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CDTs



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UKRI CDT in Natural Language Processing

Adam Lopez



Centre for Doctoral Training in Natural Language Processing

Widespread technologies:

- Machine translation
- Speech recognition
- Virtual assistants / chatbots
- Information retrieval and visualization
- Summarisation
- Sentiment analysis
- Fake news detection
- Image captioning...

Many open problems:

- Many errors, both obvious and subtle
- Over 6,000 world languages
- Social implications of NLP

Key skills for researchers:

- Linguistics
- Machine learning/ statistics
- Programming/ algorithms
- Design and ethics





CDT in NPL: Research Areas

- Natural language processing
- Computational linguistics
- Speech technology
- Dialogue
- Language and vision
- Information retrieval and visualization
- Computational social science
- Computational cognitive science
- Human-Computer interaction

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CDT in NPL: Key Ideas of Program

- Interdisciplinary: students from different backgrounds.
- Collaborative: students work together, are exposed to different backgrounds and working styles.
- No student will have background in all disciplines, so will need courses to fill gaps.
- But should be involved in research right away.
- And will sometimes need courses alongside research.
- Research methods taught alongside research.





CDT in NPL: Programme Design

- PhD with Integrated training (new UoE degree type)
 - 4 years: 75% research, 25% taught
- Year 1
 - Doing research in NLP course
 - Group project and individual project
 - Students must work with two different supervisors
 - Foundational courses
 - Informatics students in PPLS courses and vice versa
- Year 2: Controversies in the Data Society
- Years 2-4: Advanced courses > full-time research





CDT in NPL: Where are we right now?

- Strong industry support: Huawei and Naver already funding studentships, more in pipeline.
- Application deadline: 29th of March (next year: earlier!)
- 120+ applications received.
- Offers in process. Target around 12 students.
- First cohort: likely to be a good mix of CS, psychology, design, linguistics.
- Will involve supervisors in course/ project planning over summer.





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UKRI CDT in Biomedical and AI

Guido Sanguinetti



At a glance

- 60 PhD studentships over 5 intakes
- £8.3M investment, largely from UKRI, with contributions from external partners in cash and in kind
- Part of a £100M investment in AI training by UKRI, consisting of 16 CDTs across country/ disciplines
- Focus on knowledge extraction from biomedical data, connecting molecular mechanisms to translational applications (unique in the UK; other 3 CDT with healthcare focus)
- Capitalise on Edinburgh's unique strengths in AI and basic/ applied biomedical research



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A truly interdisciplinary Centre



School of Biological Sciences



School of Informatics

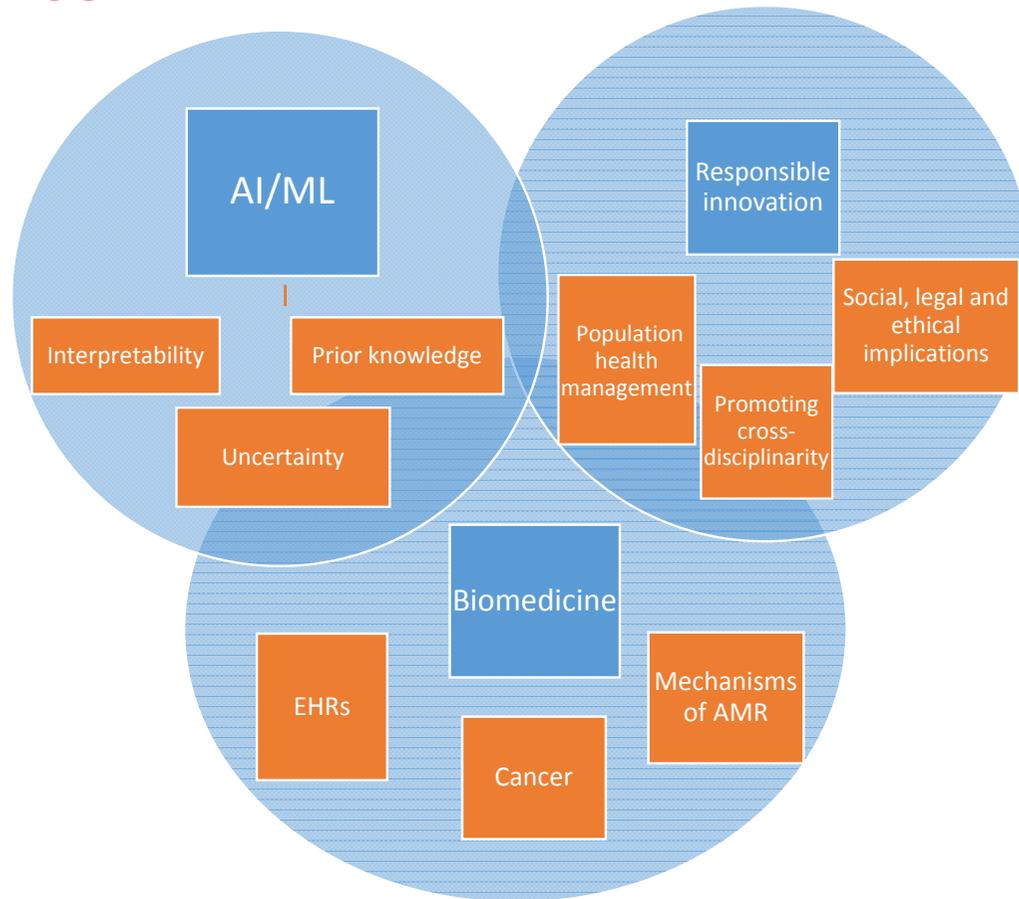


Usher Institute – Population Health
Sciences & Informatics



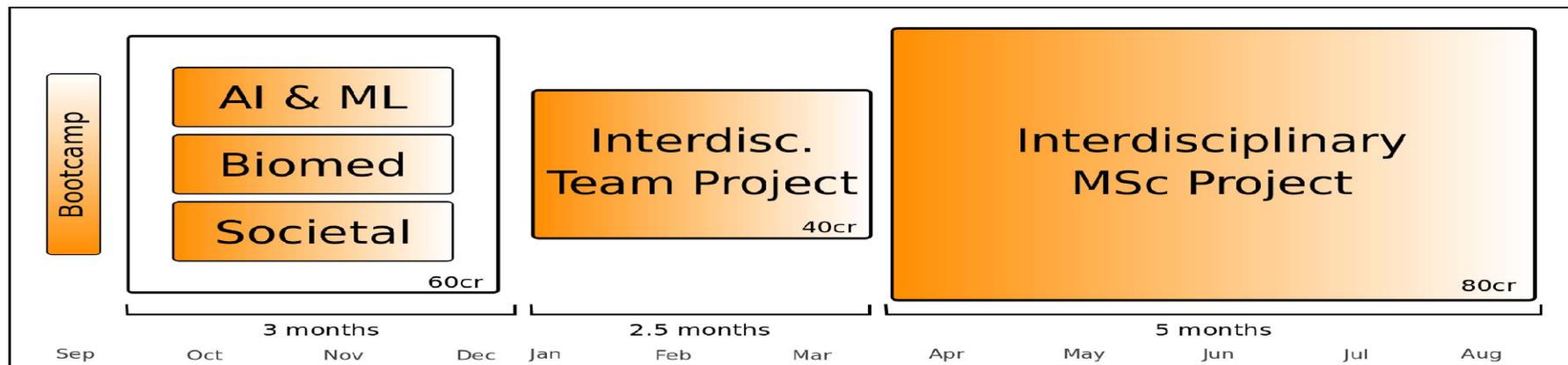


Research Themes





Course structure



- 1+3 formula: MSc(Res) followed by PhD
- PhD: 3 years embedded in a group, with shared supervision
- Multiple opportunities for leadership training
- Internship/ research visit



Management and advice

- Guido Sanguinetti (Sol), Meriem el Karoui (SBS), Chris Ponting (IGMM), Cathie Sudlow (Usher), Robin Williams (SSPS), Kathrin Cresswell (Usher), Michael Gutmann (Sol)
- EAB: Sheila McDonald (MRC Cambridge), Samuel Kaski (Aalto University), Giovanni Tonon (San Raffaele Institute, Milan), Philippe Sanseau (GSK), Fiona Reddington (CRUK), Gerald Lip (NHS Grampian), Paul Campbell (NHS/ Scottish Government)
- Over 70 supervisors from across UoE



Partners

- Additional training and supervisory capacity, plus industrial internships/ research visits
- NHS Lothian
- Over 30 international partners, including academic (Harvard, Riken, ETH, etc), tech (Microsoft, IBM), pharma (UCB-Celltech, AstraZeneca), medical systems (Canon)
- Multiple opportunities for engagement through MSc(Res) projects/ PhD sponsorship/ co-supervision



Work in Progress

- Admissions: shortlisted, first wave of interviews w/c 13/05
- Planning a second recruitment wave later, please keep advertising!
- 05/06 Industry engagement workshop!
- 07/06 PIs brainstorming workshop



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EPSRC CDT in Robotics and Autonomous Systems (CDT-RAS)

Heriot-Watt University & University of Edinburgh

Directors: Prof. Helen Hastie and Dr. Michael Mistry





CDT-RAS 4 Year PhD Programme



1. Technical Training

- Robotics Science and Systems
- Autonomous Systems Research
- Electives from ~50 courses
- Software Bootcamp/Hackathons

2. Innovation Training

- Innovation Training
 - Access to Innovation Fund
- Gateway Events
- Soft skills, e.g. presentation skills
- Creativity
- Responsible Research and Innovation (RI)
 - Morals and The Machine

3. International Experience

- International lab or industry placements





CDT-RAS 4 Year PhD Programme

Outreach

- Year of robotics
- Science Festivals
- STEM
- Carfest
- Conferences



International Challenges/Competitions

- Alexa Challenge
- ROBOCUP
- EURATHLON
- Converge challenge





CDT-RAS 2.0 Theme: *Safe Interactions*

1. *Physical Interactions*: control, actuation, compliance, sensing, mapping, planning, embodiments, swarming;
2. *People Interactions*: human-robot interaction, affective robotics, smart spaces, teaming, collaborative decision-making, cobots, multimodal and spoken interfaces;
3. *Self-Interactions*: condition monitoring, prognosis, explainable AI, certification, verification, safety, security;
4. *Interaction Enablers*: vision, embedded and parallel computing, novel fabrication methods, machine learning algorithms and other AI techniques including NLP.





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National ROBOTARIUM

A National UK Facility for Research into the Interactions amongst
Robots, Environments, People and Autonomous Systems

ROBOTARIUM West
New RAS Building
Heriot-Watt University

ROBOTARIUM East
Bayes Centre
University of Edinburgh

Living Labs: Challenges: Skills:
Clusters: Co-ordination

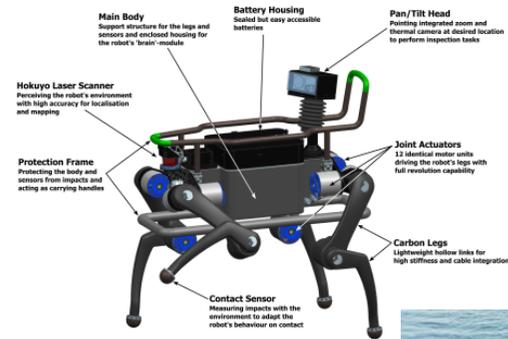
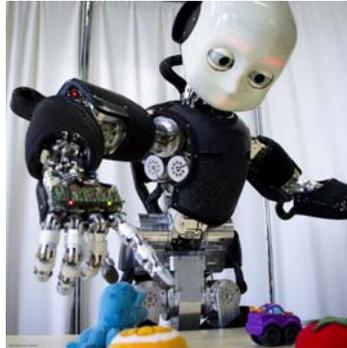


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ROBOTICS
Innovation Ready



National ROBOTARIUM

A National UK Facility for Research into the Interactions amongst Robots, Environments, People and Autonomous Systems





Industrial Projects (CDT1)



Statistical Methods for AUV Underwater Pipeline Tracking in Multi Sensor Data

Kawasaki Heavy Industries, Kobe, Japan
Pipeline tracking is a challenging task for Autonomous Underwater Vehicles because sections of the pipe may be deliberately buried and not visible from the surface. This project investigates multi-sensor solutions to tracking pipelines in and out of burial from an AUV flying low over the pipe using multi-sensor data, to be selected from sub bottom sonar, wideband biosonar, magnetometer, laser and video. The PhD work focuses on statistical methods for tracking, starting with the Probability Hypothesis Density filter.



Cooperative Control of Drilling Equipment

Schlumberger, UK
As automation of drilling processes is developed, operation will be split between completely automated tasks and tasks that are carried out by humans. The project looks at how teams comprising human and robotic actors can collaborate to achieve complex and uncertain tasks in drilling operations.



Interactive robotic inspection strategies using unstructured data

Renishaw, UK
Document based 2D technical drawings rather than a digital 3D model are still the main format in a production-inspection workflow. This research is focused on using unstructured data such as the symbolic representations of geometric dimensioning and tolerance (GD&T) as input to conduct a teach-execute regime for coordinate measuring robots.



Shared Autonomy for Kinesthetic Tools

Costain, UK
Many repetitive industrial tasks require significant cognitive load which results in operator fatigue and in turn can become dangerous. The development of robotic sensing technology and compliant feedback technology will allow semi-autonomous robotics systems to improve this type of workflow. This project aims to explore methods in which a robotic system with shared autonomy can contribute to the operation of a Kinesthetic tool (such as a piece of machinery) and in doing so reduce the cognitive load and fatigue of the human operator.



Learning to grasp movable objects based on tactile information

Honda Research Institute Europe
Intelligent systems will shape our future in a variety of forms, ranging from accident-free mobility to cognitive robotics and from smart process management to the efficient use of resources. Intelligence is necessary to handle complexity in products and in processes. The goal of this industrially sponsored project is to research concepts and methods for tactile-based exploring and grasping of movable objects.



Sharing responsibility

RSSB, UK
This project investigates how the task of driving a train is likely to evolve in the next 10 years, what other changes in rail and related industries are driving this change, how driver selection and training processes will evolve to support this change, how these changes will be received by existing train drivers and operational staff.



Intention-aware Motion Planning

Thales, UK
The goal of this industrially sponsored project is to research and extend previous techniques to give a new approach to categorising motion and inferring possible future system states to support robust maritime autonomy decision making processes.



Long term autonomy for multi agent systems in the maritime domain

BAE Systems
The main aim of this project is to develop algorithms that can devise, execute and monitor plans suitable for long-term missions of marine 'systems of systems' where overall goals are well defined but their effective implementation is dependent on external parameters that cannot be pre-determined.



Robotic Inspection and Manipulation for Fusion Remote Maintenance

UK Atomic Energy Authority
This PhD project aims to develop new technologies to support operators of RH robotics systems in nuclear facilities. Current RH systems, though reliable and capable, suffer from limitations in visualisation and capabilities of dealing with confined workspaces. The vast majority of tasks are carried out through strict human-in-the-loop operation. Future nuclear remote maintenance systems will require more advanced visualisation capabilities and automation of basic RH/inspection tasks in order to cut down on maintenance time and increase plant price-performance. This research will complement already-existing RACE research into AR and remote handling task automation for these future applications.



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Thank you for your interest!

PoC: Helen Hastie h.hastie@hw.ac.uk

Michael Mistry mmistry@ed.ac.uk





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Cyber Security, Privacy and Trust EIT DTP

Jean Carletta



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Edinburgh Cyber Security, Privacy and Trust Institute

- Academic Centres of Excellence in Cyber Security Research (ACEs-CSR): UK Gov scheme to grow academic community
- Recognises breadth + depth, international excellence, training
- 17 ACE-CSRs across UK. UoE awarded 2017-2022.
- We are now **possibly the largest** UK centre of excellence.
- By csrankings.org research metric we are in top 5 in EU
- Researchers connect across 10 departments, Informatics core



National Cyber
Security Centre

Academic Centre of Excellence
In Cyber Security Research

EPSRC

Engineering and Physical Sciences
Research Council



1. **AI** and Security



2. **Data Science** and Security



3. **Cryptography** and Distributed Ledger



4. Secure Future **Networks**



5. Privacy and Security for **Devices** and **Internet of Things**



6. Protocol and Program **Verification**



7. **Quantum** Cyber Security



8. **Socio-technical, Human Factors, Law** and **Risk**



EIT Digital Industry for Cyber Security, Privacy and Trust

- **EIT Digital:** a European funding agency (€100m/yr), mission for economic growth, innovation, entrepreneurial training.
 - Business: grants/loans for R&D
 - Training: EIT branded Masters, PhD and Professional programmes
 - EIT provides **matched funding**.
- Training programmes involve time spent in industry, business courses, and international mobility.
- Based at “Co-Location Centres” and “Satellites” in EU
 - Berlin (+ Munich), Budapest, Eindhoven, Helsinki, Madrid, Munich, London (+ Edinburgh), Paris (+ Rennes, Sophia Antipolis), Stockholm, Trento (+ Milan).

BOOSTING SCOTLAND'S INTERNATIONAL COLLABORATION IN THE DIGITAL DOMAIN

Wednesday, April 3 2019

[Share](#)

EIT Digital opens Edinburgh satellite in Scotland

Edinburgh, April 3, 2019: EIT Digital, a leading European digital innovation and entrepreneurial education organisation, today opened its new Edinburgh Satellite.

Funded by Scottish Enterprise, Scottish Funding Council and EIT Digital, and hosted by the University of Edinburgh's Bayes Centre, the new satellite will contribute to achieving the Scottish Government's goals to deepen relationships between Scotland and the EU, increase innovation and investment in R&D, increase university-industry knowledge exchange, develop skills in Scottish businesses, and promote Scotland's offer to investors and talent.



The Edinburgh Satellite intends to host a new Doctoral Training Centre, with a focus on Fintech, and Cyber Security via a new program supported by the Scottish Government's Cyber Resilience Unit and ScotlandIS, plus other areas of national strategic importance. Its students will be supported by universities across Scotland with the first students expected to start later in 2019.



Industrial DTC for Cyber Security, Privacy and Trust

- We plan a new 4-year Industry Track PhD programme
 - mandatory industry placement period (min 3 months)
 - new fee structure (TBD)
- EIT Digital will sponsor PhDs on this (max 50% up to €25k/yr)
 - Needs match funding from industry (or gov/third sector)
 - Co-proposed topic; 3-6 months int'l mobility; 6 months BD
- Benefits to student:
 - (1) industry link; (2) generous stipend and travel allowance; (3) cohort effect both in UoE and in EIT DTCs across EU
- Benefits to researcher and Informatics:
 - (1) supports funding for overseas students; (2) more help to find industry support; (3) EIT match helps recover funds for School.



Summary

- Not a normal CDT: funding is constrained, each project needs a sponsor
 - Best thought of as a way to leverage and encourage industry money
 - But building a community, more than just a collection of industry-funded PhDs
- We're still working out details of how the scheme will be run
 - Soft start this year with some students already in pipeline, 3-4 companies
 - EIT hope we can grow to 40 students steady-state (needs £1m/year from industry!)
 - Scot Gov want to extend across Scotland (may involve co-sup arrangements)
- We'll visit Informatics institutes to explain once plan is clearer
- **Meanwhile: if you have a good student ready for entry in 2019/20 on a topic related to Cyber Security, Privacy and Trust, who has external funding already or would benefit from industry funding (e.g., top-up needed), please get in touch urgently to discuss possible benefits of joining scheme.**

Contact Ahmed El-Rayis (A.El-Rayis@ed.ac.uk) or David Aspinall (David.Aspinall@ed.ac.uk).



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Doctoral Research Centre in Data Science and AI

Amos Storkey



Doctoral Research Centre in Data Science and AI Director: Amos Storkey

- Builds on EPSRC CDT in Data Science – cutting edge Data Science and AI CDT
- Examples of student outcomes:

Harri Edwards: 12 papers. Neural Statistician. Random Network Distillation (best-ever performance on Montezumas Revenge for a period). 346 citations.

Sorcha Gilroy. Outstanding paper award at NAACL 2018. Tutor at summer school.

Andreas Kapourani. Best Paper award at ECCB 2016. Nature communications paper.

Rafael Karampatsis. Paper in SEM. Sentiment Analysis

Charlie Nash. 5 papers inc AISTATS paper. Shape variational autoencoders. Inverting representations.

George Papamakarios – NIPS oral, 2 NIPS papers. Deep Learning for Density Estimation

Matt Pugh. High performance & distributed computation. Internship in Palo Alto.

Philippa Shoemark. 6 papers. Crowdsourcing annotations. Media attention: *Scottish independence and linguistic identity on social media*

Clara Vania. 8 papers inc. EMNLP 2018



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Doctoral Research Centre in Data Science and AI

- **A cohort-driven PhD programme across Informatics and Mathematics**
- Approximately 10-12 PhD studentships
- Interaction with supervisor team from day 1.
- Strong internship programme
- More than 30 programme partners
- Training opportunities: students can link with the excellent ML, data science and AI courses available across Informatics and Maths
- Cohort events, hackathons and partner engagement
- Workshop and Speaker Programme: Deep Learning Workshop
- UN Global Pulse Link
- Deadline May 21st