Proposed DPT updates

Sharon Goldwater, 11 Feb 2019

Companion document to tags_and_DPTs_proposal. See also the course collections and course tags spreadsheets.

MSc in Artificial Intelligence

Description from marketing materials

"about half your taught course credits must be chosen from areas of artificial intelligence. Course offerings follow the main research areas of our staff, with multiple course options available in natural language processing, machine learning, robotics, and related areas."

Proposed DPT

The following courses are compulsory:

Informatics Project Proposal	10
Informatics Research Review	10
MSc Dissertation	60

Select 0-10 credits from Informatics and PPLS MSc Programming Courses, i.e.:

Programming Skills	10
Introduction to Practical Programming with Objects (was: IJP)	10
Computer Programming for Speech and Language Processing	10

Select 60-100 credits from {AIA, ML, COG}: MSc AI and Cognitive Science Courses (includes one Level 10 course, CCS).*

Select 0-40 credits from {FSS}–{AIA, COG}: MSc non-AI Foundations, Systems and Software courses

Select 0-20 credits from all Level 9-10 Maths or Informatics courses.**

Select 0-20 credits from all Level 11 courses, except Medicine/Vet. (Note: see the MSc Handbook for suggested options).

Comments

*This is nearly the same set of courses that are currently referred to as "AI courses", because all courses currently tagged as CG are also tagged as AI. CCS (Level 10) has been added because we don't have an equivalent MSc course and it is not a subject most students would have had the opportunity to study before.

**The DPT is designed to be simple while also preventing students from accidentally registering for too many level 9-10 credits. Because CCS (Level 10) is now explicitly listed as an MSc course, we only allow 20 more Level 9-10 credits. For most students this is more restrictive than the current 30 (the maximum permitted by SCQF) but still very permissive compared to most degrees at the University.

AI MSc: Example course choices

Courses in yellow are chosen from the 'All Level 11' courses. IRR/IPP are not shown, for brevity.

NLP and user interaction (should be suitable for any accepted student)

Computer programming for sp/lang proc	Automatic Speech Recognition
Human-Computer Interaction	Natural Language Understanding, Gen, MT
Accelerated Natural Language Processing	Natural Language Understanding, Gen, MT
Accelerated Natural Language Processing	The Human Factor
Speech Processing	Usable Security

Applied machine learning (suitable for most accepted students; this is just one example but other applications courses could be substituted)

Programming Skills OR IPPO	Artificial Intelligence, Present and Future
Introductory Applied Machine Learning	Automatic Speech Recognition
Introductory Applied Machine Learning	Advanced Vision
Bioinformatics 1	Innovation-Driven Entrepreneurship
Machine Learning Practical	Machine Learning Practical

Robotics and vision (for a student with strong programming, required by RSS).

Image and Vision Computing	Advanced Vision
Introductory Applied Machine Learning	Reinforcement Learning
Introductory Applied Machine Learning	Robot Learning and Sensorimotor Control
Robotics: Science and Systems	Decision Making in Robots and Auton Agents
Robotics: Science and Systems	Computer Animation & Visualisation

Note: students can't take both IVC and RSS and do MLP, because MLP requires IAML or MLPR.

Natural language and web technologies (for a student with strong programming, required by TTDS).

Social and Technological Networks	Artificial Intelligence, Present and Future
Human-Computer Interaction	Automatic Speech Recognition
Accelerated Natural Language Processing	Natural Language Understanding, Gen, MT
Accelerated Natural Language Processing	Natural Language Understanding, Gen, MT
Text technologies for data science	Text technologies for data science

Machine learning and neuroinformatics (for a student with strong maths but less programming).

Programming Skills	Probabilistic Modelling and Reasoning
Machine Learning & Pattern Recognition	Probabilistic Modelling and Reasoning
Machine Learning & Pattern Recognition	Reinforcement Learning
Neural Computation OR Comp Cog Sci	Neural Info Processing OR Comp Cog Neuro
Machine Learning Practical	Machine Learning Practical

AI and its connections to algorithms and theoretical computer science (for a student with a strong mathematical CS background, perhaps who has already done some machine learning courses)

Computational Complexity	Probabilistic Modelling and Reasoning
Algorithmic Foundations of Data Science	Probabilistic Modelling and Reasoning
Social and Technological Networks	Reinforcement Learning
Automated Reasoning (level 9)	Neural Information processing
Natural Computing	Randomness and Computation

MSc in Informatics

Replacing our current 'do-anything' DPT, the aim is to require that students on this degree actually take in some of the broader span of Informatics that differs from the other degrees. We considered making more required breadth for this degree (e.g., at least one AI course and one systems/foundations course) but at present this is not part of the plan (or marketing). It could be reconsidered in future.

Description from marketing materials

"Informatics is the study of how natural and artificial systems store, process and communicate information. More than just computer science, informatics embraces interdisciplinary connections to understand and model computation and information processing in all its forms. […] About half your taught course credits must be chosen from areas focusing on computation in natural systems."

Proposed DPT

The following courses are compulsory:

Informatics Project Proposal	10
Informatics Research Review	10
MSc Dissertation	60

Select 0-10 credits from Informatics and PPLS MSc Programming Courses, i.e.:

Programming Skills	10
Introduction to Practical Programming with Objects (was: IJP)	10
Computer Programming for Speech and Language Processing	10

Select 40-100 credits from MSc NS (~15 courses, incl 1 at level 10)

Select 0-40 from Level 11 ML

Select 0-60 from Level 11 AIA

Select 0-60 from Level 11 {FSS}-{AIA, COG}: MSc non-AI Found'ns, Systems and Software courses

Select 0-20 from all Level 9-10 Maths or Informatics courses**

Select 0-20 from all Level 11 courses outside Informatics, except Medicine/Vet***

Comments

This DPT limits the number of core ML credits to 40 on this degree to better differentiate from the AI degree and reduce ML enrolments. This may not have much effect on the 3 largest ML courses, however, since students typically take 40 credits of those and likely will still do so.

**See comment for the equivalent block in the AI DPT

***Informatics courses are excluded to prevent students from taking more ML credits. This rules out EPCC courses. Consider adding 0-20 of an EPCC course collection? (Would need to check with them.)

Informatics MSc: Example course choices

IRR/IPP are not shown, for brevity.

Cognition and user interaction (should be suitable for any accepted student)

Programming Skills, IPPO, or CPSLP	Music Informatics
Human-Computer Interaction	The Human Factor
Accelerated Natural Language Processing	Usable Security
Accelerated Natural Language Processing	Software Architecture, Process, and Mgmt
Computational Cognitive Science	Computer Animation & Visualisation

Computation in biological systems (for a student with moderate programming and maths)

Programming Skills OR IPPO	Computational Cognitive Neuroscience
Bioinformatics 1	Bioinformatics 2
Natural Computing OR Comp Cog Sci	Advanced Vision
IAML OR MLPR	Reinforcement Learning
IAML OR MLPR	Algorithms and Data Structures (Level 10)

Social and web technologies (for a student with strong programming, required by TTDS and PDIoT).

Social and Technological Networks	Algorithmic Game Theory and its Applications
Human-Computer Interaction	Usable Security and Privacy
Introductory Applied Machine Learning	Principles and Design of IoT Systems
Introductory Applied Machine Learning	Principles and Design of IoT Systems
Text technologies for data science	Text technologies for data science

MSc in Computer Science

Description from marketing materials

"This MSc offers you the opportunity to obtain specialist knowledge in the design, analysis, implementation, and use of computer systems ranging from the components of a single processor to computer networks as vast as the Internet. You can also pursue a more theoretical direction by choosing courses in areas such as algorithms, programming languages, or cryptography.
[…] About half your taught course credits must be chosen areas in core computer science (foundations and systems)."

Proposed DPT

The following courses are compulsory:

Informatics Project Proposal	10
Informatics Research Review	10
MSc Dissertation	60

Select 0-10 credits from Informatics MSc Programming Courses, i.e.

Programming Skills	10
Introduction to Practical Programming with Objects (was: IJP)	10

Select 60-100 credits from Level 11 Foundations, Systems and Software Courses

Select 0-40 from Level 11 non-FSS courses (~25 courses)

Select 0-20 from all Level 9-10 Maths or Informatics courses**

Select 0-20 from all Level 11 courses, except Medicine/Vet

Comments

This DPT does not differentiate between SE and other CS courses.

We may want to discuss with EPCC whether and how to list their courses in this DPT. Currently they are effectively outside courses.

**See comment for the equivalent block in the AI DPT

CS MSc: Example course choices

I'm afraid I don't know enough about many of these courses (and their prerequisites) to easily create examples that I would feel comfortable advertising to students or PTs. We currently list 6 specialist areas in the MSc handbook: Theoretical CS; analytical and scientific databases; cybersecurity and privacy; computer systems, SE and high-performance computing; and programming languages.

However, no one has been looking after the specialist areas for several years. Probably some should be removed or re-focused given that (a) we now have a separate degree in security and (b) other course options have drifted over the years. I have recommended to DoLT that the School appoint someone in the admin role of CS degree coordinator, who would be able to update course guidance for students, review and possibly rationalize our course options and specialist areas.

MSc in Cognitive Science

Description from marketing materials

 "Students on this degree typically follow one of two tracks, either focusing on speech and language processing in humans and machines, or more broadly on models of cognition, mind and brain. […] You will round out your degree with courses in related areas from the School of Informatics and the School of Philosophy, Psychology, and Language Sciences (PPLS)."

Proposed DPT

The following courses are compulsory:

Informatics Project Proposal	10
Informatics Research Review	10
MSc Dissertation	60

Select 0-10 credits from Informatics and PPLS MSc Programming Courses, i.e.:

Programming Skills	10
Introduction to Practical Programming with Objects (was: IJP)	10
Computer Programming for Speech and Language Processing	10

Select 40-70 from MSc Cognitive Science courses (COG plus one Level 10 course and 3 PPLS courses that they agreed we can put in DPTs: Speech Proc, Speech Synth, Simulating Language)

Select 0-40 from Level 11 ML

Select 0-60 from Level 11 AIA

Select 0-20 from Level 11 {FSS}-{AIA, COG}: MSc non-AI Found'ns, Systems and Software courses

Select 0-20 from all Level 9-10 Maths or Informatics courses**

Select 0-30 from level 11 courses in PPLS*** (Note: see the MSc Handbook for suggested options.)

Comments

The number of "core" (COG) credits is lower than for other degrees, because there are only 40 credits of options on the mind/brain track, and some of them are very mathy (which is not always possible for students on this degree). We should consider whether/how to strengthen this track.

**See comment for the equivalent block in the AI DPT.

***Altogether students can do 70 credits from PPLS if they use these credits and the 40 listed specifically above. It's unlikely students would do this, but since the listed 40 are all computational, they should still have enough computational knowledge to do an Informatics project. At present, PPLS courses are not distinguished from other outside courses, and CogSci students have a maximum of 40 outside credits. Here all outside courses must be from PPLS, to simplify matters. If many concessions are requested (unlikely) we could revisit this.

CogSci MSc: Example course choices

Courses in yellow are from PPLS. IRR/IPP are not shown, for brevity.

Speech and language processing (should be suitable for any accepted student.)

Computer programming for sp/lang proc	Automatic Speech Recognition
Computational Cognitive Science	Natural Language Understanding, Gen, MT
Accelerated Natural Language Processing	Natural Language Understanding, Gen, MT
Accelerated Natural Language Processing	Simulating Language
Speech Processing	Simulating Language

Cognition, computation and society (should be suitable for any accepted student.)

Programming Skills OR IPPO	Computational Cognitive Neuroscience
Computational Cognitive Science	AI Present and Future
Human-Computer Interaction	Usable Security OR The Human Factor
Cognition, Culture and Context	Simulating Language
Speech Processing	Simulating Language

Cognition and neuroinformatics (for a student with strong maths).

Programming Skills OR IPPO	Computational Cognitive Neuroscience
Computational Cognitive Science	Neural Information Processing
Neural Computation	Reinforcement Learning
IAML OR MLPR	Advanced Vision
IAML OR MLPR	AI Present and Future

UG degrees that won't change

The attached spreadsheet provides new definitions of the undergraduate course collections in terms of the newly proposed tags. In nearly all cases, the set of courses contained in each collection is the same as at present, so for nearly all degrees, the courses permitted for our undergraduate students will not change.

DPTs for the following degrees will not change:
- MInf,
- AI, AI+Maths, AI+SE, AIw/Mgt
- CogSci
- CS+Maths, CS+Physics, CS+Mgt, CS+Elec, CSw/Mgt

UG degrees with minor changes

In four degrees, minor changes are proposed. Most of these fix issues in the existing DPTs.

In some cases we also propose replacing a course collection with another one that results in an equivalent set of allowed courses for the degree, so that one of the collections no longer needs to be maintained.

Collections in pink will no longer be needed for any degree.

BSc in Computer Science

UG3:	Current:	Proposed:
	70 compulsory credits (SDP, PI, ILP, CS)	same
	30-50 of CS yr3 (13 options)	same
	10-20 of non-CS yr3 (5 options)	10-20 of AI yr3 [this is equivalent]
	0-10 of any level 9-10	same

No changes to UG4.

BSc in AI and Computer Science

Bug fix: the DPT specifies 10-30 credits each of CS and AI courses, but with 90 compulsory credits, it needs to be either 10-20 each or 0-30 each. I propose 0-30, which is in line with the MInf year 3. Note that students have both AI and CS compulsory courses in year 3 and do a minimum of 30 credits each of AI and CS courses in year 4.

UG3:	Current:	Proposed:
	90 compulsory crdts (SDP, PI, ILP, CS, IAML)	Same
	10-30 of CS yr3 (13 options)	0-30 of CS yr3 (13 options)
	10-30 of AI yr3 (5 options)	0-30 of AI yr3 (5 options)
	0-10 of any level 9-10	Same

No changes to UG4.

BSc in SE

UG3 proposal:

1. Split the current collection of "non-SE yr3" courses into two more coherent smaller collections, both of which are also used for other degrees: "AI" courses and "Foundations and Systems" courses.

These smaller collections overlap by only one course and doing this allows us to stop maintaining the non-SE yr3 collection.

2. Fix a bug where the current DPT claims to permit up to 50 credits of SE courses, but also requires a minimum of 10 credits of non-SE courses (which in practice limits the number of SE credits to 40).

UG3:	Current:	Proposed:
	70 compulsory credits (SDP, PI, ILP, CS)	same
	30-50 of SE yr3 (4 options)	same (but updated tags so now 5 options)
	10-20 of non-SE yr3 (15 options)	0-20 of Foundations and Systems yr3
		0-20 of AI yr3
	0-10 of any level 9-10	same

UG4 proposal:

1. Split the current collection of "non-SE yr4" courses into two more coherent smaller collections, both of which are also used for other degrees: "AI" courses and "Foundations and Systems" courses. These do have some overlap (~6 courses) but we can stop maintaining the non-SE yr4 collection and we also propose to have a slightly lower limit on AI credits than on Foundations and Systems credits.

2. Increases the minimum number of SE credits from 20 to 40 (which seems appropriate for a degree with this title). The number of SE options will increase slightly with the updated tag mapping.

3. Fix a bug where the current DPT claims to permit up to 80 credits of SE courses, but also requires a minimum of 30 credits of non-SE courses (which in practice limits the number of SE credits to 50).

UG4:	Current:	Proposed:
	40 compulsory credits (PROJ)	Same
	20-80 of SE yr4 (11 options)	40-80 of SE yr4 (now 14 options)
	30-70 of non-SE yr4 (~45 options)	0-40 of Foundations and Systems yr4 (~25 options)
		0-20 of AI yr4 (~25 options)
	0-10 of any level 10-11	same

BSc in SE with management:
UG3 has 10-20 credits of "non-SE"; update to 0-20 each from AI and Foundations and Systems (by analogy with SE degree above). Also update UG4 by analogy with SE degree, as follows:

UG4:	Current:	Proposed:
	40 compulsory credits (PROJ)	Same
	10-50 of SE yr4	20-60 of SE yr4
	10-50 of non-SE yr4	0-40 of Foundations and Systems yr4
		0-20 of AI yr4
	20-30 from School of Management	same