Curriculum Vitæ: 16 June 2020

Part A: General Information

Name and title	Dr Dimitar Lubomirov Kazakov
Affiliation	Department of Computer Science, University of York
Present position	Associate Professor (Senior Lecturer) since Oct 2009

Home page	`http://www-users.cs.york.ac.uk/~kazakov`
Google Scholar	`https://tinyurl.com/nxvhpc3`
York Research DB	`https://tinyurl.com/y8rnyj8b`
ResearchGate	`https://tinyurl.com/y6dnx57r`

Previous posts

Oct 1999 – Sep 2009
Lecturer in Machine Learning, CS Dept., University of York.
Jan 1999 – Sep 1999
Research Associate, CS Dept., University of York. Project: Esprit 28623 *Applied Logic for Advanced Data mining In iNdustry (ALADIN)*. Principal investigator: Prof. Stephen Muggleton.
Mar 1998 – Dec 1998
Research Associate, CS Dept., University of York. Project: Esprit 20237 *Inductive Logic Programming II (ILP2)*. Principal investigator: Prof. Stephen Muggleton.

Qualifications

2019
Fellow of the Higher Education Academy (`https://www.heacademy.ac.uk/`).
2001
York Certificate of Academic Practice (YCAP).
2000
Ph.D. in Artificial Intelligence and Biocybernetics, Czech Technical University of Prague. Ph.D. thesis: *Natural Language Processing Applications of Machine Learning*. Supervisor: Prof. Olga Štěpánková.
1993
M.Sc. ("Engineer" diploma 5-year degree) in Technical Cybernetics, Czech Technical University of Prague. Master's thesis: *Natural Language Interface Module*. Supervisors: Assoc. Prof. Olga Štěpánková, Dr Marta Vávrová.

Languages

Fluency in Bulgarian, Czech, English and French; passive use of Russian; basic Spanish.

Professional Awards

University of York Vice-Chancellor's 2007 Teaching Award.

Part B: Research and Scholarship

Research Summary

My research has developed over the last two and a half decades around the theoretical and applied aspects of three main themes, (1) Computational Linguistics (CL) and Natural Language Processing (NLP), (2) Machine Learning (ML), and (3) Multi-agent Systems (MAS).

My work on Computational Linguistics and NLP and information retrieval has contributed to the field through the development of ML approaches that can produce NLP theories from unannotated data (plain text), and therefore make it possible to model languages (e.g. word morphology) without the need for explicit rules or annotated corpora (Kazakov and Manandhar, 2001). My research on cross-language information retrieval has looked into the construction of optimal features for document clustering and compared the results that clustering would produce for sets of identical documents in different languages (Rayner *et al*, 2007). Further use of multi-lingual parallel corpora was made in a novel dual-purpose approach that develops linguistic resources in the form of multilingual lexicons of words and phrases, which then can be used to remove some of the ambiguity from any of the given translations (Shahid and Kazakov, 2013). Research in this area also includes the use of heterogeneous data, integrating real-valued and categorical time series with text data from news portals (Yahoo Finance) (Qu and Kazakov, 2016; 2019) and social media, such as Twitter (Qu et al, 2016).

Other work with time series (in the context of financial forecasting) includes acquiring predictive models through the use of artificial neural networks, genetic algorithms, artificial immune systems, particle swarms, ensemble approaches (meta-learning) (Butler and Kazakov, 2010-2012), and equation discovery (Kazakov and Tsenova, 2009), (Alzaidi and Kazakov, 2011), (Georgiev and Kazakov, 2015).

Much of my research in the area of machine learning has centred on learning from multi-relational data through the development and application of novel Inductive Logic Programming (ILP) algorithms (Kazakov, Pulman and Muggleton, 1998), (Kazakov and Manandhar, 2001), and methods for feature construction, data summarisation and optimal discretisation (Rayner and Kazakov, 2006; 2007), (Butler and Kazakov, 2014). I have applied these ML approaches to data ranging from text to biochemical data sets (e.g. on carcinogenesis), and to the analysis of computer programs (Kazakov and Bate, 2006; 2008). The latter application also required the use of statistical ML in the form of Bayesian networks (Bartlett *et al*, 2011). At present, I am actively engaged in the development of tools for multi-relational learning from linked data (Web ontologies) (Qomariyah and Kazakov, 2017a–d), and scaling them up through the use of novel, GPU-powered concurrent algorithms (Algahtani and Kazakov, 2018; 2019).

I have used multi-agent based computer simulations to study the role of kin selection and navigation in the evolution of language, with results supporting a novel model of proto-syntax as a precursor of modern language (Turner and Kazakov, 2002), (Kazakov and Bartlett, 2002–2014). My work on using ML to analyse evolving cellular automata (Kazakov and Sweet, 2004) also demonstrates a proficiency with modelling complex spatially distributed phenomena and gaining understanging of the interaction between the level of individual agents and that of the whole system where emergent, unexpected behaviour may be observed.

Collaboration with the Centre for Linguistic History and Diversity in the department of Language and Linguistics at the University of York on the analysis of geographic, genetic and linguistic data about European and Asian populations has produced integrated models of the spread of genes, languages and other cultural phenomena in these geographic areas (Longobardi *et al*, 2016).

I have published over 120 peer-reviewed research articles and was the PI or CI on research projects with budgets totalling over £550K, with more than £15K of additional funding allocated for undergraduate and graduate teaching. I have supervised 8 PhD students and co-supervised another to completion. At present, I advise 5 PhD students. I have given a number of tutorials and invited talks at conferences, graduate summer schools and various academic and professional institutions, and chaired 4 research symposia, as well as the entire AISB convention in 2011, and the ILP conference in 2019. I have also been a committee member and Vice-Chair of the UK Society for the study of Artificial Intelligence and Simulation of Behaviour (AISB), the oldest AI society in the world.

B1: Publications

Edited books

D. Kazakov and C. Erten (Eds.) Proc. of the 29th Intl Conf. ILP 2019. 3-5 Sep 2019. Lecture Notes in Artificial Intelligence (LNAI) vol. 11770, Springer Nature, Switzerland. ISBN 978-3-030-49209-0.

Simon O'Keefe, Dimitar Kazakov and George Tsoulas (Eds). Proc. of the Symposium on Active Vision, AISB'11 Convention, York, United Kingdom. The UK Society for the Study of Artificial Intelligence and Simulation of Behaviour, 2011.

Daniela M. Romano, David C. Moffat, Dimitar Kazakov and George Tsoulas (Eds). Proc. of the Symposium on AI and Games, AISB'11 Convention, York, United Kingdom. The UK Society for the Study of Artificial Intelligence and Simulation of Behaviour, 2011.

Frank Guerin, John Alexander, Philip Quinlan, Dimitar Kazakov and George Tsoulas (Eds). Proc. of the Symposium on Computational Models of Cognitive Development, AISB'11 Convention, York, United Kingdom. The UK Society for the Study of Artificial Intelligence and Simulation of Behaviour, 2011.

Mark Bishop, Kevin Magill, Steve Russ, Yasemin J. Erden, Dimitar Kazakov and George Tsoulas (Eds). Proc. of the Symposium on Computing and Philosophy, AISB'11 Convention, York, United Kingdom. The UK Society for the Study of Artificial Intelligence and Simulation of Behaviour, 2011.

Wan Ching Ho, Mei Yii Lim and Cyril Brom, Dimitar Kazakov and George Tsoulas (Eds). Proc. of the Symposium on Human Memory for Artificial Agents, AISB'11 Convention, York, United Kingdom. The UK Society for the Study of Artificial Intelligence and Simulation of Behaviour, 2011.

Dimitar Kazakov, Preslav Nakov, Ahmad R. Shahid and George Tsoulas (Eds). Proc. of the Symposium on Learning Language Models from Multilingual Corpora, AISB'11 Convention, York, United Kingdom. The UK Society for the Study of Artificial Intelligence and Simulation of Behaviour, 2011.

Ron Chrisley, Rob Clowes, Steve Torrance, Dimitar Kazakov and George Tsoulas (Eds). Proc. of the Symposium on Machine Consciousness, AISB'11 Convention, York, United Kingdom. The UK Society for the Study of Artificial Intelligence and Simulation of Behaviour, 2011.

Matthias Mailliard, Clara Smith, Frédéric Amblard, Samuel Thiriot, Dimitar Kazakov and George Tsoulas (Eds). Proc. of the Symposium on Social Networks and Multiagent Systems, AISB'11 Convention, York, United Kingdom. The UK Society for the Study of Artificial Intelligence and Simulation of Behaviour, 2011.

Aladdin Ayesh, Mark Bishop, John Barnden, Dimitar Kazakov and George Tsoulas (Eds). Proc. of the Symposium on Towards a Comprehensive Intelligence Test, AISB'11 Convention, York, United Kingdom. The UK Society for the Study of Artificial Intelligence and Simulation of Behaviour, 2011.

D. Kudenko, D. Kazakov and E. Alonso (eds.). Adaptive Agents and Multi-Agent Systems II. Lecture Notes in Artificial Intelligence (LNAI) vol. 3394, Springer-Verlag, Berlin Heidelberg, 2005. ISBN 3-540-25260-6.

D. Kudenko, D. Kazakov and E. Alonso (eds). Proceedings of the AISB'04 Symposium on Adaptive Agents and Multi-Agent Systems (AAMAS-4). University of Leeds, Leeds, UK, 29 March – 1 April 2004.

E. Alonso, D. Kudenko and D. Kazakov (eds). Adaptive Agents and Multi-Agent Systems. Lecture Notes in Artificial Intelligence (LNAI), vol. 2636, Springer-Verlag, 2003. 322 pages, ISBN 3-540-

40068-0.

D. Kazakov, D. Kudenko and E. Alonso (eds). Proceedings of the AISB'03 Symposium on Adaptive Agents and Multi-Agent Systems (AAMAS-3). University of Aberystwyth, Wales, 10-11 April 2003.

E. Alonso, D. Kudenko and D. Kazakov (eds). Proceedings of the AISB'02 Symposium on Adaptive Agents and Multi-Agent Systems (AAMAS-2). Imperial College, London, 3-5 April 2002. ISBN 1-902956-28-0.

Technical Reports

Dimitar Kazakov, James Cussens, and Suresh Manandhar. On the duality of semantics and syntax: The PP attachment case. Department of Computer Science, University of York, UK. Technical report YCS 409, 2006.

K. Simov, D. Kazakov and P. Osenova (eds). Proceedings of the Workshop on Exploring Syntactically Annotated Corpora (held in conjunction with the Corpus Linguistics 2005 conference, University of Birmingham, 14–17 July 2005). Department of Computer Science, University of York, UK. Technical report YCS 392, 2005.

D. Kazakov. *Evolutionary Algorithms with Extended Fitness*. Department of Computer Science, University of York, UK. Technical report YCS 370, 2004.
Dimitar Kazakov, Steve Pulman, and Stephen Muggleton. The FraCaS dataset and the LLL challenge. ILP2 project paper/SRI Cambridge technical report, July 1998.

Kazakov, D. Genetic Algorithms and MDL Bias for Word Segmentation. Technical Report GL 38/97, The Gerstner Laboratory for Intelligent Decision Making, Czech Technical University, Prague, 1997.

Dimitar Kazakov, Libor Jelínek, Karel Malý, and Olga Štěpánková. Man-robot natural language interaction project—a year later. Technical report GLC 07-97 (in Czech), The Gerstner Laboratory for Intelligent Decision Making, CTU, Prague, 1997.

Libor Jelínek and Dimitar Kazakov. Man-robot natural language interaction. Technical Report GL9/96, The Gerstner Laboratory for Intelligent Decision Making, Czech Technical University, Prague, 1996.

Book Chapters

M. Bartlett and D. Kazakov. *Comparing Resource Sharing with Information Exchange in Co-operative Agents, and the Role of Environment Structure*. In D. Kudenko, D. Kazakov, E. Alonso (eds.). Adaptive Agents and Multi-Agent Systems II. Lecture Notes in Artificial Intelligence (LNAI) vol. 3394, pp.41–54, Springer-Verlag, Berlin Heidelberg, 2005. ISBN 3-540-25260-6.

D. Kazakov and M. Sweet. *Evolving the Game of Life*. In D. Kudenko, D. Kazakov, E. Alonso (eds.). Adaptive Agents and Multi-Agent Systems II. Lecture Notes in Artificial Intelligence (LNAI) vol. 3394, pp.132–146, Springer–Verlag, Berlin Heidelberg, 2005. ISBN 3-540-25260-6.

D. Kazakov and M. Bartlett. *Social Learning through Evolution of Language*. Artificial Evolution. 6th International Conference, Evolution Artificielle, EA 2003, Marseilles, France, October 27-30, 2003. Series: Lecture Notes in Computer Science, Vol. 2936. Liardet, P.; Collet, P.; Fonlupt, C.; Lutton, E.; Schoenauer, M. (Eds.) 2004, XIV, 410 p. ISBN: 3-540-21523-9.

H. Turner and D. Kazakov. Stochastic Simulation of Inherited Kinship-Driven Altruism. In E. Alonso, D. Kudenko and D. Kazakov (eds). *Adaptive Agents and Multi-Agent Systems*. Series LNAI, vol. 2636, Springer, 2003. ISBN 3-540-40068-0.

D. Kudenko, D. Kazakov and E. Alonso. Chapter Machine Learning for Agents and Multi-Agent Systems, pp.1–12. In V. Plekhanova (ed.): *Intelligent Agent Software Engineering*. Idea Group Publishing, London, 2002. ISBN 1-59140-046-5.

Dimitar Kazakov and Daniel Kudenko. Machine Learning and Inductive Logic Programming for Multi-Agent Systems. In M. Luck *et al*, editors, *Multi-Agent Systems and Applications*, volume 2086 of LNAI, pp. 246–270. Springer, 2001.

Ljupčo Todorovski, Irene Weber, Nada Lavrač, Olga Štěpánková, Sašo Džeroski, Dimitar Kazakov, Darko Zupanič and Peter Flach. Internet Resources on ILP for KDD. In *Relational Data Mining*, pp. 375–388. Springer, Berlin, 2001.

Dimitar Kazakov. Achievements and Prospects of Learning Word Morphology with Inductive Logic Programming. An invited paper in James Cussens and Saso Dzeroski, editors, Learning Language in Logic, volume 1925 of LNAI, pp. 89–109. Springer, 2000.

Journal Articles

N. Qomariyah, D. Kazakov and A.N. Fajar. On the benefits of a logic-based approach to learning pairwise comparisons. *Bulletin of Electrical Engineering and Informatics*. **9**(6), 12p. Accepted: 2 March 2020. In press. Preprint: http://eprints.whiterose.ac.uk/160798/1/iaesarticle.pdf

M. Butler and D. Kazakov. SAX Discretization Does Not Guarantee Equiprobable Symbols. *IEEE Transactions on Knowledge and Data Engineering*. **27**:4, pp. 1162–1166, 2014. https://ieeexplore.ieee.org/document/6990616

D. Kazakov and M. Bartlett. Evolutionary Pressures Promoting Complexity in Navigation and Communication. *Interaction Studies*, **14**:1, pp. 107–135. John Benjamins, 2013.

D. Kazakov. The Self-Cognisant Robot. *Cognitive Computation* **4**(3), Sept 2012.

M. Bartlett, I. Bate and D. Kazakov. Accurate Determination of Loop Iterations for Worst-Case Execution Time Analysis. *IEEE Transactions on Computers*, 59(11), pp. 1520-–1532, 2010.

A. R. Shahid and D. Kazakov. Retrieving Lexical Semantics from Multilingual Corpora, *Polibits* **5**:25-28, Jan–June 2010.

R. Alfred, E. Paskaleva, D. Kazakov, M. Bartlett, *et al*. Hierarchical Agglomerative Clustering for Cross-Language Information Retrieval. *International Journal of Translation*, **19**, 2007.

M. Bartlett and D. Kazakov. The Origins of Syntax: from Navigation to Language. *Connection Science* **17**(3–4), pp. 271–288, 2005.

D. Kazakov and M. Bartlett. Co-operative navigation and the faculty of language. *Applied Artificial Intelligence*, 18:885–901, 2004.

D. Kazakov and S. Dobnik. Inductive Learning of Lexical Semantics with Typed Unification Grammars. *Oxford Working Papers in Linguistics, Philology, and Phonetics*. Oxford University, 2003.

H. Turner and D. Kazakov. Stochastic Simulation of Inherited Kinship-Driven Altruism. *Journal of Artificial Intelligence and Simulation of Behaviour*, p. 183–196, **1**(2), 2002 (an extended version of the AAMAS-2 Symposium article).

Dimitar Kazakov and Suresh Manandhar. Unsupervised learning of word segmentation rules with genetic algorithms and inductive logic programming. *Machine Learning*, vol. 43, pages 121–162, 2001.

N. Lavrac, D. Zupanic, I. Weber, D. Kazakov, O. Stepankova, and S. Dzeroski. ILPNET repositories on WWW: Inductive Logic Programming Systems, Datasets and Bibliography. *AI Communications*, pp. 157–206, vol.9, No.4, 1996.

Refereed Conference Contributions

Eyad Algahtani and Dimitar Kazakov. *CONNER: A Concurrent ILP Learner in Description Logic*. Proc. of the 29^{th} Intl Conf. on Inductive Logic Programming, pp.1–15. Sep 2019, Plovdiv. Springer.

Mudita Sharma, Manuel Lopez Ibanez and Dimitar Kazakov. *Deep Reinforcement Learning based parameter control in Differential Evolution*. GECCO-2019: July 2019. Prague, Czech Republic.

Haizhou Qu and Dimitar Kazakov. *Detecting Causal Links between Financial News and Stocks*. IEEE Symposium on Computational Intelligence for Financial Engineering and Economics (CIFEr), May 2019, Shenzhen.

Mudita Sharma, Manuel Lopez Ibanez and Dimitar Kazakov. *Performance Assessment of Recursive Probability Matching for Adaptive Operator Selection in Differential Evolution*. 15th Intl Conf. on Parallel Problem Solving from Nature (PPSN 2018): 8-12 Sep 2018. Coimbra, Portugal.

Eyad Algahtani and Dimitar Kazakov. *GPU-Accelerated Hypothesis Cover Set Testing for Learning in Logic*. 28th International Conference on Inductive Logic Programming, 2-4 Sep 2018. Ferrara, Italy.

Dimitar Kazakov, Guido Cordoni, Eyaz Algahtani, Andrea Ceolin, Monica Irimia, Shin-Sook Kim, Dimitris Michelioudakis, Nina Radkevich, Cristina Guardiano and Giuseppe Longobardi. *Learning Implicational Models of Universal Grammar Parameters*. EVOLANG XII: 16–19 April 2018. Torun, Poland.

Nurul Qomariyah and Dimitar Kazakov. *Preference Learning from Multi-attribute Pairwise Comparisons: A Car Recommender Case Study*. 16th IEEE International Conference on Machine Learning and Applications (ICMLA 2017), Cancun, 18–21 December 2017.

Dimitar Kazakov, Guido Cordoni, Andrea Ceolin, Monica A. Irimia, Shin-Sook Kim, Dimitris Michelioudakis, Nina Radkevich, Christina Guardiano and Giuseppe Longobardi. *Machine Learning Models of Universal Grammar Parameter Dependencies*. RANLP 2017 Workshop on Knowledge Resources for the Socio-Economic Sciences and Humanities (KnowRSH). Sep 2017, Varna, Bulgaria.

Hani Elgabou and Dimitar Kazakov. *Building Dialectal Arabic Corpora*.The First Workshop on Human-Informed Translation and Interpreting Technology (HiT-IT), RANLP. Sep 2017, Varna, Bulgaria.

Nurul Qomariyah and Dimitar Kazakov. *Learning Binary Preference Relations: A Comparison of Logic-based and Statistical Approaches*. Joint Workshop on Interfaces and Human Decision Making for Recommender Systems. Como, Italy, Aug 2017.

Nurul Qomariyah and Dimitar Kazakov. *Learning from Ordinal Data with Inductive Logic Programming in Description Logic*. ILP-27, Sep 2017. Orléans, France.

M. Sharma and D. Kazakov. *Hybridisation of Artificial Bee Colony Algorithm on Four Classes of Real-valued Optimisation Functions*. GECCO (Genetic and Evolutionary Computation Conference) 2017

Student Workshop. July 2017, Berlin.

G. Longobardi, D. Michelioudakis, C. Guardiano, M. Irimia, N. Radkevich, S. Kim, G. Cordoni, A. Ceolin and D. Kazakov. *Syntactic theory and the science of (language) history*. The 46th Poznan Linguistic Meeting (PLM2016), Poznan, 15-17 Sep 2016.

A. Ceolin, C. Guardiano, M. Irimia, G. Longobardi, D. Michelioudakis, N. Radkevich, M. Bartlett, D. Kazakov, A. Brunelli, S. Ghirotto, A. Boattini, S. Sarno, D. Pettener, G. Barbujani and D. Luiselli. *Parametric history and population diversity*. 18th Diachronic Generative Syntax conference (DiGS 18). Ghent, Belgium, 29 June–1 July 2016.

H. Qu and D. Kazakov. *Quantifying Correlation between Financial News and Stocks*. IEEE Symposium on Computational Intelligence for Financial Engineering and Economics (CIFEr), Dec 2016, Athens.

H. Qu, M. Sardelich, N. N. Qomariyah and D. Kazakov. *Integrating Time Series with Social Media Data in an Ontology for the Modelling of Extreme Financial Events*. Joint Second Workshop on Language and Ontology & Terminology and Knowledge Structures. Portorož, Slovenia, 23 May 2016.

Z. Georgiev and D. Kazakov. *Learning Ordinary Differential Equations for Macroeconomic Modelling*. IEEE Symposium on Computational Intelligence for Financial Engineering and Economics (CIFEr), Dec 2015, Cape Town.

D. Kazakov and M. Bartlett. *Evolutionary paths to compositional language*. Proc. of the 10th International Conference on the Evolution of Language (EVOLANG X), p. 461–462, Vienna, Austria, 2014.

A.R. Shahid and D. Kazakov. *Using parallel corpora for word sense disambiguation*. RANLP-13, Hissar, Bulgaria, 2013.

A. Alzaidi and D. Kazakov. Earn more, Stay legal: Novel Multi-agent Support for Islamic Banking. Proc. of the 10th International Conference on Practical Applications of Agents and Multi-Agent Systems (PAAMS 2012). Salamanca, Spain, 2012.

M. Butler and D. Kazakov. *A Learning Adaptive Bollinger Band System*. Proceedings of IEEE Computational Intelligence for Financial Engineering and Economics (CIFEr). New York, 2012.

M. Butler and D. Kazakov. *Testing Implications of the Adaptive Market Hypothesis via Computational Intelligence*. Proceedings of IEEE Computational Intelligence for Financial Engineering and Economics (CIFEr). New York, 2012.

A. R. Shahid and D. Kazakov. *Using Multilingual Corpora to Extract Semantic Information*. In Proc. of the Symposium on Learning Language Models from Multilingual Corpora, AISB'11 Convention, York, United Kingdom. The UK Society for the Study of Artificial Intelligence and Simulation of Behaviour, 2011.

M. Bartlett, I. Bate, J. Cussens, D. Kazakov. *Probabilistic Instruction Cache Analysis using Bayesian Networks*. In Proceedings of the 17th IEEE International Conference on Embedded and Real-Time Computing Systems and Applications (RTCSA 2011), 2011.

A. Alzaidi and D. Kazakov. *Equation Discovery for Financial Forecasting in the Context of Islamic Banking*. In the Proceedings of The Eleventh IASTED International Conference on Artificial Intelligence and Applications (AIA 2011). Innsbruck, Austria, 2011.

M. Butler and D. Kazakov. *The Effects of Variable Stationarity in a Financial Time-Series on Artificial Neural Networks*. In Proceedings of IEEE CIFEr 2011, Paris, France, 2011.

M. Butler and D. Kazakov. *Optimizing Bollinger Bands via Particle Swarm Optimization*. Proceedings of ANTS - 7th Intl Conference on Swarm Intelligence, Brussels, Belgium, September 2010.

M. Butler and D. Kazakov. *Modeling the Behaviour of the Stock Market with an Artificial Immune System*. Proceedings of IEEE CEC, Barcelona, Spain, July 2010.

D. Kazakov. *Interplay between Language, Navigation and Kin Selection*. The Eighth Conference on the Evolution of Language (EvoLang), Utrecht, the Netherlands, April 2010.

M. Bartlett, I. Bate and D. Kazakov. *Guaranteed Loop Bound Identification from Program Traces for WCET*. Proceedings of the 15th IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS), San Francisco, CA, United States, 2009.

D. Kazakov and Ahmad R. Shahid. *Unsupervised Construction of a Multilingual WordNet from Parallel Corpora*, Workshop on Natural Language Processing Methods and Corpora in Translation, Lexicography, and Language Learning, Borovets, Bulgaria, 17 Sept 2009.

D. Kazakov and G. Tsoulas. *Applying Recapitulation Theory to Language*. Conf. on Ways to Protolanguage: the initial stages of the evolution of the language faculty, Torun, Poland, 2009.

D. Kazakov. *Simulating the Benefits of Language*. Conf. on Ways to Protolanguage: the initial stages of the evolution of the language faculty, Torun, Poland, 2009.

Ahmad R. Shahid and Dimitar Kazakov. *Automatic Multilingual Lexicon Generation using Wikipedia as a Resource, International Conference on Agents and Artificial Intelligence*, January 2009, Porto, Portugal.

Dimitar Kazakov and Tsvetomira Tsenova. *Equation Discovery for Macroeconomic Modelling*, International Conference on Agents and Artificial Intelligence, January 2009, Porto, Portugal.

I. Bate, D. Kazakov. *New Directions in Worst-Case Execution Time Analysis.* IEEE Congress on Evolutionary Computation (IEEE CEC 2008), 2008, Hong Kong.

M. Bartlett, I. Bate, D. Kazakov. *Challenges in Relational Learning for Real-Time Systems Applications*. Proceedings of the 18^{th} International Conference on Inductive Logic Programming (ILP), Springer Lecture Notes in Computer Science vol. 5194, pp.42–58, 2008, Prague.

A. Alzaidi, Dimitar Kazakov. *Designing a Supply Chain Management Approach for Islamic Banking using Reinforcement Learning with Multi-Agents Technology*. The Saudi International Innovation Conference. 2008, Leeds.

R. Alfred, E. Paskaleva, D. Kazakov, M. Bartlett, *et al. Hierarchical Agglomerative Clustering of English-Bulgarian Parallel Corpora*. International Conference on Recent Advances in Natural Language Processing (RANLP), pp.24–29, 2007, Borovets, Bulgaria.

R. Alfred and D. Kazakov. *Clustering Approach to Generalised Pattern Identification Based on Multi-Instanced Objects with DARA*. 11^{th} East-European Conference on Advances in Databases and Information Systems (ADBIS) Research Communications, 2007, Varna, Bulgaria.

R. Alfred and D. Kazakov. *Aggregating Multiple Instances in Relational Database Using Semi-*

Supervised Genetic Algorithm-Based Clustering Technique. 11^{th} East-European Conference on Advances in Databases and Information Systems (ADBIS) Research Communications, 2007, Varna, Bulgaria.

R. Alfred and D. Kazakov. *Discretisation Numbers for Multiple-Instances Problem in a Relational Database*. 11^{th} East-European Conference on Advances in Databases and Information Systems (ADBIS), pp.55–65, 2007, Varna, Bulgaria.

R. Alexander, D. Kazakov and T. Kelly. *System of Systems Hazard Analysis using Simulation and Machine Learning*. In Proceedings of the 25^{th} International Conference on Computer Safety, Reliability and Security SAFECOMP 2006, Published as LNCS volume by Springer, September 2006.

D. Kazakov and I. Bate. *Towards New Methods for Developing Real-Time Systems: Automatically Deriving Loop Bounds Using Machine Learning*. In Proc. of the 11^{th} IEEE International Conference on Emerging Technologies and Factory Automation (ETFA), 8p., 20–22 September 2006, Prague.

R. Alfred and D. Kazakov. *Data Summarisation Approach to Relational Domain Learning Based on Frequent Pattern to Support the Development of Decision Making*. In X. Li, O.R. Zaiane and Z. Li (eds.). The Proc. of the Second International Conference of Advanced Data Mining and Applications (ADMA). August 2006, Xi'An, China. LNAI 4093, pp.889–898.

D. Kazakov and I. Bate. *Learning Worst-Case Execution Time Loop Bounds with Inductive Logic Programming*. In S. Muggleton and R. Otero (eds.). Proc. of the 16^{th} International Conference on Inductive Logic Programming (short papers), pp.119–121, Santiago de Compostela, Spain, August 2006. Published by the University of La Coruña, ISBN 84-9749-206-4.

R. Alfred and D. Kazakov. *An Association-classification Hybrid Rule Learning Approach to Relational Data Mining*. The 2006 International Conference on Artificial Intelligence (ICAI'06). 26–29 June 2006, Las Vegas.

R. Alfred and D. Kazakov. *Pattern-Based Transformation Approach to Relational Domain Learning Using DARA*. The 2006 International Conference on Data Mining (DMIN'06). 26–29 June 2006, Las Vegas.

E. Ridge, D. Kudenko and D. Kazakov. *A Study of Concurrency in the Ant Colony System Algorithm*. Annual IEEE Congress on Evolutionary Computation (CEC 2006), IEEE World Congress on Computational Intelligence, Vancouver, 16–21 July 2006.

M. Bartlett and D. Kazakov. *The evolution of syntactic capacity from navigational ability*. The Sixth Intl. Conference on the Evolution of Language (EvoLang 2006), pp 393–394, Rome, 12-15 April 2006.

H. Amini, D. Kazakov and E. Ridge. *Parallelism vs Communication Overhead Trade-off in a JADE Multi-Agent Implementation of Cellular Automata*. The First International Symposium onNature-Inspired Systems for Parallel, Asynchronous and Decentralised Environments (NISPADE), AISB convention proc., vol.3, pp 174–177, Bristol, 6 Apr 2006.

E. Ridge, D. Kudenko and D. Kazakov. Parallel, *Asynchronous and Decentralised Ant Colony System*. The First Intl Symp. on Nature-Inspired Systems for Parallel, Asynchronous and Decentralised Environments (NISPADE), AISB convention proceedings, vol.3, pp 146–149, Bristol, 6 April 2006.

D. Kazakov and M. Bartlett. *Could Navigation Be the Key to Language?* In the Proc. of the Second Symposium on the Emergence and Evolution of Linguistic Communication (EELC'05), pp. 50–55. 12–15 April 2005, Hatfield UK. Published by AISB, ISBN: 1 902956 40 9.

Thomas de Simone and Dimitar Kazakov. *Using WordNet Similarity and Antonymy Relations to Aid Document Retrieval*. Recent Advances in Natural Language Processing (RANLP 2005), 21–23 September 2005, Borovets, Bulgaria.

Enda Ridge, Daniel Kudenko, Dimitar Kazakov and Edward Curry. *Moving Nature-Inspired Algorithms to Parallel, Asynchronous and Decentralised Environments*. Proceedings of the International Conference on Self-Organization and Adaptation of Multi-agent and Grid Systems (SOAS 2005), 15 pages. University of Paisley, Glasgow, UK, 11–13 December 2005.

D. Kazakov and M. Sweet. *Evolving the Game of Life*. Proceedings of the Fourth Symposium on Adaptive Agents and Multi-Agent Systems (AAMAS-4), AISB convention, Leeds, 2004.

M. Bartlett and D. Kazakov. *The role of environment structure in multi-agent simulations of language evolution*. Proceedings of the Fourth Symposium on Adaptive Agents and Multi-Agent Systems (AAMAS-4), AISB convention, Leeds, 2004.

J. Sedding and D. Kazakov.*WordNet-based Text Document Clustering*. In Proc. of the Third Workshop on Robust Methods in Analysis of Natural Language Data (ROMAND), pp.104-113, Geneva, 2004.

D. Kazakov and M. Bartlett. *Social Learning through Evolution of Language*. In the Proceedings of the 6th International Conference on Artificial Evolution (EA'03), Université de Provence, France, 27–30 October 2003.

D. Kazakov and M. Bartlett. *A Multi-Agent Simulation of the Evolution of Language*. In Marko Grobelnik, Marko Bohanec, Dunja Mladenic and Matjaz Gams (eds): The Proc. of Information Society Conference IS'2002, p.39–41, Ljubljana, Slovenia, Josef Stefan Institute, October 2002. ISBN 961-6303-41-4.

H. Turner and D. Kazakov. *Stochastic Simulation of Inherited Kinship-Driven Altruism*. Proceedings of the AISB'02 Symposium on Adaptive and Multi-Agent Systems (AAMAS-2), p.60–66, Imperial College, London, 3–5 April 2002. ISBN 1-902956-28-0.

Dimitar Kazakov. Combining LAPIS and WordNet for the learning of LR parsers with optimal semantic constraints. In Sašo Džeroski and Peter Flach, editors, *The Ninth International Workshop ILP-99*, Bled, Slovenia, 1999. Springer-Verlag.

Dimitar Kazakov, Suresh Manandhar, and Tomaž Erjavec. Learning word segmentation rules for tag prediction. In Sašo Džeroski and Peter Flach, editors, *The Ninth International Workshop ILP-99*, Bled, Slovenia, 1999. Springer-Verlag.

Dimitar Kazakov and Suresh Manandhar. A hybrid approach to word segmentation. In David Page, editor, *The Eighth International Conference ILP-98*, pages 125–134, Madison, Wisconsin, USA, 1998. Springer-Verlag.

Libor Jelínek, Dimitar Kazakov, Karel Malý, and Olga Štěpánková. Speech support for robot control. In *Eighth International Symposium on Measurement and Control in Robotics*, pages 271–277, Prague, Czech Republic, June 1998.

Libor Jelínek and Dimitar Kazakov. A prototype of multi-level spoken language processing. In *The Seventh Czech-German Workshop on Speech Processing*, Prague, 1997.

Dimitar Kazakov. Unsupervised learning of naïvemorphology with genetic algorithms. In W. Daelemans, A. van den Bosch, and A. Weijters, editors, *Workshop Notes of the ECML/MLnet Workshop on Empirical Learning of Natural Language Processing Tasks*, pages 105–112, Prague, April 1997.

Dimitar Kazakov. An inductive approach to natural language parser design. In Kemal Oflazer and Harold Somers, editors, *Proc. of NeMLaP-2*, pages 209–217, Ankara, 1996. Bilkent University.

All Other Works

Mudita Sharma, Manuel López-Ibáñez and Dimitar Kazakov. Unified Framework for the Adaptive Operator Selection of Discrete Parameters, arXiv 2005.05613, 12 May 2020. https://arxiv.org/abs/2005.05613.

N. Qomariyah, D. Kazakov and H. Petrie. *Pairwise Comparisons in a Logic-Based Recommender System*, 4p. Late breaking abstracts, ILP 2019, Plovdiv. https://ilp2019.org/publications/

Fakher Raza and Dimitar Kazakov. *Using ILP to Detect Anomalies in Pipelines*, 4p. Late breaking abstracts, ILP 2019, Plovdiv. https://ilp2019.org/publications/

Can Erten, Eyad Algahtani, Ian Fairlamb, Eduardo Garcia-Padilla, Jason Lynam, Suresh Manandhar, John Slattery and Dimitar Kazakov. *Unsupervised Learning of Functional Groups for Computational Chemistry*, 4p. Late breaking abstracts, ILP 2019, Plovdiv. https://ilp2019.org/publications/

V. Sarangi, E. Algahtani, D. Kazakov and A. Pelah. *Explainable AI for Clinical Gait Analysis: Developing Diagnostics with Inductive Logic Programming*, 4p. Late breaking abstracts, ILP 2019, Plovdiv. https://ilp2019.org/publications/

D. Kazakov. *Self-reflective machine learning*. The Workshop on Grand Challenges for Computing Research, Panel D submission. Edinburgh, Nov 2002.

D. Kazakov and M. Bartlett. *A Multi-Agent Simulation of the Evolution of Language*. In Peter McBurney and Michael Wooldridge (eds.): Working Notes of UKMAS 2002, St Catherine's College, Oxford, Dec 2002. (extended abstract).

Dimitar Kazakov. Natural Language Processing Applications of Machine Learning. PhD thesis, Department of Cybernetics, Czech Technical University, Prague, 2000.

Dimitar Kazakov. Natural Language Communication Module. (Modul pro komunikaci v přirozeném jazyce.) (In Czech). Master's thesis, Czech Technical University, Prague, 1993.

Submissions under Review

Dimitar Kazakov, Guido Cordoni, Eyad Algahtani, Cristina Guardiano and Giuseppe Longobardi. Modelling Universal Grammar Parameters and Language Families for Historical Linguistics. *Interaction Studies*, Benjamin. Accepted subject to minor revisions.

Editorial Duties

Editor of Lecture Notes in Artificial Intelligence Series:

LNAI Springer, vol. 2636 (2003), 3394 (2005) and 11770 (2019) (see Part B: Edited Books).

Guest Editor for Special Journal Issues:

D. Kazakov and F. Zelezny (Editors). *Machine Learning*: Special Issue on ILP 2019. https://tinyurl.com/y7nqhkq9

E. Ridge, E. Curry, D. Kudenko and D. Kazakov (Editors). *Multi-Agent and Grid Systems (MAGS) Journal*: Special Issue on Nature-Inspired Systems for Parallel, Asynchronous and Decentralised Environments. **3**(1), 2007. http://www.cs.york.ac.uk/aig/nispade-mags.

Journal Reviewer:
Journal of Logic, Language and Information (JoLLI), Connection Science, International Journal of Approximate Reasoning (IJAR), Applied Artificial Intelligence (AAI), Journal of Natural Language Engineering (JNLE), Journal of Artificial Intelligence Research (JAIR), Frontiers in Neuroscience.

Programme Committee Member:
European Conference on Machine Learning (ECML) & Principles and Practice of Knowledge Discovery in Databases (PKDD) 2003–2005, 2010, Symposium on Adaptive Learning Agents and Multi-Agent Systems (ALAMAS) 2006–2007, 11^{th} Conference of the European Chapter of the Association for Computational Linguistics (EACL) 2006, Conference on Intelligent Text Processing and Computational Linguistics (CICLING) 2008, The International Conference on Recent Advances in Natural Language Processing (RANLP) 2011, 2013 and 2017.

B2: Research Funding

Machine Learning Approaches to Computational Chemistry
Dimitar Kazakov (PI), Suresh Manandhar, John Slattery, Jason Lynam and Ian Fairlamb. U. of York pump-priming fund. Duration: 1 March – 31 July 2019. Budget: £**14,200**.

e-Platform for Islamic Retail Banking
Principal Investigator, Early Stage Commercialisation Funding, University of York Enterprise and Innovation Office. Duration: Feb 2014–Sep 2015. Budget: **£19,200**.

The Centre for Language and Cultural Evolution: Organisational Workshop
Co-investigator, University of York Research and Innovation Office grant. Dates: 12–14 Feb 2015. Budget: **£12,500**.

Travel award to promote collaboration in Computation and Islamic Finance with Saudi Arabia, University of York Seedcorn Funding, 2012. Budget: **£1,660**.

Using Learning to Support the Development of Embedded Systems
Co-investigator in an EPSRC grant (with PI: Iain Bate, and Co-I John Clark (CS)). Duration: Oct 2007 – June 2011. Budget: **£362,230**.

From the referees' comments: *This project has a very strong team of investigators... This is one of the strongest software engineering research teams in the country...* (**Reviewer EPSRC reference: YD9NFQ**), *The team is ideal...* (**Reviewer EPSRC reference: 5QK6PB**).

Document Clustering for Cochrane Group Reviewing Support
Principal investigator in a Capacity Building Grant for Knowledge Transfer to Industry White Rose Research Triangle (HEIF). Duration: Dec 2005 – April 2007. Budget: **£39,740**. The industrial partner, INVU Plc, has made a contribution in kind (software licences for the University of York and University of Leeds) worth **£12,000**. June 2008: Additional **£2,000** provided by the University of York Enterprise and Innovation Office for the development of a commercial prototype.

Revision of Natural Language Grammars and Domain Theories using Inductive Logic Programming
Principal investigator from July 2001 on an EPSRC ROPA research grant. Duration: Jan 2001 – Sep 2002. Budget: **£95,000**.

Proposals under Review

D. Kazakov (PI), A. Pelah, Nico Surantha and N. Qomariyah. AI-based Telemedicine for COVID-19 Patients. Newton Institutional Links, British Council. Partner institution: Bina Nusantara University, Jakarta. Submitted on 12 June 2020. Duration: 22 Feb 2021 – 19 Oct 2022. Total budget: £**106,444**.

P. Tiffin (PI), L. Kim, D. Kazakov, I. Iakovides, F. Patterson (City), N. Guenole (Goldsmiths) and E. Morley (Work Psychology Group). Developing computational psychometric approaches to evaluating interpersonal judgment. ESRC Research Methods Development Grants (2020). Submitted on 12 June 2020. Duration: 1 March 2021 – 31 Aug 2022. Total budget: £**199,809**.

B3: Research Students

Completed PhDs

Mark Bartlett. Human Language as an Exaptation and the Origin of Syntax. PhD thesis, University of York, 2006.

Enda Ridge. Design of Experiments for the Tuning of Optimisation Algorithms. Co-supervision (with Daniel Kudenko). PhD thesis, University of York, 2007.

Rayner Alfred. A Data Summarisation Approach to Knowledge Discovery. PhD thesis, University of York, 2008.

Amer Alzaidi. Intelligent Agents for Islamic Banking. PhD thesis, University of York, 2011.

Ahmad Shahid. Extraction of Linguistic Resources from Multilingual Corpora and their Exploitation. PhD Thesis, University of York, 2012.

Matthew R. Butler. Computational Intelligence for Analysis Concerning Financial Modelling and the Adaptive Market Hypothesis. PhD thesis, University of York, 2012.

Haizhou Qu. Financial Forecasting with Time Series and News. PhD thesis, University of York, 2018.

Nunung Nurul Qomariyah. Machine Learning of Pairwise Preferences for Recommender Systems. 2018.

Mudita Sharma. Learning to Control Differential Evolution Operators. 2020.

Ongoing PhD Supervision

Hani Elgabou. Text Summarisation for Arabic. Start date: Oct 2015.

Noof Alfear. Automated Text Simplification. Start date: Feb 2017. (Distance, part-time.)

Can Erten. Automated Trading Research Analyst using Machine Learning. (Distance, part-time.) Start date: Oct 2018.

Fakher Raza. Machine Learning Models for Pipeline Anomaly Detection. (Part-time.) Start date: Oct 2018.

Viktor Ivanov. Safe Artificial Intelligence. (Distance, part-time.) Start date: 1 April 2019.

PhD Thesis Examinations

Lyndon Drake:	Internal PhD examiner.	University of York, 2005
Spiros Kapetanakis:	Internal PhD examiner.	University of York, 2005.
Thimal Jayasooriya:	Internal PhD examiner.	University of York, 2008.
Sebastian Spiegler:	External PhD examiner.	University of Bristol, 2011.
Waleed Alsanie:	Internal PhD examiner.	University of York, 2012.
Fabio Ruini:	External PhD examiner.	University of Plymouth, 2012.
Fang Liu:	External PhD examiner.	Brunel University, 2012.
T.C.M. Ralph Eastwood:	Internal PhD examiner.	University of York, 2016.
Hanna Béchara:	External PhD examiner.	U. of Wolverhampton, 2019.
Farhana Lisa:	External PhD examiner.	U. of Kent, 2019.
Sultan Alahmari:	Internal PhD examiner.	University of York, 2020.

B4: Other Research Activities and Distinctions

Conference Chair

Co-Chair, Symposium on Adaptive Agents and Multi-Agent Systems (AAMAS) (2002, 2003, 2004)

Co-Chair, Workshop on Exploring Syntactically Annotated Corpora (ESAC) (2005)

Convention Chair: AISB 2011. https://tinyurl.com/y8ja8rm2

Chair: The 29th International Conference on Inductive Logic Programming, 3-5 Sep 2019, Plovdiv, Bulgaria. https://ilp2019.org.

Visiting Research Posts and Buyouts

July — Sep 2018
A 25% buyout from the ERC Advanced Grant project LanGeLin: *Meeting Darwin's last challenge: toward a global tree of human languages and genes*. Grant holder: Prof. Giuseppe Longobardi, Department of Language and Linguistic Science, University of York.

July — Dec 2002
Visiting researcher at the Josef Stefan Institute, Ljubljana.

Sep 1995 — Feb 1996
Graduate research at Ecole Nationale Supérieure des Télécommunications – Paris. Supervisor: Dr Martin Rajman.

May — July 1994
Graduate research at II Universita di Roma Tor Vergata. Supervisor: Prof. M. T. Pazienza.

Invited Talks and Seminars

10 June 2020
The Decision and Cognitive Science Research Centre at Alliance Manchester Business School. *CONNER: A Concurrent Learner in Description Logic*. Recording: https://tinyurl.com/ycy5r5vf

13 Nov 2019
Department of Computer Science, University of York. *CONNER: A Concurrent Learner in Description Logic* (with E. Algahtani)

10 Oct 2018
Department of Computer Science, University of York. *A Computational Approach to Historical Linguistics* (with Giuseppe Longobardi)

8 June 2017
Workshop on Social Evolution, Keele University: *Evolutionary Pathways to Compositional Language*

21 Oct 2014
Qassim University, Buraydah, Kingdom of Saudi Arabia: *Natural Language Processing, Financial Forecasting and Islamic Banking*

22 Sep 2014
Qatar Computing Research Institute (QCRI), Doha, Qatar: *Natural Language Processing, Financial Forecasting and Islamic Banking*

June 2012
IBM–UoY CS Joint Research Seminar *Research Overview*

19 May 2012
Leeds Skeptics in the Pub talk: *Origins of Language and the Present Imperfect of Science*

24 June 2009
University of Wolverhampton: *Unsupervised Learning of Language*

10 Aug 2006
Bulgarian National Bank (BNB): *Machine Learning and Inductive Logic Programming*

24 March 2006
University of Essex: *Symbolic Learning of Natural Language*

9 Dec 2005
University of Wolverhampton: *Navigation: A Key to Language?*

17 July 2003
QinetiQ, Grand Malvern: *Machine Learning for Multi-Agent Systems*

2 June 2003
University of Oxford: *Evolving Social Behaviour and Language in a MAS*

21 Nov 2002
Josef Stefan Institute, Ljubljana: *Learning and Evolution in Multi-Agent Systems*

17 May 2002
University of Leeds: *Agents and Learning*

Part C: Teaching and the Promotion of Learning

Summary

The various aspects of my teaching include admission interviews (which combine elements of teaching and examination), undergraduate and master's level teaching, small group tutorials, supervision of final year undergraduate and master's projects, as well as the supervision of PhD students. In addition, I take part in outreach events, both in and outside the university, from numerous graduate summer schools, all the way down to sessions for primary schools.

In the course of the last 21 years, I have taught nine modules (Sect. C1), of which two, Symbolic Learning of Language (SLL) and Adaptive and Learning Agents (ALA), were an international first. The former module also provided material for a very successful ESSLLI Summer School course in 2004 (see Sect. C2 for evidence of teaching beyond my own university.) I have taken part in one national (UK) and one international network to exchange best practice in teaching, and inform it from research (Sect. C2).

My teaching creed is based on the idea that it should link material in all years of the programme, from admission to graduation, across all subjects, in a seamless way, and provide material to and feed the imagination of students interested in a graduate degree. Wherever possible, one should look for synergy between teaching, research, and even administrative tasks, such as outreach. One recent example is when my introductory lecture of the Y2 Artificial Intelligence module was opened to the public, with excellent feedback (see here for video and handout of lecture: `https://tinyurl.com/ybtnlyjp`).

Similarly, teaching and assessment should both feed into each other, combining a formative element with a way of gauging one's abilities. I believe students should be treated as individuals, whose personal issues are inseparable from the academic aspect of their work. Finally, I believe teaching is a two-way process, in which student contribution and feedback are essential elements.

Over the years, I have made a contribution to: (1) the overall management of teaching the introductory course on the Principles of Programming Languages (POP) through a portfolio (`https://www.cs.kent.ac.uk/people/staff/saf/dc/portfolios.html`) and systematic exchange of best practice on a national and international level through a HEA Disciplinary Commons network, and another one created to test ways of early detection of programming aptitude; (2) the use of innovative ways of supporting the learning process, including audio and video recordings and transcripts of lectures well before this became the norm. Furthermore, (3) the systematic way of designing open assessments (ALA) allowed the students best to show their abilities, and offered an optimal balance between the formative and summative aspects of the examination process (Kazakov 2006, `https://www-users.cs.york.ac.uk/~kazakov/papers/kazakov-ai-in-education-06.pdf`). I have published several peer-reviewed papers related to teaching (CV, Sect. C5).

Analysis of the results of one cohort of students showed that (4) my individual project supervisees achieve marks that are almost a class better than their average mark from Year 2, a difference, which stands out when compared to the rest of the cohort. I believe this is an indication of good teaching practice, and commitment from the lecturer, which allows the students to show their very best. This is also supported by the fact that I have published refereed research articles with a number of my individual project students, e.g. (Sedding and Kazakov 2005), which has 180+ citations. These articles were written and published after each project had been submitted, to avoid interference.

In my teaching, I have used assessments, as well as final year and summer projects, small group tutorials, and hands-on teaching to arouse the students' curiousity and inspire learning, with summer school teaching taking that beyond the university boundaries. My teaching draws on my research (SLL, ALA, but also LPA (Logic Programming and AI) and IPL/LSA (Compilers), which were closely linked to my PhD), personal teaching experience and available evidence (SLL, ALA, POP, projects) and/or best practice in the field (POP: Disciplinary Commons, Testing Programming Aptitude).The latter two projects have also provided support for student learning on an international level, well beyond my institution. Finally, my continuous review of teaching, e.g. through reflecting on my teaching portfolio (`https://www.cs.kent.ac.uk/people/staff/saf/dc/retrospective/dkazakov-story.swf`) and ALA assignment analysis have resulted in improvements in my teaching

practice, as witnessed in students' examination marks and feedback.

Over the years, I have developed a successful proposal for a new undergraduate programme, MEng in Computer Science with AI, and initiated and represented my university in the work on a proposal for a new, joint PhD degree between the University of York and a major technical university in Mexico, IPN. I chaired the remodularisation process of all departmental teaching related to Artificial Intelligence, served as Chair of DTC , and as a member of the University Science and Society Group, and, finally, acted as a committee member and Vice-Chair of a major UK learned society, SSAISB (`www.aisb.org.uk`).

I am a recepient of the University of York Vice-Chancellor's 2007 Teaching Award. This award recognises excellence in teaching. More specifically, the citation reads: *" The selection panel commended in particular your thoughful approach to assessment, and your engagement with the wider teaching community at a national level."* The award was one of 11 granted in that year. In May 2017, I was nominated by students for the UoY Students' Union Excellence Award in the PhD Research Supervisor of the Year category.

I am Fellow of the Higher Education Academy (`https://www.heacademy.ac.uk/`), and, having taken part in the pilot programme for Research Supervision Recognition of the UK Council for Graduate Education (`http://ukcge.ac.uk`), am currently finalising a portfolio for submission.

C1: Teaching undertaken

Past teaching

Implementation of Programming Languages (Y2/UG)
A second-year, 20-credit core module (100+ students) taught jointly with another lecturer. Period: 1999/2000 – 2001/02.

Logic Programming and Artificial Intelligence (Y2/UG)
A new, second-year, 20-credit core module (100+ students) taught jointly with another lecturer. Years: 2000/01, 2009/10.

Symbolic Learning of Natural Language (Y3/UG)
A new, optional, third-year, 10-credit module. Period: 2000/01 – 2001/02.

Lexical and Syntax Analysis (Y2/UG)
A second-year, 10-credit core module (100+ students) taught jointly with another lecturer in 2002/03 and 2003/04.

Principles of Programming (Y1/UG)
A 10-credit, first-year core module. Period: 2004/05 – 2010/11.

Principles of Programming Languages (Y2/UG)
Half of a 20-credit, second-year core module (all non-concurrent programming paradigms). Period: 2015/16 – 2018/19.

Adaptive and Learning Agents (Y4/MEng, MSc)
An original, optional, fourth-year (MEng), 10-credit module also made available to students on the MSc in Natural Computation and the Advanced Computer Science MSc. Period: 2003/04 – 2019/20.

This was a new Master's level module without close analogues at the time of its conception. The hands-on curriculum has been informed by my close involvement with the AAMAS series of symposia, and the publication of two eponymous edited volumes in the LNAI Springer series). A substantial systematic effort was put in the design of the module open-book assessments in order to offer an exciting and useful formative experience to students together with an appropriate range and distribution of marks. The findings have been published as:

D. Kazakov. Open Book Examinations in AI Teaching: A Case Study. In the 2^{nd} UK WS on AI in Education, http://www.cs.york.ac.uk/~kazakov/papers/kazakov-ai-in-education-06.pdf), Cambridge, 11 Dec 2006.

Introduction to Artificial Intelligence (Y2/UG)
A new, core, 20-credit module taught jointly with 2 other lecturers. The module introduced the field of artificial intelligence and studied the principal ideas and techniques in three core areas: problem solving (search, problem representation), knowledge representation (Logic, semantic ontologies) and machine learning (learning in logic & statistical approaches). Over the years, I have taught material corresponding to all three sections. Period: 2011/12-2019/20.

First year tutorials (*aka* SKIL) (Y1/UG)
A year-long series of weekly small-group tutorials. Period: 1999/00 – 2018/2019.

Current teaching

Software 2 (Y1/UG)
The Theory half of a 20-credit, Y1 core module on algorithms and data structures. Since 2019/20.

Fundamentals of Machine Learning (Y3/UG) A 10-credit module aiming to teach the main theories and techniques of statistical machine learning. The objectives are to understand basic probability theory, know how to apply Bayesian inference to a problem, and learn techniques for learning models from data. From: Autumn 2020. Module preparations under way.

Individual Project Supervision (Y3/UG, Y4/MEng, MSc)
A 40-80 credit, final-year undergraduate or Master's core module. Since 1999/00 – present.

My undergraduate and Master's project supervision has produced a number of peer-reviewed publications with my students, e.g. (Turner & Kazakov 2002), (Kazakov & Sweet 2004), (Sedding & Kazakov 2004) (with over 180 citations to date), (Simone & Kazakov 2005), (Georgiev & Kazakov 2015).

C2: Wider involvement in the community

Dissemination of best practice

All publications but one in Sect. C5 are examples of dissemination of best practice through teaching conferences. The penultimate item is a portfolio first discussed and presented at a series of seminars held in London between Oct 2005 and June 2006 as part of a HEA network, *Disciplinary Commons in Computing Education* (see below).

Teaching and learning collaborations

Disciplinary Commons in Computing Education: Oct 2005–June 2006. UK-wide HEA project, http://www.cs.kent.ac.uk/people/staff/saf/dc/portfolios.html, coordinator: Sally Fincher (Kent) (NTFS Fellow).

Participants: James Bown (Abertay Dundee), Mark Ratcliffe (Aberystwyth), Pete Bibby (Bolton), Michael Jones (Bournemouth), Thomas Lancaster (Central England), Stephan Jamieson (Durham), Quintin Cutts (Glasgow), Vicky Bush (Gloucestershire), David Barnes (Kent), Tony Jenkins (Leeds), Dermot Shinners-Kennedy (Limerick), Phil Campbell (London South Bank), Monika Seisenberger

(Swansea), Chris Whyley (Swansea), Linda White (Sunderland), Dimitar Kazakov (York).

As part of a High Education Academy project, Disciplinary Commons in Computing Education (Oct 2005 – June 2006), aiming to bring together UK academics teaching introductory programming, I met a group of some 20 colleagues on a monthly basis for a year. The group was headed by a 2005 NTFS Fellow, Sally Fincher, and included academics in policy making roles, such as the Director of Teaching in CS at Aberystwyth, and considerable teaching experience (more than 20 years in several cases). I also took part in mutual visits to observe each other's teaching, and compiled a portfolio of documents about each of the aspects of teaching POP (departmental context, module content, instructional design, assignments, marking, etc.). These materials help the process of self-reflection and analysis, but can also be of particular interest to a new member of staff, who is not familiar with our overall course content, type of students, and teaching style. The public part of my portfolio is published on the Commons Web site `http://www.cs.kent.ac.uk/people/staff/saf/dc/portfolios.html` in order to:

- "document and share knowledge about teaching and student learning on introductory programming courses in the UK."
- "establish practices for the scholarship of teaching by making it public, peer-reviewed, and amenable for future use and development by other educators: creating a teaching-appropriate document of practice equivalent to the research-appropriate journal paper."

This was an attempt without analogue in the UK, which had an impact on teaching introductory programming beyond its boundaries, as it ran in parallel with a similar initiative in the United States. My participation in the project resulted in the publications listed as No 1, 2 and 4 in Sect. C5.

The Programming Commons initiative has generated a number of other publications (http://www.cs.kent.ac.uk/people/saf/dc/meta-presentations), which highlights its substantial impact.

Testing Programming Aptitude: 2006–2007. Coordinator: Saeed Dehnadi (Middlesex).

Partners: Stuart Wray, Royal School of Signals in Blandford (associated institution of Bournemouth University), Steve Easterbrook, University of Toronto, Dave Donnellan and Charlie Daly, School of Computing in DCU, Dublin, Lee Mark and Barney Dalgarno, Charles Stuart University, NSW, Australia, Sunam Pradhan, University of Ballarat, Victoria, Australia, Aidan Delaney, University of Brighton, Keith Lander, Department of Science Teaching, The Weizmann Institute of Science, Israel, Kathleen Weaver, Dallas Independent School District, Dallas,Texas, Dimitar Kazakov, University of York, UK.

This collaboration tested the hypothesis that a simple test can be used to predict success in programming courses *before they start*, see: S. Dehnadi, *Testing Programming Aptitude*, PPIG Annual conference, September 2006, Brighton.

The proposed test was hoped to identify students who are expected to encounter difficulties, which would allow the lecturer to provide additional support *before* they start falling behind. The test was offered to the 2006/07 Y1 intake. The 100+ tests were (anonymously) evaluated by the test's designer, S. Dehnadi (School of Computing, Middlesex University). *There was a substantial positive correlation between failing the test, and failing POP* (or dropping out of the course prior to the assessments). However, the number of students concerned was too low to draw strong conclusions. The full details of this research form part of S. Dehnadi's PhD thesis.

Generating a Multilingual Lexicon of CS Terms: 2007–2008.
Results from joint research with a PhD student, A. Shahid, were used to *support non-native speakers' familiarisation with the Computer Science terminology*. A multilingual dictionary of CS terms in

30+ languages was automatically extracted from Web resources (Wikipedia), and made available to students on the Inernet in the form of an easily printable table. The idea and results have been published at an HEA workshop:

Dimitar Kazakov and Ahmad R. Shahid. *Extracting Multilingual Dictionaries for the Teaching of CS and AI*. The 4th UK Workshop on AI in Education, 9 Dec 2008, Cambridge. URL: http://www-users.cs.york.ac.uk/~kazakov/my-publications.html.

Teaching beyond the institution

6 Sep 2019
ILP 2019 Tutorial: ILP Tools for Learning in Description Logic (DL-Learner, CONNER). Plovdiv, Bulgaria. (Eyad Algahtani and Dimitar Kazakov.) https://ilp2019.org/tutorials/

March 2015
Workshop on The New Historical Linguistics and the World of Annotated Corpora. Keynote lecture: *Learning word morphology and lexical semantics from unannotated corpora*. University of Campinas, Brazil. http://www.york.ac.uk/language/research/centres/clhd/nhlwac/.

Sept 2007
Recent Advances in Natural Language Processing (RANLP): Invited graduate-level tutorial on Information Retrieval (Borovets, Bulgaria), http://lml.bas.bg/ranlp2007/tutorials.htm#IR.

Sept 2006
Spatial Cognition 2006 1/2 day tutorial on Navigation, Cooperation and Language (Bremen).
http://www.cs.york.ac.uk/~kazakov/SpatialCognition-06/NavCoopLangTut.html

July 2004
ESSLLI Summer School 1-week Tutorial on Symbolic Learning of Natural Language (in Nancy, jointly with James Cussens). A reader is available through the ESSLLI 2004 Web site: http://esslli2004.loria.fr/.

July 2002
ECAI Summer School 1/2 day tutorial on Machine Learning for Agents and Multi-Agent Systems (in Lyon, jointly with D. Kudenko.)

July 2001
Dimitar Kazakov and Daniel Kudenko. Machine Learning and Inductive Logic Programming for Multi-Agent Systems. An invited 1/2 day lecture at The Third European Agent Systems Summer School in Prague (part of ACAI-01). http://www-users.cs.york.ac.uk/~kazakov/papers/acai01.htm.

The academic content of the Outreach Officer administrative role (see Sect. D1) was also within the remit of this aspect of my teaching.

C3: Teaching bids, awards, and other distinctions

Awards

Recepient of the **University of York Vice-Chancellor's 2007 Teaching Award**. This award recognises excellence in teaching, in particular: *" The selection panel commended in particular your thoughful approach to assessment, and your engagement with the wider teaching community at a national level."* The award, of the value of £1,000, was to support the development of one's professional interests, and was one of 11 granted in 2007.

Funding for Teaching

On several occasions, I have assisted first year students to apply for industry-funded Summer internships, and supervised them in the department. Between 2000 and 2001, there were 3 such students who received a £3000 grant and a laptop each from Microsoft, followed by a number of paid-for conference participations, furthering their professional orientation:

Alife 2D Environment
Undergraduate Research Project funded by Microsoft. Duration: July–Sept 2000. Student appointed: Lee Mallabone. Budget: £3000 + contribution in kind (laptop).

Learning Agents for Robotic Football
Undergraduate Research Projects funded by Microsoft. Duration: July–Sept 2001. Students appointed: Judith Gedye and Henry Robinson. Budget: £3000 + contribution in kind (laptop) per student.

York-Robocup
A joint project with Daniel Kudenko and Guillem Bernat funded by the University of York Innovation and Research Priming Fund. Duration: July 2001 – June 2002. Budget: £4000.

Bulgarian IST Centre of Competence in the 21^{st} Century (BIS-21++)
Duration: Summer of 2006, Summer of 2007. I was a named partner on this EU project (FP6-2004-ACC-SSA-2). As a result, the York CS Department has benefitted from 3000 EUR allocated to my graduate student R. Alfred for graduate training, which took place on the premises of the grant holder, the Institute for Parallel Processing at the Bulgarian Academy of Sciences (IPP–BAS), Sofia.

C4: Continuing professional development and reflective practice

The main relevant events/courses/projects in which I have participated are as follows:

- Oct 1999—Oct 2001: The York Certificate of Academic Practice (YCAP).
- Oct 2005—June 2006: The Disciplinary Commons in Computing Education (see above).
- 29 April 2019: Fellow of the Higher Education Academy (FHEA).
- In 2019, I took part in the pilot programme for Research Supervision Recognition of the UK Council for Graduate Education (http://ukcge.ac.uk), and am currently finalising a portfolio for submission.

C5: Publications on teaching

Sally Fincher, David Barnes, Peter Bibby, Jim Bown, Vicky Bush, Phil Campbell, Quintin Cutts, Stephan Jamieson, Tony Jenkins, Michael Jones, Dimitar Kazakov, Thomas Lancaster, Mark Ratcliffe, Monika Seisenberger, Dermot Shinner-Kennedy, Carole Wagstaff, Linda White, and Chris Whyley. *Some Good Ideas from the Disciplinary Commons*. The Higher Education Academy 7^{th} Annual Conference. 29–31 August 2006, Trinity College, Dublin. http://www.disciplinarycommons.org/some-good-ideas.doc

Quintin Cutts, Sally Fincher, David Barnes, Peter Bibby, Jim Bown, Vicky Bush, Phil Campbell, Stephan Jamieson, Tony Jenkins, Michael Jones, Dimitar Kazakov, Thomas Lancaster, Mark Ratcliffe, Monika Seisenberger, Dermot Shinner-Kennedy, Carole Wagstaff, Linda White, and Chris Whyley. *Laboratory Exams in First Programming Courses*. The Higher Education Academy 7^{th} Annual Conference. 29–31 August 2006, Trinity College, Dublin.

D. Kazakov. *Open Book Examinations in AI Teaching: A Case Study*. In the 2^{nd} UK WS on AI in Education, http://www.cs.york.ac.uk/~kazakov/papers/kazakov-ai-in-education-06.pdf Cambridge, 11

Dec 2006.

D. Kazakov. *Introduction to Programming Commons Portfolio*. June 2006, Disciplinary Commons in Computing Education. http://www.cs.kent.ac.uk/people/staff/saf/dc/portfolios.html.

Dimitar Kazakov and Ahmad R. Shahid. *Extracting Multilingual Dictionaries for the Teaching of CS and AI*. The 4th UK Workshop on AI in Education, 9 Dec 2008, Cambridge. URL: http://www-users.cs.york.ac.uk/~kazakov/my-publications.html.

Part D: Administration, Leadership and Management

D1: Departmental Administrative Posts

Artificial Intelligence Group Co-ordinator

Duration: since Dec 2019

Departmental Research Seminar Organiser

Duration: since Oct 2018

Chair of the Departmental Teaching Committee

Duration: 2011/12–2014/15
I oversaw the implementation of a major restructuring (remodularisation) of all undergraduate teaching in this period.

Establishing New Undergraduate and Graduate Programmes

I was the sole departmental member of staff responsible for the approval of two new programmes, (1) a four-year, undergraduate MEng in Computer Science with Artificial Intelligence (CSwithAI), and, (2) a joint PhD in Computer Science between the CS Deparment of the University of York, and Instituto Politécnico Nacional (IPN, the National Polytechnic Institute) of Mexico City. In the latter case, a full proposal was approved by the University of York, which was later used to inform a university-wide joint degree format. Ultimately, the approval procedure of the specific PhD programme was never completed by the partner university due to rotation of personnel.

Project Allocation

Duration: Feb 2000—Oct 2007.

A major role, spanning most of the year, and involving coordination of 40+ academic supervisors (and up to 270 project proposals), over 150 students, and several other academic, secretarial and technical support staff in the Department. The allocation procedure was modified twice in order to address several deficiencies in the original procedure. The effort made also included **developing a substantial piece of software, which implemented more efficient and effective procedures, and added automation and flexibility to the process**. The new approach was documented and analysed in a report to allow best practice to be shared in the community:

D.Kazakov. *Coordination of Student Project Allocation*. YCAP project, University of York, 2001. (22p.)
http://www-users.cs.york.ac.uk/~kazakov/papers/proj.pdf

Coordinator of Open Days and Admission Interviews (UCAS Days)

Duration: Oct 2006—Sep 2010.

The role involved organising open days for potential applicants twice a year (in July and October), as well as up to 6 days of interviews with the shortlisted applicants.

OPEN DAYS: The role involved coordinating (in cooperation with the Admissions Office) a part of a large event, which sees up to 9,000 visitors on the university premises.
ADMISSION INTERVIEW DAYS: These are similar in content to the open days, and involve question gathering and question answering sessions as well as plenary talks and live demonstrations. Further,

face-to-face inteviews with the applicants take place, and they have the chance to have a tour of the department and the university, including student accommodations. Lunch is served to the students and parents, during which they can talk to the staff and student helpers present.

Admissions Interviewer

This is a task I have been performing since 1999.

Outreach Officer

I was responsible for the links with schools and public understanding in the period 2006–2010. The task involved accommodating visits from schools throughout the year, and giving the children hands-on programming tutorials; visits to schools to discuss the job of a computer scientist/software engineer, and organising events for the lay public. Organisationally, it required collaboration within the department with the undergraduate admissions secretary, who provides timetabling support, the Widening Participation Office at the Admissions and Recruitment Department of the University, work with voluntary organisations, such as YorCares, seeking advice from the National Science Learning Centre at York, as well as direct links with schools. For an example of a public talk, see:
https://www.york.ac.uk/news-and-events/events/public-lectures/spring-18/back-future/

D2: University Administrative Posts

University Science and Society Group Member

Duration: 2007–2013.
The Science and Society Group was set up by the University's Communications Office to help co-ordinate the University's public engagement in science activities.

D3: Other Administrative Work and Distinctions

Committee Member and Vice-Chair of the UK Society for the Study of Artificial Intelligence and the Simulation of Behaviour (SSAISB)

I was an elected committee member of the Society for the Study of Artificial Intelligence and Simulation of Behaviour (SSAISB) between 2004 and 2015, and was its Vice-Chair and SSAISB Company Director from 2006 until 2010. SSAISB is the oldest AI society in the world. It publishes its own quarterly issue, the Q, and organises an annual four-day convention (http://www.aisb.org.uk). SSAISB is a member of the European Coordinating Committee for Artificial Intelligence (ECCAI). As a member of the SSAISB committee, I was jointly responsible for running the society, including planning the annual convention, strategic decisions related to the society periodicals, organising and sponsoring public outreach events, and managing the budget. The committee is often consulted, through its Chair, on policy issues related to the CS community, including on the composition of the CS sub-panel for the RAE/REF. I also represented the Society at a European level, as a member of the ECCAI Coordination Committee (Patras, Greece, 23 July 2008).

AAMAS Co-Chair and Steering Committee Member

I organised and co-chaired three issues (2002-2004) of the Symposium on Adaptive Agents and Multi-Agent Systems (AAMAS) (http://www-users.cs.york.ac.uk/~kazakov/aamas/index.html). The symposium was initially part of the UK AISB convention; since 2005, it has become a stand-alone international event. I was a member of the Symposium Steering Committee in the period 2005–2006. From 2006, the event has been renamed Adaptive Learning Agents and Multi-Agent Systems (ALAMAS).

AISB'11 Convention Chair

I organised and chaired this $3\frac{1}{2}$-day event with 120+ participants, which took place at the University of York (http://www.aisb.org.uk/convention/aisb11/). The programme included 9 symposia and 4 invited speakers.

Co-chair, Workshop on Language Variation and Change & Cultural Evolution, 12-14 Feb 2015

University of York: http://www.york.ac.uk/language/news/events/wlvcce2015/.

Chair, 29th International Conference on Inductive Logic Programming (ILP), 3-5 Sep 2019, Plovdiv, Bulgaria.

https://ilp2019.org/.

External Examiner, Faculty of Computing and Informatics, Universiti Malaysia Sabah, Kota Kinabalu, Malaysia 2014–2015

Courses: undergraduate teaching.

External Examiner, School of Computer Science, University of Birmingham, 2014/15–2018/19

Courses: BSc in Computer Science, BSc in Computer Science Joint Honours and BSc in Artificial Intelligence and Computer Science.