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## CEO's Update – Sanjay Mazumdar

As we at the D2D CRC work towards its completion date of 30 June 2019, our focus is now on finishing the research projects, operationalising capabilities through our spinout companies Fivecast<sup>®</sup> and NQRV<sup>™</sup>, delivering a final series of training and showcasing our achievements. An update on these activities is provided in this newsletter. Of note is our final conference in Canberra on 3-5 April 2019. Further details can be found in the newsletter.



## D2D CRC Events update

### D2D CRC Conference 2019

The 2019 D2D CRC Conference is fast approaching. The three day event will be held on **3, 4 and 5 April 2019** at the **QT Canberra**. If you are yet to register your attendance, please contact [info@d2dcr.com.au](mailto:info@d2dcr.com.au) for a program and registration form.

D2D CRC will also host a *Law and Policy Principles* working breakfast on **Friday 5 April 2019, 7:45 – 9:30 am** at **QT Canberra** on principles to guide big data usage for defence, national security and law enforcement purposes. To register, please visit [the event website](http://the.event website).

### Law & New Technologies Conference

The Law & New Technologies Conference is organised by the Law & Policy programme of the D2D CRC, together with the Deakin Law School, La Trobe University and UNSW Sydney. It is a three day event being held on **29 April to 1 May 2019** at the **Melbourne Convention and Exhibition Centre**.

Presentations will be from academics and industry leaders, and will touch on:

- Applications of new data technologies for national security and law enforcement agencies
- Privacy & data protection
- Reforming institution, practices and law
- Governance – having oversight through technology
- Normative multi-agency systems: AI and the law
- Drones, robotics & the law

Visit [their website](http://their website) to find out more and register now



## Research Update

### Beat the News

#### Disease prediction stream (University of Adelaide):

- Submitted journal article on connecting influenza surveillance data with population-level influenza incidence.
- Prepared for presentations on disease prediction work at the Australia New Zealand Industrial and Applied Mathematics conference (ANZIAM 2019) in New Zealand.

#### Social disruption prediction stream (University of Adelaide):

- Tobin South was awarded a summer internship to work on emotion prediction at D2D CRC.
- Developed a text-based emotion prediction machine learning model for entry into SemEval19 competition.

#### Proactive Approach to Potential Social Disruption (University of South Australia):

- Published two research papers in the following conferences:
  - The Web Conference 2019, *A Graph is Worth a Thousand Words: Telling Event Stories using Timeline Summarization Graphs*, Jeffery Ansaah et al.
  - The Pacific-Asia Conference on Knowledge Discovery and Data 2019, *Semantic Explanations in Ensemble Learning* by Zahid Islam et al.
- Submitted a research paper to SIGIR 2019 discussing ensemble model selection based on semantic explanation.

### Apostle

#### Fivecast update

- Released version 1.16 of Fivecast Insight which now includes support for additional data sources
- Undertook a business development trip to USA, with demonstrations to new law enforcement customers in the United States
- Commenced two new trials in USA
- Negotiating reseller and distribution agreements with a number of parties

#### Picturing Knowledge (Australian National University)

- Presented at Association for the Advancement of Artificial Intelligence (AAAI) Conference 2019 (PhD student presented, Umanga Bista)
- Received news coverage for the Comparative Summarisation of News Collections work, see [more here](#).
- Presented on Visualising Knowledge Graph Differences for the International Conference on Web Search and Data Mining conference (PhD student presented, Minjeong Shin).

#### Knowledge Graph Construction and Query (UNSW)

- Published two papers in AAAI 2019 on embedding and relation extraction.
- Published a paper in Database Systems for Advanced Applications Conference (DASFAA) 2019 on Concept Graph construction.

#### Semantic Indexing (UTS)

- Three research papers accepted to AAAI and one International Conference on Learning Representations (ICLR) paper accepted.

#### Knowledge Mining (UNSW)

- Developed novel topic model for identifying a group's issues of interest and orientation toward those issues.
- Completed prototype event ranking system showing groups supporting and opposing issues related to an event, and a timeline of related posts containing inflammatory language.

### Integrated Law Enforcement

#### NQRV

- Released v2.4.0 of the CaseWalls<sup>™</sup> Investigation Management System, incorporating a new security model and including offence management and high-level management functions.
- Teamed with solution partners to tender the CaseWalls IMS and Federated Search tool into multiple project opportunities, currently awaiting outcomes.
- The Federated Search tool prototype is being supported in ongoing operational use by first law enforcement customer.
- Released new versions of the Federated Search tool including phonetic, synonym and permutation searches, grey searching and with re-engineering of ingestion for large data sources.
- Commenced further live trials of the CaseWalls IMS with commonwealth and state government agencies

#### Engineering and Dev ops team

- Continued development of the federated search tool.
- Released v2.4.0 of the Investigation Management System.

#### Entity Linking (University of South Australia)

- Completed extended experiments testing the performance of the graph functional dependency-based entity resolution (ER) method.
- Paper accepted for publication by Very Large Data Base Endowment (VLDB Endowment).
- Drafted paper *Linking Graph Entities with Provenance and Multiplicity* which proposes the data structures used in our ER prototype for retrieval with higher accuracy and presents the investigation results of implementations of the ER prototype on different data management systems: Postgres and Hbase.

#### Data Curation Foundry for Federated Data Intelligence (UNSW)

- Improved event type recognition using Vector Space Models.
- Completed the Event Entity Extraction and Recognition APIs.
- Designed and implemented component that supports natural language query over investigation data.
- Designed, implemented and demonstrated features of a digital assistant for analysis of investigation data (offence types, evidence items, allegations and event types).

### Narrative Visualisation – Bruce Thomas

- Presented three papers at Big Data Visual Analytics 2018 (BDVA) in Germany.
- Held an immersive visualisation workshops at BDVA and International Symposium on Mixed and Augmented Reality (ISMAR) 2018 in Germany.
- Presenting a paper on GeoGate at IEEE Virtual Reality in Osaka, Japan, in March (written by Sain Youb Seung)

### Law and Policy

- The Compliance by/through Design research was presented to international audiences at Technologies for Regulatory Compliance (TethoCom) and Artificial Intelligence and the Complexity of Legal Systems (AICLS) workshop of JURIX 2018, the 31st international conference on Legal Knowledge and Information Systems, held in Groningen.
- Two team papers were presented by the project lead, Professor Pompeu Casanovas (La Trobe), one of which was co-authored with Professor Markus Stumptner and Dr Wolfgang Mayer (UnISA) of the Integrated Law Enforcement program.



[Any questions? Please don't hesitate to contact Brenton Cooper](#)

## Achievements

The Innovation Exchange was featured in the press for its work on the Big Data Connect Program in collaboration with Coopers Brewery. The work involved using big data analytics to improve the foam of the Coopers Pale Ale. Articles are linked at the bottom of this newsletter.

D2D CRC spin out company, Fivecast, was awarded an Australian Government Accelerating Commercialisation Grant to help develop the Fivecast AI system for automated, ongoing and autonomous risk assessment. This grant was followed by a visit from the Minister for Defence, the Hon Christopher Pyne MP to learn more about Fivecast.

Image: Fivecast Board with Christopher Pyne at Base64.



## Recent Publications

### Beat the News

- **GLeSS: Semi-supervised Graph Labelling with Markov Random Walks to Absorption**  
Max Glonek, Jonathan Tuke, Lewis Mitchell, Nigel Bean.
- **Effective Outlier Detection based on Bayesian Network and Proximity**  
Sha Liu, Liu Liu, Juyong Li, Thuc Duy Lu.
- **Energy-Efficient Automatic Train Driving by Learning Driving Patterns**  
Jin Huang, Yue Gao, Sha Lu, Xbin Zhao, Yangdong Deng, Ming Gu.
- **Bile-Inspired Multisensory Fusion for Autonomous Robots**  
Madhura Jayarathne, Damayanti Alathakoon, Dawsin De Silva, Xinghuo Yu.

### Law and Policy

- **Information Inference: Assessing the Advantage**  
Miah Hammond-Emry
- **The Retention and Disclosure of Location Information and Location Identifiers; OTT Content and Communications Services**  
Stanley Sivarajadasa

### Integrated Law Enforcement

- **DUAL: A Deep Unified Attention Model with Latent Relation Representations for Fake News Detection**  
Manqing Dong, Lina Yao, Xianzhi Wang, Boualem Benatallah, Quan Z. Sheng, Hao Huang

### Apostle

- **Late Fusion via Subspace Search with Consistency Preservation**  
Xuanqi Dong, Yan Yan, Minghui Tan, Yi Yang, Jov W. Tsang
- **Progressive Learning for Person Re-Identification with One Example**  
Yi Wu, Y Liu, X Dong, Y Yin, W Jian, Y Yang
- **A bottom-up clustering approach to unsupervised person re-identification**  
Y Liu, X Dong, L Zhang, Y Yin, Y Yang - AAAI Conference on Artificial Intelligence, 2019
- **CamStyle: A Novel Data Augmentation Method for Person Re-Identification**  
Zhan Zhong, Liang Zheng, Zhenfeng Zhen, Zhao Li, Yi Yang
- **Comparative Document Summarisation via Classification**  
Umanga Bista, Alexander Mathews, Minjeong Shin, Aditya Krishna Menon, Leiqing Xie

### A full list of formal publications can be found at:

- [Apostle](#)
- [Beat the News](#)
- [Integrated Law Enforcement](#)
- [Law and Policy](#)

## Innovation Exchange

After successfully wrapping up the Big Data Connect Program (BDCP), work hasn't slowed down in the Innovation Exchange program.

Upon completion of their BDGP project, Coopers Brewery were very happy with the results and have requested further analysis and potential opportunities for ongoing projects. In addition to this, our work was the subject of a feature article published in *The Advertiser* in collaboration with Carnegie Mellon University.

The Ziteck soil calibration project recently completed. This has involved ground-breaking techniques in the analysis of spectral frequencies using machine learning.

We also successfully completed projects with Sentek Blockchain: A graph analytics perspective and was presented by Chiraki Patel, software architect at Data to Decisions CRC. The second seminar was delivered in Canberra on Exploring the world of Data Sciences by Dr Murli Viswanathan, Associate Teaching Professor, Carnegie Mellon University.

Both presentations were streamed live and are available [with slides on D2D CRC website](#).

Four D2D CRC PhD students will also be presenting seminars in the coming months.

A new 3-day bespoke short course on *Data and Technical Literacy* was delivered to a D2D CRC participant in October 2018 and will be delivered again in April 2019. This course was created with the help of Carnegie Mellon, Deakin and La Trobe universities

### Future workforce

#### PhD Update

D2D CRC hosted a networking event for D2D CRC PhD students in Canberra, bringing together representatives from five national security agencies and 14 students.

D2D CRC organised a public speaking workshop in November 2019, which was specifically tailored to PhD student needs. It was attended by 9 students.

The D2D CRC currently has 44 active PhD students. On top of this, eight PhD students submitted their thesis by the end of 2018. As of the publishing of this newsletter four of those students have been awarded their degrees. We expect 11 more students to submit before 30 June 2019.

#### Internships

D2D CRC is currently hosting our two last interns. One intern is working with the data science team, in collaboration with University of Adelaide, one is working with the Apostle team. The CRC has now hosted a total of 49 interns and honours students.

#### Data Science Competency Framework (DSCF) and Development Planning Tool (DPT)

Interest in the DSCF and DPT continues to grow, including discussions with several organisations looking to trial/host the framework and tool. Over 330 people in the APS have now trialled the system.

The last trial of the beta version concluded in October 2018. Feedback from the pilot and trials was implemented to further enhance the framework and tool. Both are now ready to be used, free of cost, by the public sector in the final version.

For more information on how to access the DSCF and DPT by your organisation, please contact [rajna.richelle@d2dcr.com.au](mailto:rajna.richelle@d2dcr.com.au)

## In the news



**Coopers Brewery frothy pale ale**

**A Byte-Sized Revolution**

**\$433,214 Funding Boost for Sturt Business**

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