HKUST Big Data Institute (BDI)

Qiang Yang, Yang Wang and Lei Chen
Hong Kong University of Science & Technology
Data Extraction

Big Data Computing & Data Management

Data Integration

Data Mining & Visualization

Privacy & Security

Data Sharing Policy

Data Extraction:
- Online Shopping
- Smart Cities
- Health
- Finance & Risk Management
- Genetic Farming

Data Integration:
- Web Data
- City Data
- Financial Data
- Logistics Data
- Agricultural Data
- Sensor Data
World Experts in Big Data and Artificial Intelligence Gather at HKUST to Share Insights into Future

Dr Tieniu Tan, Vice Minister of the Liaison Office of the Central People’s Government in HKSAR (7th from right), HKUST President Prof Tony F Chan (6th from right), Vice-President for Research and Graduate Studies Prof Nancy Ip (7th from left), Dean of Engineering Prof Tim Cheng (5th from right), Prof Qiang Yang, Head of the Department of Computer Science & Engineering and Director of the Big Data Institute (4th from right), with world-class academic and industry leaders in Big Data and AI fields, and HKUST faculty. [Download Photo]
• WeChat-HKUST Joint Lab on Artificial Intelligence (WHAT Lab)
  – aims at social networking big data mining and machine learning, natural language processing and robotics research.

• Big-Data Bio-Intelligence and Machine Learning Lab
  – aimed at the development of advanced machine learning systems and promoting applications of machine learning in bio and genetic areas.

• Smart City Transportation Lab
  – aimed at using AI and Big Data technologies in smart city applications
• Joint Master’s Degree in Big Data Technology
  – Over 100 students graduate from these programs each year
• New Joint Bachelor’s Degree in Data Science
• Collaboration
  – Computer Science and Engineering and
  – Mathematics
• **BDI Advisory Committee (Internal):**
  – Chairman: Dean of School of Engineering: Professor Tim Cheng
  – Dean of School of Science: Professor Yang Wang
  – Dean of School of Business & Management: Professor Kar Yan Tam
  – Associate Vice President of Knowledge Transfer: Professor Enboa Wu
  – Head of Department of Industrial Engineering & Logistics Management: Professor Guillermo Gallego
  – Head of Department of Electronic and Computer Engineering: Professor Bert Shi
  – Head of Division of Biomedical Engineering: Professor I-Ming Hsing
  – Head of Division of Social Science: Professor Kellee Tsai
  – Director of HKUST Big Data Institute: Professor Qiang Yang

• **BDI Advisory Committee (External):**
  – Mr. Francis Kwok, Founder & Chief Product Designer of Radica Systems Ltd
  – Mr. Herbert Chia, Venture Partner of Sequoia Capital China
  – Professor Michael Franklin, Liew Family Chair of Computer Science, Senior Advisor to the Provost for Computation and Data, Interim Director of Computation Institute, University of Chicago
  – Professor Leonidas J. Guibas, Professor of Computer Science, Stanford University
  – Professor Tamer Ozsu, Professor of Cheriton School of Computer Science, University of Waterloo
The Executive Committee

- Chairman: Professor Qiang Yang
- Members:
  - Professor Lei Chen, Associate Director of HKUST Big Data Institute, and Department of Computer Science and Engineering
  - Professor Yang Wang, Associate Director of HKUST Big Data Institute, and Dean of Science
  - Professor Cameron Campbell, Professor of Division of Social Science
  - Professor Inchi Hu, Chair Professor of Department of Information Systems, Business Statistics and Operations Management
Clustered Hires (5):
• Yangqiu SONG, Assistant Professor, (CSE 75%/ MATH 25%; 6/2016)
• Yuan YAO, Associate Professor, (MATH 100%/ BME; 8/2016)
• Jiguang WANG, Assistant Professor, (LIFS 50%/ BME 50%; 12/2016)
• Kohei KAWAGUCHI, Assistant Professor, (Econ 100%; expect to report duty in 9/2017)
• Yu HU, Assistant Professor, (MATH 50%/ LIFS 50%; expect to report duty in summer 2018)
• Research Assistant Professor:
  ▪ Yu Zhang (BDBI-ML/CSE 100%; 6/2017)
• EO Admin:
  ▪ Irene Lau (EVPPO 100%; 11/2016)
• Project Managers:
  ▪ Ouyang Jun (Thales-ITF)
  ▪ Yutao Deng (WHAT Lab)
  ▪ Leye Wang (Digital-China-ITF)
Joint Research Projects

• WHAT Lab: Tencent entered into a 5-year research partnership with BDI since late 2015, amounts to RMB10 million in total; 9 faculty; 15 students

• BDBI-Machine Learning Lab: Donation by Mr. Raymond Chu for a duration of 5 years, totals US$1 million; 3 faculty, 1 RaP, 16 students

• Smart City: ITF project partnered with Digital China, HK$20 million for 2 years; 12 faculty; 14 students

• Smart Transportation: ITF project partnered with Thales, HK$10 million for 2 years; 10 faculty; 56 students
## BDI Students (~91 in total)

<table>
<thead>
<tr>
<th>Thales Smart Transportation</th>
<th>Total: 56 students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zhang Qiang</td>
<td>Xu Haodi</td>
</tr>
<tr>
<td>You Yang</td>
<td>He Xiang</td>
</tr>
<tr>
<td>Zhu Chengkai</td>
<td>Zhao Zhenjie</td>
</tr>
<tr>
<td>Zhou Haofei</td>
<td>Yu Miaomiao</td>
</tr>
<tr>
<td>Han Dong</td>
<td>Li Wendong</td>
</tr>
<tr>
<td>Zou Changliang</td>
<td>Chin Jing Wei</td>
</tr>
<tr>
<td>Cheng Sijing</td>
<td>Dong Xujiong</td>
</tr>
<tr>
<td>Du Qing</td>
<td>Fang Jin</td>
</tr>
<tr>
<td>Wang Jinglu</td>
<td>Zhang Chen</td>
</tr>
<tr>
<td>Han Siyuan</td>
<td>Lam Ho Sam</td>
</tr>
<tr>
<td>Yang Yang</td>
<td>Xiong Qi</td>
</tr>
<tr>
<td>Yun Tiaojiao</td>
<td>Zhang Haowei</td>
</tr>
<tr>
<td>Chen Zhong</td>
<td>Li Tianyuan</td>
</tr>
<tr>
<td>Chan Ho Yin</td>
<td>Dey Anik</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Smart City</th>
<th>Total: 14 students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zhang Haowei</td>
<td>Yu Yaoyao</td>
</tr>
<tr>
<td>Tong Ka Wei</td>
<td>GE LV</td>
</tr>
<tr>
<td>Yao Quanming</td>
<td>Ya Da</td>
</tr>
<tr>
<td>Mok Chi Wing</td>
<td>Zhang Han</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WHAT Lab</th>
<th>Total: 15 students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wu Yuxiang</td>
<td>Xiao Wenyi</td>
</tr>
<tr>
<td>Zhu Ziqi</td>
<td>Jiang He</td>
</tr>
<tr>
<td>Chen Li</td>
<td>Yi Bairen</td>
</tr>
<tr>
<td>Qiu Kejie</td>
<td>Sun Mingfei</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BDBI &amp; Machine Learning Lab</th>
<th>Total: 6 students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Huang Yanzhou</td>
<td>Li Jiajun</td>
</tr>
<tr>
<td>Zhu Ziqi</td>
<td>Qian Yue</td>
</tr>
</tbody>
</table>
• Prof Ke Yi received ACM SIGMOD Best Paper Award 2016 and ACM SIGMOD Best Demonstration Award 2015

• Director Qiang Yang is the Editor in Chief of the IEEE Transactions on Big Data

• BDI Associate Director Professor Lei Chen is the Editor in Chief of the VLDB journal and Associate Editor in Chief of the IEEE TKDE journal.

• BDI and WHAT Lab member Professor Kai Chen and Tencent launched a new big-data and AI platform known as Angel and Amber to tackle the fast-growing big data analytic demands at WeChat and Tencent Cloud.

• BDI and WHAT Lab member Professor Huamin Qu’s WeSeer system is being used to analyze the information-diffusion patterns of millions of news articles each day.

• Best Presentation Award — Prof Dekai WU and Karteek ADDANKI. "Neural Versus Symbolic Rap Battle Bots". 41st International Computer Music Conference (ICMC 2015)., Texas: Sep 2015

• Prof Jiguang Wang and others’ paper “Spatiotemporal genomic architecture informs precision oncology in glioblastoma” is published in Nature Genetics in March 2017
Research Achievements

• **WHAT Lab: WeSeer System: (go online)**
  The WeSeer system developed by WHAT Lab was deployed and applied to WeChat, Tencent for daily propagation analysis. The system enable to analysis how official public account article information propagate in WeChat platform from different perspectives, involving a 3D global overview, time-varying propagation view, community detection view, etc.
• A one-year anniversary was held in Guangzhou on 16 Nov 2016 aiming to share the achievement of WHAT Lab in 2016 with Tencent. 8 professors in WHAT Lab gave project reports and show demos which were highly appreciated by Tencent. The event was a great success, with thousands of Tencent employees tuning in and listening to our talks. The WeChat Management team has given us very high commendation.
Industry & Academic partners

- **ITF Project Sponsors:**
  - Thales
  - Digital China

- **Tencent WeChat**
  - Established a joint lab (WHAT Lab) with HKUST in December 2015
  - WHAT Lab Opening Workshop in 26 November 2015
  - WHAT Lab one year anniversary in 16 November 2016
  - Funding: 2016/17 – HK$2 million; 2017/18 – HK$4 million

- **Shanghai Jiaotong University**
  - Joint workshop on big data in September 2016

- **Microsoft Research Lab Asia**
  - HKUST-MSRA Cup on “Big Ideas of Artificial Intelligence” in December 2016
Education Programs

- MSc in Big Data Technology (started in Fall 2016) – CSE & MATH
- UG Minor in Big Data Technology – SENG
- MSc in Business Analytics (will start in Fall 2017) – ISOM & CSE
- UG Major in Data Science (likely start in Fall 2017) – MATH & CSE
- AI-Robotics Training Workshops (planning) – RI & BDI
- Executive business programs (planning) – SBM
- Coordinated effort with:
  - Robotics Institute
  - SENG, SBM, Departments of MATH & ISOM
## Admission in MSC-BDT

<table>
<thead>
<tr>
<th></th>
<th>2015-2016</th>
<th>2016-2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicants</td>
<td>495</td>
<td>1067 (up to the end of March 2017)</td>
</tr>
<tr>
<td>International Applicants</td>
<td>56</td>
<td>54</td>
</tr>
<tr>
<td>Citizenship for (2)</td>
<td>Canada, Colombia, Ecuador, Ethiopia, France, Ghana, India, Indonesia, Italy, Korea, Mexico, Nepal, Netherlands, Nigeria, Norway, Pakistan, Palestinian Territory, Russian Federation, Saudi Arabia, Singapore, Slovakia, South Africa, Spain, Sweden, Switzerland, Turkey, United Kingdom &amp; United States</td>
<td>Australia, Bangladesh, Canada, India, Korea, Malaysia, Morocco, Nigeria, Pakistan, Philippines, Portugal, Russian Federation, Saudi Arabia, Singapore, South Africa, Sri Lanka, United Kingdom &amp; United States</td>
</tr>
<tr>
<td>Offer made</td>
<td>144</td>
<td>204</td>
</tr>
</tbody>
</table>
Big Data Technology Courses

Core Courses (12 credits):
• MSBD5001 Foundations of Data Analytics (3 Credits)
• MSBD5002 (Co-Listing with CSIT 5210) Data Mining and Knowledge Discovery (3 Credits)
• MSBD5003 Big Data Computing (3 Credits)
• MSBD5004 Mathematical Methods for Data Analysis (3 Credits)

Elective Courses (18 credits):
• MSBD5005 Data Visualization (3 Credits)
• MSBD5006 (Co-Listing with MAFS 5130) Quantitative Analysis of Financial Time Series (3 Credits)
• MSBD5007 Optimization and Matrix Computation (3 Credits)
• MSBD5008 Introduction to Social Computing (3 Credits)
• MSBD5009 Parallel Programming (3 Credits)
• MSBD5010 Imaging: Data Analytics and Pattern Recognition (3 Credits)
• MSBD5011 Advanced Statistics: Theory and Applications (3 Credits)
• MSBD5012 Machine Learning (3 Credits)
• MSBD5013 Statistical Prediction (3 Credits)
• MSBD6000A Artificial Intelligence (3 Credits)
• MSCBD6000B Deep Learning (3 Credits)
• MSBD5014 Independent Project (3 Credits)
In collaboration with different departments and divisions, HKUST BDI has been organizing a monthly lecture series from January 2017 onwards, inviting cross disciplinary speakers to enhance students, teaching staff and public's understanding on related big data topics and foster exchange and collaboration between academia and industry beyond borders and research fields.
Publicity & outreach

- Website development and maintenance (ongoing)
- Demos for constant visitors
- Big Data & AI Day (26 May 2017) – open conference with nation-wide participation among academia and industry
- Monthly open seminars series – partners with different departments on cross-disciplinary topics
- Organize student competitions (e.g. MSRA Cup, Smart City East Kowloon Competition, etc.)
- Researchers in projects take part in external competition to promote research strengths (e.g. entry for Hong Kong ICT Awards 2017 - Best Smart Hong Kong Award, 2017 Shenzhen City Open Data Innovation, etc.)
Future Plans

• AI-FINTECH Program with Business School and Hong Kong Financial Industry
• Student Internship Program with Industry
• Machine Learning Lab: Joint with BDBI Lab
• Joint University Program with Other Top Universities in the World
APPENDIX: More Media Coverage About BDI
港科大聯手微信建「智能實驗室」

科大設大數據生物智能實驗室

【大公報訊】記者簡英北京報道：去年底，微信團隊與香港科技大學聯合成立「微信—香港科技大學聯合實驗室」，由微信創始人、微信團隊創始人張志軍與香港科技大學理工學院電子及計算機工程系系主任林偉光組成。微信微信與香港科技大學高科技實驗室合作，推動人工智能技術的發展。

報道介紹，香港科技大學在人工智能、機器人和大數據領域在世界上都是處於領先地位，機器學習獲得多項世界優秀獎，包括ACM KDDCUP大賽、北京大學大賽以及ImageNet。在應用層面，微信團隊還與微信電商合作，建立微信電商平臺。

日前，微信與香港科技大學聯合成立的實驗室「科大設定大數據生物智能實驗室」正式啟用，將微信connection在大數據領域的先進技術，並為微信的業務發展帶來助力。

實驗室將深度融合微信的先進技術和香港科技大學的先進研究，推動微信在大數據領域的業務發展，為微信的業務發展帶來新的動力。
Digital China, 11 Sep 2015

神州数码牵手港科大，共建智慧城市（香港）研究院

2015年9月10日，神州数码控股有限公司与香港科技大学签署合作协议，携手共建智慧城市（香港）研究院。神州数码控股主席兼执行董事郭为与香港科技大学校长高锟教授代表双方签署协议。

Publicity & Media coverage

QQ.com, 19 Dec 2015

专访微信人工智能实验室：社交网络已成为人工智能的一个热点

港科大与神州数码将在智慧城市发展规划、市民服务、政府决策建议、大数据处理、云计算、高可靠软件、嵌入式与智能计算、车联网、未来媒体、未来网络、数据融合处理、智慧医疗、智慧城市交通、移动互联网技术等领域开展合作。双方将积极投入研究人员（教授和研究生）、配套资金、设备、实验环境等资源，推动在智慧城市标准、专利、产品技术等多个领域取得创新性的成果。双方将成立联合管理委员会、技术委员会、项目联络办公室等机构，保障合作的顺利推进。

港科大计算机系于11月30日宣布成立联合实验室，WeChat-Tificial Intelligence Technology，简称：WHAT Lab。该实验室将以人工智能改善用户的生活服务体验，借助大数据拓展机器学习的边界。

出的一款手机社交媒体应用，与开放性的舆论平台不同，微信是一种封闭的到了迅猛的发展，到现在它拥有了6.5亿的活跃用户，创造了中国IT的又一个