



# Proposal for New Degree Programmes

## Stage 2

### Contents

- 1 PROGRAMME SPECIFICATION**
  - 1.1 OVERVIEW
  - 1.2 EXTERNAL SUMMARY
  - 1.3 EDUCATIONAL AIMS OF THE PROGRAMME
  - 1.4 PROGRAMME OUTCOMES
  - 1.5 PROGRAMME STRUCTURE AND FEATURES
  - 1.6 TEACHING AND LEARNING METHODS AND STRATEGIES
  - 1.7 TEACHING AND LEARNING WORKLOAD
  - 1.8 ASSESSMENT METHODS AND STRATEGIES
  - 1.9 ASSESSMENT METHOD BALANCE
  - 1.10 CAREER OPPORTUNITIES
  - 1.11 OTHER ITEMS
  
- 2 ABOUT THE PROGRAMME**
  - 2.1 ADDITIONAL REQUIREMENTS
  - 2.2 CONSULTATION
  - 2.3 ADDITIONAL DOCUMENTS
  
- 3 APPROVAL**
  - 3.1 STAGE 1: SCHOOL BOARD OF STUDIES REVIEW AND APPROVAL
  - 3.2 STAGE 2: HEAD OF SCHOOL REVIEW AND APPROVAL
  - 3.3 STAGE 3: COLLEGE CURRICULUM APPROVAL BOARD REVIEW AND OUTCOME
  
- 4 DOCUMENT CHECKLIST**

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THE UNIVERSITY OF EDINBURGH

PROGRAMME SPECIFICATION FOR [*INSERT NAME OF PROGRAMME OF STUDY, e.g. M.A. Honours in Ancient History or M.Sc. in Public Health*]<sup>1</sup>

## 1 PROGRAMME SPECIFICATION

*Grey text has been added to provide guidance. Please delete as you add your own text, remove italics, and change the font colour to black.*

**NB. This document has been created from the University Degree Programme Specification (DPS) and can therefore be copied and pasted directly on to the template to be submitted to Student Systems.**

<https://www.ed.ac.uk/academic-services/staff/curriculum/degree-prog-specific>

1.1 OVERVIEW	
Awarding Institution	University of Edinburgh
Teaching Institution	University of Edinburgh
Programme accredited by	n/a
Final Award	PhD

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<sup>1</sup> The information contained in this Programme Specification should be used as a guide to the content of a degree programme and should not be interpreted as a contract.

<b>Programme Title</b>	PhD with integrated study in Natural Language Processing
<b>UCAS Code</b>	n/a
<b>Relevant QAA Subject Benchmarking Group(s)</b>	n/a
<b>Postholder with overall responsibility for QA</b>	Director of QA (currently John Longley)
<b>Date of Production/revision</b>	20/09/2018

## 1.2 EXTERNAL SUMMARY

We have witnessed the rapid evolution of a wide range of natural language processing (NLP) systems that translate text, recognize or produce speech, answer questions, retrieve documents or facts, respond to commands, summarise articles, and simplify texts for children or non-native speakers. NLP is transforming the way humans communicate with each other and with machines.

However, there are many NLP applications that are not yet realized, as well as language and speaker populations that current technology does not serve. Improving NLP to address these problems requires a diverse array of expertise including linguistics, machine learning, computer science, and design. NLP researchers and practitioners must master large-scale mining of structured and unstructured data, computer programming, and algorithm engineering. This multidisciplinary PhD programme brings together these diverse skills in a single programme in order to train the next generation of scientists in this critical area. The programme will equip students with the fundamental skills for advanced research in NLP and language science, giving them foundations in linguistics, machine learning, statistics, algorithms, programming, as well as covering design, ethics, and responsible innovation

## 1.3 EDUCATIONAL AIMS OF THE PROGRAMME

This four-year PhD programme will give students a solid foundation in the challenge of working with language in a computational setting and its relevance to critical engineering, scientific, and ethical problems in our modern world. It will also train them in the key software engineering and machine learning skills necessary to solve these problems. We will deliver a programme which will have a transformative effect on the students we train and on the field as a whole, by developing future leaders and producing cutting-edge research in both methodology and applications.

## 1.4 PROGRAMME OUTCOMES

### Knowledge and Understanding

Students successfully completing the programme should:

- have a broad knowledge of current NLP research
- understand and be able to apply state of the art methods in the field
- be aware of relevant work in adjacent fields (e.g., linguistics and HCI)
- be familiar with foundations of NLP in mathematics and machine learning
- understand responsible innovation and how it should guide the professional practice of NLP researchers

<b>Graduate Attributes: Skills and abilities in Research and Enquiry</b>	<p>Graduates from the programme will be able to:</p> <ul style="list-style-type: none"> <li>• conduct independent research in NLP or adjacent fields</li> <li>• evaluate state of the art research in the field</li> <li>• explore alternative approaches to a given problem, and integrate different approaches</li> <li>• quickly assimilate existing work of relevance to a given problem</li> </ul>
<b>Graduate Attributes: Skills and abilities in Personal and Intellectual Autonomy</b>	<p>Graduates will have proven ability to:</p> <ul style="list-style-type: none"> <li>• be able to assess new research ideas and turn them into research prototypes</li> <li>• build complex NLP systems and evaluate them</li> <li>• make use of existing work and datasets in order to make their research as efficient as possible</li> </ul>
<b>Graduate Attributes: Skills and abilities in Communication</b>	<p>Graduates will have proven ability to:</p> <ul style="list-style-type: none"> <li>• communicate effectively through talks, papers, and posters</li> <li>• write up their research for an academic audience in the form of conference or journal papers</li> <li>• communicate technical content to a range of different audiences</li> <li>• work effectively as part of a research team</li> </ul>
<b>Graduate Attributes: Skills and abilities in Personal Effectiveness</b>	<p>Graduates will have proven ability to:</p> <ul style="list-style-type: none"> <li>• acquire knowledge from a variety of sources, including the research literature, peer interaction, online materials, conferences</li> <li>• work effectively on large projects, both individually and as part of a team</li> <li>• organize their workload and manage their time when working independently, and complete complex tasks under deadline pressure</li> </ul>
<b>Technical/practical skills</b>	<p>Graduates will have proven ability to:</p> <ul style="list-style-type: none"> <li>• implement research prototypes of models in the literature, and of models they have developed themselves</li> </ul>

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|--|---|
|  | <ul style="list-style-type: none"><li>• use state of the art programming techniques, including advanced research libraries</li><li>• use existing data sets for their work, but also be able to collect and annotate new data</li><li>• design, run, and evaluate experiments to test research hypotheses</li></ul> |
|--|---|

## 1.5 PROGRAMME STRUCTURE AND FEATURES

**Course structure:** The degree program is designed to be maximally flexible, while also including some compulsory courses and requiring all students to take a total of 180 points of courses over four years, 150 of which have to be at level 11 or above. An example path through the program is given in the following table:

year 1	Doing re- search in NLP [20pts]	foundational courses [40pts]	group project [20pts]	individual project [40pts]	PhD research [60pts]
year 2	specialist courses [20pts]	responsible innovation [20pts]	PhD research [140pts]		
year 3	specialist courses [20pts]	PhD research [160pts]			
year 4	PhD research [180pts]				

### Year 1 foundational courses.

Students will be routed into courses following a skills assessment on entry: students with strong computer science or maths background will take more linguistics courses, while students with strong linguistics or cognitive background will take more programming and machine learning courses. *Foundational courses include* Accelerated natural language processing, Machine learning and pattern recognition, Machine learning practical, Computer programming for speech and language processing, Speech processing, Introduction to phonology and phonetics, Introduction to morphology, Introduction to syntax.

**Year 1 group project.** Students will form interdisciplinary teams to tackle a directed research problem assigned to them by a team of CDT supervisors. In their group project, students can directly apply the skills they learn in their foundational courses and in the Doing Research in NLP course (see below). As all students in a given year take part, the group project will help build a cohort and will also train students in project management and team work skills. The project topics will be defined in consultation with our industrial partners, who will also contribute resources.

**Year 1 individual project.** In addition to the group project, each student will also select a supervisor and define a short individual research project, which may be stand-alone or serve as the basis for a subsequent PhD project. We expect students to work with different supervisors



on their individual and group project, to experience different working styles and broaden their methodological skillset. Some of the individual projects will again be conducted with our industrial partners.

**Year 1 Doing research in NLP.** Designed to complement the first-year projects, this course will align with project milestones and teach skills that students can immediately put into practice. In addition to technical skills in NLP at the level required for PhD work, it will teach presentation, communication, and writing skills. Project and time management, as well as NLP specific aspects of responsible innovation will be covered. The course will also contain a substantial peer learning element: in the first year, it will be offered only to CDT students. In subsequent years, we expect these students to assist in delivering a similar experience to newer cohorts, and to a wider cohort of taught MSc students in NLP.

**Year 2 responsible innovation.** To provide all CDT students with training in responsible innovation, they will take the course *Controversies in the data society*. It covers general (non-NLP specific) aspects of the responsible innovation process, complementing the material in *Doing research in NLP*. The course is offered by the School of Social and Political Sciences, with participation from the School of Informatics.

**Years 2-4 specialist courses and PhD research.** Following first-year projects, students will select a PhD supervisor and define a PhD project. In years 2 and 3, students take specialist courses that are relevant for their PhD project, while increasingly focusing on research. *Specialist courses include* Machine translation, Natural language understanding, Probabilistic modelling and reasoning, Neural computation, Neural information processing, Human-computer interaction, The human factor: working with users, Automatic speech recognition, Speech synthesis, Simulating language, Sentence comprehension, Discourse comprehension, Language production, and Speech production and perception. In the final year, students will pursue research full-time.

**Entry requirements:** These will be in line with the entry requirements for the existing Informatics PhD programmes:

A UK 2:1 honours degree, or its international equivalent, in computer science, mathematics, linguistics, cognitive science, or a related discipline.

All applicants must have one of the following qualifications as evidence of their English language ability:

- an undergraduate or masters degree, that was taught and assessed in English in a majority English speaking country as defined by UK Visas and Immigration
- IELTS Academic: total 6.5 with at least 6.0 in each component
- TOEFL-iBT: total 92 with at least 20 in each section
- PTE(A): total 61 with at least 56 in each of the Communicative Skills scores
- CAE and CPE: total 176 with at least 169 in each paper

- Trinity ISE: ISE II with distinctions in all four components

**Progression requirements:** All courses CDT students take (including individual project and group project) are assessed through exams or coursework, and a mark is awarded for each course. These marks will be ratified by the MSc Board of Examiners in Informatics. The PhD research component is evaluated through a written annual progress report that the student also presents as a talk or poster. The two supervisors of the student, together with a third faculty member, evaluate the progress report and the presentation.

Based on the course marks and the annual evaluations, the CDT progression committee decides annually on the progression of all CDT students. Students with satisfactory marks and annual evaluations will be allowed to progress to the next year, students whose marks and annual evaluation has not been satisfactory but shows potential for improvement will be allowed to progress under specific conditions (e.g., retaking courses, re-doing the progress report).

The CDT progression committee will consist of the CDT co-director, the CDT training coordinator, and two members of the Informatics Graduate School.

**Exit awards:** Students whose marks or annual evaluations are unsatisfactory will be asked to leave the program, with the option of being awarded a PG certificate, a PG diploma, or an MSc by Research.

**Mode of study:** full time

**Language of study:** English

## 1.6 TEACHING AND LEARNING METHODS AND STRATEGIES

The courses in the taught component of this degrees is taught through lectures (typically around 16 lectures for a 10-point course, and around 32 lectures for a 20-point course). In most cases supporting materials, including notes, slides and sometimes video recordings of the lectures themselves, are made available to students on the web. Lecturers also direct students to recommended reading to supplement the lecture material.

Lectures are often supported by weekly scheduled tutorials, in which students in groups of 10–15 work through set tutorial exercises with the help of a tutor, and have the opportunity to seek assistance with the course material where required. Some courses are supported by scheduled laboratory sessions or supervised drop-in laboratory time, in which they are able to seek help with the practical (e.g. programming) aspects of the course material.

The group project and the individual project (see above) are delivered through a mixture of structured meetings and supervised sessions in which are designed to enable students to work independently on a research problem. The PhD research component of the degree is delivered by a team of two supervisors (principal and assistant supervisor) who hold regular supervision meetings with the student.

### 1.7 TEACHING AND LEARNING WORKLOAD

Please indicate the typical workload for a student on this programme for each year of study

Start Year	Time in scheduled teaching (%)	Time in independent study (%)	Time on placement (%)
1	30	70	0
2	20	80	0
3	10	90	0
4	0	100	0

### 1.8 ASSESSMENT METHODS AND STRATEGIES

For most courses, the student's achievement is assessed by academic staff via a combination of examinations and coursework assignments. (The balance is typically around 75% for the examination and 25% for coursework, with some variation between courses.) Depending on the course, examinations may be written or online, and assessed assignments may be pen-and-paper or practical programming exercises. Tutorial exercises are not usually assessed directly, but makes an important contribution to preparing students for examinations.

The group and individual projects are assessed via reports on the project work. This is assessed independently by two members of academic staff, typically in the light of a live demonstration of the project work given by the student. The markers then confer to agree on the final mark for the project.

### 1.9 ASSESSMENT METHOD BALANCE

Please indicate the typical assessment methods for a student on this programme for each year of study. Additionally please complete the Assessment matrix (UG, PGT and integrated PhD programmes only)



The following table only takes into account the 180 taught credits of the program. The remaining 540 credits are PhD research, which are not assessed by either exam or coursework.

Start Year	Assessment by written exams (%)	Assessment by practical exams (%)	Assessment by coursework (%)
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1	25	0	75
2	37.5	0	62.5
3	75	0	26
4	0	0	0

#### 1.10 CAREER OPPORTUNITIES

The demand for NLP practitioners in industry, science, commerce, and the public sector outstrips supply. Companies like Google and Amazon are aggressively recruiting NLP experts trained at PhD levels because there are relatively few available.

Edinburgh PhD graduates in NLP have obtained academic positions in some of the best universities in the world; examples include the University of Illinois at Urbana-Champaign, the University of Melbourne, the University of Texas at Austin, the University of Pennsylvania, Tsinghua University, Peking University, Hosei University, Saarland University, Stellenbosh University, UCL, the University of Warwick, the University of Aberdeen, and Bangor University.

Our PhD graduates have also obtained industry positions at Amazon, Facebook, Google, Microsoft, Apple, Thomson Reuters, as well as at a large number of SMEs and Startups.

#### 1.11 OTHER ITEMS

## 2 ABOUT THE PROGRAMME

### 2.1 ADDITIONAL REQUIREMENTS

<b>PRSB Accreditations (where relevant)</b>	<i>Please note accreditations awarded or planned</i>
<b>Admissions requirements UG/PGT Programmes only:</b> <b>Before completing this section please contact College Recruitment and Admissions for further guidance (<a href="mailto:sciengra@ed.ac.uk">sciengra@ed.ac.uk</a>)</b>	<i>To be demonstrated through certificated or experiential learning (around 100 words). English language requirements across the accepted tests should also be included.</i>
<b>To be completed by College Recruitment and Admissions (UG/PGT only)</b>	<i>Please select to confirm that a member of the R &amp; A section has been consulted on the Admissions requirements.</i> <input type="checkbox"/>
<b>Work experience/work based learning opportunities</b>	<i>Details of organised work experience / work based learning opportunities available during the programme (if applicable)</i>

### 2.2 CONSULTATION

<b>Student consultation</b>	n/a
<b>External consultation</b>	The proposal is currently subject to external peer review as part of the UKRI selection process. We will take into account any comments regarding the programme received from reviewers and during the selection interview.

<b>2.3 ADDITIONAL DOCUMENTS</b>	
Draft Memorandum of Agreement (if applicable)	
Award letter (if applicable)	
DPT (please provide draft in Word document or similar)	X
Any other relevant documentation (please specify)	

### 3 APPROVAL

<b>Programme Title:</b>	PhD with integrated study in Natural Language Processing
<b>Programme Proposer:</b>	Dr. Adam Lopez and Prof. Frank Keller

#### 3.1 SCHOOL BOARD OF STUDIES REVIEW AND APPROVAL

Confirmation of approval of the proposal at the School Board of Studies should be entered below.

Date of BoS:
Convener Name:
Comment and Approval (BoS Minute): <i>Please provide either a link to the minutes of the Board or a copy of the relevant text from the minutes.</i>

#### 3.2 HEAD OF SCHOOL REVIEW AND APPROVAL

Head of School: <i>Please print name</i>
Comment and Approval:
Signature:

#### 3.3 COLLEGE CURRICULUM APPROVAL BOARD REVIEW AND OUTCOME

Date of CCAB:	
Convener Name:	
Stage 2 Outcome (please select as appropriate)	
Proposal approved ➔ Proceed to <i>New Programme Request &amp; Final DPT creation</i>	<input type="checkbox"/>

Proposal approved with conditions	<input type="checkbox"/>
Proposal rejected with recommendations	<input type="checkbox"/>
Proposal rejected	<input type="checkbox"/>
Comment:	



#### 4 DOCUMENT CHECKLIST

Document	Completed
DPT	<input checked="" type="checkbox"/>
Memorandum of Agreement (if applicable)	<input type="checkbox"/>
Assessment Matrix	<input checked="" type="checkbox"/>
Award letter (if applicable)	<input type="checkbox"/>

#### Document Control

Date approved: Start date:	Amendments:	Date for next review: April 2019
Contact name & role: Matt Elliot	Department: College Academic Affairs	Email: <a href="mailto:Matt.Elliot@ed.ac.uk">Matt.Elliot@ed.ac.uk</a>
If you require this document in an alternative format please email: <a href="mailto:DeanQA@ed.ac.uk">DeanQA@ed.ac.uk</a>		