

GSLT

Graduate School of Language Technology

A national graduate school of language technology

Programme declaration

Contents

1	Background	5
1.1	The school's role	5
1.2	The school's scientific area	5
1.3	The school's goals	7
1.4	Contributing institutions	7
2	Organisation	8
2.1	Academic Board	8
2.2	Advisory Boards	9
2.3	Finance	9
3	Relation to other doctoral programmes	9
4	Application procedures	9
4.1	Advertising	9
4.2	Entrance qualification and prerequisites	9
4.3	Suitability for graduate study	10
4.4	Selection procedure	10
4.5	Possibility of changing home department	10
5	The study programme	11
5.1	Individual study programmes	11
5.2	Teaching and supervision	11
5.3	Graduate courses	11

5.4	Research seminars	13
5.5	Example of an individual study programme	14
5.6	Organisation of courses	14
5.7	Doctoral thesis	15
5.8	Examination	15
6	Financial support for doctoral students	15
7	International policy	16
8	Equal opportunities	16

1 Background

1.1 The school's role

The Swedish government is financing a number of national graduate schools with the aim of increasing the quality of graduate education in Sweden. Sweden is a relatively small country and competence in various disciplines is spread over a number of academic institutions. A national graduate school offers the possibility of combining the research competencies of various institutions, thereby creating a critical mass of graduate students, supervisors and instructors. This increases the possibility of creating coherent internationally competitive study programmes with a broad interdisciplinary base.

Sweden has a number of new universities and smaller colleges where there is a good deal of research competence though a lack of the formal power to grant graduate degrees. These are included in national graduate schools so that they may benefit from the competence in teaching and supervision which is spread over several academic institutions in Sweden.

Göteborg University has been appointed by the Swedish government to be the host of a graduate school in the area of language science on the basis of a proposal for a graduate school in language technology. This proposal for a national graduate school was a development of an earlier proposal made in collaboration with representatives of language technology research at a number of Swedish institutions.

1.2 The school's scientific area

We are at the beginning of a revolution in the way we interact with computers. The traditional human-computer interface involving a screen and a keyboard will increasingly be replaced by more natural ways of interacting. Over the last five years we have become increasingly used to the idea that vast amounts of information are available in the form of natural languages such as English and Swedish, over computer networks which are universally accessible. For many *IT* has become synonymous with the world-wide web. At the same time mobility is increasing and there is a huge demand for access to information by people on the move as is shown by the success of mobile telephones. Our homes are increasingly populated by complex machines which contain more and more computational elements such as video machines and microwave ovens. Our machines are becoming more and more capable of carrying out complex tasks but at the same time the interfaces tend to be more and more frustrating and less and less user friendly. We need to be able to interact with our machines in a more human way and the key to this is human language. An increase in the linguistic capability of our machines could improve the quality of life in the information society in almost any area you care to look. Here are some examples:

mobility People on the move cannot be looking at a screen and typing on a keyboard. They may, however, need to interact with a machine that can tell them where to go or be able to process email or other messages or look up information on the web.

appliances in the home Leisure has become more complicated. Digital TV provides us with hundreds of channels and we want to make an informed choice. Video machines are notoriously difficult to program. Currently there is a great deal of interest in smart houses which will enable us to interact with devices in the home in a number of different ways including via internet and phone. Devices that can engage you in simple conversations and have even a limited understanding of what you say to them could bring immense improvement to people's lives.

services Increasingly banking, travel, cinema and theatre booking as well as information services in general are becoming automated. We can, for example, communicate with our banks by phone or by computer interface. Current phone interfaces are normally menu driven and tedious, and if things go wrong it is probably best to hang up and start again. A telephone interface with simple dialogue capabilities could greatly improve this situation.

multilinguality The need for communication between people who have different native languages has increased dramatically in the information society. At the same time there is a desire to preserve linguistic diversity. An international information society with English or Chinese as the dominant language is as unappealing as it is unjust. Computational systems that can communicate in different languages or that can assist with translation are now available, but they are in need of improvement, as anybody who has used translation systems available on the internet will realize.

incoming information Electronic media have made possible the storage of vast quantities of information in the form of human language. Current information technology has made large amounts of this information available, although it can be a time-consuming and frustrating experience to find precisely the information you want. Language technology gives us ways of sorting this information by various techniques of document classification and information extraction. Information filtering is perhaps one of the most important tasks we need to find solutions for in the coming information society.

outgoing information The information society puts increased pressure on us to create documents and to communicate, often across linguistic barriers. We need tools that will help us to author documents and decrease the time we need to do it. Spelling, grammar and style checkers are much more widely available for majority languages like English than for minority languages like Swedish. Very few of these tools are oriented to the needs of non-native speakers.

information exchange Sometimes people need help to communicate with each other, for example if they do not have a common language. Various kinds of disabilities can also make communication more difficult. Current language technology translation and dialogue systems and aids for people with special needs will in the future be able to benefit from the development of multi-modal systems (which, for example, can take account of facial expressions) and the possibilities available for communicating with the aid of virtual environments.

The two basic technologies which underlie language technology applications are speech technology and natural language processing (NLP). Speech technology is concerned with the processing and generation of speech signals. NLP, broadly speaking, has to do with the processing and generation of strings of words (e.g. written text). Speech technology and NLP developed as two separate fields. Speech technology has been for the most part engineering oriented while NLP has in large part been

linguistically oriented. In recent years there has been increasing recognition that these two technologies need to be integrated in order to produce the next generation of language technology applications such as spoken dialogue systems, spoken translation systems, and information systems with spoken language interfaces. It as an central feature of the graduate school's programme that these technologies be integrated and that young researchers be trained who are familiar with both.

1.3 The school's goals

GSLT has the following goals:

- to contribute to Swedish society by producing graduates with a competence not available elsewhere
- to raise the general standard of language technology education in Sweden
- to create a broad interdisciplinary platform for graduate education in language technology. This platform should provide a multidisciplinary basis on which the student can build further.
- to create an international profile by inviting instructors from foreign universities and research institutes and by encouraging foreign students to apply to the school or take individual courses. Within Scandinavia there are already plans for collaboration on graduate education in language technology and GSLT should be able to play a central role in this Scandinavian initiative.

In order to achieve this the school aims to provide a unified educational programme consisting of graduate courses and supervision which takes account of a number of the various disciplines which contribute to language technology. The departments which contribute to the school come from several universities and colleges in Sweden where language technology research is conducted. Among them are, for example, departments of computational linguistics, computer and information science, library science, linguistics and phonetics, philosophy, speech technology and Swedish language.

1.4 Contributing institutions

It is planned that the following academic institutions will take part in the school:

Göteborgs Universitet, coordinating host
Högskolan i Borås, partner designated by the government
Högskolan i Skövde, partner designated by the government
Växjö universitet, partner designated by the government

Chalmers Tekniska Högskola
Kungliga Tekniska Högskolan
Linköpings universitet

Uppsala universitet

Further academic institutions will be added to the school depending on how and where language technology develops in the country. Negotiations are currently in progress with Lund University, Stockholm University and Umeå University.

Research centres and companies will also collaborate with the school in various ways (for example, by contributing to teaching and supervision). Negotiations are in progress with SICS (Swedish Institute of Computer Science) and others.

2 Organisation

2.1 Academic Board

The school is lead by an academic board with one member from each participating institution. Initially the board consists of the following people:

Professor Lars Ahrenberg, Linköping University
Professor Rolf Carlson, KTH (Royal Institute of Technology)
Professor Robin Cooper, Göteborg University, chair
Dr Barbara Gawronska, Högskolan i Skövde
Professor Lars Höglund, Högskolan i Borås
Dr Joakim Nivre, Växjö universitet
Professor Bengt Nordström, Chalmers University of Technology
Professor Anna Sågvall Hein, Uppsala University
a representative from the Faculty of Arts, Göteborg University

the programme administrator with responsibility for the school from the Faculty of Arts,
Göteborg University

A graduate student will be a member of the Academic Board.

The Academic Board's mandate will include among other things making proposals to the Faculty Committee of the Faculty of Arts concerning scientific content and the development of a scientific profile, planning of courses, supervision etc., ensuring academic diversity and competence, issues concerning the size of the school and the administration of applications.

2.2 Advisory Boards

The school intends to appoint an international advisory board including both academic and non-academic experts. In addition the school will have an industrial advisory board with members from the Swedish business community.

2.3 Finance

The school's financial support will in the first place come from those funds which have been provided to Göteborg University for the purpose. The school will actively seek additional support for teaching and other projects.

3 Relation to other doctoral programmes

Swedish doctoral students in other programmes who meet the prerequisites for particular courses may register for those courses on an individual basis free of charge (provided the course is not full). (The school reserves the right to limit the number of students attending a course.) Foreign doctoral students who meet the prerequisites and have appropriate financial support are also welcome.

4 Application procedures

4.1 Advertising

Admission to the school will follow national advertising (and also international advertising in the electronic media). The first round of doctoral student positions will be advertised in March 2001 with a deadline of 1st May 2001. Applicants should first contact a possible supervisor from GSLT. The supervisor will provide advice concerning application. Students who prefer to make their first contact centrally will be assigned to a supervisor who will provide support in the application procedure in the same way.

Applications should be sent to: GSLT, Faculty of Arts, Box 200, SE 405 30 Göteborg, Sweden.

4.2 Entrance qualification and prerequisites

Applicants to the school should simultaneously apply for a graduate programme at an academic institution which is participating in the school in a department where supervision is available in the

school's areas of study and in a subject where an individual study plan can be approved in accordance with one of the alternatives given in section 5.1.

Language technology is a multidisciplinary area and for this reason various undergraduate degrees can be seen as a qualification for the school's programme. Examples are language technology and computational linguistics. Other degrees which can be regarded as providing qualification (provided that they include at least 20 credit points (i.e. half a year's full-time study) of subjects relevant to computational linguistics or speech technology) are, for example, general linguistics, a modern language, engineering, computer science, information science and cognitive science. It is important that a doctoral student has some experience of language technology before she applies for a four-year programme in the subject. For applicants who do not have sufficient prerequisites the Faculty of Arts at Göteborg University will give preparatory courses. Examples of such courses are *Introduction to linguistics and computational linguistics* and *Introduction to programming for computational linguists*. Courses in other degree programmes at other academic institutions can fulfil the requirement of study corresponding to 20 credit points in computational linguistics.

4.3 Suitability for graduate study

Acceptance to the school requires, in addition to the basic qualifications for graduate study in Sweden and the particular requirements for this programme, that the student is judged to have the ability that is required to complete the school's programme.

4.4 Selection procedure

The school's Academic Board will prepare the selection of applicants in consultation with potential supervisors. Selection will be based on applicants' previous examination results and the quality of any research or project work they have submitted. Particular emphasis is placed on evidence of ability to carry out independent academic work. This ability can be demonstrated by essays, project reports (including implementations) and the like. In addition to quality the selection can be influenced by distribution over GSLT's various scientific areas and over the participating academic institutions.

Admission is carried out in the normal way at the academic institution where the graduate student is placed. In cases where the academic institution does not have the right to admit graduate students in an appropriate subject, admission will be to the Faculty of Arts, Göteborg University.

4.5 Possibility of changing home department

After completing two years of the programme (60–80 credit points), doctoral students will have the opportunity to apply for transfer to a different home department if primary supervision is available at the new department in the student's thesis topic. (We assume that students' main areas of interest may change as a result of taking part in the first two years of the programme.)

5 The study programme

5.1 Individual study programmes

When a student is admitted an individual study programme will be set up according to one of the following alternatives:

A. At least 60 credit points of the school's courses (obligatory courses on level 1 together with at least 30 credit points on level 2 and 10 credit points on level 3 as described in section 5.3). In addition to these 60 credit points a further 20 credit points can be included, either in the form of project work or in the form of optional courses within the subject in which the student has been admitted to her home department. The thesis, which must be in the area of language technology, accounts for 80 or 100 credit points depending on which of the previous options is chosen.

B. At least 30 credit points of the school's courses (at least 10 credit points of these at level 2). The thesis, which must be in the area of language technology, accounts for 80 or 100 credit points.

If option A is chosen the first supervisor is to be one of the school's supervisors at the home academic institution. If option B is chosen either the first or second supervisor is to be one of the school's supervisors.

5.2 Teaching and supervision

Each doctoral student will have a main supervisor at her home institution who will devote approximately 80 hours of her time per year to supervision of the student. Each student will also have a second supervisor (normally at a different university or member institution or at a non-academic institution or company associated with the school). The second supervisor will devote approximately 40 hours of her time to supervision of the student.

5.3 Graduate courses

Students studying full-time will normally follow an study programme consisting of 60 credit points of courses or project work during their first three semesters. Students may receive credit for courses meeting which they take at other departments with the proviso that these are approved by the supervisor. Courses which a student takes at her home department or at another department may be counted as one of the school's courses. A student may also put together reading courses in consultation with her supervisor which will then give credit towards the doctoral degree. Such courses may also be counted as one of the school's courses.

Courses are divided into three levels: level 1, level 2 and level 3. The aim of this is to enable courses to build on those from previous levels thus achieving a gradual development towards specialisation in accordance with the school's intention to offer a coherent graduate programme of a type which is common in other countries, e.g. USA. Thus a course on level 2 can have one or more courses on level 1 as prerequisites. Similarly a course on level 3 can require one or more courses on levels 1 or 2.

The following courses will be offered. Which courses a student takes and in which order will depend on the individual student's needs based on the competencies they already have. The courses offered in any given semester will be chosen with regard to students' needs and wishes.

Level 1

A course on level 1 carries 5 credit points and offers an introduction to research in one of the school's various areas. It should make it possible for a student who has not taken undergraduate courses in this area to gain quick entry to the subject. As the courses will be research oriented from the outset they can also be taken with advantage by graduate students who have taken undergraduate courses in the area.

Certain of the courses on level 1 will be obligatory for students following a programme of study according to Option A (if the courses are not covered by courses taken as an undergraduate). The aim of this is to ensure the interdisciplinary content of the programme.

Examples of courses which may be offered are:

Natural Language Processing, 1

Speech Technology, 1

Phonetics, 1

Linguistics, 1

Formal methods, 1

Statistical methods, 1

Research methodology and theory of science

Computational methods, 1

Linguistic resources (corpora, lexicons, computational grammars), 1

Programming, 1

Level 2

A course on level 2 carries 5 credit points and focusses on a particular subarea of one of the school's areas which is of current research interest in language technology. Different subareas will be taken up in different instances of the courses. For example, one instance of Natural Language Processing, 2 could treat parsing technology, another computational semantics. The aim of these courses is to give advanced knowledge in a subarea in a way which makes clear where open research questions are. The requirements for the course normally include a small research project which can be completed during the period during which the course is offered.

Courses on level 2 can address a subarea of either a foundational area of language technology or an application area.

Examples of courses which may be offered are:

Level 2, foundations of language technology

Natural Language Processing, 2
Speech Technology, 2
Phonetics, 2
Linguistics, 2
Formal methods, 2
Statistical methods, 2
Computational methods, 2
Linguistic resources, 2
Programming, 2

Level 2, applications oriented courses

Communicative systems
Translation systems
Authoring tools
Information access
Computer assisted language learning

Level 3

A course on level 3 carries 10 credit points and offers a detailed examination of a current open research problem. Usually the instructor will present some research of her own which she develops during the course and course projects will contribute to this research of present alternative solutions. An example of an applications oriented course on level 3 might involve an introduction to and further development of a system which the instructor is herself in the process of developing.

Optional courses

Courses from neighbouring disciplines can be chosen in consultation with the student's supervisor.

5.4 Research seminars

Doctoral students are to follow the departmental seminar for graduate students at the department they are registered in. It is assumed that they will actively participate in the work of this seminar and in this way become thoroughly familiar with ongoing research in the subject area of the department. The department's requirements for attendance at the doctoral seminar hold for the school's graduate students in the same way that they do for other students in the department.

In order that the school will provide a cohesive programme of study to completion its students will also be given an opportunity to take part in the school's seminars. Students will present work towards their thesis and also parts of the thesis text as it progresses. These seminars will be arranged at least

once a semester in association with the courses that the school arranges.

5.5 Example of an individual study programme

A typical individual study plan could be an instantiation of the following template:

First semester

4 courses on level 1 (20 credit points)

Second semester

2 courses on level 2 in the foundations of language technology (10 credit points)
2 applications oriented courses on level 2 (10 credit points)

Third semester

2 courses on level 2 (foundational or applications oriented) (10 credit points)
1 course on level 3 (10 credit points)

Fourth semester

Project course (20 credit points)

Fifth to eighth semesters

Thesis (80 credit points)

There are, however, many other ways to design an individual study programme according to the school's requirements in section 5.1. For example, many students may wish to spread the 20 credit points of project work in the fourth semester over several semesters culminating in the fourth semester. This would mean that they would take other courses in the fourth semester as well.

5.6 Organisation of courses

Students in the school will be spread geographically over a number of different academic institutions in Sweden. For this reason IT-related aids will play a natural part in the school's organisation. Joint courses and seminars will be given in intensive form at the various academic institutions involved in the school.

GSLT will buy courses from the departments taking part in the school and will invite guest lecturers from other Nordic countries and also from non-Scandinavian countries. All courses financed by the school for a particular semester will begin with two intensive weeks near the beginning of each term

when graduate students, instructors and researchers associated with the school will have an opportunity to meet. These weeks will be hosted by the coordinating host, Göteborg University. Courses will continue by distance teaching during the remainder of the term.

5.7 Doctoral thesis

One of the programme's central goals is that students will prepare and present a doctoral thesis of high quality. The thesis is to be an independent application of scientific method to a research topic within the subject area. Doctoral students will seek to make a contribution to the general development of the subject area through their thesis work.

The quality of the thesis should be such that it may be acceptable for publication in the scientific literature. The thesis should document the student's ability carry out independent work on a scientific problem within the subject area. The thesis can either take the form of a unified coherent work (a monograph) or number of scientific papers and articles written by the author (a collection).

The thesis will be defended at a public defence and be publically available three weeks before this. The thesis will be reviewed by an opponent (external reviewer) and will be judged by a specially appointed examining committee. The opponent and the examining committee will be appointed by the committee of the faculty concerned. The thesis and its defence will be awarded one of the grades "approved" or "not approved".

5.8 Examination

A graduate student will be admitted to graduate study according to alternative A or B in a subject which allows for the approval of an individual study programme in accordance with the school's programme. The degree will thus be issued by the committee of the corresponding faculty in which the student is registered.

To gain the doctoral degree requires that the student has obtained the grade "approved" in those examinations required by the school's programme and also at the public thesis defence. Depending on the student's previous degree and the regulations holding at the institution at which the student is registered, the degree of Doctor of Philosophy or Doctor of Technology will be awarded.

6 Financial support for doctoral students

Students who are admitted according to alternative A (in section 5.1) will receive 100% financial support from the school. Students who are admitted according to alternative B will receive support from the school for at least those courses and that supervision which is part of the school's programme. Normally at least 60% of the school's graduate students will be accepted under alternative A.

A plan for financial support for the whole period of graduate study will be drawn up on admission to the school. The student's home department will receive financial support for the student. If the student should change department this support will be transferred to the new department. The doctoral appointments following alternative A will cover either four years' full-time study or five years' study at 80% of full time combined with 20% service to their department. These two alternatives can be combined for different years. GSLT is also willing to accept industrial doctoral students who work part-time with a company.

Högskolan i Borås, Högskolan i Skövde and Växjö University will receive additional help in the recruitment of doctoral candidates and the school guarantees that these institutions will receive at least two of the first 25 doctoral appointments (a total of 6 doctoral appointments).

7 International policy

GSLT is committed to creating a programme of study which attains an international standard and which is visible outside Sweden. The Academic Board intends to create an international environment which promotes the students' research work by implementing the following measures:

- Foreign doctoral students will be able to take part in GSLT's course offerings.
- The school will encourage applications from foreign doctoral students, with the proviso that a significant part of the school's work will be devoted to work on Swedish and other Scandinavian languages.
- Courses will be taught in English unless all present agree that they prefer Swedish.
- The school's documentation will be maintained in English (as well as Swedish).
- We will actively seek funds to enable visits from non-Swedish doctoral students (including students from developing countries).
- The school's programme of courses will include courses taught by instructors from other Scandinavian countries and from countries outside of Scandinavia.
- The school will actively seek to organise international workshops in conjunction with the intensive course weeks.
- We will have an advisory board of international experts who will contribute to the evaluation of the school's programme and organisation and make recommendations for future developments.

8 Equal opportunities

GSLT, in common with Göteborg University, seeks to achieve equal distribution among the sexes of its students, instructors and supervisors and equal access to all in its admissions procedure.