• **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 (BDBI) 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.
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]
Joint Research Projects

- WHAT Lab: Tencent entered into a 5-year research partnership with BDI since late 2015, amounts to RMB10 million in total; 11 faculty; 20 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(Innovation and Technology Fund) 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

面向高维度的机器学习的计算框架—Angel

简介

为支持高维度机器学习模型运算，腾讯数据平台与香港科技大学合作开发了面向机器学习的分布式计算框架——Angel 1.0。

Angel是使用Java语言开发的专有机器学习计算系统，用户可以像用Spark、MapReduce一样，用它来完成机器学习的模型训练。Angel已经支持了SGD、ADMM优化算法，同时我们也提供了一些常用的机器学习模型；但是如果用户有自定义需求，也可以在我们提供的最优化算法基础上比较容易地封装模型。

Angel应用香港科技大学的Chakonu 作为网络解决方案。在高维度机器学习的参数更新过程中，有针对地给落后的计算任务的参数传递提速，整体上缩短机器学习算法的运算时间。这一创新采用了香港科技大学陈凯教授及其研究小组开发的可感知上层应用（Application-aware）的网络优化方案，以及杨强教授领导的的大规模机器学习研究方案。
WHAT Lab: A. Establishment

WHAT LAB, which is short for WeChat-HKUST Joint Lab on Artificial Intelligence Technology, is dedicated to foster artificial intelligence and big data research to improve people’s living and advance the frontiers of knowledge, marking a milestone in the collaboration of WeChat and the higher education sector.

WeChat and HKUST will jointly conduct Artificial Intelligence (AI) Technology related research and explore the far-reaching frontiers of AI. This collaboration on AI research is expected to be long-term and world-leading. Research areas of WHAT LAB include intelligent robotic systems, natural language processing, data mining, speech recognition and understanding.

2015-11-26 WHAT Lab was established in HKUST
WHAT Lab: B. Research Area

1. Natural language processing
2. Data Mining & Visualization
3. Video Analysis
4. Large-Scale Machine Learning
5. Robotic Application

Scale:
1. 11 projects
2. 11 professors from CSE, ECE, MATH, ISOM
3. 20 students
Machine Reading aims to develop Machine Learning algorithms that could read and comprehend natural language documents as humans do. With Machine Reading, natural language information is converted to the form that could be processed by computers, and could be further utilized in applications such as summarization, question answering and dialogue system.
What Lab: C. Achievement II- dialog system

- A dialog system is a computer system intended to converse with a human. Through the dialogue system, computer information can be translated into natural language description, and human language can also be translated into computer information, so as to achieve human-computer interaction.

- Reinforcement and transfer learning, can be used to solve the problem of dialogue system. Reinforcement learning can solve the problem of delayed feedback in multiple rounds of dialogue, while transfer learning can help target areas by using data from similar fields, which can solve the problems of traditional intensive learning data.
In this project, we visually investigated 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. We also implemented several designs by using real propagation data, including the propagation clock, propagation wave, propagation galaxy and propagating tree. The system --- WeSeer has already been deployed and applied to WeChat, Tencent for daily propagation analysis.
Model-based Global Localization for Aerial Robots using Edge Alignment

Kejie Qiu, Tianbo Liu and Shaojie Shen

High resolution video available at:
http://www.ece.ust.hk/~eeshaojie/ral2017kejie.mp4

- The video contains three parts
- The first part presents the localization accuracy and global consistency by comparing with the ground truth provided in the indoor environment.
- The second part shows the real-time localization results in outdoor case.
- The third part of the video shows the closed-loop control by a trajectory tracking experiment using the proposed method for state feedback."
The Big Data for Bio Intelligence Laboratory (BDBI) aims to become a leading laboratory in the research of big data for biological intelligence and to bridge the knowledge gap between academics and practitioners.
Research areas of the Laboratory include new big data solutions such as “deep learning solution”, which generates rich features to describe a machine learning problem in order to let computers make decisions, and “transductive transfer learning” – allowing computer models to be easily adapted for use in many different application domains. It will also focus on genetic farming with objectives of making the process more automatic and user-friendly and scaling it to cater to very large data sources.
• In this project, we proposed a people-aware smart city framework that integrates data extracted continuously from the people, discovers their needs from integrated multi-source data, and finally determines the best resource allocation plans to satisfy these needs.

• People’s needs from the areas of education, health, travel, safety, finance and entertainment, which all have measurable objectives, will be studied in this project.

• In order to achieve the goals in the framework, several state of art techniques will be developed including data integration solutions to handle different data sources with different formats, transfer learning-based mechanisms to reveal knowledge, and machine-human collaborative approaches to make wise decisions.
Achievements: Open Data APIs (aggregated with Digital China platform)
Hong Kong University of Sciences and Technology (HKUST) and Thales are carrying out research and development to build a Big Data platform to address two critical problems in the public transport.

The project is unique to the extent that academia, industry and government work closely together to build an interdisciplinary and cross-domain solution for problems pertinent to Hong Kong and other large cities. The Big Data platform helps public transport agencies to build smart transport solutions in moving people efficiently and safely and, hence, enhancing citizen’s quality of living in a smart city.
Smart Transportation: B. Purpose and Scope of research

• **The purpose of this platform:**

(1) The platform aims at effectively monitoring and directing the crowd in railway stations so that early warnings can be given on potential dangers.

(2) Ensuring smooth operation of railway transport system by predicting potential major equipment failure.

• The platform will cover a number of frontiers of big data research, including data integration, data analysis, human factors, optimization / visualization, transfer of learning, simulation and operational research.
Other participation in cooperation

• Personalized Real-time Air quality Informatics System for Exposure (PRAISE-HK): a 5-year project funded by the HSBC 150th Anniversary Charity Program (more than HK$30M)
  BDI faculty involved as Co-I: QU Huamin and CHEN Lei

• Learning and Assessment for Digital Citizenship: receives HK$20M from TRS, 2016-2017
  BDI faculty involved as Co-I: TC Pong, Huamin Qu, and Xiaojuan Ma

• Big Data for Smart and Personalized Air Pollution Monitoring and Health Management: receives HK$50M, 2017-2018
  BDI faculty involved as Co-I: Huamin QU

• An Open Learning Design, Data Analytics and Visualization Framework for E-Learning: receives HK$8M from ITC
  BDI project involved: Huamin QU (PI), TC Pong, and Qiong Luo

• Data mining and deep learning of the human face for enhanced social power and advertising effectiveness: This project is funded HK$900K under University-Industry Collaboration Programme (UICP).
  BDI faculty involved: Huamin Qu (PI)
Research Achievements

• Prof Ke Yi received ACM SIGMOD Best Paper Award 2016 for Wander Join: Online Aggregation via Random Walks, and ACM SIGMOD Best Demonstration Award 2015 for STORM: Spatio-Temporal Online Reasoning and Management of Large Spatio-Temporal Data.

• 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

• Prof Yangqiu Song others’ paper HinDroid: An Intelligent Android Malware Detection System Based on Structured Heterogeneous Information Network won the Best paper and best student paper in applied data science track, in ACM SIGKDD 2017.
• **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.
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

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

- **NVIDIA Deep Learning Institute**
  - Joint workshop on practical deep learning in July 2017

- **Microsoft Research Lab Asia**
  - HKUST-MSRA Cup on “Big Ideas of Artificial Intelligence” in December 2016
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.
HKUST BDI is excited to partner with NVIDIA Deep Learning Institute, which has established itself as the leading provider of processing power for AI software, in launching its first-ever practical deep learning workshop on 27 July 2017.
• 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
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」

時間：2016-07-28 09:16:41

科大設大數據生物智能實驗室

29 June 2016
People.cn
协议约定，围绕双方的资源优势和战略发展规划，港科大与神州数码将在智慧城市发展规划、市民服务、政府决策支持、大数据处理、云计算、高可靠软件、嵌入式系统及智能计算、物联网等领域开展深度合作。双方还将共同成立智能城市研究院，并基于长期合作伙伴关系，开展智慧城市领域的深度合作。神州数码控股董事局主席郭为与香港科技大学校长陈繁昌教授代表双方签署协议。

腾讯旗下微信团队和香港科技大学于11月30日宣布成立联合实验室，WeChat-HKUST Joint Lab on Artificial Intelligence Technology，简称：WHAT Lab。该实验室将以人工智能为主要研究方向，旨在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。

背景：

微信是腾讯于2011年推出的一款手机社交媒体应用。与开放式的舆论平台不同，微信是一种封闭的社交平台。发布之后得到了迅猛的发展，到现在它拥有了6.5亿的活跃用户，创造中国IT的又一个奇迹。
BDI Website: http://bdi.ust.hk

About BDI
Leveraging on the existing strength and resources of the Hong Kong University of Science and Technology (HKUST), the Big Data Institute (BDI) was established upon the needs from both industry and society for a new model for managing multi-disciplinary focal points for Big Data research, by coordinating faculty's research on Big Data and Data Science at HKUST. BDI will provide a strong and highly visible leadership role in Big Data and Data Science research in Hong Kong and the world...

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