

## Curriculum Vitae

Mark James Carman BA & BE(EEE), Ph.D

Associate Professor,  
Dipartimento di Elettronica, Informazione e Bioingegneria (DEIB),  
Politecnico di Milano  
Milan, Italy

May 31, 2019

Webpages:

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## 1 Career History

- Dec 2018 - Present: Associate Professor,  
Dipartimento di Elettronica, Informazione e Bioingegneria (DEIB),  
Politecnico di Milano, Milan, Italy
- Jan 2015 - Dec 2018: Senior Lecturer (Tenured),  
Faculty of Information Technology  
Monash University, Melbourne, Australia
- Nov 2010 - Dec 2014: Lecturer (Tenured),  
Faculty of Information Technology,  
Monash University, Melbourne, Australia.
- Aug 2007 - Oct 2010: Postdoctoral Researcher,  
Faculty of Informatics,  
University of Lugano (Universita' della Svizzera Italiana), Switzerland.
- Jan 2005 - Nov 2006: Visiting PhD Student/Scholar  
Information Sciences Institute,  
University of Southern California, Los Angeles, USA.
- Dec 2001 - Dec 2004: PhD Student,  
ITC-irst and the Department of ICT,  
University of Trento, Italy.
- Jan 2001 - Nov 2001: Assistant Researcher,  
Automated Reasoning Systems Division,  
ITC-irst, Trento, Italy.
- Jan 2000 - Dec 2000: Research Technologist,  
E-Commerce Division,  
Telstra Research Laboratories, Sydney, Australia.

## 2 Education and Qualifications

### 2.1 Education

**Ph.D (Dottorato di Ricerca) in Information and Communication Technologies**,  
University of Trento, Italy – July 2006.

Thesis title: *Learning Semantic Definitions of Information Sources on the Internet*

**Bachelor of Engineering (Electrical & Electronic) and Bachelor of Arts**

with First Class Honours in Engineering

University of Adelaide, Australia – April, 2000.

### 2.2 Accreditation

**Italian National Scientific Qualification - Associate Professor in Computer Engineering - 09/H1**  
(*Abilitazione Scientifica Nazionale - Fascia: II - Settore Concorsuale 09/H1 Sistemi di Elaborazione delle Informazioni*),  
26 July 2018

**Italian National Scientific Qualification - Associate Professor in Computer Science - 01/B1**  
(*Abilitazione Scientifica Nazionale - Fascia: II - Settore Concorsuale 01/B1 Informatica*),  
28 March 2018

### 2.3 Languages Spoken

Dr. Carman is tri-lingual:

- *English: Native speaker*  
Dr. Carman attended primary and secondary school in Adelaide, South Australia.
- *Italian: Highly fluent*  
Dr. Carman lived and worked in Trento from 2001 to 2004 and in Lugano from 2007 to 2010. He became an Italian citizen in 2014 and regularly spends time in Italy with relatives and friends.
- *German: Fluent*  
Dr. Carman studied German at high school and university, achieving a Mittelstufe II certification in 1998. He studied for one semester at the University of Stuttgart in 1998/99 and majored in German studies (as part of his double degree in Engineering/Arts) at the University of Adelaide in 2000.

### 2.4 Awards and Fellowships

2011: Faculty of Information Technology Early Career Researcher Award, Monash University, AUD 10,000

2009: Offered ERCIM Fellowship (European Research Consortium for Mathematics & Informatics)

2006: Nominated by the University of Trento for an ACM Doctoral Dissertation Award

1997: The E.V. Clarke Prize for Electrical & Electronic Engineering, University of Adelaide

1997: Dean's Merit Certificate for 2nd Year Results in Engineering, University of Adelaide

1996: Dean's Merit Certificate for 1st Year Results in Engineering, University of Adelaide

1995: Australian Students' Prize (on High School completion)

## 3 Research

### 3.1 Research Interests and Expertise

Dr. Carman is an expert in **Data Science**, **Data Mining** and the analysis of **Big Data**. His primary research interests are **Information Retrieval** and **Machine Learning**. His specific areas of expertise include:

- *Regression & Rank Learning*: machine learning algorithms for classification and regression with large data quantities, especially structured learning problems such as rank learning for Web Search.
- *Statistical Modeling of Text*: machine learning and topic modelling techniques applied to various problems in information retrieval and natural language processing.
- *Personalized Search & Recommender Systems*: Models for recommending items to users and personalising web search results to user interests.
- *Crowdsourcing and Expertise Estimation*: Statistical models for quality control in crowdsourcing and for user expertise estimation in online forums.
- *Analysis of User-Generated Data*: Application of Machine Learning techniques (including sentiment analysis) to the modeling of blogs, tags, tweets and query-log data.
- *Relational Learning and Automated Planning* applied to problems in data integration, Web Services and grid computing.

His research and interests span theoretical studies (e.g. investigating statistical properties of information retrieval measures), through to practical applications (e.g. technology for assisting police during digital forensic investigations).

Dr. Carman has authored a large number of publications in prestigious venues, including full papers at SIGIR, KDD, IJCAI, CIKM, ECIR, WSDM, HT, CoNLL, EACL, HCOMP and ICDAR, and articles in TOIS, IR, JMLR, ML, PR, JAIR, CS&L, JASIST, DI and CSUR. According to Google Scholar, his publications have:

- a citation count over 1500
- an h-index of 20

*Major contributions* of his research career have included developing **state-of-the-art techniques** for:

- learning Web search ranking functions and transferring knowledge across collections [10, 29, 37, 38],
- fast Machine Learning algorithms allowing systems to scale up to very large datasets [6, 9, 36, 12],
- clustering high-dimensional data using density-based techniques [8, 32],
- improving quality-control for crowd-sourcing applications [18, 19, 26, 55],
- accelerating digital forensic investigations and analysis of the Dark Web [4, 11],
- characterising, detecting and generating sarcasm in text [5, 21, 25, 31, 34, 35, 56, 58, 60],
- optical-character recognition error correction for Indic languages [24, 54],
- personalising Web search results to the interests of individual searchers [40, 45],
- efficiently and accurately evaluating text-processing APIs [7, 28],
- estimating user expertise in social media [27, 33],
- modelling Wikipedia content to automatically generate disambiguation pages [30, 59],
- recommending products based on rating and click data (aka collaborative filtering) [42],
- ranking of weblogs based on content and expressed sentiment [13, 47, 14],
- analysing and leveraging tag data in information retrieval [49, 61, 43],
- routing queries to appropriate collections within search engines [51, 39],
- learning semantic descriptions of online services [17, 52],
- planning for the automated composition of web services [65, 67], and
- managing data repositories on a data grid [53].

## 3.2 Research Supervision

Dr. Carman is a prolific and dedicated research supervisor. He has supervised seven PhD students to completion and currently supervises another two PhD students. He is versatile in his supervision methods, having supervised students both locally (in Melbourne) and remotely (in India and Malaysia).

List of completed PhD students:

- Yuan Jin  
Monash University (20/03/2019)  
Thesis title: *Modelling Techniques and Inference Procedures for Improving Quality Control in Crowdsourcing Applications*

- Janis Dalins  
Monash University (6/03/2019)  
Thesis title: *Sustaining Future Digital Forensics Through Intelligent Automation*
- Lim Wern Han  
Monash University Malaysia (24/05/2018)  
Thesis title: *Bringing Order To User-Generated Content On The Web: Estimating User Expertise And Information Quality*
- Aditya Joshi  
Indian Institute of Technology Bombay - Monash Research Academy (20/11/2017)  
Thesis title: *Investigations in Computational Sarcasm*  
★ Winner of the Best Thesis Award from the IITB-Monash Research Academy.
- Ramakrishna Bairi  
Indian Institute of Technology Bombay - Monash Research Academy (28/07/2017)  
Thesis title: *Adaptive Organization of Digital Documents using Knowledge Graphs*  
★ Winner of the Excellence in Ph.D. Research Award for the best Computer Science thesis at IIT Bombay.
- Ye Zhu  
Monash University (31/05/2017)  
Thesis title: *Efficient Identification of Arbitrarily Shaped and Varied Density Clusters in High-dimensional Data*  
★ Winner of the Mollie Holman Medal for the best doctoral thesis in the Faculty of IT, Monash.
- Muhammad Ibrahim  
Monash University (11/01/2017)  
Thesis title: *Scalability and Performance of Random Forest based Learning-to-Rank for Information Retrieval*

Dr. Carman currently supervises the following PhD projects:

- Unsupervised transfer learning techniques for learning to rank.  
RMIT University (Melbourne)
- Improving reliability of optical character technology for Indic scripts.  
IITB-Monash Academy (Mumbai)

In addition to PhD student supervisions, Dr. Carman has supervised to completion 2 Honours students and 5 Masters minor-thesis students. He has also examined a large number of Honours and Minor thesis projects.

With regards to thesis examination, Dr Carman has been:

- examiner for Ph.D. thesis, Macquarie University (10/09/2018)
- examiner for Master of Research thesis, Macquarie University (15/01/2018)
- examiner for Ph.D. thesis, University of Porto (20/12/2017)
- examiner for Master of Research thesis, Macquarie University (17/10/2014)

He has also been on progress review committees for a very large number of PhD students at Monash University.

### 3.3 Research Grants

Mark Carman has received competitive research project funding from research bodies in Australia, Asia and Switzerland.

- 2014: Victorian Government Department of State Development, Business and Innovation, Technology Voucher Program (with QSR International Pty Ltd): *Large-scale Qualitative Data Analysis*, AUD 64,793
- 2014: National ICT Australia Limited (NICTA) Collaborative Research Project: *Improved Statistical Models of Document Corpora and User-Click Behaviour with Application to Personalised Patent Search*, AUD 60,000
- 2012: Co-applicant for US Air Force Asian Office of Aerospace Research and Development (AOARD) grant FA2386-12-1-4030: *Dynamic dimensionality selection for Bayesian classifier ensembles*, USD 270,000
- 2010: Co-applicant for Swiss National Science Foundation (SNSF) grant 130208: *Mining Conversational Content for Topic Modelling and Author Identification (ChatMiner)*, CHF 156,540

### 3.4 Research Project Participation

Prior to gaining a faculty position at Monash, Dr. Carman also participated in a number of European, Swiss and US projects:

2008/9: ADIR+ project, Hasler Stiftung

2007/8: ADIR project, Swiss National Science Foundation

2005/6: CALO project, Defense Advanced Research Projects Agency, DoD

2004: KnowledgeWeb project, European Research Council

2002/3: Edamok project, Provincia Autonoma di Trento

2001: DataGrid Project, European Research Council

## 4 Teaching

Dr. Carman is passionate about teaching. He has over 8 years experience teaching a variety of different undergraduate and postgraduate courses mostly at Monash University, but also at the University of Lugano (Università della Svizzera Italiana). He has taught courses ranging from introductory level through to advanced and consistently receives strong positive feedback from students regarding the content and delivery of the courses he teaches and has been nominated on multiple occasions for teaching awards.

While capable of teaching any course in a Computer Science curriculum, Dr. Carman's interest and specialities lie in the mathematical and statistical end of the curriculum in areas such as *Data Science*, *Machine Learning*, *Data Mining*, *Artificial Intelligence*, *Optimisation*, *Information Retrieval*, and *Experiment Design*. Indeed Dr. Carman has **experience teaching in most areas of Data Science** from the introductory to the expert level, including:

- *Basic Data Analysis*: data wrangling & visualisation in Python/R, correlation analysis & clustering
- *Predictive Modelling*: linear classification & regression, (un-)directed graphical models, tree ensembles<sup>1</sup>
- *Time series Modelling*: forecasting and simulation including MCMC techniques
- *Experiment Design*: statistical hypothesis testing, A/B testing, etc.
- *Optimisation*: Constrained (non-)Linear Programming, CSP, SAT, heuristic & stochastic search, etc.
- *Text analysis*: Natural Language Processing and Information Retrieval techniques, etc.
- *Artificial Intelligence*: knowledge representation & automated reasoning: resolution in FOL, planning
- *Big Data processing*: Hadoop/Spark, stream processing, etc.
- *Data Management*: SQL and noSQL databases, semi-structured data management, etc.
- *General programming*: and data structures in Python, R, C, XSLT, etc.

### 4.1 Courses taught

The following is a list of courses taught by Dr. Carman, in which he filled the role of both Lecturer and Examiner. For most courses taught at Monash University he also managed a number of tutors and took one of the tutorials for the course himself. Dr. Carman regularly revises and updates the material for each of the courses he teaches, emphasising the practical aspects of each course while making the content as exciting, current and coherent as possible.

- *Introduction to Data Science (FIT5145)*, Master of Data Science, Monash University
  - Years taught: 2016, 2017
  - Main topics covered: *roles, resources, technologies and methods involved in data science projects; data cleaning, analysis, management and storage*
  - Median student evaluation of teaching score (1-low to 5-high): 3.80
- *Computer models for business decision making (FIT2017)*, B. of Business Information Systems, Monash
  - Years taught: 2014, 2015, 2017

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<sup>1</sup>Thus far Dr. Carman has not had the opportunity to teach a course in Deep Learning but has research experience in this area and would be interested to develop such a course in the future.

- Main topics covered: *linear programming, non-linear programming, inventory modelling, decision making under uncertainty, basic forecasting*
- Median student evaluation of teaching score (1-low to 5-high): 3.86, 4.19, 3.91
- *IT Research Methods (FIT4005/5125)*, Bachelor of Computer Science (Hons) / Master of IT, Monash
  - Years taught: 2012, 2013, 2016, 2017
  - Main topics covered: *experiment design, probability theory, statistical hypothesis testing*
  - Median student evaluation of teaching score (1-low to 5-high): 2.5, 3.75, 4.5, 4.13/4.75
- *Computer science project (FIT3036)*, Bachelor of Computer Science (Honours), Monash University
  - Years taught: 2017
  - Main topics covered: *designing, developing and testing a computer science project*
  - Median student evaluation of teaching score (1-low to 5-high): TBA
- *Introduction to Data Science (FIT1043)*, Bachelor of Computer Science, Monash University
  - Years taught: 2016
  - Main topics covered: *roles, resources, technologies and methods involved in data science projects; data cleaning, analysis, management and storage*
  - Median student evaluation of teaching score (1-low to 5-high): 3.31
- *Intelligent Systems (FIT5047)*, Master of Information Technology, Monash University
  - Years taught: 2013, 2014
  - Main topics covered: *artificial intelligence, propositional and first order logic, planning, supervised and unsupervised machine learning, Bayesian networks*
  - Median student evaluation of teaching score (1-low to 5-high): 4.0, 4.05
- *Business Intelligence Modelling (FIT5097)*, Master of Information Technology, Monash University
  - Years taught: 2012, 2013
  - Main topics covered: *linear & non-linear programming, inventory modelling, queue models, decision theory, forecasting*
  - Median student evaluation of teaching score (1-low to 5-high): 4.21, 3.91
- *Advanced topics in algorithms and discrete structures (FIT4010)*, Honours in Computer Science, Monash
  - Years taught: 2011, 2012, 2013
  - Main topics covered: *propositional satisfiability solvers, non-linear programming, constrained optimisation, Markov chain Monte Carlo*
  - Median student evaluation of teaching score (1-low to 5-high): 4.25, 4.5
- *Object and semi-structured database (FIT5168)*, Master of Information Technology, Monash University
  - Years taught: 2011, 2012
  - Main topics covered: *semi-structured databases, XML, schema languages, transformation & query languages*
  - Median student evaluation of teaching score (1-low to 5-high): 4.12, 4.61
- *Programming in C*, Bachelor in Informatics, Università della Svizzera italiana
  - Years taught: 2009
  - Main topics covered: *basic C syntax and data structures, dynamic memory allocation*

## 4.2 Courses Assisted

Prior to joining Monash, Dr. Carman assisted teaching of a number of courses at the University of Lugano and the University of Southern California:

2010: Lecturing: *Information and Knowledge Management II*, Bachelor degree, U. Lugano

2010: Lecturing: *Intelligent Information Access*, Masters degree, U. Lugano

2008: Project assistance: *Software Atelier IV*, Bachelor degree, U. Lugano

2008: Guest lecturer: *Intelligent Information Access*, Masters degree, U. Lugano

2008: Guest lecturer: *Information and Knowledge Management II*, Bachelor degree, U. Lugano

2006: Guest lecturer: *Information Integration on the Web*, Masters degree, U. Southern California

### 4.3 Examples of Student Feedback

In 2013 Dr. Carman received teaching award nominations for both of FIT5047 and FIT5097, with anonymous comments such as the following for FIT5047:

*Dr. Carman was always very lively during the lectures. He tried to keep the lectures interesting even though on occasions the lecture material was quite mathematical and dry. The problems discussed in class helped me relate to real-world scenarios and gave me a deeper insight into the topic of “intelligent systems”.*

And for FIT5097:

*Good use of “real world” examples and ability to draw connections between different topics in the course and good use of the whiteboard in lecture theatres. Detailed and timely responses to questions from students and helpful feedback over email when required. Broad interest in different subject material and ‘cross promotion’ of other available courses.*

## 5 Professional Activities

Mark Carman is a highly active participant in the Information Retrieval and Data Mining communities. He regularly reviews for the premier international conferences (SIGIR, KDD, CIKM, IJCAI, AAAI, ACML, etc.). He also organises conferences, and is an associate editor for the most important journal in Information Retrieval, namely TOIS.

### 5.1 Editorial Duties

Jan 2016 – Present: **Associate Editor**

ACM Transactions on Information Systems (TOIS)

*TOIS is considered the most prestigious journal in Information Retrieval.*

### 5.2 Conference Organising

2017: **Conference and Program Co-chair**

22nd Australasian Document Computing Symposium (ADCS 2017),  
7-8 Dec 2017, Brisbane, Australia

2016: **Conference and Program Co-chair**

21st Australasian Document Computing Symposium (ADCS 2016),  
6-7 Dec 2016, Melbourne, Australia

2003: **Local Arrangements Organiser**

Third International Summer School on AI Planning,  
Madonna di Campiglio, Trentino, Italy

### 5.3 Program Committees

Below is a list of some of the major international conferences for which Dr. Carman has been a program committee member. The list includes *the most important international conferences in Information Retrieval (namely SIGIR, WSDM, CIKM, ECIR), Data Mining (KDD, WWW), Artificial Intelligence (IJCAI, AAAI, ACML)*, and Natural Language Processing (EMNLP, COLING, NAACL-HLT), among many others. For brevity, local Australian conferences and workshops are not listed, nor are multiple tracks at the same conference.

2019: 25th ACM SIGKDD Conference on Knowledge Discovery & Data Mining (KDD’19)

33rd AAAI Conference on Artificial Intelligence (AAAI 2019)

12th International Conference on Web Search and Data Mining (WSDM 2019)

11th Asian Conference on Machine Learning (ACML 2019)

2018: 27th International Conference on Computational Linguistics (COLING 2018)

24th ACM SIGKDD Conference on Knowledge Discovery & Data Mining (KDD’18)

- 16th Annual Conference of the NAACL: Human Language Technologies (NAACL-HLT'18)  
 27th International World Wide Web Conference (WWW 2018)
- 2017: 9th Asian Conference on Machine Learning (ACML 2017)  
 40th Int. ACM Conference on Research & Development in Information Retrieval (SIGIR'17-short)  
 10th International Conference on Web Search and Data Mining (WSDM 2017)  
 26th International World Wide Web Conference (WWW 2017)
- 2016: 8th Asian Conference on Machine Learning (ACML 2016)  
 25th ACM Conference on Information and Knowledge Management (CIKM'16)  
 22nd ACM SIGKDD Conference on Knowledge Discovery & Data Mining (KDD'16)  
 39th Int. ACM Conference on Research & Development in Information Retrieval (SIGIR'16)  
 25th International Joint Conference on Artificial Intelligence (IJCAI'16)  
 38th European Conference on Information Retrieval (ECIR 2016)
- 2015: 7th Asian Conference on Machine Learning (ACML 2015)  
 24th ACM Conference on Information and Knowledge Management (CIKM'15)  
 21st ACM SIGKDD Conference on Knowledge Discovery & Data Mining (KDD'15)  
 38th Int. ACM Conference on Research & Development in Information Retrieval (SIGIR'15)  
 1st ACM International Conference on the Theory of Information Retrieval (ICTIR'15)  
 37th European Conference on Information Retrieval (ECIR 2015)
- 2014: 6th Asian Conference on Machine Learning (ACML 2014)  
 Conference on Empirical Methods on Natural Language Processing (EMNLP 2014)  
 37th Int. ACM Conference on Research & Development in Information Retrieval (SIGIR'14)  
 36th European Conference on Information Retrieval (ECIR 2014)
- 2013: 36th Int. ACM Conference on Research & Development in Information Retrieval (SIGIR'13)  
 35th European Conference on Information Retrieval (ECIR 2013)
- 2012: 26th Conference on Artificial Intelligence, AI and the Web track (AAAI-12 AIW)  
 35th Int. Conf. on Research & Development in Information Retrieval (SIGIR'12-Poster)  
 34th European Conference on Information Retrieval (ECIR 2012)
- 2011: 25th Conference on Artificial Intelligence, AI and the Web track (AAAI-11 AIW)  
 International Conference on the Theory of Information Retrieval (ICTIR'11)  
 20th ACM Conference on Information and Knowledge Management (CIKM'11-Poster)  
 5th International AAAI Conference on Weblogs and Social Media (ICWSM'11)
- 2010: 33rd Int. ACM Conference on Research & Development in Information Retrieval (SIGIR'10)  
 24th Conference on Artificial Intelligence, AI and the Web track (AAAI-10 AIW)  
 4th International AAAI Conference on Weblogs and Social Media (ICWSM'10)
- 2009: 32nd Int. ACM Conference on Research & Development in Information Retrieval (SIGIR'09)
- 2008: 22nd Conference on Artificial Intelligence, AI and the Web track (AAAI-08 AIW)

## 5.4 Journal Reviewing

Dr. Carman regularly reviews for a number of prestigious international journals, some of which are listed below:

- ACM Transactions on Information Systems (TOIS): *2015 to 2018*
- Information Retrieval (IR): *2016 to 2018*
- Machine Learning (ML): *2017*
- Artificial Intelligence (AI): *2017*
- Pattern Recognition (PR): *2016 to 2017*
- Communications in Statistics – Theory and Methods: *2017*
- IEEE Transactions on Knowledge and Data Engineering (TKDE): *2009 to 2017*
- Transactions on Parallel and Distributed Systems: *2017 to 2018*
- Data Mining and Knowledge Discovery (DAMI): *2010 to 2015*
- Information Processing and Management (IP&M): *2007 to 2017*



- ACM Transactions on the Web (TWEB): 2015
- Inform's Journal on Computing (IJOC): 2014
- Foundations and Trends in Information Retrieval (FnTIR): 2012

## 5.5 Funding Proposal Reviewing

Dr. Carman has been asked to review funding proposal submitted to the Austrian Science Fund (FWF), the Swiss National Science Foundation (SNF) and the Italian Ministry of Education, Universities and Research (MUIR).

## 5.6 Invited talks

2016 *Investigating performance and scalability issues for rank learning with regression tree ensembles*, The Artificial Intelligence Research Institute (IIIA), Barcelona, Spain

2016 *Investigating performance and scalability issues for rank learning with regression tree ensembles*, Computer Science Colloquium, University of Groningen, Netherlands

2006 *Learning Semantic Descriptions of Online Information Sources*, Information Sciences Institute, University of Southern California, USA

2003 *Planning for Web Services*, Digital Enterprise Research Institute, University of Innsbruck, Austria

## 5.7 University Positions and Committees

Since joining Monash University in late 2010, Dr. Carman has been an active member of the academic community within the Faculty of IT. He has started reading groups, participated in and managed various committees, and directed undergraduate degree courses. Some of the roles that he has assumed, have included:

Jan 2016 - Oct 2017: **Course Director** for the Bachelor of Computer Science Advanced (Honours), and the Bachelor of Informatics and Computation Advanced (Honours).  
*Tasks include: managing student enrolment, course progression issues including credit assignment, handling course accreditation process with accreditation bodies.*

2016: **Member** of the Faculty Undergraduate Programs Committee.  
*Tasks included: monitoring and managing changes to undergraduate courses in the Faculty of IT.*

2015: **Member** of the Honours Curriculum Review Committee.  
*Tasks included: reviewing entry requirements and assessment policies for Honours and Minor theses programs.*

2011-2015: **Chair** of the Faculty of IT Early Career Researcher committee  
*Task included: representing the interests of early career researchers, managing faculty funds for early career researchers, running career building and research writing workshops.*

2011-2015: **Member** of the Faculty Research Committee.  
*Tasks included: monitoring research output and research initiatives within the Faculty.*

2013-2014: **Member** of two Interview Panels for new Lecturer/Senior Lecturer Positions.  
*Tasks included: interviewing and ranking of applicants.*

2011-2014: **Coordinator** of the Faculty of IT Machine Learning Reading Group.  
*Task: Organising fortnightly meetings to promote interactions between researchers within the vibrant machine learning community of the faculty.*

## 6 Technology Transfer & Press Coverage

### 6.1 Technology Transfer

Most of Dr. Carman’s publications provide practical solutions to real world problems. Examples of the types of technology developed include methods for improving blog search, personalising Web search retrieval results, improving classification performance on large datasets, identifying Twitter users under the influence of alcohol, aiding police to accelerate digital investigations, etc..

In addition to disseminating results via publication, Dr. Carman works closely with industry wherever possible and also releases the code associated with his research. Some examples of the types of technology transfer he is involved in are:

- 2018 Analysis of on-field player tracking data for a professional sports team, the St Kilda Football Club – member of the Australian Football League, in order to derive insights for improving player training and conditioning.
- 2016 Crawl and analysis of the Dark Web, with knowledge and support of the Australian Federal Police and the Australian Justice Minister [4].
- 2015 Development of a prototype system for automated skill keyphrase extraction from job advertisements and its demonstration to Australia’s largest employment search website.
- 2014 Benchmarking commercial and open-source Named Entity Extraction systems for use by a qualitative data analysis software vendor in order to develop new product functionality.
- 2013 Release of software developed for fast estimation of large scale classifiers using the Weighted Naive Bayes model.
- 2011 Talk to industry leaders on behalf of the Monash Faculty of IT on the importance of Web personalisation technology.
- 2006 Release of software for service discovery and semantic characterisation developed during PhD thesis as open source.
- 2001 Report and prototype development with CERN for a Data Grid infrastructure.

### 6.2 Industry Testimonials

After working with Monash students and staff to analyse on-field player tracking data for a professional sports team, we received these comments:

*Monash University are a fantastic and innovative partner for the St Kilda Football Club and just one example of this is the Data Research they completed for us in 2018. The task was to analyse over 1000 variables of Catapult GPS & Champion data to determine the most relevant points influencing performance. The quality of work was extremely high, all completed in a very timely manner with the results influencing the way we critique our players and game style. A number of drills exercises have also been designed and prescribed during the 2019 pre-season based on the findings of this research.*

(Simon Kearney, Sports Science & Innovation Manager, St Kilda Football Club)

### 6.3 Press Coverage

Dr. Carman’s work and/or expertise has been discussed in the press:

- **Science Trends:** Co-author Ye Zhu was invited to contribute an article describing their recent Pattern Recognition journal article to Science Trends in *Clustering By Shared Subspaces: A New Framework For Data Analysis* by Ye Zhu (6/12/2018) <sup>2</sup>
- **The Sydney Morning Herald:** PhD student Janis Dalins was interviewed about a paper that they wrote together with Campbell Wilson on crawling the Dark Web in *To catch a spider: Could police use AI to trawl the dark web?* by Liam Mannix (March 25, 2018).<sup>3</sup>

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<sup>2</sup><https://sciencetrends.com/clustering-by-shared-subspaces-a-new-framework-for-data-analysis/>

<sup>3</sup><https://www.smh.com.au/technology/to-catch-a-spider-could-police-use-ai-to-trawl-the-dark-web-20180319-p4z53i.html>

- **The Times (of London)**: PhD student Aditya Joshi was interviewed regarding a survey paper they wrote on computational sarcasm in “*AI can struggle to detect sarcasm*” by Oliver Moody (September 19, 2017).<sup>4</sup>
- **MIT Technology Review**: A paper co-authored by Mark Carman was discussed in the article “*How Vector Space Mathematics Helps Machines Spot Sarcasm*” (October 13, 2016).<sup>5</sup>
- **New Scientist**: Mark Carman was quoted as a subject expert in the article “*AI reads your tweets and spots when you’re being sarcastic*” by Edd Gent (4 August 2016).<sup>6</sup>
- **The Indian Express**: A paper co-authored by Mark Carman was discussed in the article “*IIT-Bombay team creates program to detect drunk text message writers*” by Mihika Basu (21 August 2015).<sup>7</sup>

## 7 Refereed Publications

Below is a selection of refereed publications in reverse chronological order, divided into journal articles followed by conference papers, workshop papers and posters.

### 7.1 Journal Articles

- [1] Kai Ming Ting, Ye Zhu, Mark Carman, Yue Zhu, Takashi Washio, and Zhi-Hua Zhou. “Lowest Probability Mass Neighbour Algorithms: Relaxing the metric constraint in distance-based neighbourhood algorithms”. In: *Machine Learning* (2018), In Press (Available online 2 July 2018).
- [2] Ye Zhu, Kai Ming Ting, and Mark J. Carman. “Grouping Points by Shared Subspaces for Effective Subspace Clustering”. In: *Pattern Recognition* 83 (2018), pp. 230–244.
- [3] Janis Dalins, Yuriy Tyshetskiy, Campbell Wilson, Mark J. Carman, and Douglas Boudry. “Laying foundations for effective machine learning in law enforcement: Majura - A labelling schema for child exploitation materials”. In: *Digital Investigation* 26 (2018), pp. 40–54.
- [4] Janis Dalins, Campbell Wilson, and Mark Carman. “Criminal motivation on the dark web: A categorisation model for law enforcement”. In: *Digital Investigation* 24 (2018), pp. 62–71.
- [5] Aditya Joshi, Pushpak Bhattacharyya, and Mark J. Carman. “Automatic Sarcasm Detection: A Survey”. In: *ACM Computing Surveys* 50.5 (Sept. 2017), 73:1–73:22.
- [6] Nayyar A. Zaidi, Geoffrey I. Webb, Mark J. Carman, François Petitjean, Wray Buntine, Mike Hynes, and Hans De Sterck. “Efficient parameter learning of Bayesian network classifiers”. In: *Machine Learning* 106.9 (2017), pp. 1289–1329.
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