

Annual Report

Graduate School of Language Technology (GSLT)

Academic Year 2002–2003

1 Overview

The Graduate School of Language Technology (GSLT) is a national graduate school for which Göteborg University (Faculty of Arts) is the coordinating host. General information about the school and its original programme statement can be found on its web page <http://www.gslt.hum.gu.se>. This report covers its second year of operation. During this year Lund University was added to the school which means that students may now be registered at any of the following academic institutions:

- University College of Borås
- Chalmers University of Technology
- Göteborg University
- KTH (Royal Institute of Technology)
- Linköping University
- Lund University
- University of Skövde
- Stockholm University
- Uppsala University
- Växjö University

We are still open for the addition of further institutions in the future if this should become appropriate. Supervision is also available from SICS (Swedish Institute of Computer Science).

2 Teaching

The following table gives an overview of the courses offered by GSLT during the academic year 2002–2003.

Course	Semester	Level	Credits	Inst	GSLT students	External students
Natural Language Processing	Autumn	1	5	VxU	12/12	0/0
Speech Technology	Autumn	1	5	KTH	8/9	0/0
Linguistic Resources	Autumn	1	5	SU	6/7	2/2
Lexical Semantics	Autumn	2	5	UU	6/7	2/2
Multimodal Communication	Autumn	2	5	GU	3/5	0/1
Machine Translation	Spring	2	5	UU	3/4	4/7
Programming in Oz	Spring	2	5	GU	7/13	0/1
Dialogue Systems 2	Spring	3	10	GU	6/10	0/0

Course	Lecturers	University
Natural Language Processing	Prof. Joakim Nivre Prof. Lars Borin Prof. Torbjörn Lager Ass. Prof. Barbara Gawron-ska	Växjö University Stockholm University Göteborg University Skövde University
Speech Technology	Prof. Rolf Carlsson Prof. Björn Granström Ass. Prof. David House Dr Mats Blomberg	KTH KTH KTH KTH
Linguistic Resources	Prof. Lars Borin Prof. Brita Bergman Dr Jerker Järborg	Stockholm University Stockholm University Göteborg University
Lexical Semantics	Prof. Åke Viberg Dr Maria Toporowska Gronostaj	Uppsala University Göteborg University
Multimodal Communication	Prof. Jens Allwood Dominic Masaro Prof. Björn Gransröm Prof. Kristiina Jokinen Dr Lars Erik Holmquist	Göteborg University University of California at Santa Cruz KTH University of Art and Design, Helsinki Victoria institute/Göteborg University
Machine Translation	Prof. Anna Sågvall Hein Jörg Tiedemann Eva Forsbom	Uppsala University Uppsala University Uppsala University
Programming in Oz	Prof. Torbjörn Lager Dr Denys Duchier	Göteborg University Équipe Calligramme LORIA, Nancy, France
Dialogue Systems 2	Dr Staffan Larsson Ass. Prof Arne Jönsson Pontus Johansson Botond Pacucs Gabriel Skantze	Göteborg University Linköping University Linköping University KTH KTH

The number of GSLT students and external students in each course is given as a ratio between the number of students that completed the course on time and the number of students that started the course. We may note that the trend continues from the first academic year in that most courses have been successful in terms of quantitative throughput. In addition, course evaluations have generally been positive. Compared to the first academic year, there is less participation from external students, but this can at least partly be explained by the fact that the courses Natural Language Processing and Speech Technology were both given for the second consecutive year

3 Relations to Swedish industry

The closest relation to Swedish industry so far is through the GSLT group of industrial advisors which was formed during the first year. The members of the group are

Johan Boye, Telia Research AB

Eva Ejerhed, Hapax AB

Jesper Högberg, Pipebeach AB

The first meeting with the advisory group was held 21–22 October 2002. In this meeting several ideas for the curriculum and for other types of industrial contacts were generated. One result was the decision to start a series of seminars where companies located in Sweden present their business and branch. The first industry seminar was held during the first intensive week of the fall semester 2003 and it is planned that every intensive week will offer an industry seminar.

Another activity that was proposed was in the reverse direction, i.e., presenting research by GSLT PhD-students to Swedish industry. We find this to be a good idea and events of this kind will probably take place in the future. It is important, though, to find the proper forum and context for this.

We have also considered advertising the GSLT courses to industry. This is commonplace in other parts of the world, as pointed out at the meeting with our international group of advisors. So far, no action has been taken in this direction.

Another area of contact is through associate membership. A company or any other non-academic organisation with activities in language technology may join GSLT as an associate member. Associate members may contribute to GSLT in several ways, e.g., with thesis supervision, internships and so on. So far, GSLT has one associate member, Swedish Institute of Computer Science (SICS), where actually two of the graduate students that were admitted in 2002 are employed. Admission of industry graduate students with joint funding from their employer and GSLT has also been raised, but not found practical at the moment.

Relations with industry also develop at the participating departments, where our students' work often relate to ongoing research projects with participation from industry.

For the coming year we plan the following activities:

- Second meeting with the industry advisors (23 October)
- Four industry seminars
- Language technology workshop or conference
- Courses advertised to industry

4 PhD Students

Fourteen new PhD students began at the beginning of the academic year 2002–3, 4 female and 10 male. It was decided not to recruit new students for the academic year 2003–4 but rather to shift to the calendar year, i.e. to recruit during the autumn of 2003 for students to begin January, 2004. The distribution of students over different subject areas was reported in last year’s annual report.

A list of GSLT’s PhD students with a short description of their respective thesis project can be found in appendix B.

A list of publications by GSLT’s PhD students during 2002–2003 can be found in Appendix C and conference papers can be found in Appendix D.

5 Financial Report

The Graduate School has a total budget of 63 MSEK 2001-2007.

The following table summarises our finances for 2002–03. The first column is a forecast of the total costs for the calendar year 2003. The second column shows the total actual costs 2003-01-01 to 2003-06-30. The last column shows the total costs for the calendar year 2002. All amounts are stated in SEK.

	Outgoings 20031231	Outgoings 20030630	Outgoings 20021231
Salaries			
PhD	7757000	4366000	4216000
Admin	492000	260000	359000
Director	382000	177000	382000
	8631000	4803000	4957000
Equipment and services			
Computers	336000	152000	209000
Local Comp admin	274000	155000	148000
Service, support	57000	57000	107000
Copying, mail, etc	91000	34000	69000
Equipment	256000	142000	149000
	1014000	540000	682000
Teaching			
Courses	356000	190000	438000
Supervision	918000	458000	442000
Local costs	947000	540000	478000
	2221000	1188000	1358000
Travel, meetings, miscellaneous			
Retreat	81000	80000	144000
Travel	13000	2000	
PhD-travel	123000	73000	81000
Consultation	57000	50000	14000
Accomodation	47000	25000	48000
Meetings	83000	34000	71000
Other	8000	0	12000
	412000	264000	370000
SUM TOTAL	12278000	6795000	7367000

6 Computer Systems, Electronic Resources, and Services

There continue to be great demands on our computer systems mostly from research activities of our Ph.D. students working remotely on our machines from around the country. Among other things this year we have enhanced the web form service for applications to the Graduate School, for example, adding functions for uploading enclosures to applications. We have also started to look into how to replace our existing web technology with JavaServer Pages. This technology was presented to us by the Swedish Information Centre on Language Technology (www.sprakteknologi.se, www.språkteknologi.se) that we host. The mailing lists service provided for the graduate courses and special interest groups were moved to a mailing list management system, namely Sympa. We have also started to host a CVS repository for the Göteborg University Dialogue Systems Laboratory and may extend this service to others in the future.

The Graduate School's computer laboratory has been used heavily during the intensive weeks over the year. On other days during the semester it is used by the Undergraduate Programme in Computational Linguistics, Göteborg University, as a quiet working area for students writing Masters theses. The computer lab has also been used during the summer for researchers working on projects in GSLT and the Department of Linguistics, Göteborg University. An extra processor and a new disk raid system were installed during autumn 2002 on our server to overcome the resource problems caused by PhD students running batch jobs. Laptop computers for the new students have been bought and we updated Linux and Windows operating systems, as well as updates of some important language technology programs and development environments. Updating of systems on laptops for all GSLT students is a part of the ongoing support package that we provide.

7 GSLT strategy

We are still actively pursuing the strategy described in last year's report. We have, for example, together with the Finnish Graduate School of Language Technology, coordinated a proposal to NorFA for a Nordic Graduate School of Language Technology and received preliminary funds to write this proposal during this academic year.

We have had meetings with both our industrial and international advisory groups. The industrial group was reported on in section 3. The members of our international advisory group are:

Dr Lori Lamel, LIMSI-CNRS, Paris
Professor Stephen Pulman, Oxford University
Professor John Nerbonne, Groningen University

Separate reports are available from both these groups. Here we just summarise their recommendations. The industrial group recommended courses on methodological issues such as user studies and also course on human-machine interaction. They also recommended industrial seminars as discussed in section 3 and also encouraged us to take part in other popular scientific forums. The international

group thought that it was important that we continue to exist and explored with us alternative funding strategies, suggesting that perhaps we could obtain a statement of intent from participating universities to keep the school alive and that we could seek funding for extra expenses of students not funded by the core grant. They also felt that we should widen industrial relations (e.g including publishers and the car industry in our interest group). They thought that we should explore possibilities for joining a European network of excellence, collaborating with other European PhD and Masters programmes. They also suggested more advertising of courses (both to students and industry) and more internet based courses, perhaps with less dependence on intensive weeks.

On the European front we have had further contact with the European Post-Graduate College in Language Technology and Cognitive Systems (a collaboration between Saarland and Edinburgh Universities) with a view to joint meetings.

A Reports from universities and associated organizations

Borås University College

In 2003, Borås University College had the opportunity to further cross-pollinate research and development in the field of information retrieval by inspiration and input from the language technology community. We regard this as a promising sign for our ongoing engagement in this direction, and a measure of success in the cooperation between the library and information science PhD programme and GSLT. We have recruited an Associate Professor to supervise the studies of our two PhD students at GSLT, and are exploring opportunities of how to join, or launch, research projects financed by national and international funding agencies, prominently the EU. We regard our partners in GSLT as prospective team members in such R and D efforts. Further, as a marked development for last year, we have established a local special interest group called "Focusing on Language for Advanced Information Retrieval" (FLAIR), embedded in the InfoShare Research Group of the Swedish School of Library and Information Science, and a competitive research agenda to be tested in 2004. After receiving international feedback, in the form of courses, we plan to channel back our findings to GSLT. By this cooperation pattern, we expect to raise awareness for the high-quality scientific work going on in the intersection of language technology and information science.

Chalmers

The department of Computing Science is shared between the university of Göteborg and Chalmers university of technology. The research group in Language Technology has been built up during the last 6-7 years. Our scientific contact with linguists in Sweden has earlier been restricted to the department of linguistics in Göteborg but thanks to the establishment of GSLT we now also have contact with other linguists in Sweden. We hope that this will lead to further scientific cooperation. Our graduate students in Computing can now specialize in language technology and we are impressed by the quality and quantity of organized courses which GSLT has made available to them. The Department has since Autumn 2002 one GSLT-funded PhD student

Göteborg

Language Technology continues to be a priority area in our faculty and GSLT continues to play a central role in this. Since the last report two new professors in the area have been appointed in the faculty: Lars Borin (Natural Language Processing) and Torbjörn Lager (General and Computational Linguistics). Our collaboration with Chalmers is also developing on various levels of activity: undergraduate teaching (through the undergraduate programme in computational linguistics), graduate teaching (largely through GSLT) and in research. The Department of Linguistics currently has two shared projects with the Department of Computing Science. While language technology is a growth area in our faculty it is still of paramount importance that we train our graduate students in a national context in order to be able to achieve the critical mass of teachers and students and the interdisciplinary spread of teaching and research that is necessary to make us competitive internationally. GSLT has

given us support for students that we otherwise would not have been able to admit and has enabled us to teach courses that we otherwise would not have been able to teach. It is therefore greatly in our interest that GSLT should continue as a national graduate school.

KTH, Royal Institute of Technology

Two departments from KTH, Royal Institute of Technology, participate in GSLT: Numerical Analysis and Computer Science (NADA) and Speech, Music and Hearing (TMH). In total six graduate students get support from GSLT, one from NADA and five from TMH. The creation of GSLT has formed a high-quality foundation foreducation in language technology on a national level. The richness of education offered by the school is very difficult for one single university or institution to offer with limited resources and a small number of students. GSLT has formed an inspiring and supportive network for graduate students and also teachers and an excellent base for cross-fertilisation. This will form a new generation of researchers with good national contacts, representing different backgrounds in language technology. Despite the positive outcome we find it problematic that the effort so far is limited in time and support. After the development stage we have now created a very good foundation for a true national graduate school in language technology. Thus, it is unfortunate to already at this stage have to worry about the future of the school and the current reduction of the number of new students.

Linköping University

The natural language processing laboratory at Linköping University has four doctoral students financed through GSLT. GSLT has enabled us to conduct research in important language technology research areas that we had not been able to do without GSLT. This includes spoken language processing, user modelling and talking heads. The amount of funding for language technology in Sweden is currently very limited, with only one program from Vinnova devoted to such research. The structure of GSLT, where language technology doctoral students in Sweden meet regularly, has given not only the graduate students but also our research group a firm understanding of the research activities carried out at the various departments. It has initiated new co-operations and also given our graduate students a wider range of in-depth graduate courses than we could have provided on our own.

Lund University

The Department of Linguistics at Lund University is currently in a dynamic period of development. The Faculty of Humanities and Theology has made the decision to build a new Language and Literature Center and construction work is now underway. All the departments of language and literature will, during the next three years, be gathered together in the Helgonabacken area where the linguistics department is currently situated. Existing buildings will be renovated and a new building, housing a library, humanist lab and meeting places for staff and students is under construction and will be completed at the beginning of the study year 2004-2005. The humanist lab will make it possible for

the department of linguistics to offer students and researchers a modern and well-equipped facility for pursuing studies on language and speech. The department has also made a strategic decision to focus educational resources on the area of language and speech processing/technology in the coming years and has received support from the faculty in order to realize this goal. External funds have also been received to finance an assistant professor position (forskarassistent) in speech technology in 2002 and a number of the department's researchers have been awarded external grants from Vinnova and FAS for projects dealing with language processing and speech technology. This research lies in particular within the areas of spoken language processing/technology as well as on-line written language processing in combination with eye-tracking, and the department will actively strive to recruit graduate students in these areas in the coming years. It is therefore stimulating for the department of linguistics in Lund to be associated with GSLT and have the possibility of interacting with language and speech technology students and researchers from other areas of Sweden as well as from other Nordic countries.

University College of Skövde

For the University College of Skövde, the possibility to participate in GSLT has been of crucial importance, since the University College has no right to give PhD education on its own. Furthermore, the study programme in Computational Linguistics in Skövde is relatively young (it started 1996). Because of this, collaboration with universities that have longer experience in the field of speech and language technology is of great value. Participation in GSLT has made it possible to employ our first two PhD students, which is a step towards establishing an active and competitive research group.

Without GSLT, we would not have been able to give all necessary courses on PhD level. Now, our PhD students have access to competence represented on several well-known research centers. They also have opportunity to meet other PhD students with different background competence, which, as we hope, will result in a fruitful scientific exchange and cooperation.

Stockholm University

The creation of GSLT has enhanced the quality of the graduate level education in computational linguistics offered at Stockholm University in several ways. The course offerings of GSLT allow our students to study topics in language technology from some of the most competent researchers in the field. Previously, the study of subjects outside the areas of competence of the local staff had to be done by individual reading, generally without the help of someone experienced in that area. Second, the financing of two graduate students by GSLT has enriched the research group at Stockholm University. For projects, and even for seminars and good discussions, a critical mass is often necessary, and the addition of these two GSLT graduate students helps achieve this. In addition two new PhD students that are financed through Stockholm University were able to participate in the fall 2003 GSLT courses which enables them to broaden their background and to get acquainted with the national research context. Being involved with GSLT has given our students the chance to interact with experienced researchers and experts in the respective fields. Finally, involvement in GSLT by students and staff at Stockholm University has helped us become more integrated in the language technology community.

Because our students now have the chance to study and work with other graduate students from across the country, they are able to make strong contacts that helps to create a potential for research collaboration that will make Sweden even more competitive internationally.

Uppsala University

Uppsala University has provided graduate training in computational linguistics since 1992. However, funding and the number of doctoral students in the first decade has been very limited. This is so in spite of the fact that the university runs a four year masters programme in language engineering and that many of the students finishing this programme would like to go on with graduate training. With the creation of GSLT the situation has improved substantially. The financing of two students in 2002 means doubling the number of graduate students in computational linguistics at the university. The regular courses arranged by the school, the contacts with the pool of supervisors, the other graduate students and the international contacts provided by the school means a lot to the quality of the training. The setting is found to be very inspiring by the students. Five students with a new master's in computational linguistics have expressed their intention of applying for admission to GSLT in 2003.

Växjö University

For Växjö University participation in GSLT continues to be a very important component in the build-up of a Ph.D. program in computer science with specialization in language technology. Although we did not receive any new students in the second intake, we have managed to recruit one more Ph.D. student employed on local funding, which means that we now have a group of three Ph.D. students in the Växjö group. We have also continued to be active in organizing courses within GSLT (three courses in four semesters), which has created many possibilities for cooperation with other sites within the school

B PhD projects

Loredana Cerrato Department of Speech, Music and Hearing, Royal Institute of Technology

Previous degree: Foreign language, literatures and linguistics at University of Naples, 1992.

Thesis topic: analysis of verbal and non-verbal feedback across modalities

Supervisor: David House, Associate Professor, Department of Speech Music and Hearing, KTH

Assistant Supervisor: Jens Allwood, Professor of General Linguistics, Department of Linguistics, Göteborg University

The research is concerned with the analysis of feedback phenomena in human-human and human-machine communication. Particular attention is paid to the analysis of prosodic and gestural cues of feedback. The main aim of the investigation is to formalize some aspects of human communication that can be implemented in the design of human-computer interfaces.

Susanne Ekeklint School of Mathematics and Systems Engineering, Växjö University

Previous degree: M.A. in computational linguistics, Göteborg University 2001

Thesis topic: Dependency Based Generation of Natural Language

Supervisor: Joakim Nivre, Professor of Computational Linguistics, School of Mathematics and System Engineering, Växjö University

Assistant Supervisor: Torbjörn Lager, Professor of General and Computational Linguistics, Department of Linguistics, Göteborg University

In this research we will consider different methods for generating natural language using dependency grammars. The natural language that mainly will be analyzed is Swedish, since this is a language with rather free word order and therefore interesting to analyze using dependency grammar. The investigation will start with surface generation or linguistic realization from dependency trees to well formed strings. We will thereafter consider the problem of choosing the best linearisation depending on context and what the sentence is to be used for. The different methods will initially be tested on text sequences but will later be extended so that they can handle dependency trees that are representations of spoken utterances as well.

Stina Ericsson Department of Linguistics, Göteborg University

Previous degree: B.A. Computer Science, Linguistics and French

Thesis topic: The Interpretation of Information-Rich Constituents in Dialogue

Supervisor: Robin Cooper, Professor of Computational Linguistics, Department of Linguistics, Göteborg University

Assistant Supervisor: Valéria Molnár, Professor, Department of German, Lund University

‘Information rich constituents’ is a term I have chosen for a phenomenon in human-human and human-machine dialogue, a phenomenon which has much in common with what has been studied within approaches to ellipsis, but which also, and importantly, embrace differences. Through the term information richness I want to emphasise that the examples are not reduced in any sense. Rather, as you find when studying dialogue, in the context in which these utterances are produced they contain

just the right amount of information. Exploring the full complexity of spontaneous spoken dialogue, I also try to investigate the impact that the presence of a potentially large dynamic context and several speakers with utterances distributed across turns (which gives overlap, interruptions, etc) have on information richness. My analysis of dialogue corpora uses theories of Information Structure, and my thesis work also includes formalisation and implementation using the Information State approach to dialogue.

Markus Forsberg Department of Computing Science, Chalmers University of Technology, Göteborg

Previous degree: M.Sc., Computer Engineering

Thesis topic: Grammar and Morphology Formalisms

Supervisor: Aarne Ranta, Associate Professor of Computing Science, Department of Computer Science, Chalmers University of Technology and Göteborg University

The thesis is focused on how we can define appropriate formalisms for defining grammars and morphologies. My main tool for defining such formalisms is functional programming, in particular the functional programming language Haskell. Furthermore, I investigate how we can define as general description as possible of the grammars/morphologies, from which we can generate what ever we are interesting in. From a morphology we may be interested in a regular relation that defines the morphology, or a SQL database or inflection tables and so on. From a grammar, we may want a parser that parses the described language, or lexical analyzer that tokenize the language etc.

Some of the projects related to my thesis that I have been/are involved in:

GF (Grammatical Framework), a grammar formalism based on Type Theory.

www.cs.chalmers.se/~aarne/GF

Open-Source Functional Morphology, a formalism for defining Morphologies.

www.cs.chalmers.se/~aarne/morphology

prototype morphology web server:

www.cs.chalmers.se/~markus/svenska

BNF Converter, a formalism for defining compiler front-ends for programming languages:

www.cs.chalmers.se/~markus/BNFC

Gramlets. Special-purpose language applications written in java, which are generated from a GF grammar.

Genevieve Gorrell Department of Computer and Information Science, Linköping University

Previous degree: M. Phil Computer Speech and Language Processing programme, Cambridge University, UK.)

Thesis topic: Context-Sensitive Spoken Language Understanding

Supervisor: Arne Jönsson, Associate Professor of Computer Science, Department of Computer and Information Science, Linköping University

Assistant Supervisor: Robin Cooper, Professor of Computational Linguistics, Department of Linguistics, Göteborg University

The current developments in spoken dialogue systems present challenges for speech recognition, with the requirement for speaker-independence opposing the desire for maximal flexibility in the range of

utterances able to be recognised. Insufficient attention is often given to the potential role of dialogue context in constraining the range of language that needs to be recognised in an invisible fashion. Widespread preference for statistical language modelling provides limitations, in that the approach is time-consuming and expensive, and makes online manipulation an impossibility. The alternative of grammar-based language modelling is perceived as unnatural and overly-restrictive of what the user is able to say. This thesis explores the possibilities for combining the two approaches in such a way as to maximally leverage the strengths of both, along with the information made available through dialogue context. The approach developed will use backing-off and help strategies to be robust to unexpected input, providing a positive experience for users of all competences. Semantic interpretation and speech recognition will be considered interdependent. The strategies developed will be applicable across domains.

Anders Green Numerical Analysis and Computer Science (NADA) at the Royal Institute of Technology (KTH), Stockholm.

Previous degree: M.A in Computational Linguistics, Göteborg University.

Thesis topic: Human-Robot Interaction using Multi-sensory Natural Language Interfaces

Supervisor: Kerstin Severinson Eklundh, Professor, Department of Numerical Analysis and Computer Science, KTH

Assistant Supervisor: Henrik Christiansen, Professor, Numerical Analysis and Computer Science (NADA) at the Royal Institute of Technology (KTH), Stockholm.

How should a Multi-sensory Natural Language User Interface between a human user and an Intelligent Service Robot, be designed in order to support naturalness in human-robot communication, and in particular, communication using speech and gestures in combination? What types of dialogue and what kinds of gestures are required to successfully perform practical tasks using a robot? The view taken in this research is that a Multi-sensory Natural Language User Interface can be thought of as a system that uses several sources of information to analyze the behavior of the user. This information is used by the system to come up with an appropriate response, typically an utterance or an action of the underlying system.

The two main themes of this research are:

1. Establishing principles for the design of usable Multi-sensory natural language user interfaces for Intelligent Service Robots.
2. To develop methods for computational analysis of co-expressive speech and gesture used to instruct Intelligent Service Robots.

Leif Grönqvist School of Mathematics and Systems Engineering, Växjö University

Previous degree: MSc, Computing Science, Göteborg University

Thesis topic: Improved Latent Semantic Indexing Models for Information Retrieval

Supervisor: Joakim Nivre, Professor of Computational Linguistics, School of Mathematics and System Engineering, Växjö University

*Assistant Supervisor:*Jussi Karlgren,PhD, The Human Computer Interaction and Language Engineering Laboratory, SICS

Latent Semantic Indexing could theoretically raise both the precision and recall for an information retrieval system, compared to a system using traditional indexing. The main idea is that a document's contents is better represented in a low dimensional vector space with dimensions corresponding to abstract concepts rather than a high dimensional space with the same dimensionality as the total number of terms found in the document set. The projection between these vector spaces could for example be calculated as a Singular Value Decomposition - based on eigenvectors - of the co-occurrence matrix, or by random indexing.

This work aims to solve or at least throw some light on various problems with the basic LSI model:

- It does not handle ambiguous words and phrases very well
- Similarities in the model is difficult to interpret
- It is unclear how the number of dimensions influences the performance

Mikael Gunnarsson Swedish School of Library and Information Sciences, University College of Borås

Previous degree: Librarianship diploma

Thesis topic: Document Transformations

Supervisor: Lars Höglund, Professor, Library and Information Science, Högskolan i Borås, joint unit with Göteborg University

*Assistant Supervisor:*Barbara Gawronska, Associate Professor, Department of Languages, University College Skövde

Most scholarly papers and other academic writings on the World Wide Web demonstrate the use of compositional styles and writing strategies that in several aspects are alike. Even though several elements of standard styles may be easily recognized by the eye, efforts to automatically detect and process their contents are not simple. Common writing strategies tend to treat HTML (or related technologies) as presentational markup rather than as descriptive markup (e.g. markup tags for headings are used for formatting instructions, rather than for descriptive purposes). This may devalue the markup in certain situations and for particular processing tasks. Nevertheless, the existence of this markup is important. Consequently, my main interest lies in the elaboration of a working model for analysis of document structures so that more or less semantic inferences (in a broad sense) may be drawn from the output of the analysis. In other words, the transformation of procedural markup to semantic markup. This implementation may turn out to be a transformation based analyzer that makes use of recently elaborated W3C technologies such as XSLT, XPath and XQuery.

Sofia Gustafsson-Capková Computational Linguistics, Department of Linguistics, Stockholm University

Previous Degree: Fil. Mag. in Computational Linguistics and Czech language, Stockholm university

Thesis topic: Integrating Prosody in an Account for Discourse Structure

Supervisor: David House, Associate Professor, Department of Speech Music and Hearing, KTH
Assistant Supervisor: Elisabet Engdahl, Associate Professor of Scandinavian Linguistics, Department of Swedish Language, Göteborg University

The thesis aims to address two main research questions:

1. How is discourse structure established, and how is prosody affecting and/or contributing to it?
and
2. What are the relevant prosodic features to take into account in a discourse analysis?

In spoken language the rhythm, melody and pausing pattern plays a crucial role for the structuring of the message. To understand this message structure is in turn important when it comes to the interpretation of the message. The view that prosody is important for the discourse structure is stressed by many researchers.

It is, however, not clear in detail how prosody relates to the textual discourse structure. Thus, a deeper understanding of how prosody is interacting with the discourse structure should be beneficial for all branches in Natural Language Processing (NLP) that are working with some aspect of spoken language understanding.

In this thesis I will investigate i) subjects perception and ii) acoustic properties of text-based and speech-based discourse structure in four speech styles: Text-based monologue, text-based dialogue, spontaneous monologue and spontaneous dialogue.

Cecilia Hemming Department of language, University College of Skövde (Department of Linguistics, Göteborg University).

Previous degree: B.A. French and Linguistics, Skövde

Thesis topic:

Supervisor: Barbara Gawronska, Associate Professor, Department of Languages, University College Skövde

Assistant Supervisor: Joakim Nivre, Professor of Computational Linguistics, School of Mathematics and System Engineering, Växjö University

Morphology and semantics of compounds and multi-word terms used to designate technical items

Technical word formation in both French and Swedish is facilitated by using affixation, compounding and combinations of both. There are production patterns though that seem to be language specific. Contrastive studies can reveal what similarities, divergences and relations there are in the two languages. The result of this linguistic analysis can be used in the development of applications for Machine Translation or Information Extraction.

Per-Anders Jande Department of Speech, Music and Hearing, Royal Institute of Technology

Previous degrees: B.A. (Phonetics), B.A. (General Linguistics), B.A. (Computational Linguistics),

M.A. (Computational Linguistics)

Thesis topic: Pronunciation variation modelling for Swedish

Supervisor: Rolf Carlson, Professor in Speech Technology, Department of Speech Music and Hearing, KTH

The goal of this project is to develop a model for automatically creating transcriptions specific to different speaking styles and speech rates from canonical transcriptions of Swedish words. Since the model should be usable as a knowledge-base for various speech technology applications, it will be represented on a general format. A knowledge-based reduction rule system has been developed and evaluated in a speech synthesis context. The results of this evaluation showed that it is possible to increase the naturalness of fast speech synthesis using reduction rules. However, the influence of factors such as word predictability will need further investigation. Different methods for investigating the influence of a number of factors on pronunciation variation using speech data will be explored.

Pontus Johansson Department of Computer and Information Science, Linköping University

Previous degree: Master of Social Science: Cognitive Science

Thesis topic: User Modeling in Adaptive Dialogue Systems

Supervisor: Arne Jönsson, Associate Professor of Computer Science, Department of Computer and Information Science, Linköping University

Assistant Supervisor: Lars Degerstedt, Research Engineer, Department of Computer and Information Science, Linköping University

In order to enhance the naturalness of interaction, efficiency in task management, and user experience in multimodal dialogue systems, adaptive functionality is needed. Adaptive behavior can be achieved utilizing an explicit representation of individual users' needs, i.e. a user model. User modeling is concerned with inferring users' goals and needs for the users' task at hand, in order to provide the right information, at the right time, in the right way, thus ensuring that usability requirements are met. My aim is to incorporate user modeling capabilities at several levels throughout the dialogue system interaction in a distributed fashion and evaluate this approach. This implies designing, implementing, and evaluating separate user modeling components for: interaction management components to handle adaptive multimodal interaction; dialogue management components to cater for adaptive dialogue; and domain reasoning components to ensure adaptive behavior at task level. This also implies investigations on how user model information is acquired incrementally during interaction at use-time.

Rebecca Jonson Department of Linguistics, Göteborg University

Previous degree: M.A. Computational Linguistics, Göteborg University *Thesis topic:* Multilingual and Cross-cultural Dialogue Systems

Supervisor: Robin Cooper, Professor of Computational Linguistics, Department of Linguistics,

Multilinguality have mostly been of interest in machine translation research but multilinguality is a system feature that will grow in importance in other areas as well, since natural language technologies are entering the commercial market and people want to have access to the latest technology in their own language. Multilinguality is also a desirable feature for developers as their products may reach a

much broader market. Many multilingual dialogue systems are still systems that have been developed separately for each of the languages that they manage. In my research I will focus on issues concerning multilingual and cross-cultural spoken dialogue systems and study how cross-linguistic and cross-cultural differences will affect the performance of a dialogue system.

Fredrik Kronlid Department of Linguistics, Göteborg University

Previous degree: M.A. Computational Linguistics

Thesis topic: Dialogue systems as concurrent stream processing by agents

Supervisor: Torbjörn Lager, Professor of General and Computational Linguistics, Department of Linguistics, Göteborg University

Assistant Supervisor: Kerstin Severinson Eklundh, Professor, Department of Numerical Analysis and Computer Science, KTH

The thesis work is concentrated around the view of dialogue systems as interactive transducers of streams of communicative events or tokens.

Such a dialogue system can be composed of autonomous agents, each of them with competences and shortcomings in different areas.

Traditionally agent based dialogue systems consist of agents who are functionally specialized (parsing, semantic interpretation etc.). In this project agents are complete dialogue systems (functionally), but specialized in different subject areas.

Monica Lassi Swedish School of Library and Information Sciences University College of Borås

Previous degree: M.Sc. Library and Information Science

Thesis topic: Implementation of linguistic methods for use in automatic indexing

Supervisor: Lars Höglund, Professor, Library and Information Science, Högskolan i Borås, joint unit with Göteborg University

Assistant Supervisor: Barbara Gawronska, Associate Professor, Department of Languages, University College Skövde

Indexing is a process in which the content of a text stored in a document is to be represented by a set of index terms. The index terms are a way to later retrieve the documents. Automatic indexing is performed by programs that often use quite crude statistical methods based on word frequency without any consideration of the linguistic properties of the text. Use of linguistic knowledge is expected to increase the quality of the automatic indexing process, and consequently the performance of IR systems. I am interested in using methods for linguistic analysis to improve the automatic indexing process.

Svetoslav Marinov Department of language, University College of Skövde

Previous degree: M.Phil. Linguistics, University of Tromsø

Thesis topic: Parsing and grammar formalisms

Supervisor: Barbara Gawronska, Associate Professor, Department of Languages, University College Skövde

Assistant Supervisor: Joakim Nivre, Professor of Computational Linguistics, School of Mathematics and System Engineering, Växjö University

The dissertation will most probably deal with parsing and different grammar formalism used for this purpose. As a starting point I will look at the possibility to use a framework like Minimalist Program (Chomsky 1995) and the Minimalist Grammar formalisms (Stabler 1997) for parsing of Bulgarian. Other Slavic languages might subsequently be looked at. I would mostly be interested to look at the argument structure of Slavic as compared to that of the Scandinavian Languages. The results might be used in eventual machine translation (i e. Bulgarian-Swedish) and information extraction systems.

web page: www.gslt.hum.gu.se/~svet

Fredrik Olsson Department of Swedish language, Göteborg university and SICS.

Previous degree: Fil lic. in computational linguistics, Dept of linguistics, Uppsala University.

Thesis topic: Portability Issues in Information Refinement

Supervisor: Lars Borin, Professor of Natural Language Processing, Department of Swedish, Göteborg University

Assistant Supervisor: Björn Gambäck, PhD, Distributed Systems Lab, SICS

By the term information refinement, the process is referred to in which text is handled with the aim of accessing the pieces of content that are relevant from a certain perspective. To date, information extraction, automatic summarisation and information retrieval represent the state of the art when it comes to techniques that can be used to form an information refinement system. These techniques have in common that they all work reasonably well when used by experienced users in the research labs, but not necessarily as well when applied in everyday situations encountered by less experienced users. It seems as if the fundamental obstacle to facilitate usage of tools equipped with such techniques outside the laboratories, is to find methods and techniques for adaptation of information refinement systems to new information needs and domains.

This thesis will investigate the nature of textual information expressed in a few selected domains with respect to linguistic characteristics and plausible computational treatment of those. The aim of the investigation is to better understand how to construct information refinement systems that are portable across domains and information needs.

Botond Pakucs Department of Speech, Music and Hearing, Royal Institute of Technology

Previous degree: M.Sc. Computer Science.

Thesis topic: Adaptive and personalized dialogue management for mobile and ubiquitous computing environments.

Supervisor: Rolf Carlson, Professor in Speech Technology, Department of Speech Music and Hearing, KTH

Assistant Supervisor: Kerstin Severinson Eklundh, Professor, Department of Numerical Analysis and Computer Science, KTH

The thesis work addresses the domain of speech interfaces in mobile and ubiquitous computing environments with a special focus on dialogue management issues and adaptation to users and to the situational context. During the first phase of the thesis work the usability aspects and user requirements on the speech interfaces in mobile environments were studied. Based on this study a generic dialogue manager has been designed and implemented. During the development process, the focus was on enabling the dialogue manager with support for personalization and adaptation towards the situational context. The major research question left to be addressed is how to represent knowledge specific to individual users and knowledge related to the surrounding context. Another challenge will be to achieve adaptation based on the available knowledge and the available information

Sara Rydin Department of Speech, Music and Hearing, Royal Institute of Technology

Previous degree: B.A., Computational Linguistics

Thesis topic: Acquiring lexical relations

Supervisor: Rolf Carlson, Professor in Speech Technology, Department of Speech Music and Hearing, KTH

Assistant Supervisor: Joakim Nivre, Professor of Computational Linguistics, School of Mathematics and System Engineering, Växjö University

This thesis concerns the problem of how information on lexical relations can be acquired automatically from text and/or speech. My aim is to investigate the specific problems concerning acquisition of lexical relations for Swedish. Also, a lexicon based on lexical relations will be built for evaluation, and implementation in the framework of language modeling for Swedish.

Magnus Sahlgren Department of linguistics, Stockholm university and SICS

Previous degree: M.A. philosophy and computational linguistics

Thesis topic: Vector-based semantic analysis: context and emergence

Supervisor: Jussi Karlgren, PhD, The Human Computer Interaction and Language Engineering Laboratory, SICS

Co-occurrence information can be used to extract semantic relations between linguistic units. This is done by comparing the distributional patterns of the linguistic units over large amounts of data. If the patterns are similar, we treat the units as related in meaning. This methodology is motivated by the "distributional hypothesis", which states that semantically similar words occur in similar contexts.

The first part of the dissertation is concerned with the philosophical rationale for the distributional hypothesis. The second part of the dissertation deals with the implementation of the distributional hypothesis in vector space models. A new technique called "Random indexing" is introduced, and it is argued that this new technique is more flexible, efficient, scalable and cognitively motivated than traditional vector space approaches. It is also shown how the performance of vector space models can be improved by using linguistic information. The vector space techniques are evaluated in a series of experiments including vocabulary tests, comparisons with manually compiled thesauri, information retrieval and classification tasks.

Susanne Schötz Department of Linguistics and Phonetics, Lund University

Previous degree: M.A. in Phonetics

Thesis topic: Speaker Age in analysis and synthesis

Supervisor: Per Lindblad, Associate Professor, Department of Linguistics and Phonetics, Lund University

Assistant Supervisor: Gösta Bruce, Professor, Department of Linguistics and Phonetics, Lund University

Assistant Supervisor: Rolf Carlson, Professor of Speech Technology, Department of Speech Music and Hearing, KTH

My work is focused on finding acoustic and perceptual correlates to speaker age. Acoustic features will be automatically extracted from a large number of natural speakers of different ages and analysed carefully. A number of potential features will then be subject to further analysis and tested using formant synthesis. Listening tests and interviews will be used to find out what dominant age cues, there are and how much they vary between listeners as well as between speakers. If successful, my methods may be applied to other paralinguistic properties of speech as well, including health state, attitudes and emotions. The goal of my research is to help improving the naturalness of synthetic speech.

Gabriel Skantze Department of Speech Music and Hearing, KTH

Previous degree: M.A. in Cognitive Science (Linköping University)

Thesis topic: Error and Miscommunication in Spoken Dialogue Systems

Supervisor: Rolf Carlson, Professor of Speech Technology, Department of Speech Music and Hearing, KTH

The thesis will concern methods for studying miscommunication caused by speech recognition errors in spoken dialogue systems, and models for how these problems can be handled. Central to this is the study of how different levels of linguistic feedback can be used to signal understanding (in order to detect errors), depending on variables like speech recognition confidence, consequence of task failure, and dialogue efficiency. These models will also be implemented in a dialogue system. Miscommunication in task-oriented dialogue will be compared to miscommunication in dialogues for information browsing. Another central aspect of miscommunication is the user's experience of errors, and how this relates to the errors that actually occur.

Mustapha Skhiri Department of Computer and Information Science, Linköping University

Previous degree: M.Sc., Computer Science

Thesis topic: Computational Models of facial and head movements in interactive dialogue systems

Supervisor: Bertil Lyberg, Adjunct Professor in Speech Technology, Reader (docent) in Phonetics

Assistant Supervisor: Lars Ahrenberg, Professor of Computational Linguistics, Department of Computer and Information Science, Linköping University

Dialogue is an interactive communication of information mainly based on speech, but also visual information such as gesture, facial expression and head movement clearly makes the conversations much smoother and more natural. In my research I will first do an examination of the face and head

movements in turntaking situations and also study how these movements are related to the speech signal in human-human and human-computer situation. Then I will make a computational model and implement these movements in a “talking head” and study the perceptual relevance of this in a dialog system that includes visual information.

Håkan Sundblad Department of Computer and Information Science, Linköping University

Previous degree: M.Sc., Cognitive Science

Thesis topic: Question analysis in open domain question answering dialogue systems

Supervisor: Arne Jönsson, Associate Professor of Computer Science, Department of Computer and Information Science, Linköping University

Assistant Supervisor: Magnus Merkel, PhD, Department of Computer and Information Science, Linköping University

In recent years, there has been a surge in interest surrounding question answering (QA) systems and technologies. The perhaps the most exciting features of QA systems are that they work against open domains and unstructured information. So far, QA systems have not been designed to support dialogic features, such as posing clarification questions. Regarding these issues, results from research on dialogue systems can contribute to a large extent. Traditional dialogue systems, however, have been designed for small, rather restricted domains, and often make use of a structured information source, such as a database. This thesis investigates how we can combine the features of QA systems with the features of dialogue systems. More specifically, the thesis investigates how the question analysis must be modified in order to accommodate the new features that emerge. The thesis proposes a question taxonomy, an answer taxonomy, and a model for automatic content analysis.

Per Weijnitz Department of Linguistics, Uppsala University

Previous degree: Master of Philosophy in Language Engineering

Thesis topic: Corpus-Based Methods for Robust Semantic Analysis

Supervisor: Anna Sågvall Hein, Professor of Computational Linguistics, Department of Linguistics, Uppsala University

The purpose is to investigate ways of doing robust, (and presumably shallow) semantic analysis with minimal overhead in terms of syntactic analysis. Implemented, the methods described would not correspond to a stand alone system useful on its own, but rather to a component useful for a variety of language engineering purposes, e.g. data mining and machine translation. A number of issues are relevant in this context, e.g. the representation of semantic information, grammar rules and lexical information. It is desirable that semantic principles be extracted from corpora. To which extent this is possible still remains to be investigated. To start with I will consider the suitability of dependency-oriented models of linguistic structure.

Kenneth Wilhelmsson Department of Linguistics, Göteborg University

Previous degree: M.A. computational linguistics (Göteborg)

Thesis topic: Ambiguity in the Writing Process

Supervisor: Robin Cooper, Professor of Computational Linguistics, Department of Linguistics, Göteborg

University

Text being produced without a common frame of reference and without well-known purposes runs the risk of severely complicating the task of interpretation. Which are the formal patterns of different types of ambiguity? Would it be possible to recognize the cases in text that could lead to misinterpretations without needing a textual representation of the whole world to look at for multiple realistic interpretations? The question of ambiguity becomes intriguing because of the fact that numerous different types of lexical and syntactic constructions will have an ambiguous outcome. People reading text may often fail to discover the potential two-foldness of a message, something which probably has to do with our search for a semantically plausible content. Thus, this research might have to involve some type of semantic analysis. The result of this work could be a module compatible with a text editor helping an author to spot sequences in text likely to be misinterpreted.

Gustav Öquist Department of Linguistics, Uppsala University

Previous degree:

Language Engineering Programme, Uppsala University

Thesis topic: Readability on Small Screens

Supervisor: Anna Sångvall Hein, Professor of Computational Linguistics, Department of Linguistics, Uppsala University

Assistant Supervisor: Jan Ygge, Professor, Department of Clinical Sciences

Assistant Supervisor: Mikael Goldstein, Associate Professor, Ericsson Research Kista

With the increasing amount of information available to users of mobile devices, the issues regarding readability on small screens are becoming progressively more important. The problem is that the devices usually have to be small and that low readability is intrinsic to limited screen space. However, one approach to overcome the size constraints may be to design interfaces that utilize the possibilities offered by mobile devices to dynamically work with the text and present it in a more suitable way for the user. Since improved readability on small screens also means improved usability of mobile devices, it is important to explore the possibilities of dynamic text presentation. The aim with the thesis is to bring forward efficient and usable text presentation formats for small screens, which adheres to the natural reading process that has evolved over time, by making the most of the opportunities for linguistic processing and novel interaction offered by mobile devices.

C Publications by GSLT's graduate students during AY 2002–03

- Botond, Pakucs (2003) SesAME: A Framework for Personalized and Adaptive Speech Interfaces. *Proc of the EACL-03 Workshop on Dialogue Systems: interaction, adaptation and styles of management*. Budapest, Hungary, April, 2003.
- Cerrato, Loredana (2002) Some characteristics of feedback expressions in Swedish, in *TMH.OPSR Vol.43 Fonetik 2002* pp. 101–104.
- Cerrato, Loredana (2002) A comparison between feedback strategies in Human-to Human and Human-Machine communication, in *Proceedings of ICSLP-2002*, Denver, Colorado USA.
- Cerrato, Loredana (2002) A Study of Verbal Feedback in Italian, in *Proceedings of the NORDTALK Symposium on Relations between Utterances*, Copenhagen 5–7 dec. 2002, pp. 80–97
- Cerrato, Loredana (2003) Analysis and measurement of communicative gestures in human dialogues with Mustapha Skhiri, *Proc. of AVSP 2003*, St. Jorioz, France, pp. 251–256
- Cerrato, Loredana (2003) Duration and tonal characteristics of short expressions in Italian , with Mariapaola D'Imperio In *Proc.of the ICPHs*, Barcelona, 2-9 Augusti 2003.
- Cerrato, Loredana (2003) Utilizzo dei parametri della fonetica acustica nell' identificazione del parlante in ambito forense, with Andrea Paoloni. In *Voce, Canto Parlato, Studi in Onore di Franco Ferrero P. Cosi, E. Magno Caldognetto A. Zamboni* (eds), Unipress 2003 pp.59–66
- Goldstein, M., Öquist, G., and Björk, S. (2002) Evaluating Sonified Rapid Serial Visual Presentation: An immersive reading experience on a mobile device. In *Proceedings of User Interfaces for All 2002* (Paris, France). Berlin: Springer.
- Haage M, Schötz S, Nugues P. (2002) A Prototype Robot Speech Interface with Multimodal Feedback. in *Proceedings of IEEE ROMAN 2002*, Berlin, 25–27 September, 2002.
- Kruijff-Korbyova, I., E. Karagjosova, K.J. Rodriguez and S. Ericsson. (2003) A Dialogue System with Contextually Appropriate Output Intonation. EACL'03. Demonstration abstract. 199–202.
- Kruijff-Korbyova, I., K.J. Rodriguez, S. Ericsson and E. Karagjosova. (2003) Producing Contextually Appropriate Intonation in an Information-State Based Dialogue System. EACL'03. 227–234.
- Jande, Per-Anders (2003) Evaluating Rules for Phonological Reduction in Swedish, in *Proceedings of Fonetik 2003*, pp. 149–152
- Jande, Per-Anders (2003) Phonological Reduction in Swedish, in *Proceedings of the International Congress of Phonetic Sciences (ICPhS)*, pp. 2557–2560
- Johansson, Pontus. (2003) Natural Language Interaction in Personalized EPGs. In *Proceedings of the 3rd Workshop on Personalization in TV* (9th International Conference on User Modeling). Johnstown (PA), USA, June 23, 2003. pp. 27–31
- Johansson, Pontus., Degerstedt, L., Jönsson, A. (2002) Iterative Development of an Information-Providing Dialogue System. In *Proceedings of the 7th ERCIM Workshop on User Interfaces for All: Universal Access Special Theme*. Chantilly, France, October 23–25, 2002. pp. 29–36.

- Ibrahim, A., Johansson, P. (2002) Multimodal Dialogue Systems: A Case Study for Interactive TV. In *Proceedings of the 7th ERCIM Workshop on User Interfaces for All*. Chantilly, France, October 23–25, 2002. pp. 209–218.
- Ibrahim, A., Johansson, P. (2002) Multimodal Dialogue Systems for Interactive TV Applications. In *Proceedings of the 4th IEEE International Conference on Multimodal Interfaces*, Pittsburgh (PA), USA, October 7–10, 2002. pp. 117–222.
- Skantze, G. (2002). Coordination of referring expressions in multimodal human-computer dialogue. *Proceedings of the International Conference on Spoken Language Processing*.

D Conference presentations by GSLT's graduate students during AY 2002–03

Ericsson, Stina (2003) A Dialogue System with Contextually Appropriate Output Intonation. EACL'03. With I. Kruijff-Korbayova and E. Karagjosova.

Ericsson, Stina (2003) Contexts for Information Richness in Dialogue. NoDaLiDa, Reykjavik, May 30–31, 2003.

Gambäck, B., Cheadle, M., Hansen, P., Olsson, F. Sahlgren, M. (2003) A Spoken Swedish E-mail Interface. Presented at the 14th Nordic Conference on Computational Linguistics, NoDaLiDa 03, May 30–31, Reykjavík, Iceland.

Megyesi, B & Gustafson-Capkova, S. (2002) Production and Perception of Pauses and their Linguistic Context in Read and Spontaneous Speech in Swedish. ICSLP 2002 - 7th International Conference on Spoken Language Processing, Denver, USA 16-20 September 2002.

Sahlgren, M., Karlgren, J., Cöster, R. & Järvinen, T. (2002) SICS at CLEF 2002: Automatic Query Expansion Using Random Indexing. The CLEF 2002 Workshop, September 19–20, 2002, Rome, Italy.

Sahlgren, M., Hansen, P. & Karlgren, J. (2002) English-Japanese Cross-lingual Query Expansion Using Random Indexing of Aligned Bilingual Text Data. The Third NTCIR Workshop, October 8–10, 2002, Tokyo, Japan.

Sahlgren, M. (2003) Content-based Adaptivity in Multilingual Dialogue Systems. Presented at the 14th Nordic Conference on Computational Linguistics, NoDaLiDa 03, May 30–31, Reykjavík, Iceland