



Trinity College Dublin
Coláiste na Tríonóide, Baile Átha Cliath
The University of Dublin

School of Computer Science & Statistics (SCSS)
Faculty of Science, Technology, Engineering and Mathematics (STEM)

B.A. (Mod) in Computer Science, Linguistics and a Language

(formerly known as Computer Science and Language)

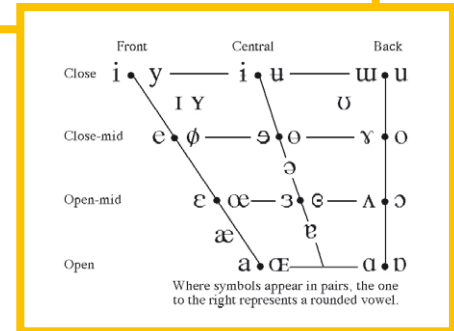
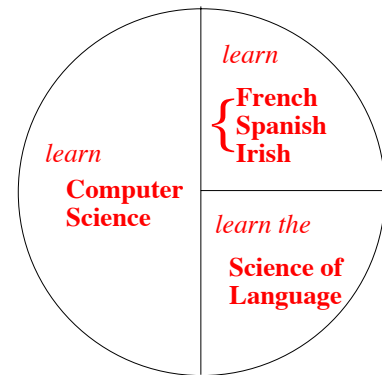
Course Code: TR039
**(Replaces TR010/
TRO11/TRO13)**

Special Entry Requirements:

Leaving Certificate: H4 Mathematics and either H3 Spanish or H3 French or H3 Irish (chosen language of study)

Other Examination Systems:

www.tcd.ie/Admissions/undergraduate



It is astonishing what language can do.

With a few syllables it can express an incalculable number of thoughts... This would be impossible, were we not able to distinguish parts in the thoughts corresponding to the parts of a sentence, so that the structure of the sentence serves as the image of the structure of the thoughts. – Frege 1923

What is CSLL?

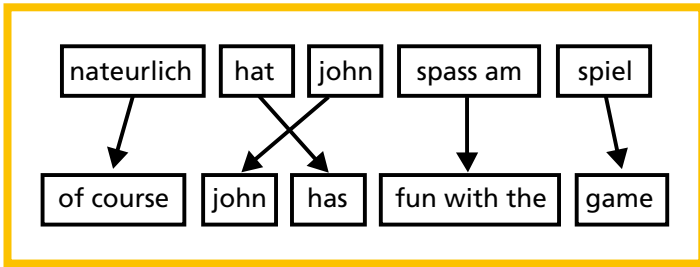
Computer Science, Linguistics and a Language (CSLL) is a combined study of computer science, linguistics, and a language, with a study of computational linguistics as a uniting thread.

Computer Science: Would you like to master the techniques and technologies that lie behind what you see on the screen of one of today's computers? The computer science component of CS seeks to give you this mastery, a full understanding of the computer applications of today, and an ability to participate in the development of the applications of the future. No prior knowledge of computing is required. Some aptitude for mathematics, for problem analysis, for recognition of structure will help. For this reason the degree requires a H4 or better in Higher Level maths.

Language: In CSLL, language consists of Language Studies and Linguistics.

Language Studies: Are you a student of Spanish, French or Irish? The language component of CSLL will provide you with a degree-level standard of comprehension, grammatical competence and fluency, in both written and spoken language. Part of this is a year spent abroad as an Erasmus exchange student.

Linguistics: Have you ever been intrigued by languages themselves, how they are learned, how they differ from each other, how ambiguity arises, how words emerge from a sea of sound, how they are uttered by manipulating a flow of air, how language relates to the mind and thoughts? These are the questions looked at in linguistics, the scientific study of language, one of the components of CSLL.



Studies in Computer Science and Language are united in the field known as Computational Linguistics. On the one hand this uses computational techniques to further the scientific study of human languages, and on the other, seeks to develop computer applications which handle language intelligently. Examples of such applications are machine translation, speech recognition, and information retrieval.

This degree is one of the most interdisciplinary offered by the university, bridging both science and arts. Its prerequisites are curiosity, creativity, intelligence and diligence. Its rewards include a qualification that opens many subsequent employment avenues in an ever more multilingual and technological world: in the computer sector; using the foreign language; for language technology companies.

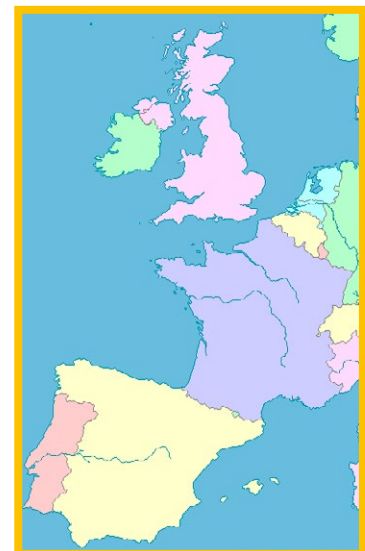
The mix amongst the streams making up CSLL is roughly 50% computer science, 25% linguistics and 25% study of the language of choice. This holds in each of the 4 years.

Whilst the computer science stream involves mastering several programming languages (such as Java and C++), there are other important background theory and skills which are needed to produce effective software, and these are addressed in a range of mathematics courses, in courses on data structures and algorithms, software engineering and databases. Artificial Intelligence – the

techniques involved in creating ‘smart’ software – are emphasised throughout and to a greater extent than in the other Trinity Computer Science programmes. Conversely, certain hardware-related topics are given less emphasis. Some of the modules are shared with the other programmes, whilst others are specific to the CSLL degree.

The linguistics stream covers all aspects of the scientific study of language; language is superficially familiar to everyone, but is revealed on closer inspection to be governed by remarkably intricate structures and regularity. To some extent anyone studying a second language has the beginnings of an insight into this. Syntax is studied, but rather than emphasising proscriptions about what one should not write, its overwhelming concern is with the description of what is written (or said), analysing its structure to best predict what related things might be said, what it means, how it might be pronounced, the developmental stage at which a child might say it and so on. Phonetics, phonology and speech science are a similarly detailed study of word structure and of the relation of language to the medium of sound.

The language stream, which will be one of French, Spanish or Irish, aims to give students competence to operate in that language in their future careers. Spending the third year as an Erasmus exchange student at a university abroad is a feature of the degree: this is a requirement for those studying French and Spanish, and it is a possibility for those studying Irish. The CSLL degree has an extensive network of exchange agreements with European universities that offer a similar combination of computer science and linguistics (see map for a sample), and during the year abroad education across the characteristic streams of CSLL continues. For those studying French and Spanish for example, this will entail study of computer science and linguistics via the relevant language.



What career opportunities are open afterwards?

In an increasingly technological and multilingual world, the mathematical, computer science and language abilities of our graduates make them attractive to employers, as do their proven analytical skills and not least their self-sufficiency and maturity in having spent a year abroad.

Here is a sample of areas into which CSLL graduates have gone in Ireland and abroad:

- the language technology industry (e.g. IBM, Microsoft)
- general software engineering in Ireland and abroad (e.g. Accenture, Google)
- technological and organisation roles within IT or other sections of multinationals (BMW, Ingersoll Rand)

What do the graduates say?

“This course provides an exceptional range of skills that allow you to pursue an enormous number of options after graduation. For me, it gave a fantastic background to pursue a career in software development. The distinctive combination of subjects encourages flexible thinking and an open minded approach to problem solving that will prove invaluable to graduates.”

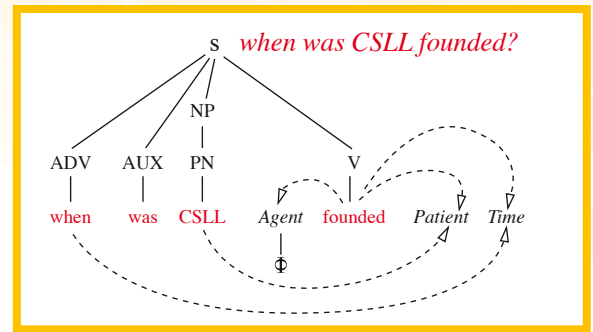
James Gibbons, working as a software developer.

“I very much believe that it was the multi-faceted aspect of CSLL that gave me not only the confidence to live and work abroad but also pursue a career in a very fast moving role.”

Deirdre Ni Dhea, has worked abroad and in Ireland in Customer Relationship Management, Project Management and IT consultancy.



“I always had an interest in technology growing up, and combined with my love of languages, this course stood out as the perfect way to explore a range of topics in science and the arts. A typical day in the course puts your flexible thinking and ability to adapt to the test as you jump between programming classes, semantics and French grammar! I loved that my graduating class was very small as it allowed us to build true friendships which have lasted to this day. After the course, I completed an M.Sc. in Security and Forensic Computing at DCU, during which I was offered a job with PricewaterhouseCoopers in Toronto, Canada. I've been here for



CSLL was founded in 1985 and became CSL in 2012

- direct use of language skills in translation consultancy (e.g. Transpiral), in the Irish Diplomatic Corps and the European Patent Office
- Banking and finance (e.g. Deutsche Bank, DEPFPA)
- speech and language therapy
- further postgraduate study
- there are hundreds of representative opportunities listed at: www.scss.tcd.ie/clg/FYI/

the last four years working in forensics and security consulting and I even get to put my French to use with clients in French Canada. This multidisciplinary course gave me the flexible thinking that I use every day in the world of consulting.”

Lydia Behan

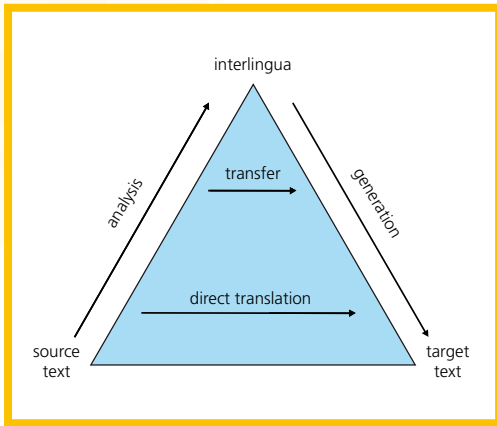


“I was drawn to the CSLL course because of the wide range of topics it provided. Very few third-level courses offer such a varied combination of arts- and science-based subjects. The computer science courses gave me general problem solving skills as well as programming skills. Programmers are in high demand at the moment, so such skills are invaluable.

The language courses not only deepened my knowledge of French, but also of language in general. However, it's the combination of these skills that distinguishes CSLL as a course. Learning how to use computers to interpret and generate language is truly fascinating.

The year abroad was without doubt one of the best years of my life. Living and studying in a different country is a unique experience that I can't recommend highly enough. When I finished the course I started a PhD here at Trinity College. My research involves analysing the things people write (e.g. tweets) in order to identify things they are interested in.”

Aonghus McGovern



Some features of CSLL

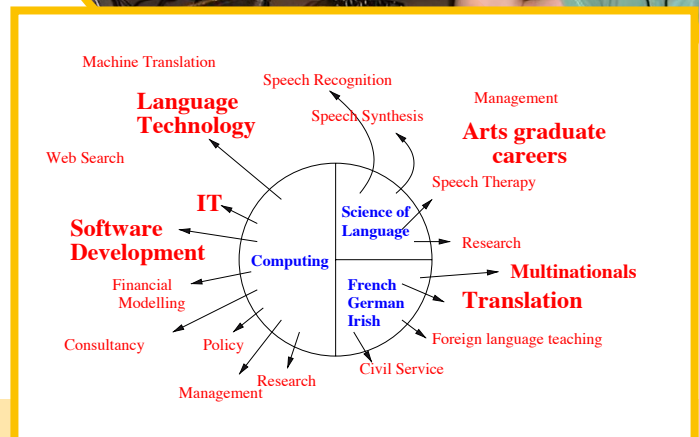
- The programme tends to attract an even gender balance
- The year abroad at a partner university is universally cherished
- In the other years you will also run into exchange students who have come to Trinity to take some of the CSL courses
- Some lectures are shared with other computer science students, some are shared with other students of linguistics, others are with students of a particular language, and some are solely for CSL students, giving a wide range of lecture experiences

The Dublin Computational Linguistics Seminar series (DCLRS) invites internationally known speakers to present their research to the Dublin community of students (undergraduate and postgraduate) and the established researchers in academia and industry. The DCLRS is a joint venture between TCD, University College Dublin (UCD), Dublin City University (DCU) and Dublin Institute of Technology (DIT). Students from each of the partner institutions participate.

The seminar features talks on all topics within “computational linguistics”, such as pure translation theory, syntax, semantics, speech science, phonetics, psychology, psycholinguistics and artificial intelligence.

Access to leading researchers is assured in each area of the degree. This includes contact with lecturers, co-participation in seminars, supervision of projects and career mentoring.

Any questions? If you have any questions between now and the start of your degree programme, you are encouraged to contact the Course Director at: ccls@tcd.ie or the Director of the Centre for Computing and Language Studies at: ccls@tcd.ie



Is iontach an rud is féidir le teanga a dhéanamh

Is féidir léi líon gan áireamh de smaointe a chur in iúl le beagán siollaí, i dtreo is gur féidir fiú an smaoinimh atá neach talmhaí tar éis a ghreamú den chéad uair a chur i mbriathra a thuigfidh duine a mbeidh an smaoinreamh sin úrnua ar fad aige. Níorbh fhéidir sin a dhéanamh mura mbeimid in ann páirteanna de na smaointe a aithint a chomhfhreagraíonn do na páirteanna d’abairt, ionas go bhfónann struchtúr na habairte maríomhá de struchtúr na smaointe.

Frege 1923

Les prestations de la langue sont vraiment surprenantes

Exprimer un très grand nombre de pensées avec peu de syllabes – ou même trouver la manière de donner à une pensée [...] une mise qui permette qu’un autre, pour lequel elle est absolument nouvelle, la reconnaisse. Cela ne serait pas possible si nous ne pouvions distinguer dans la pensée de parties auxquelles correspondent de parties de l’énoncé, de manière à ce que la construction de la pensée.

Frege 1923

Erstaunlich ist es, was die Sprache leistet

Indem sie mit wenigen Silben unübersehbar viele Gedanken ausdrückt, daß sie sogar für einen Gedanken, den nun zum ersten Male ein Erdbürger gefaßt hat, eine Einkleidung findet, in der ihn ein anderer erkennen kann, dem er ganz neu ist. Dies wäre nicht möglich, wenn wir in dem Gedanken nicht Teile unterscheiden könnten, denen Satzteile entsprechen, so dass der Aufbau des Satzes als Bild gelten könnte des Aufbaus des Gedankens.

Frege 1923

B.A. (Mod) in Computer Science, Linguistics and a Language

First Year – Junior Fresh	Second Year – Senior Fresh
<p>Computer Science Introduction to Computing Computer Programming Mathematics – logic linear algebra and calculus</p>	<p>Computer Science Discrete Mathematics Data Structures and Algorithms C++ Programming & Natural Language processing</p>
<p>Linguistics Language, The Individual and Society Syntactic Analysis Phonetics and Phonology</p>	<p>Linguistics Formal Syntax & Semantics Instrumental Phonetics and Speech Science Computational Morphology & Inferential Statistics</p>
<p>Language Fluency and Culture (<i>French, Spanish or Irish</i>)</p>	<p>Language and Culture (<i>French, Spanish or Irish</i>)</p>
<p>Dublin Computational Linguistics Seminar</p>	<p>Dublin Computational Linguistics Seminar</p>
Third Year – Junior Sophister	Fourth Year – Senior Sophister
<p><i>Students attending partner institutions abroad take courses comparable to those below:</i></p>	<p>Computer Science Databases, Machine Learning in Computational Linguistics Knowledge Representation, Fuzzy Logic</p>
<p>Computer Science Logic Programming, Artificial Intelligence Software Engineering & Group Project Introduction to Functional Programming</p>	<p>Linguistics Speech analysis and synthesis, Computational Linguistics</p>
<p>Linguistics Written language, Lexicology Language learning, Sociology</p>	<p>Language Fluency and Culture (<i>French, Spanish or Irish</i>)</p>
<p>Language Fluency and Culture (<i>French, Spanish or Irish</i>)</p>	<p>Options: Students choose from a wide range of options offered by the Computer Science and Linguistics departments (e.g. Computer Vision, Computer Graphics, Unsupervised Machine Learning in Computational Linguistics, Formal Methods, Historical Linguistics, Second Language Acquisition etc.) as well as by the individual Language departments.</p> <p>The above is a possible selection; there is some choice on the prominence given to the 3 strands and within these the modules adopted. There are further options in CS and linguistics (e.g. Computer Vision, Computer Graphics, Machine Learning, Formal Verification, 2nd Language Acquisition) as well as by the individual Language departments.</p>
<p>Options: Students choose from a wide range of options offered by the Computer Science and Linguistics departments (e.g. Computer Vision, Computer Graphics, Unsupervised Machine Learning in Computational Linguistics, Formal Methods, Historical Linguistics, Second Language Acquisition etc.) as well as by the individual Language departments.</p> <p>The above is a possible selection; there is some choice on the prominence given to the 3 strands and within these the modules adopted. There are further options in CS and linguistics (e.g. Compiler Design, Computer Networks, Computational Mathematics, Probability & Statistics).</p>	<p>Project: substantial research and dissertation supervised by an established researcher.</p>
<p>Project: research in the language of the degree focus, from the perspective of a subdiscipline of Linguistics</p>	<p>Dublin Computational Linguistics Seminar</p>
<p>Seminar Series</p>	

Detailed curriculum information is available at: www.tcd.ie/scss/courses



Trinity College Dublin
Coláiste na Tríonóide, Baile Átha Cliath
The University of Dublin



Faculty of Science, Technology, Engineering and Mathematics (STEM)
School of Computer Science and Statistics

Tel: +353 1 896 1765 Email: teaching-unit@rt.scsss.tcd.ie

Web: www.tcd.ie/scss

CC 06508 10/22

The College reserves the right to update aspects of the course at any time.