Computer Science, Linguistics and a Language

Dr. Martin Emms
Course Director
CSLL is a combined study of

learn Computer Science

learn Language Science of Irish, Spanish

learn the French
CSLL is a combined study of

- Computer Science

learn

- Computer Science
- French
- Irish
- Spanish

learn the

Science of Language
CSLL is a combined study of

- Computer Science
- a Language,

learn Computer Science

{learn French
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learn the Science of Language
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- **Computer Science**

- a **Language**, one of
  - French
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- **Computer Science**
- a **Language**, one of **French**, **Irish**, **Spanish**
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  - **linguistics** the scientific study of language in general
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- a **Language**, one of
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- **Science of Language**
  - **linguistics** the scientific study of language in general
  - **computational linguistics** the associated technologies concerning language
learn COMPUTER SCIENCE

1. sent_false = 0;
2. while(more 'students') {
3.   s = next 'student';
4.   if (s is 'CSLL') {
5.     vp_true = 0;
6.     while(more 'courses') {
7.       c = next 'course';
8.       if (c is 'syntax') {
9.         if (s 'studies' c) {
10.            vp_true++;
11.         }
12.       }
13.     }
14.   if(vp_true == 0) {
15.     sent_false++;
16.   }
17. }
18. }
19. if(sent_false > 0) { return false }
20. else { return true }
master the techniques and technologies that lie behind what you see on the screen of one of today’s computers

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- become able to participate in the development of the applications of the future.

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- become able to participate in the development of the applications of the future.
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- the degree requires a C3 or better in Higher Level maths

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master A LANGUAGE
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- you will study either French, Irish or Spanish,
You will study either French, Irish or Spanish, reach a sufficient competence to operate in that language in your professional career.
master A LANGUAGE

- you will study either French, Irish or Spanish,
- reach a sufficient competence to operate in that language in your professional career
- your 3rd year is spent abroad as an Erasmus exchange student.
study the science of LANGUAGE

Language can be scientifically studied – this is linguistics
study the science of LANGUAGE

- Language can be scientifically studied – this is linguistics
- Language requires its own technologies – this is computational linguistics
study the science of LANGUAGE

- Language can be *scientifically studied* – this is linguistics
- Language requires its own *technologies* – this is computational linguistics
- systems in the *sounds* of languages, the International Phonetic Alphabet

Where symbols appear in pairs, the one to the right represents a rounded vowel.
Language can be *scientifically studied* – this is linguistics

Language requires its own *technologies* – this is computational linguistics

- systems in the *sounds* of languages, the International Phonetic Alphabet

- systems in the *words* of languages

```
darwin  -ian-ism    good
```

```
darwin  -ism-ian    bad
```
*Computer Science and Language*

---

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- Systems in the *words* of languages
- Systems in the *grammars* of languages
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- Systems in the *words* of languages
- Systems in the *grammars* of languages
- Systems relating *grammar* to *meaning*
st

```cpp
def check_course(s, c):
    sent_false = 0
    while more 'students':
        s = next 'student'
        if s is 'CSLL':
            vp_true = 0
            while more 'courses':
                c = next 'course'
                if c is 'syntax':
                    if s 'studies' c:
                        vp_true++
            if vp_true == 0:
                else: return true
            if sent_false > 0:
                return false
        else: return true
    if sent_false > 0:
        return false
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learn Computer Science

learn the Science of Language

{learn French, Irish, Spanish}
more links than you might think

- mastering a foreign language fosters a feel for grammar ⇒ a headstart in linguistics
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- notions of recursion, subroutine and substructure are shared between computer science and linguistics
- linguistics and computer science are joined in computational linguistics
What is Computational Linguistics?

Sergei Brin is the founder of Google. When he founded the company in 2001.

<table>
<thead>
<tr>
<th>Name</th>
<th>Founder</th>
<th>StockPrice</th>
</tr>
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<tbody>
<tr>
<td>Google</td>
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wann wurde Google gegründet

when was Google founded?

Finding Answers in Text
Finding Answers in Databases
Translation
Speech Synthesis
What is Computational Linguistics?

- answering questions using texts
- machine translation
- document summarisation
- speech synthesis
- speech recognition
- language generation
- document categorisation
- speaker identification
- lie detection
- sentiment analysis

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Translation

- "wann wurde Google gegründet" becomes "when was Google founded?"

Finding Answers in Text

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- Speech recognition
- Language generation
- Document categorisation
- Speaker identification
- Lie detection
- Sentiment analysis
Careers

CSL graduates have skills in

*Problem-solving* • *Programming* • *Analysis*

*Foreign-language* • *Self-reliance*
Careers

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- Problem-solving
- Programming
- Analysis
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CSL graduates have gone into a wide range of careers, for example:

- IBM, Microsoft, Trados
  *developing language technology*
- Google, Accenture
  *general software engineering*
- BMW, Ingersoll Rand
  *technological and organisation roles within IT or other sections of multinationals*
- Deutsche Bank, DEPFA
  *Banking and finance*
- Irish Diplomatic Corps
  *combining language with analytical skills*
- the European Patent Office
  *combining language with technical knowledge*
- Transpiral
  *direct use of language skills in translation consultancy*
- speech and language therapy
Year on Year

First Year
Computing
▷ Fundamentals
▷ Intro to Computer Programming (Java)
▷ Mathematics – logic linear algebra and calculus

Linguistics
▷ Language, Mind and Society
▷ Syntactic Analysis
▷ Phonetics and Phonology

Language (F/I/S)
▷ Fluency
▷ Culture

Second Year
Computing
▷ Data Structures and Algorithms
▷ C++ Programming & Computational Linguistics
▷ Discrete Mathematics

Linguistics
▷ Formal Syntax & Semantics
▷ Instrumental Phonetics and Speech Science
▷ Computational Morphology

Language (F/I/S)
▷ Fluency
▷ Translation (esp. Comp Sci area)
Third Year
spent as Erasmus exchange student
at partner university with courses on
Computing
- A.I./Computational Linguistics
- Software Engineering
- Probability & Statistics and Formal Methods
Linguistics
- Lexicology
- Language learning
Language (F/I/S)
- Fluency
- Rhetoric
Project: applying linguistics or comp. ling to target language

Fourth Year
Computing
- Databases
- Artificial Intelligence
Linguistics
- Speech Science
- Computational Linguistics
Language (F/I/S)
- Fluency
- Translation
Option course: eg. advanced Comp. Ling.
Project: substantial research and dissertation supervised by an established researcher.
Some interesting features
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- has tended to be *gender balanced*
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- through projects in years 2, 3 & 4 CSL undergraduates are **encouraged to develop their own ideas and solutions.**
- CSL students attend **a weekly research seminar**, *The Dublin Computational Linguistics Research Seminar*
And finally

This is a challenging, useful and fascinating degree (and that's not just my opinion)
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the skills I learned as a result of this degree both in terms of personal development and technical and language skills have led me to a career that I find personally and professionally fulfilling. I have been shaped by my experiences in Trinity and I can certainly say that I couldn't be happier with the result

Anne McCarvill
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for further opinions and many more details see the web site

www.scss.tcd.ie/undergraduate/