A FUTURE IN COMPUTATIONAL INTELLIGENCE
Increased customer expectation brought about by rapid technological advancement has made information management a key component of daily life. Consumers want access to data in a format that they can use and understand, and they want it immediately.

Computational intelligence deals with the retrieval, manipulation and presentation of every type of data, from a road map for a lost driver to a huge dataset for a corporation’s technology director.

The field of computational intelligence offers sophisticated techniques for automatically uncovering patterns hidden in data. Such techniques go far beyond traditional methods of querying data in databases.

In contrast to simply retrieving data, computational intelligence methods reveal knowledge deeply embedded in data. Such knowledge can be used to support strategic decision making in every aspect of business.

Professionals in this domain need to be agile, with the ability to think laterally and creatively to solve complex problems, and then be able to communicate their solutions to non-technical colleagues and clients. If you are interested in shaping the way that the information is organised and perceived, this could be the career path for you.
OUTLOOK AND TRENDS

Long-term skills shortage
The technology industry faces a critical shortage of skills in the areas of computational intelligence, and a new breed of IT professionals called data scientists are engaged in activities that range from data management, data visualisation, data mining and machine learning.

ICT project manager, database administrator and business analyst all appear on Immigration New Zealand’s long-term skill shortage list, which means the Government is actively encouraging skilled specialists from overseas to work in New Zealand.

Big data
Many companies are collecting massive amounts of data, but many are strapped for resources when it comes time to organising data in a practical way. In 2014, the global demand for big data skills increased over 120 per cent for IT project managers and just under 90 per cent for computer systems analysts.

Source – CIO.com

Cloud
The adoption of cloud storage through systems like iCloud, OneDrive, Google Drive, and Dropbox has prompted the need for more data analysts and security professionals. Users demand seamless access to content across devices, be it personal or professional.

As cloud computing continues to move into the mainstream, there will be an even greater demand for workers skilled in cloud computing, as well as cloud security.

Source – CIO.com

Key concepts

Information science is the extraction of knowledge from data using computational approaches.

Artificial intelligence covers a number of approaches to knowledge representation. It also presents strategies for general problem solving using goal oriented approaches.

Machine learning draws on methods developed within the artificial intelligence and statistical analysis disciplines to support decision making through the production of automatic methods for pattern extraction and prediction.

Nature inspired computing uses inspiration from nature to present a series of sophisticated algorithms for solving optimisation problems and for machine learning.

Data mining and knowledge engineering builds on ideas from information science, and presents a number of key machine learning approaches to pattern extraction from data.

WORK SETTINGS

Professionals in this field usually work regular office hours, but may have to work some evenings and weekends to meet project deadlines.

They normally work in offices but may travel to see clients and work on projects at their workplaces. Increasingly there is the option of working from home.

They work for a wide range of organisations, including private companies that provide computer, database and network services to clients, specialist ICT companies, software companies including entertainment and gaming specialists, start-ups, computer consultancies and telecommunication companies.

CAREER ROLE EXAMPLES

Data scientist – a multi-faceted role that involves familiarity with big data platforms for data management, data visualisation and data mining using methods from machine learning. Data scientists are able to interpret patterns in data and communicate results to an end user in a clear and logical format.
Data analyst – designs, develops and implements organisations’ database management systems, operating systems, and security policies and procedures.

Logistics analyst – evaluates the information management of a business, testing and upgrading systems to ensure that optimal performance is attained.

IT project leader – manages technical projects for one or more organisations, usually setting up or improving the information services of a business. Manages the information services and technological aspects of projects.

SKILLS AND KNOWLEDGE

Technical skills
• Ability to analyse an organisation’s overall business needs, and establish how information management can best contribute to these
• Knowledge of design methods for database management, knowledge of artificial intelligence methods and algorithms
• Detailed technical understanding of data mining concepts including machine learning algorithms for data and text mining
• Ability to assess new information management applications to see if they are suitable, and if the existing hardware will support them
• Ability to create architectural plans outlining the structure of new information management networks
• Skilled in explaining to people throughout an organisation how the software will affect their work
• Capable of developing training manuals and running training sessions to show clients how to use databases and applications

General skill requirements
• Competent in oral and written communication, with good presentation skills
• Able to work well under pressure
• Able to work well as part of a team, and with minimal supervision
• Confident in problem-solving and decision-making

PERSONAL QUALITIES
• Strongly investigative
• Able to see patterns and trends in data
• Excellent attention to detail
• Interested in mathematical modelling
• Quick to learn
• Logical, and strong planning

SALARY GUIDE

<table>
<thead>
<tr>
<th>Role</th>
<th>Salary (per year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data scientist (a relatively new job title)</td>
<td>$60,000 – well over $100,000, depending on seniority</td>
</tr>
<tr>
<td>Business analyst</td>
<td>$60,000 – $70,000 (junior), $70,000 – $85,000 (intermediate), $85,000–$100,000 (senior)</td>
</tr>
<tr>
<td>Data analyst</td>
<td>$65,000 – $80,000</td>
</tr>
<tr>
<td>IT project leader</td>
<td>$60,000 – $80,000</td>
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Sources: Hudson Salary Review 2014, Hays Salary review 2015
Salary range is indicative of the New Zealand job market at the time of publication (early 2016) and should only be used as a guideline.

THE AUT APPROACH

All final year students complete a research and development project for an industry or research centre client. Students work in teams, as consultants, on a wide range of exciting computing projects with companies such as Fisher & Paykel Healthcare Ltd, Eagle Technology and FutureTech, where they are supervised by AUT staff.

Research institutes play an important role, including:

Data Science Research Group. In collaboration with industry partners, DSRG researches new methods for big data mining and management, mining high speed data streams and other challenging environments that require machine learning approaches.

High Performance Computing Research Laboratory. The HPCRL is the hub for high performance computing projects in New Zealand, working across research and industry projects aligned with computing technologies such as exascale supercomputing, big data processing and low power computing.

FURTHER STUDY OPTIONS

For those wanting more specialised study, programmes include Graduate Certificate and Graduate Diploma in Computer and Information Science, Master of Computer and Information Science, Master of Information Security and Digital Forensics, and Doctor of Philosophy in computational intelligence.

Recent research in the school includes topics in mining high speed data, streams pattern mining, time series prediction and artificial intelligence.
I initially studied and worked in biotechnical engineering in Romania, but I’ve always been fascinated by numbers. Whenever there’s a theory about anything, it always comes back to the numbers, analysing patterns and testing the data to validate what is being proposed. That’s the reason I chose to study computational intelligence – it opened new ways of seeing things and taught me how numbers can be used to explain how everything works.

I now work for Vista Entertainment Solutions, the world’s leading supplier of cinema management software, with installations in over 60 countries. I offer broad software support to our customers. This could be anything from fixing simple incidents in their ticketing system, to applications problems on loyalty programmes, to large configuration issues where I need to rebuild a client’s software system locally in order to find a solution.

My main clients are in the US, but I can also be working with China, the UK or anywhere really. This can be challenging in terms of time zones and communication lags, but I really enjoy the variety of it. We update our product every two months, there is always something new and challenging to learn.

I’m currently working with a colleague on an analysis tool to optimise server performance that will increase efficiency for our customers. Vista runs an ‘Innovation Cup’ day where we have an opportunity to brainstorm our ideas and demonstrate them via a presentation. It is a lot of fun and can lead to investment in new development. In the future I’d like to move into the analytics side of the business, so I’m pretty motivated by that.”

GABRIEL CONSTANTIN
Software Services Consultant, Vista Entertainment Solutions.
Bachelor of Science in Analytics
(Gabriel has done the papers required of the Computational Intelligence major, but it was not yet on offer when he was studying at AUT, so he completed the degree above instead).

EMPLOYER COMMENT

“Vista’s Services team is a pivotal part of our Vista family. Our customers are assigned to a service consultant, who is their main point of contact and go-to person if they have any questions or concerns. Our service consultants in New Zealand are split into four regional teams (US, UK, China, Rest of World). Gabriel sits in the US team, assisting with incidents raised by the customer base there.

Gabriel’s past experience and skills learnt in his previous role, especially T-SQL, were key factors leading to his employment at Vista. Vista software, ‘Behind All the Best Cinemas’, supports an ever-growing number of cinema exhibitor customers around the world and having multi-lingual teams is also a huge bonus for us.”

Yann Teboul
Global Services Manager, Vista Entertainment Solutions
USEFUL WEBSITES
Institute of IT Professionals
www.iitp.org.nz

KD Nuggets (Data Mining, Analytics, Big Data, and Data Science)
www.kdnuggets.com

Kaggle – the home of data science
www.kaggle.com

FURTHER INFORMATION
For the most up to date information on computational intelligence and the Bachelor of Computer and Information Sciences, please visit our website www.aut.ac.nz/computational-intelligence

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The information contained in this career sheet is correct at time of printing, August 2019.