2146 2147 2148 2149 2150 2151 2152 2153 2154 2155 2156 2157 2158 2159 2160 2161 2162 2163 2164 2165 2166 2167 2168 2169 2170 2171 2172 2173 2174 2175 2176 2177 2178 2179 2180 2181 2182 2183 2184 2185 2186 2187 2188 2189 2190 2191 2192 2193 2194 2195 2196 2197 2198 2199 2200 2201 2202 2203 2204 2205 2206 2207 2208 2209 2210 2211 2212 2213 2214 2215 2216 2217 2218 2219 2220 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Loosely restricted reading comprehension

An example

Question: *What are the methods of propaganda mentioned in the article?*

Target: *The methods include use of labels, visual images, and beautiful or famous people promoting the idea or product. Also used is linking the product to concepts that are admired or desired and to create the impression that everyone supports the product or idea.*

Sample Learner Responses:

- ▶ A number of methods of propaganda are used in the media.
- ▶ Positive or negative labels.
- ▶ Giving positive or negative labels. Using visual images. Having a beautiful or famous person to promote. Creating the impression that everyone supports the product or idea.

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CAM-En learner corpus

- ▶ The corpus was collected in second language classrooms, using the ordinary exercises assigned by the teacher.
 - ▶ Teachers also provided target answers and learner answer assessment.
- ▶ CAM-En corpus: 566 responses to RC questions from intermediate English as a Second Language students.
 - ▶ Development set:
 - ▶ 311 responses from 11 students to 47 questions
 - ▶ Test set:
 - ▶ 255 responses from 15 students to 28 questions

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Annotation: Categories for content assessment

- ▶ The annotation scheme was developed by analyzing target and learner responses in the development corpus.
- ▶ Two graders independently annotated the data:
 - ▶ detection (binary): correct vs. incorrect meaning
 - ▶ diagnosis (5 codes): correct; missing concept, extra concept, blend, non-answer
- Eliminated responses which graders did not agree on
 - ▶ 48 in development set (15%) and 31 in test set (12%)
- ▶ Learner responses vary significantly; no full bag-of-word overlap between test set answers and targets.
- ▶ On average, 2.7 form errors per sentence.

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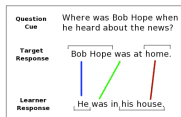
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Basic idea: Comparing responses & targets



- ▶ CAM compares target & learner responses in three steps:
 1. **Annotation** uses NLP to enrich the learner and target responses and question text with linguistic information.
 2. **Alignment** maps units in the learner response to units in the target response using the annotated information.
 3. **Diagnosis** analyzes the alignment to label the learner response with a target modification diagnosis code.

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Types of alignment

Alignment can involve different types of representation:

Alignment Type	Example Match
Token-identical	advertising advertising
Lemma-resolved	advertisement advertising
Spelling-resolved	campaign campaign
Reference-resolved	Clinton he
Semantic similarity-resolved	initial beginning
Specialized expressions	May 24, 2007 5/24/2007

Levels of alignment

Alignment can take place at different levels of representation:

Level	Example	Alignment
Tokens	The explanation is simple. The reason is simple.	explanation reason
Chunks	A brown dog sat in a nice car. A nice dog sat in a car.	a brown dog a nice dog
Dependency triples	He knows the doctor. John knows him.	obj(knows, doctor) obj(knows, him)

NLP tools used

Annotation Task	Language Processing Tool
Sentence Detection, Tokenization, Lemmatization	MontyLingua (Liu 2004)
Lemmatization	PC-KIMMO (Antworth 1993)
Spell Checking	Edit distance (Levenshtein 1966), SCOWL word list (Atkinson 2004)
Part-of-speech Tagging	TreeTagger (Schmid 1994)
Noun Phrase Chunking	CASS (Abney 1996)
Lexical Relations	WordNet (Miller 1995)
Similarity Scores	PMI-IR (Turney 2001; Mihalcea et al. 2006)
Dependency Relations	Stanford Parser (Klein & Manning 2003)

Features used for content assessment

- Diagnosis is based on 14 features:

of Overlapping Matches:

- keyword (head word)
- target/learner token
- target/learner chunk
- target/learner triple

Nature of Matches:

- % token matches
- % lemma matches
- % synonym matches
- % similarity matches
- % sem. type matches
- match variety

Semantic error detection

- For combining the evidence, machine learning (TIMBL, Daelemans et al. 2007) worked better than manual rules.

Results

Binary classification	Accuracy
Random Baseline	50%
Development Set (leave-one-out testing)	87%
Test Set	88%

Diagnosis with 5 codes	Accuracy
Development Set	87%
Test Set	87%

Form errors don't negatively impact results:

- 68% of correctly diagnosed items had form errors.
- 53% of incorrectly diagnosed ones did as well.

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Related work

- No directly comparable systems, but competitive with results for automatic scoring of native speaker short answers by C-Rater (Leacock & Chodorow 2003; Leacock 2004).
 - Techniques used by essay grading systems (e.g., E-Rater, Burstein et al. 2003; AutoTutor, Graesser et al. 1999) do not generalize well to short (1-2 sentence) responses.
- Related research issues
 - Paraphrase recognition (e.g., Brockett & Dolan 2005; Hatzivassiloglou et al. 1999)
 - Machine translation evaluation (e.g., Banerjee & Lavie 2005; Lin & Och 2004)
 - Essay-based question answering systems (e.g., Deep Read, Hirschman et al. 1999)
 - Automatic grading (e.g., Leacock 2004; Marin 2004)
 - Recognition of Textual Entailment (RTE, Dagan et al. 2006)

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Future work

Towards Interpretation in Context

- The reading comprehension question task we are focusing on provides an explicit context in form of
 - the text, and
 - the questions asked about it.
- CAM currently takes this context into account for basic anaphora resolution in the target and learner answers.
- But how about other aspects of this context?
 - How should information in the answers that is given in the question be interpreted?
 - How can the nature of a question and the task strategies it requires be taken into account?

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Towards interpretation in context

Treatment of *given* information

- Example from CAM-en:
 - Cue:** *What was the major moral question raised by the Clinton incident?*
 - Target:** *The moral question raised by the Clinton incident was whether a politician's personal life is relevant to their job performance.*
 - Response:** *A basic question for the media is whether a politician's personal life is relevant to his or her performance in the job.*
- The current CAM version simply removes *given* words.
- A more sophisticated approach is needed to
 - keep sentence intact for deeper processing
 - use the occurrence of *given* information to distinguish between incorrect answers and off-topic answers.

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Towards interpretation in context

Question classification

- ▶ Comparing the meaning of answers to questions should make use of nature of the questions being answered.
- ▶ Features to be investigated include
 - ▶ **Learning Goals:** Targeted cognitive skills and knowledge (e.g., Anderson & Krathwohl 2001)
 - ▶ **Knowledge Sources:** The implicit/explicit answer source (Irwin 1986; Pearson & Johnson 1978)
 - ▶ **Text Type:** The rhetorical structure of the text (Champeau de Lopez et al. 1997)
 - ▶ **Answer Type:** The kind of answer expected (Gerbault 1999)
- ▶ Results here may also help answer:
 - ▶ What are suitable, more fine grained diagnosis categories for content assessment?

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Adaptivity of analysis

- ▶ Given the high number of form errors in learner data, deep analysis and model construction often is not feasible.
- ▶ However, there are patterns for which a dedicated, deep analysis may be possible or even important.
- ▶ Patterns to be explored include
 - ▶ semantic units expected in the answer (cf. answer typing)
 - ▶ specific linguistic constructions identified in the answer which require special treatment (e.g., negation).
 - ▶ typical well-formed "islands of compositionality" supporting a deep analysis (e.g., particular NP patterns)
- ▶ Adaptively combining shallow & deeper analyses becomes especially important when going from English to languages with richer morphology & freer word order (e.g., German).

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Input enhancement: Our starting point

Insights from Second Language Acquisition Research

- ▶ Second language learners benefit from or may require a so-called **focus on form** to overcome incomplete or incorrect knowledge (Long 1991; Lightbown 1998).
 - ▶ Focus on Form: "an occasional shift of attention to linguistic code features" (Long & Robinson 1998, p. 23).
 - ▶ Strategies highlighting the salience of language forms and categories are referred to as **input enhancement** (Sharwood Smith 1993).
- ⇒ Let's use NLP to provide automatic input enhancement for language learners! → WERTi

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WERTi: Working with English Real Text

- ▶ Provide learners of English (ESL) with input enhancement for any web pages they are interested in.
- good for learner motivation:
- ▶ learners can choose material based on their interests
 - ▶ includes news, up-to-date information, hip stuff
 - ▶ pages remain fully contextualized (video, audio, links)
- wide range of potential learning contexts:
- ▶ can supplement regular classroom instruction
 - ▶ can support voluntary, self-motivated pursuit of knowledge, i.e., **lifelong learning**.
 - ▶ can foster **implicit learning**, e.g., for adult immigrants:
 - ▶ already functionally living in second language environment, but stagnating in acquisition
 - ▶ without access/motivation to engage in explicit learning, but browsing the web for information and entertainment

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What language properties should we enhance?

- ▶ A wide range of linguistic features can be relevant for awareness, incl. morphological, syntactic, semantic, and pragmatic information (Schmidt 1995).
- ▶ We focus on enhancing language patterns which are well-established difficulties for ESL learners:
 - ▶ determiner and preposition usage
 - ▶ use of gerunds vs. to-infinitives
 - ▶ wh-question formation
 - ▶ phrasal verbs

NLP identifying other patterns can easily be integrated as part of a flexible NLP architecture.

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How should the targeted forms be enhanced?

- ▶ WERTI currently offers three types of input enhancement:
 - a) color highlighting of the pattern or selected parts thereof
 - b) pages supporting clicking, with automatic color feedback
 - ▶ automatic feedback compares automatic annotation of clicked on form with targeted form
 - c) pages supporting practice (e.g., fill-in-the-blank), with automatic color feedback
 - ▶ automatic feedback compares form entered by learner with form in original text
- ▶ This follows standard pedagogical practice ("PPP"):
 - a) receptive presentation
 - b) presentation supporting limited interaction
 - c) controlled practice
 - d) (free production)

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Prepositions: Presentation (Color)

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Prepositions: Practice (FIB)

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Cows also 'have regional accents'

Cows have regional accents like humans, language specialists have suggested.

They decided to examine the issue after dairy farmers noticed their cows had slightly different moos, depending on which herd they came from.

John Wells, Professor of Phonetics at the University of London, said regional twangs had been seen before in birds.

The farmers in Somerset who noticed the phenomenon said it may have been the result of the close bond between them and their animals.

Farmer Lloyd Green, from Glastonbury, said: "I spend a lot of time with my ones and they definitely moo with a Somerset drawl."



Cows moo with a regional twang
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Prepositions: Presentation + Interaction (Click)

Car-free cities: an idea with legs

Car-free neighbourhoods are no unrealistic utopia – they exist all over Europe

59 (59) | 110 (110)
Tweet this (121)
Comments (88)



'Not anti-car, just pro-choice' ... a cyclist in Vauban, Germany. Photograph: Sipa Press/Retna Features

A quarter of households in Britain – more in the larger cities, and a majority in some inner cities – live without a car. Imagine how quality of life would improve for cyclists and everyone else if traffic were removed from areas where people could practically choose to live without cars. Does this sound unrealistic, utopian? Did you know many European cities are already doing it?

Posted by Steve Mella Thursday 29 October 2009 08:00 GMT
guardian.co.uk

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Phrasal verbs: Presentation (Color)

Laugh Lines

Funny Stuff From All Over

May 6, 2010, 11:14 AM

Letterman: "They Don't Like Immigrants"



Sanders.

Monologue | Wednesday night on "The Late Show With David Letterman" on CBS: You folks been following the big British Petroleum oil spill in the Gulf of Mexico? I'm telling you, British Petroleum has **put** more birds **in** oil than Colonel

I was thinking about this. Here's what I **came up** with. Now, in Arizona, you know about the new immigration law, where if you don't look like you belong there, they can **run** you **out** of the state? And they've got patrol cars driving around, **pulling up** to people, saying: "You don't look like you belong here. **Get out!**" So the deal is, in Arizona, they don't like immigrants. And I was thinking, well, that's odd, because right across the river there in California, they elected one governor.

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Phrasal verbs: Practice (Fill-in-the-blank)

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Gerunds vs. infinitives: Presentation (Color)

"The government says it is expanding **access to university**, but they are actually blocking people's aspirations and betraying a generation."

The government was forced to cap student numbers **after discovering** a £200m black hole in the university financing budget at the end of last year. Labour was accused of **abandoning** its pledge to **expand higher education**, adding pressure to a growing debate about how **to fund** the growing number of young people who **want to do** a degree. The government is due **to announce** a review of student finance.

The massive increase in applicants has put a strain on the university system this year, with one university forced **to convert** single bedrooms in halls into doubles, and others putting students up in hotels.

Source: <http://www.guardian.co.uk/education/2009/oct/14/30000-miss-university-place>

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Gerunds vs. infinitives: Practice (FIB)

"The government says it is expanding access to university, but they are actually blocking people's aspirations and betraying a generation."

The government was forced to cap student numbers after [] () (discover) a £200m black hole in the university financing budget at the end of last year. Labour was accused of [] () (abandon) its pledge to expand higher education, adding pressure to a growing debate about how to fund the growing number of young people who want [] () (do) a degree. The government is due to announce a review of student finance.

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Wh-questions: Presentation + Interaction (Click)

If someone takes drugs, they can become addictive depending on the drug. Overdoses typically happen with cocaine, **opioids**, benzos, especially mixing benzos and opioids (Xanax, Valium, or Klonopin).

Why do people use illegal drugs? **subject** [change]

Most illegal drugs cause people to become intoxicated ^[needs proving]. The slang term for this experience is "getting stoned" or "getting high." When a drug user is intoxicated, they may feel strange, happy, dizzy, or weird. Some drugs such as **marijuana** and **hashish** often make users feel sleepy and relaxed. Some drug users have feelings that they are floating or dreaming. Drugs such as LSD make people feel intensely; they make one see and feel things like never before, and think things about the world they would normally not. Some say it increases knowledge and creates wisdom. Other drugs such as **Crystal Meth** make users feel excited and happy and full of energy.

Source: http://simple.wikipedia.org/wiki/Illegal_drugs

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Wh-questions: Presentation + Interaction (Click)

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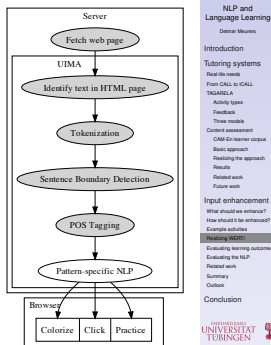
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Realizing WERTi

- ▶ Guiding ideas behind implementation:
 - ▶ Reuse existing NLP tools where possible
 - ▶ Support integration of a range of language patterns
- ▶ First WERTi prototype (Amaral/Meurers/Metcalf at CALICO 06, EUROCALL 06) cf. <http://purl.org/icall/werti-v1>
 - ▶ implemented in Python using NLTK (Bird & Loper 2004), TreeTagger (Schmid 1994)
 - ▶ integrated into Apache2 webserver using mod_python
 - ▶ targeted determiners and prepositions in Reuters news
- ▶ How can we flexibly support integration of a wider range of language patterns using heterogeneous set of NLP?
 - integrate NLP into UIMA-based architecture on server

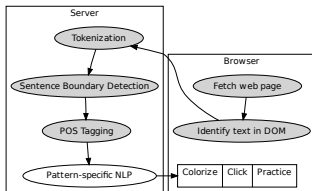
WERTi architecture

- ▶ reimplementation in Java (Dimitrov/Zai/Ott)
- ▶ Tomcat servlet
- ▶ idea behind architecture
 - ▶ use same core processing
 - ▶ demand-driven
 - ▶ pattern-specific NLP
- ▶ input enhancement targets:
 - ▶ determiners
 - ▶ prepositions
 - ▶ gerunds vs. *to*-infinitives
 - ▶ tense in conditionals
 - ▶ *wh*-questions



WERTi architecture: Browser plugin version

Firefox plugin (Adriane Boyd) moves fetching of web page and text identification to client to better support sites requiring login, cookies, or dynamically generated text.



- ▶ beta version at: <http://purl.org/icall/werti-plugin>

Pattern-specific NLP

- ▶ UIMA-based architecture (Ferrucci & Lally 2004)
 - ▶ each NLP tool annotates the input
 - ▶ OpenNLP tools, LingPipe tagger, TreeTagger, Constraint Grammar CG 3
 - ▶ UIMA data repository is common to all components (Götz & Suhre 2004)
- ▶ We use available pre-trained models for
 - ▶ TreeTagger with PennTreebank tagset
 - ▶ LingPipe Tagger with Brown tagset
 - ▶ OpenNLP tools (Tokenizer, Sentence Detector, Tagger, Chunker)
- ▶ Specify input enhancement targets
 - ▶ in terms of standard annotation schemes
 - ▶ e.g., identify determiners via AT|DT|DTI|DTS|DTX using Brown tagset
 - ▶ using constraint-grammar rules (CG 3 compiler), e.g.:
 - ▶ 101 rules for gerunds vs. *to*-infinitives
 - ▶ 126 rules for *wh*-question patterns

Evaluating input enhancement techniques

Does input enhancement improve learning outcomes?

- ▶ Improving learning outcomes is the overall goal of WERTi and visual input enhancement in general.
- ▶ While some studies show an improvement in learning outcomes, the study of visual input enhancement solely needs more experimental studies (Lee & Huang 2008).
- ▶ WERTi can systematically produce visual input enhancement for a range of language properties
 - Supports real-life foreign language teaching studies under a wide range of parameters.
 - Supports lab-based experiments to evaluate when input enhancement succeeds in making learners notice enhanced properties (eye tracking, ERP).

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Evaluating input enhancement techniques

High precision NLP needed for automatic input enhancement

- ▶ Automatic visual input enhancement requires reliable identification of the relevant classes using NLP.
 - ▶ Note: Precision of identification of specific classes relevant, not overall quality of POS-tagging or parsing.
- ▶ Problem 1: Often no established gold standard available for the language classes to be enhanced.
- ▶ Problem 2: Realistic test set must be established by studying what pages learners choose for enhancement.

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Evaluating input enhancement techniques

Evaluating determiner and preposition identification

- ▶ Evaluation of preposition and determiner identification using BNC Sampler Corpus
 - ▶ high quality CLAWS-7 annotation provides gold standard for preposition and determiner classes
 - ▶ relatively broad representation of English
- ▶ Performance of the LingPipe POS tagger in WERTi:

	precision	recall
prepositions	95.07%	90.52%
determiners	97.06%	94.07%

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Related work

Data-Driven Learning

- ▶ One can view automatic input enhancement as an enrichment of Data-Driven Learning (DDL).
 - ▶ DDL is an "attempt to cut out the middleman [the teacher] as far as possible and to give the learner direct access to the data" (Boulton 2009, p. 82, citing Tim Johns)
- ▶ WERTi: learner stays in control, but NLP uses 'teacher knowledge' about relevant language properties to make those more prominent to the learner.

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Related work

- ▶ Automatic Exercise Generation:
 - ▶ MIRTO (Antoniadis et al. 2004)
 - ▶ KillerFiller in VISL (Bick 2005)
- ▶ Reading Support Tools:
 - ▶ Glosser-RuG (Nerbonne et al. 1998)
 - ▶ COMPASS (Breidt & Feldweg 1997)
 - ▶ ALPHEIOS (<http://alpheios.net>)
 - ▶ REAP (Heilman et al. 2008b)

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Summary

- ▶ We motivated and discussed an approach providing automatic input enhancement of authentic web pages.
 - ▶ NLP identifies relevant linguistic categories and forms.
 - ▶ The sentences turned into activities can remain fully contextualized as part of the pages selected by learner.
- ▶ Automatic feedback for the practice activities is feasible since the original text is known.
 - ▶ Next step: Where possible alternatives exist, determine equivalence classes automatically; e.g., for prepositions building on Elghafari, Meurers & Wunsch (2010).
- ▶ Web pages are selected by learners based on interest.
 - ▶ Next step (Ott & Meurers 2010): Develop search engine which takes into account
 - ▶ content of interest to learner
 - ▶ general readability measures (Petersen 2007; Heilman et al. 2008a; Mitsakaki & Trout 2008)
 - ▶ language properties to be input enhanced

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Outlook: Questions to be addressed

- ▶ Which language pattern types should be input enhanced?
 - ▶ adverb placement
 - ▶ tense and aspect
 - ▶ while effect is semantic, lexical cues can be identified by NLP ("*usually* go" vs. "*are going tomorrow*")
 - ▶ passive vs. active
 - ▶ ...
- ▶ Which aspect of the patterns should be input enhanced?
 - ▶ lexical classes, morphemes
 - ▶ contextual clues (optional or obligatory)
- ▶ What is the best input enhancement, i.e., highlighting or interaction possibilities
 - ▶ for a particular linguistic pattern,
 - ▶ given a specific web page with its existing visual design features?

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Conclusion

- ▶ NLP analysis offers interesting opportunities in the context of language learning
 - ▶ analyzing learner language
 - immediate feedback on form and contents in ITS
 - ▶ analyzing language for learners
 - visual input enhancement
- ▶ Interdisciplinary collaboration integrating
 - ▶ foreign language teaching practice
 - ▶ second language acquisition research, and
 - ▶ linguistic modeling and NLPis crucial for sustainable progress in this field.

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Abney, S. (1996). Partial Parsing via Finite-State Cascades. In *The Robust Parsing Workshop of the European Summer School in Logic, Language and Information (ESSLI '96)*. Prague, Czech Republic, pp. 1–8. URL <http://www.vinartus.net/spa/97a.pdf>.

Amaral, L. (2007). Designing Intelligent Language Tutoring Systems: Integrating Natural Language Processing technology into foreign language teaching. Ph.D. thesis, The Ohio State University.

Amaral, L., V. Metcalf & D. Meurers (2006). Language Awareness through Re-use of NLP Technology. Pre-conference Workshop on NLP in CALL – Computational and Linguistic Challenges. CALICO 2006. May 17, 2006. University of Hawaii. URL <http://purl.org/net/icall/handouts/calico06-amaral-metcalf-meurers.pdf>.

Amaral, L. & D. Meurers (2006). Where Does ICALL Fit into Foreign Language Teaching? URL <http://purl.org/net/icall/handouts/calico06-amaral-meurers.pdf>. 23rd Annual Conference of the Computer Assisted Language Instruction Consortium (CALICO), May 19, 2006. University of Hawaii.

Amaral, L. & D. Meurers (2008). From Recording Linguistic Competence to Supporting Inferences about Language Acquisition in Context: Extending the Conceptualization of Student Models for Intelligent Computer-Assisted Language Learning. *Computer-Assisted Language Learning* 21(4), 323–338. URL <http://purl.org/dm/papers/amaral-meurers-call08.html>.

Amaral, L. & D. Meurers (2009). Little Things With Big Effects: On the Identification and Interpretation of Tokens for Error Diagnosis in ICALL. *CALICO Journal* 27(1). URL <http://purl.org/dm/papers/amaral-meurers-09.html>.

(eds.), *Proceedings of the 3rd Workshop on Innovative Use of NLP for Building Educational Applications (BEA-3) at ACL 08*. Columbus, Ohio, pp. 107–115. URL <http://aclweb.org/anthology/W08-0913>.

Banerjee, S. & A. Lavie (2005). METEOR: An automatic metric for MT evaluation with improved correlation with human judgments. In *Proceedings of Workshop on Intrinsic and Extrinsic Evaluation Measures for MT and/or Summarization at the 43th Annual Meeting of the Association of Computational Linguistics (ACL-2005)*. URL <http://www.cs.cmu.edu/~alavie/papers/BanerjeeLavie2005-final.pdf>.

Bick, E. (2000). *The Parsing System "Palavras": Automatic Grammatical Analysis of Portuguese in a Constraint Grammar Framework*. Aarhus University Press. URL <http://beta.visl.sdu.dk/~eckhard/pdf/PLP20-amilo.ps.pdf>.

Bick, E. (2004). PaNoLa: Integrating Constraint Grammar and CALL. In H. Holmboe (ed.), *Nordic Language Technology, Arbog for Nordisk Sprogteknologisk Forskningsprogram 2000-2004 (Yearbook 2003)*, Copenhagen: Museum Tusulanum, pp. 183–190. URL <http://beta.visl.sdu.dk/~eckhard/pdf/PaNoLa-CALL-yearbook2003.ps.pdf>.

Bick, E. (2005). Grammar for Fun: IT-based Grammar Learning with VISL. In P. Juul (ed.), *CALL for the Nordic Languages*, Copenhagen: Samfundslitteratur, Copenhagen Studies in Language, pp. 49–64. URL <http://beta.visl.sdu.dk/pdf/CALL2004.pdf>.

Bird, S. & E. Loper (2004). NLTK: The Natural Language Toolkit. In *Proceedings of the ACL demonstration session*, Barcelona, Spain: Association for Computational Linguistics, pp. 214–217. URL <http://aclweb.org/anthology/P04-3031>.

Boulton, A. (2009). Data-driven Learning: Reasonable Fears and Rational Reassurance. *Indian Journal of Applied Linguistics* 35(1), 81–106.

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Amaral, L. & D. Meurers (2011). On Using Intelligent Computer-Assisted Language Learning in Real-Life Foreign Language Teaching and Learning. *ReCALL* 23(1). URL <http://purl.org/dm/papers/amaral-meurers-10.html>.

Amaral, L., D. Meurers & R. Ziai (2011). Analyzing Learner Language: Towards A Flexible NLP Architecture for Intelligent Language Tutors. *Computer-Assisted Language Learning* URL <http://purl.org/dm/papers/amaral-meurers-ziai-10.html>.

Anderson, L. W. & D. Krathwohl (eds.) (2001). *A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives*. New York: Longman Publishers.

Antoniadis, G., S. Echinard, O. Kraif, T. Lebarbé, M. Loiseau & C. Ponton (2004). NLP-based scripting for CALL activities. In L. Lemnitzer, D. Meurers & E. Hinrichs (eds.), *Proceedings of eLearning for Computational Linguistics and Computational Linguistics for eLearning, International Workshop in Association with COLING 2004*. Geneva, Switzerland: COLING, pp. 18–25. URL <http://aclweb.org/anthology/W04-1703>.

Antworth, E. L. (1993). Glossing Text with the PC-KIMMO Morphological Parser. *Computers and the Humanities* 26, 475–484. URL <http://www.springerlink.com/content/r20w66k70976ur9l/fulltext.pdf>.

Atkinson, K. (2004). Spell Checking Oriented Word Lists (SCOWL). URL <http://wordlist.sourceforge.net/>. Web resource.

Bailey, S. & D. Meurers (2006). Exercise-driven selection of content matching methodologies. Peer reviewed conference presentation. EUROCALL06. September 6, 2006. University of Granada.

Bailey, S. & D. Meurers (2008). Diagnosing meaning errors in short answers to reading comprehension questions. In J. Tetreault, J. Burstein & R. D. Felice

Breidt, E. & H. Feldweg (1997). Accessing Foreign Languages with COMPASS. *Machine Translation* 12(1–2), 153–174. URL <http://www.springerlink.com/content/v8336050611683501/fulltext.pdf>. Special Issue on New Tools for Human Translators.

Brockett, C. & W. B. Dolan (2005). Support Vector Machines for Paraphrase Identification and Corpus Construction. In *Proceedings of the Third International Workshop on Paraphrasing (IWP2005)*. pp. 1–8. URL <http://aclweb.org/anthology/I05-5001>.

Burstein, J. & M. Chodorov (1999). Automated Essay Scoring for Nonnative English Speakers. In *Proceedings of a Workshop on Computer-Mediated Language Assessment and Evaluation of Natural Language Processing, Joint Symposium of the Association of Computational Linguistics (ACL-99) and the International Association of Language Learning Technologies*. pp. 68–75. URL http://www.ets.org/Media/Research/pdf/erater_acl99rev.pdf.

Burstein, J., M. Chodorov & C. Leacock (2003). Criterion: Online Essay Evaluation: An Application for Automated Evaluation of Student Essays. In *Proceedings of the Fifteenth Annual Conference on Innovative Applications of Artificial Intelligence (IAAI-03)*. Acapulco, Mexico, pp. 3–10. URL http://ftp.ets.org/pub/res/erater_iaai03_burstein.pdf.

Champeau de Lopez, C., G. Marchi & M. Arreaza-Coyle (1997). A Taxonomy: Evaluating Reading Comprehension in EFL. *English Teaching Forum* 35(2), 30–42. URL <http://dosfan.lib.uic.edu/usia/E-USIA/forum/vols/vol35/no2/p30.htm>.

Daelemans, W., J. Zavrel, K. der Sloot & A. van den Bosch (2007). *TIMBL: Memory-Based Learner Reference Guide, ILK Technical Report ILK 07-03*. Induction of Linguistic Knowledge Research Group Department of

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Communication and Information Sciences, Tilburg University, P.O. Box 9015, NL-5000 LE, Tilburg, The Netherlands, version 6.0 ed. URL <http://lik.uvt.nl/downloads/pub/papers/ilk/0703.pdf>.

Dagan, I., O. Glickman & B. Magnini (2006). The PASCAL Recognising Textual Entailment Challenge. In J. Q. Candela, I. Dagan, B. Magnini & F. d'Alché Buc (eds.), *Machine Learning Challenges, Evaluating Predictive Uncertainty, Visual Object Classification and Recognizing Textual Entailment, First PASCAL Machine Learning Challenges Workshop, MLCW 2005, Southampton, UK, April 11-13, 2005, Revised Selected Papers*. Springer, vol. 3944 of *Lecture Notes in Computer Science*, pp. 177-190. URL <http://u.cs.biu.ac.il/~dagan/publications/RTChallenge.pdf>.

Doughty, C. & J. Williams (eds.) (1998). *Focus on form in classroom second language acquisition*. Cambridge: Cambridge University Press.

Elghafar, A., D. Meurers & H. Wunsch (2010). Exploring the Data-Driven Prediction of Prepositions in English. In *Proceedings of the 23rd International Conference on Computational Linguistics (COLING)*. Beijing, China.

Ellis, N. (1994). Implicit and Explicit Language Learning - An Overview. In *Implicit and Explicit Learning of Languages*, San Diego, CA: Academic Press, pp. 1-31.

Ferrucci, D. & A. Lally (2004). UIMA: An architectural approach to unstructured information processing in the corporate research environment. *Natural Language Engineering* 10(3-4), 327-348.

Gerbault, J. (1999). Towards an analysis of answers to open-ended questions in computer-assisted language learning. In S. Lajoie & M. Vivet (eds.), *Proceedings of AIED*. IOS Press, pp. 686-689.

pp. 325-332. URL <http://www.eccs.berkeley.edu/~nimar/readings/hirschman1999.pdf>.

Irwin, J. W. (1986). *Teaching Reading Comprehension Processes*. Englewood Cliffs, New Jersey: Prentice-Hall, Inc.

Johns, T. (1994). From printout to handout: Grammar and vocabulary teaching in the context of data-driven learning. In T. Odlin (ed.), *Perspectives on Pedagogical Grammar*, Cambridge: Cambridge University Press, pp. 293-313.

Karlfson, F., A. Vuolteenaho, J. Heikkilä & A. Anttila (eds.) (1995). *Constraint Grammar: A Language-Independent System for Parsing Unrestricted Text*. No. 4 in *Natural Language Processing*. Berlin and New York: Mouton de Gruyter.

Klein, D. & C. Manning (2003). Accurate Unlexicalized Parsing. In *Proceedings of the 41st Meeting of the Association for Computational Linguistics (ACL 2003)*. Sapporo, Japan, pp. 423-430. URL <http://aclweb.org/anthology/P03-1054>.

Leacock, C. (2004). Scoring Free-Responses Automatically: A Case Study of a Large-Scale Assessment. *Exams* 1(3). URL http://www.nocheating.org/Media/Research/pdf/erater_examens_leacock.pdf.

Leacock, C. & M. Chodorow (2003). C-rater: Automated Scoring of Short-Answer Questions. *Computers and the Humanities* 37, 389-405. URL <http://www.ingentaconnect.com/content/klu/chum/2003/00000037/00000004/0514472?crawler=true>.

Lee, S.-K. & H.-T. Huang (2008). VISUAL INPUT ENHANCEMENT AND GRAMMAR LEARNING: A Meta-Analytic Review. *Studies in Second Language Acquisition* 30, 307-331.

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Götz, T. & O. Suhre (2004). Design and implementation of the UIMA Common Analysis System. *IBM Systems Journal* 43(3), 476-489.

Graesser, A. C., K. Wiemer-Hastings, P. Wiemer-Hastings & R. Kreuz (1999). AutoTutor: A simulation of a human tutor. *Journal of Cognitive Systems Research* 1, 35-51.

Hatzivassiloglou, V., J. Klavans & E. Eskin (1999). Detecting Text Similarity over Short Passages: Exploring Linguistic Feature Combinations via Machine Learning. In *Proceedings of Empirical Methods in Natural Language Processing and Very Large Corpora (EMNLP'99)*. College Park, Maryland, pp. 203-212. URL <http://aclweb.org/anthology/W99-0625>.

Heift, T. (2004). Corrective Feedback and Learner Uptake in CALL. *ReCALL* 16(2), 416-431. URL <http://journals.cambridge.org/production/action/cjoGetFullText?fulltextid=265118>.

Heilman, M., K. Collins-Thompson & M. Eskenazi (2008a). An Analysis of Statistical Models and Features for Reading Difficulty Prediction. In *Proceedings of the 3rd Workshop on Innovative Use of NLP for Building Educational Applications*. Columbus, Ohio. URL <http://aclweb.org/anthology/W08-0909>.

Heilman, M., L. Zhao, J. Pino & M. Eskenazi (2008b). Retrieval of Reading Materials for Vocabulary and Reading Practice. In *Proceedings of the Third Workshop on Innovative Use of NLP for Building Educational Applications (BEA-3) at ACL'08*. Columbus, Ohio: Association for Computational Linguistics, pp. 80-88. URL <http://aclweb.org/anthology/W08-0910>.

Hirschman, L. M., Light, E. Breck & J. Burger (1999). Deep Read: A Reading Comprehension System. In *Proceedings of the 37th Annual Meeting of the Association for Computational Linguistics (ACL-99)*. College Park, Maryland,

Levenshtein, V. I. (1966). Binary Codes Capable of Correcting Deletions, Insertions, and Reversals. *Soviet Physics Doklady* 10(8), 707-710.

Lightbown, P. M. (1998). The importance of timing in focus on form. In Doughty & Williams (1998), pp. 177-196.

Lightbown, P. M. & N. Spada (1999). *How languages are learned*. Oxford: Oxford University Press.

Lin, C.-Y. & F. J. Och (2004). Automatic Evaluation of Machine Translation Quality Using Longest Common Subsequence and Skip-Bigram Statistics. In *Proceedings of the 42nd Annual Meeting of the Association for Computational Linguistics (ACL-04)*, pp. 605-612. URL <http://www.mt-archive.info/ACL-2004-Lin.pdf>.

Liu, H. (2004). MontyLingua: An End-to-End Natural Language Processor with Common Sense. Software Website. Media Laboratory, Massachusetts Institute of Technology, Cambridge, Massachusetts. URL <http://web.media.mit.edu/~hugo/montylingua/>.

Long, M. H. (1991). Focus on form: A design feature in language teaching methodology. In K. De Bot, C. Kramsch & R. Ginsberg (eds.), *Foreign language research in cross-cultural perspective*. Amsterdam: John Benjamins, pp. 39-52.

Long, M. H. (1996). The role of linguistic environment in second language acquisition. In W. C. Ritchie & T. K. Bhatia (eds.), *Handbook of second language acquisition*, New York: Academic Press, pp. 413-468.

Long, M. H. & P. Robinson (1998). Focus on form: Theory, research, and practice. In Doughty & Williams (1998), pp. 15-41.

Lyster, R. (1998). Negotiation of form, recasts, and explicit correction in relation to error types and learner repair in immersion classroom. *Language Learning* 48, 183-218.

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Marin, D. R. P. (2004). Automatic Evaluation of Users' Short Essays by Using Statistical and Shallow Natural Language Processing Techniques. Master's thesis, Universidad Autónoma de Madrid. URL <http://www.ii.uam.es/~dperez/lea.pdf>.

Martins, R., F. Hasegawa & M. das Graças Nunes (2006). Curupira: a functional parser for Brazilian Portuguese. In *Computational Processing of the Portuguese Language, 6th International Workshop, PROPOR. Lecture Notes in Computer Science 2721*. Faro, Portugal: Springer. URL <http://www.springerlink.com/content/048vjft1188yvj0/fulltext.pdf>.

Metcalf, V. & D. Meurers (2006). Generating Web-based English Preposition Exercises from Real-World Texts. URL <http://purl.org/net/ical/handouts/eurocall06-metcalf-meurers.pdf>. EUROCALL 2006. Granada, Spain. September 4–7, 2006.

Meurers, D., R. Ziai, L. Amaral, A. Boyd, A. Dimitrov, V. Metcalf & N. Ott (2010). Enhancing Authentic Web Pages for Language Learners. In *Proceedings of the 5th Workshop on Innovative Use of NLP for Building Educational Applications (BEA-5) at NAACL-HLT 2010*. Los Angeles: Association for Computational Linguistics. URL <http://purl.org/dm/papers/meurers-ziai-et-al-10.html>.

Mihalcea, R., C. Corley & C. Strapparava (2006). Corpus-based and Knowledge-based Measures of Text Semantic Similarity. In *Proceedings of the National Conference on Artificial Intelligence*. Menlo Park, CA: American Association for Artificial Intelligence (AAAI) Press, vol. 21(1), pp. 775–780. URL http://www.cse.unt.edu/~rada/papers/mihalcea_aaai06.pdf.

Miller, G. (1995). WordNet: a lexical database for English. *Communications of the ACM* 38(11), 39–41. URL <http://aclweb.org/anthology/H94-1111>.

University of Washington. URL <http://sarahpetersen.net/sarah.petersen.dissertation.pdf>.

Sachs, R. & B.-R. Suh (2007). Textually enhanced recasts, learner awareness, and L2 outcomes in synchronous computer-mediated interaction. In *Oxford applied linguistics*, Oxford: Oxford University Press.

Schmid, H. (1994). Probabilistic Part-of-Speech Tagging Using Decision Trees. In *Proceedings of the International Conference on New Methods in Language Processing*. Manchester, UK, pp. 44–49. URL <http://www.ims.uni-stuttgart.de/ftp/pub/corpora/tree-tagger1.pdf>.

Schmidt, R. (1995). Consciousness and foreign language: A tutorial on the role of attention and awareness in learning. In R. Schmidt (ed.), *Attention and awareness in foreign language learning*, Honolulu: University of Hawaii Press, pp. 1–63.

Sharwood Smith, M. (1993). Input enhancement in instructed SLA: Theoretical bases. *Studies in Second Language Acquisition* 15, 165–179.

Turney, P. (2001). Mining the Web for Synonyms: PMI-IR Versus LSA on TOEFL. In *Proceedings of the Twelfth European Conference on Machine Learning (ECML-2001)*. Freiburg, Germany, pp. 491–502.

Wiemer-Hastings, P., K. Wiemer-Hastings & A. Graesser (1999). Improving an Intelligent Tutor's Comprehension of Students with Latent Semantic Analysis. In S. Lajoie & M. Vivet (eds.), *Artificial Intelligence in Education*, IOS Press, pp. 535–542. URL <http://eprints.klupm.edu.sa/45213/1/45213.pdf>.

Ziai, R. (2009). A Flexible Annotation-Based Architecture for Intelligent Language Tutoring Systems. Master's thesis, Universität Tübingen, Seminar für Sprachwissenschaft.

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Millsakci, E. & A. Trout (2008). Real Time Web Text Classification and Analysis of Reading Difficulty. In *Proceedings of the Third Workshop on Innovative Use of NLP for Building Educational Applications (BEA-3) at ACL '08*. Columbus, Ohio: Association for Computational Linguistics, pp. 89–97. URL <http://aclweb.org/anthology/W08-0911>.

Nerbonne, J., D. Dokter & P. Smit (1998). Morphological Processing and Computer-Assisted Language Learning. *Computer Assisted Language Learning* 11(5), 543–559. URL http://urd.let.rug.nl/nerbonne/papers/call_fr.pdf.

Norris, J. & L. Ortega (2000). Effectiveness of L2 Instruction: A Research Synthesis and Quantitative Meta-Analysis. *Language Learning* 50(3), 417–528.

Ott, N. (2009). Information Retrieval for Language Learning: An Exploration of Text Difficulty Measures. ISCL master's thesis, Universität Tübingen, Seminar für Sprachwissenschaft, Tübingen, Germany. URL <http://drii.de/zap/ma-thesis>.

Ott, N. & D. Meurers (2010). Information Retrieval for Education: Making Search Engines Language Aware. *Themes in Science and Technology Education. Special issue on computer-aided language analysis, teaching and learning: Approaches, perspectives and applications* URL <http://purl.org/dm/papers/ott-meurers-10.html>.

Pearson, P. D. & D. Johnson (1978). *Teaching Reading Comprehension*. New York: Holt, Rinehart and Winston.

Petersen, K. (2010). Implicit Corrective Feedback in Computer-Guided Interaction: Does Mode Matter? Ph.D. thesis, Georgetown University. URL http://apps.americancouncils.org/transfer/KP_Diss/Petersen_Final.pdf.

Petersen, S. E. (2007). Natural Language Processing Tools for Reading Level Assessment and Text Simplification for Bilingual Education. Ph.D. thesis,

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