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DKE

**DATA AND KNOWLEDGE
ENGINEERING
RESEARCH GROUP**

APPLY FOR A RESEARCH
HIGHER DEGREE

www.itee.uq.edu.au/dke/



School of Information Technology
& Electrical Engineering

Brisbane, Queensland AUSTRALIA





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WHY UNDERTAKE A RESEARCH HIGHER DEGREE WITH DATA AND KNOWLEDGE ENGINEERING (DKE)?



<http://www.itee.uq.edu.au/dke/>

The Data and Knowledge Engineering (DKE) group provides students with outstanding research leadership, and cutting edge facilities within a thriving research environment. DKE Research Higher Degree (RHD) students enjoy opportunities to travel to conferences, visits to leading international research groups, and internships in industry like Microsoft and SAP.

CHOOSING UQ



<https://graduate-school.uq.edu.au/choosing-uq>

<https://future-students.uq.edu.au/why-choose-uq>

The University of Queensland (UQ) is one of Australia's premier research institutions, internationally-renowned for its highly-awarded teaching staff, world-acclaimed researchers and superior campus facilities and services. UQ has awarded over 15,000 students with a research higher degree and is currently supporting a further 4,300 students to achieve their research goals. As an RHD student at UQ you join a culture of research excellence. UQ's longstanding reputation for quality is reinforced by affiliations with prestigious national and international groups, including the Australian Group of Eight (Go8) and Universitas 21. Internationally UQ ranks in the world's top 100 in a ranking compiled in by the prestigious Times Higher Education Supplement. It also consistently ranks as one of the best universities in the Asia-Pacific region by the Shanghai Jiao Tong University's Academic Ranking of World Universities.

DKE OVERVIEW

Research Strengths



<http://www.itee.uq.edu.au/dke/research>

In both 2015 and 2012, the DKE group was awarded “**ERA 5**” as part of the Australian Research Council’s (ARC) **Excellence in Research Australia** program, making it one of six leading groups Australia wide in the area of Computer Science and Information Systems. An “**ERA 5**” denotes research achievement well above world standards. In 2013, the DKE group’s “Information Systems and Data Management” area was officially recognised as one of UQ’s top-30 research strengths.

Data and Knowledge Engineering research aims to find innovative and practical solutions for creating value from big data in business, scientific and social applications.

The DKE research group currently has five key areas of research activity:

- ◆ Spatiotemporal Data Management
- ◆ Multimedia and Pattern Recognition
- ◆ Data Quality Management
- ◆ Social Media Analytics
- ◆ Big Data Foundation and Infrastructure

Members of DKE contribute to all aspects of data-centric research including: Data modeling, Indexing, Querying, Cleansing, Analysing, Visualising, and use and adoption over a number of application areas.

Research Staff



<http://www.itee.uq.edu.au/dke/our-people>

In 2016, the DKE group comprises 7 full-time academic staff including 2 ARC Future Fellows, and 9 research fellows including 2 ARC Discovery Early Career Researcher Awards (DECRA).

Research Higher Degree (RHD) Students



<http://www.itee.uq.edu.au/dke/research-students>

DKE has established itself as a leading group in database education and research training, graduating over 90 PhD and MPhil students since 1990. In 2016, the group supervises 35 RHD students, with 12 thesis completions in the last two years.

Publication Profile



<http://www.itee.uq.edu.au/dke/publications>

The DKE group has published over 350 papers since 2010 with over 60% in top journals and conferences such as VLDBJ, IEEE Transactions on Data and Knowledge Engineering, IEEE TIP, ACM Transactions on Database Systems, ACM TOIS, World Wide Web Journal, Information Systems Journal, AAAI, ACM SIGMOD, IEEE ICDE, ACM Multimedia, CIKM, and ACM SIGKDD.

Grants and Funding



<http://www.itee.uq.edu.au/dke/grants>

The group has over \$4million in current research funding from the Australian government and industry via various ARC schemes including Discovery Projects, Linkage Projects, infrastructure and equipment grants, and various fellowship schemes.

Conference Leadership

Over the years, DKE has organized, or contributed to the organization of, a number of major conferences in Brisbane including VLDB 1990, WWW 1998, WISE 2004, BPM 2007, DASFAA 2009, ACIS 2010, ICDE 2013 and ACM Multimedia 2015.

Research Collaborations

International research partners and collaborators include SAP, AT&T, Microsoft, University of Pittsburg, the Chinese Academy of Sciences Joint Lab for Data Engineering and Software Engineering Research, Renmin University of China Joint Lab on Data and Knowledge Engineering Research, and Soochow University Advanced Analytics Lab. Within Australia, DKE works with the Commonwealth Scientific and Industrial Research Organisation (CSIRO), National ICT Australia (NICTA), and the Southeast Queensland Healthy Waterways Partnership.

Editorial Boards, Committees and Awards

DKE staff provide leadership roles internationally:

- ◆ Chair, IEEE Technical Committee on Data Engineering (Prof Xiaofang Zhou)
- ◆ Member, Queensland State Government Open Data Bill Consultation Committee (Prof Xiaofang Zhou)

- ◆ Deputy Chair of National Committee on Information and Communications Science, Australian Academy of Science (Prof Shazia Sadiq)
- ◆ Program Committee Chairs and General Chairs of top international conferences: ICDE, SIGMOD, CIKM, ACM-MM, BPM, ICIQ, DASFAA, CAISE
- ◆ Editorial board membership for most top journals in our field: VLDB Journal, *IEEE Transactions on Knowledge and Data Engineering (TKDE)*, WWW Journal, Parallel and Distributed Databases, Database Management, and Information System Frontiers, *ACM Transactions on Database Systems (TODS)*, *IEEE Transactions on Multimedia*,
- ◆ Keynote speeches including CIKM 2015, ICDT 2016, ASWEC 2016
- ◆ Numerous awards including:
 - Best Paper Awards: ICDE 2015, SIGMOD 2013/2015, DASFAA 2012/2016, WISE 2012/2013, APWeb 2010
 - Queensland Government's Premier Open Data Award 2014
 - 2012/2014 WiT (Women in Technology) Infotech Research Award (Prof Shazia Sadiq & Dr Helen Huang)
 - 2010/2016 Chris Wallace Award for outstanding Research Contribution conferred by Computing Research and Education Association, Australasia (Prof Heng Tao Shen & Dr Helen Huang)
 - #1 in MSR-Bing Image Retrieval Challenge 2014

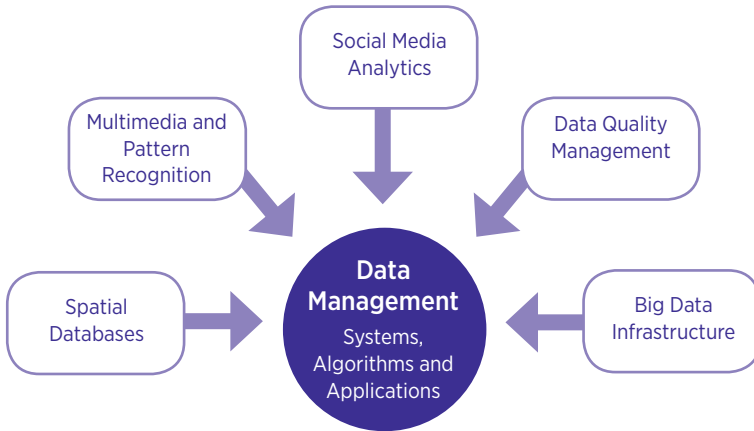
Historical Highlights

The DKE group has made significant contributions, since the 1980s, to information systems in the areas of conceptual modelling, theory of representation, distributed systems, workflow technology and bioinformatics.

During the last 10 years the group has spearheaded major national initiatives including the ARC Research Network on Enterprise Information Infrastructure (EII). Running from 2004–2011, EII profoundly influenced the Australian ICT community in terms of research collaboration, training (especially through the annual PhD school), and research quality. The aims of EII were to provide focus for research exchange via networking and collaboration and to improve the quality, impact and visibility of Australian ICT research. This unique initiative was funded by the ARC in conjunction with financial support provided by 21 Australian and international institutions including Microsoft and SAP. DKE continues to play a leading role in promoting excellence in research training.

RESEARCH HIGHLIGHTS

DKE currently has five key areas of research activity:



<http://www.itee.uq.edu.au/dke/multimedia-and-pattern-recognition>

DKE research on **Multimedia And Pattern Recognition** includes designing innovative methods to collect, manage, index, analyse, and search big multimedia data, with scalable algorithms to recognize and understand multimedia content for many practical applications.



<http://www.itee.uq.edu.au/dke/social-media-analytics>

DKE research on **Social Media Analytics** is to answer questions such as: how can we detect and predict the emerging sensitive events? How can we predict the propagation patterns of online micro-blogs? How can we understand people's opinions about a current issue, a new product, or an important event?



<http://www.itee.uq.edu.au/dke/data-quality-management>

DKE research on **Data Quality Management** includes practical methods to support and improve data quality practices in organisations as well as advanced computational methods to assist in data quality detection, profiling, repair and enrichment for business, spatio-temporal and social data. Our work highlights opportunities for improved cross-fertilization between research, industry and user groups in the area of data quality management.



<http://www.itee.uq.edu.au/dke/spatial-databases>

DKE researchers have specifically targeted **Spatiotemporal And Multimedia Data**, an area that has seen massive growth in volume and use due to prevalence of GPS devices and media empowered smartphones. The DKE group has developed novel multi-resolution map data access methods, data mining approaches, trajectory search algorithms, a highly efficient near-duplicate video retrieval system capable to detect duplicates over millions of video clips, and novel approaches to real-time content based multimedia search. The research has been immensely successful in attracting funding and interest from major industry players in the software industry such as Microsoft and SAP.



<http://www.itee.uq.edu.au/dke/big-data-infrastructure>

DKE research into **Big Data Infrastructure** is targeted towards the storage, exploration, and analysis of big data in business and scientific applications. Our approach is based on designing novel big data platforms that rely on scalable data processing and query optimization techniques at all three levels of the database architecture: user interaction, middleware access, and database engine. Special emphasize is given to emerging database technologies such as column stores, in-memory databases, key-value stores, cloud and distributed infrastructures.

RESEARCH APPLICATIONS AND SYSTEMS



<http://www.itee.uq.edu.au/dke/dke-lab>

DKE researchers have access to a one terabyte SAP HANA in-memory database platform. The SAP HANA technology provides DKE with invaluable computing power to analyse large experimental datasets.

Computing Infrastructure

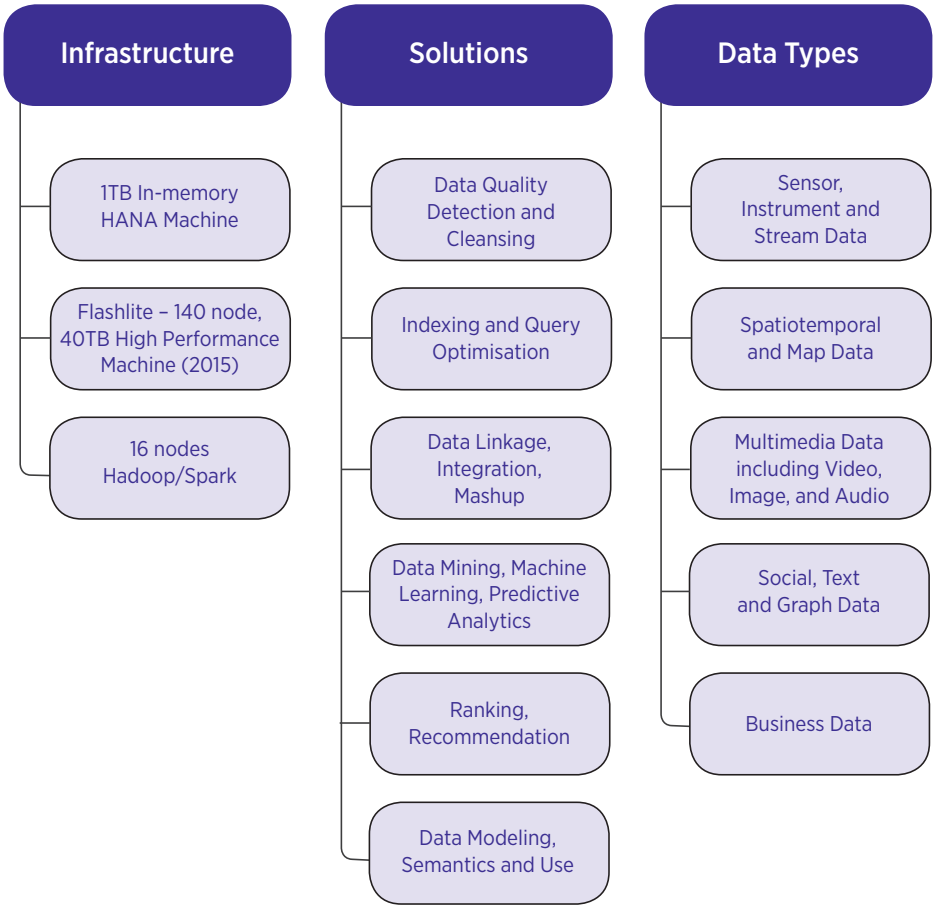
- ◆ A dedicated DKE Lab
- ◆ 8 high-end servers + 4 GPUs
- ◆ In-memory computing including SAP HANA (1TB Memory) + a HANA-free mirror
- ◆ FlashLite: 70 compute nodes (~2400 cores)
 - Dual socket Intel E5-2680v3 2.5GHz (Haswell)
 - 512 GB DDR-2
 - 4.8 TB NVMe SSD
- ◆ 16-node Cluster/Hadoop/Spark platforms

Methods

- ◆ Indexing and Query Processing
- ◆ Data Quality Management
- ◆ Information Extraction, Linkage and Integration
- ◆ Data Mining and Pattern Recognition
- ◆ Clustering, Ranking and Recommendation

Data Types

- ◆ Spatiotemporal Data
- ◆ Multimedia Data
- ◆ Social, Text and Graph Data
- ◆ Business Data



LEADING RESEARCH STAFF



Prof Xiaofang Zhou

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Professor Xiaofang Zhou's research is focused on finding effective and efficient solutions to managing, integrating and analysing very large amount of complex data for business and scientific applications.

3 MPhil and 17 PhD students have graduated under his supervision. He currently supervises 2 MPhil and 8 PhD students.

Professor Zhou received his PhD in Computer Science from the University of Queensland in 1994. From 1994 to 1999, he worked as a Senior Research Scientist and Project Leader in CSIRO.



Prof Shazia Sadiq

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Shazia's main research interests are innovative solutions for Business Information Systems that span several areas including business process management, governance, risk and compliance, and information quality and use. Her influential works on declarative modelling of business processes are some of the highest cited works in the area and include an industry patent.

1 MPhil and 14 PhD students have graduated under her supervision, with 3 theses near completion. She currently supervises 2 MPhil and 4 PhD students.

She holds a PhD from The University of Queensland in Information Systems.



Prof Xue Li

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Xue's current research projects are in the fields of: Opinion Analysis from Social Media, Big Data Analytics, Knowledge Discovery from Sequences, Mining Distributed, High-Speed, Time-Variant Data Streams. The Australian Financial Review in their Power Issue 2015 has honoured Prof Xue Li as one of "the most powerful people in Australia" in the area of Big Data.

3 MPhil and 15 PhD students have graduated under his supervision. He currently supervises 5 PhD students.

He received his PhD from Queensland University of Technology in 1997.



Prof Heng Tao Shen

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Heng Tao's research interests mainly include Multimedia Search, Pattern Recognition, computer vision, and Big Data Management on spatial, temporal, multimedia and social media databases.

7 PhD students have graduated under his supervision, and he is currently supervising 4 PhD students.

Heng Tao is an ARC Future Fellow. He obtained his PhD from National University of Singapore in 2004. He then joined the University of Queensland and became a Professor in late 2011.



Prof Yufei Tao

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Yufei's current research aims to develop "small-and-sweet" algorithms. Small: easy to implement for deployment in practice. Sweet: having non-trivial theoretical guarantees. He is particularly interested in algorithms dealing with massive datasets that do not fit in memory.

Yufei Tao joined as a Professor in the DKE group in January 2016. He obtained his PhD degree from Hong Kong University of Science and Technology (HKUST) in 2002. Prior to joining UQ, he held positions at Carnegie Mellon University, City University of Hong Kong, KAIST, and the Chinese University of Hong Kong (CUHK).

While at CUHK, 3 PhD students graduated under his supervision. Yufei is currently supervising 1 PhD student.



Dr Helen Huang

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Dr Huang's research interests include multimedia indexing and search, social data analysis and knowledge discovery.

1 MPhil student has graduated under her supervision, and she has acted as Associate Advisor for 4 PhD graduates. Helen currently supervises 3 PhD students.

Dr Huang is currently an ARC Future Fellow at The University of Queensland. She received her PhD in Computer Science in the DKE group at The University of Queensland in 2007.



Dr Mohamed Sharaf

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Mohamed's research interests cover several topics in data management with emphasis on data exploration and visualization, data warehousing and analytics, data stream management systems, sensor, mobile and pervasive data management, and web databases.

4 RHD students are currently under his supervision.

Mohamed received a PhD in Computer Science from the University of Pittsburgh in 2007. He was a postdoctoral Research Fellow at the University of Toronto 2007-2009 and a Visiting Professor at the University of Pittsburgh in 2016.

DKE GRADUATE SUCCESS STORIES

Undertaking PhD research with the DKE group is a great way to launch a successful research career. DKE RHD graduates go on to work with major players in both public and private sectors within Australia and internationally, including leading companies like Amazon, IBM, SAP, InfoSys and Microsoft, as well as with universities worldwide. Some DKE graduates also go on to start up their own technology companies, or take up leadership positions in industry R&D.

A number of DKE's current staff are RHD graduates from the DKE group including:

- ◆ **Prof Xiaofang Zhou** who leads the DKE group. Among his recent accolades was his keynote address at the leading international conference, CIKM 2015. Also in 2015, Prof Xiaofang Zhou was appointed as a member of the Queensland State Government Open Data Bill Consultation Committee. In 2014, Prof Xiaofang Zhou was elected to the prestigious position of Chair of the IEEE Technical Committee on Data Engineering.
- ◆ **Prof Shazia Sadiq** who has gone on to win a number of awards including a university teaching award, and the InfoTech Research Award at the 2012 Women in Technology Awards. The WiT Awards is an annual program developed association with industry to celebrate outstanding women in the technology industries.
- ◆ **Dr Helen Huang** was the recipient of the 2016 Chris Wallace Award for Outstanding Research. In 2014, Helen won the Infotech Research Award at the Women in Technology awards (WiT). Helen was selected as the winner for “her contribution to the field of IT research, her commitment to ongoing research and her ability and drive to guide the young minds of the future”. In 2013, Helen became the DKE group's new ARC Future Fellow.





Other notable recent graduates include:

Dr Yang Yang graduated from DKE group with a PhD degree in Computer Science in 2012, and joined the National University of Singapore as a Research Fellow. Since 2014, he has been a Professor at the University of Electronic Science and Technology of China, under the University's "Hundred Talents Program" (校百人计划), and he leads a research group working on big multimedia research. Due to his outstanding research performance, he was selected into China's "Thousand Youth Talents Plan" (国家青年千人计划) in 2015.

2015 DKE PhD graduate, **Dr Han Su**, is currently a postdoc in InfoLab and IMSC at the University of Southern California, USA, working with Professor Cyrus Shahabi. In May 2016, Han was selected by the Dean of the UQ Graduate School as a recipient of the *2015 Dean's Award for Outstanding Research Higher Degree Theses*. Han's thesis examiners nominated her for this award as they considered her thesis to be a substantial contribution to international DKE research.

Dr Vinita Nahar is currently a Research Fellow at the Research Group in Computational Linguistics, University of Wolverhampton, UK. While undertaking her PhD within the DKE group, she won the prestigious Google Anita Borg Memorial Scholarship (Australia and New Zealand) 2013 for her PhD project on cyberbullying detection.

Dr Naiem Yeganeh was awarded his PhD in 2013, and after initial positions with Microsoft and Schneider Electric, he now resides in Seattle, USA, working as a Software Engineer at Amazon.

Graduating in 2013, **Dr Shuo Shang** is currently a Professor of Computer Science at China University of Petroleum-Beijing. He is also the Assistant Director of Beijing Key Laboratory of Big Data Management and Analysis Methods.

DKE graduates hold research and leadership positions in government and industry

Below are a number of notable examples:

- ◆ **Dr Hoyoung Jeung** is Director, SAP Innovation Center Network, SAP, Australia
- ◆ After a number of positions with IBM, **Dr Xingzhi Sun** is currently Senior Development Leader at Microsoft Research Asia, Beijing, China
- ◆ **Dr Jiajun Liu** is a Research Fellow at the Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia
- ◆ **Dr Kexin Xie** is a Senior Data Scientist at Krux Digital, Inc. San Francisco, USA
- ◆ **Dr Zaiben Chen** is a BI Analyst at Allianz Global Assistance, Australia
- ◆ **Dr Ruopeng Lu** is a Senior Technical Consultant – SAP HANA/EIM/BI, Australia Post
- ◆ **Dr Karsten Schulz** is Program Director Digital Careers – National ICT Australia (NICTA)
- ◆ **Dr Ralf Muhlberger** is Department Coordinator, Animation, Design, and Web & Mobile departments at SAE Institute Australia
- ◆ **Dr Nirad Sharma** is a Quantitative Trader at SAC Capital, New York City, USA
- ◆ **Dr George Semeczko** is Chief Technology Officer (CTO) & VP Infrastructure Service Delivery at RSA Canada



DKE graduates hold positions in the international and Australian university sector

DKE RHD graduates have taken up academic and research positions in the **international university sector** in Thailand, Indonesia, Vietnam, Italy, Malaysia, Saudi Arabia, USA, Brunei, Iran, India, China, and the UK.

Similarly, DKE RHD graduates have taken up academic and research positions in the **Australian university sector** including:

- ◆ One of DKE's earliest PhD graduates from 1991, **Professor Yanchun Zhang**, is now Director of the Centre for Applied Informatics (CAI) at Victoria University.
- ◆ **Dr Marta Indulska** is an Associate Professor and Leader of the Business Information Systems discipline at The University of Queensland's Business School.
- ◆ **Dr Yi-Ping Phoebe Chen** is Professor and Chair at the Department of Computer Science and Computer Engineering, La Trobe University
- ◆ **Dr Olivera Marjanovic** is Associate Professor at The University of Sydney Business School

DKE Alumni, **Dr Wasim Sadiq**, was featured as a "research leader" in UQ's flagship publication *Discovery at UQ* in October 2014. At that time, Dr Sadiq was Vice-President of Strategic Customer Engagement at SAP (one of the largest software companies in the world). He is now the General Manager of Research at Infosys.

In this article, he comments on the importance in a research career of industry engagement from the time of undertaking a PhD. He also cautions research students not to focus on the end goal so much that they forget to appreciate the experiences along the way:

"Doing a PhD is one opportunity in your life where you get to work on a complex problem for a few years. Sometimes, submitting the final PhD dissertation to get the degree becomes the key objective. My advice is not to make this the only goal. That will happen in any case if you do the right things. The experiences and lessons you will learn during your PhD are going to be the key asset in your professional life afterwards. Completing a PhD helps you gain valuable problem-solving skills by looking at problems in a multi-faceted way. It also helps you learn how to handle constructive criticism and most importantly, to not give up."



<http://www.uq.edu.au/research/research-at-uq/files/2014/discovery-at-uq-2014.pdf>

FUNDING

China Scholarship Council (CSC)



<http://www.csc.edu.cn/>

The China Scholarship Council – Post-graduate Study Abroad Program finances outstanding Chinese students (Chinese citizens) to study at top universities around the world. The University of Queensland is a partner university in this program. Please refer to CSC website for most up to date information.

UQ Scholarships



<https://graduate-school.uq.edu.au/scholarships>

The University of Queensland has scholarship schemes that provide financial support for tuition fees, living costs and travel which enables you to focus on your research and achieve the best results. Applicants who wish to be considered for a UQ Graduate School tuition fee and/or living allowance scholarship should note that the RHD Scholarship Selection Committee meets twice a year to select the recipients.

INTERESTED IN JOINING THE DKE GROUP AS AN RHD STUDENT?

Here are the steps on how to apply:

1. Make contact with a potential supervisor from DKE.
Please see pages 10 – 11 of this booklet.
2. After discussions and agreement about both your research direction and funding available:
 - a. Prepare your documentation.
 - b. Complete and submit the university's online application form:



<https://graduate-school.uq.edu.au/future-students/applying-research-higher-degree>

RHD Application Process – School of Information Technology & Electrical Engineering



<http://www.itee.uq.edu.au/rhd-application-process>





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