

# Application Guide

## 2017 Tencent Rhino Bird Elite Graduate Program

### I. General Guidelines:

Tencent hereby announces the launch of Rhino Bird Elite Graduate Program for the purposes of enhancing skills of graduate students, and partnering with higher education institutions to train high-level talents that can adapt to China's economic development, technological advancement and social progress.

### II. Application Terms:

This program has been tailored for full-time master and doctoral students, including the fresh recruits for academic year 2017 (required to submit the tutor's recommendation form provided by the institution they are currently enrolled at). For the application, at least one of the following conditions has to be met:

- The applicant has published papers in top-tier journals or conferences (China Computer Federation Types A, B or equivalent) as the primary author or having the tutor being the primary author and the candidate being the secondary author;
- The applicant is a key member of major provincial or national research programs, or has made prominent contributions to established open-source programs;
- The applicant has received national or international academic awards, awards from student contests or graduate awards from academic organizations such as China Computer Federation, Chinese Institute of Electronics, ACM, IEEE.

Graduate students meeting the following condition will be fast-tracked to review:

- The applicant was a participant/member of Tencent's research collaborations, e.g., CCF-Tencent Rhino Bird Fund, Tencent's joint lab programs, etc.

### III. Review Process:

Eligible graduates shall fill out the application form within the set timeframe and upload their resume, tutor's recommendation form and other supporting materials (See Appendix 2 and Appendix 3 for details of the application form and tutor's recommendation form). Application webpage is: <http://ur.tencent.com/register/4>. Each applicant is allowed to submit one application only and a maximum of two subjects can be applied for (priority will be given to the first subject). Important dates are as follows:

- March 20, 2017: Application begins;
- May 10, 2017: Application deadline;
- July 10, 2017: Announcement of results.

Please follow announcements of the program for specific milestones.

#### **IV. Resource Support:**

All elite graduates will be trained jointly by their tutor and an expert mentor from Tencent.(See Appendix 1 for related research directions and profiles of Tencent mentors). The elite graduates will be given the opportunity of an over three-month research visit to Tencent for gaining first-hand access to real-life problems in the industry, expanding their research mindset, validating academic theories and co-publishing papers and application for patents. In addition, the program will design a series of courses, such as communication skills and innovation methodology, and host online and offline academic exchange events.

The elite graduates will have access to the following resources:

- Online access to "Elite Group"(An online community platform targeting elite graduates, who will be required to register with their real name. See Appendix 4 for details);
- Opportunities to attend industry forums, academic conferences and training sessions;
- Receive research grants during visit to Tencent and have opportunity of being considered for annual rewards and research bonuses;
- Priority interview opportunities for internships or job openings.

#### **V. Terms of Training:**

The elite graduates will generally visit Tencent for 3-12 months (confirmed with both tutor and corporate mentor). At the end of joint training, the graduates will maintain access to "Elite Group" and the right to enlist for internal events and access contents. In principle, the graduates are not permitted to leave the program half-way. However, if necessary, a statement needs to be signed by both tutors and submitted with the program manager.

#### **VI. Organization & Management:**

The elite graduate program will be operated by an advisors' panel, an expert group, a mentor group and a project management team. The advisors' panel and the expert group will consist of academic institutions and Tencent's R&D experts, who will be responsible for controlling and optimizing project quality and selecting elite graduates. The tutor group will comprise tutors of the chosen graduates and Tencent's R&D team, and shall be responsible for mentoring the graduates' academic research. The project management team will consist of the project manager for Rhino Bird Elite Graduate Program and select elite graduates, who will be responsible for building and running the elite group and organizing academic exchange events.

For more information, please contact the program manager, Mr. Zhang Long, at [gluckzhang@tencent.com](mailto:gluckzhang@tencent.com).

- VII.** These Guidelines will come into effect on the day of their release. Should the material be different from the Chinese version, the Chinese version shall prevail.

## Appendix 1:

# Research Directions of 2017 Tencent Rhino Bird Elite Graduate Program

## Direction 1: Visual and Multimedia Computing

### Subject 1.1: Research on Key Technologies for Face Detection and Recognition

Research on automatic face detection and recognition is a hot topic and key challenge in the area of AI and computer vision. It has received widespread attention in both the industry and academia. This topic addresses the significant demand for face recognition technology in the areas of finance, mobile internet, video surveillance, etc. It employs cutting-edge computer vision technologies (primary technical approach being deep learning) and focuses on making breakthroughs in key technological issues – face detection and face recognition.

**Mentor Profile:** *Tencent's expert researcher, senior member of IEEE.* [He] graduated from Chinese University of Hong Kong with a postgraduate degree (2003) and a doctorate degree (2006) in Information Engineering. [He] began working at the Advanced Technology Institute of Chinese Academy of Sciences in March 2013 as associate researcher, researcher and PhD tutor, respectively. [His] researches cover AI, computer vision, face detection and recognition, among other areas. [He] has published over 20 high quality essays in CVPR, ICCV, ECCV and world-class multimedia conferences, such as ACM and MM.

### Subject 1.2: Research on Image and Video Editing Technology

This topic involves technological research on computer vision, including image de-noising, image super resolution, image & video de-blurring, image & video filter style switching and video stabilization. Particularly, it encourages graduates to attempt innovation in video de-blurring and video filter style.

### Subject 1.3: In-Depth Research on Image & Video Understanding Technology

Understanding images & texts and learning the complex relationship between the two require an effective presentation of them both, so as to actualize image and textual search and generation of descriptions. Video understanding not only requires learning how to represent single-frame images but also understanding the correlation between video frames of modeling time domains. Students may focus on making breakthroughs in image & text co-modeling, video frame modeling, etc.

#### **Subject 1.4: Vision-Based Deep Learning Research**

This topic involves vision-based deep learning and focuses on AI in 3D video games. It also studies how to directly export the control signals of game players from image sequence and how to empower game players with memory and mid to long term strategic planning. It attempts at making breakthroughs in gaming AI and general AI.

#### **Subject 1.5: Research on Computer Vision Technology in Augmented Reality**

Augmented reality involves computer vision technologies, including image/video-based SLAM technology and 3D scenario understanding. Students may focus on researches of vision SLAM, 3D reconstruction and scenario analysis.

**Mentor Profile (Subject 1.2-1.5):** *Tencent's expert researcher.* [He] obtained a PhD degree from Columbia University with a distinction in computer science and electronic engineering; received the Youth Researcher award at international Computer Vision and Pattern Recognition (CVPR) Conference; and best thesis award at Special Interest Group on Information Retrieval (SIGIR). [He] engages in basic research and product development in computer vision, machine learning, data mining and information search. To date, [he] has published over 100 papers and boasts of a citation count of over 3,600, according to Google Scholar. Most of his papers are published in internationally renowned periodicals and conferences, including Proceedings of the IEEE, IEEE TPAMI, NIPS, ICML, KDD, CVPR, ICCV, ECCV, IJCAI, AAAI, UAI, SIGIR, and SIGCHI. [He] has acted as guest editor and reviewer of authoritative international periodicals on several occasions and has served on the program committee of top international conferences since 2007, including NIPS, CVPR and ICCV.

#### **Subject 1.6: Research on Application of Deep Learning Technology in Advertising Images**

This area mainly involves studying the application of deep learning technology in an advertising scenario, including text detection and recognition in advertising image (video) materials, semantic understanding of advertising image materials, expression of traits, user profile mining, etc.

**Mentor Profile:** [He] graduated from Tokyo University, Japan and went on to work there as an assistant professor, focusing on computer vision. [He] has published a number of academic papers and served as the special reviewer for *Pattern Recognition Letters*. [He] continues to work on image-related algorithm studies and application of related technologies.

## **Subject 1.7: Deep Learning-Based OCR Research**

Students will mainly engage in OCR research based on deep learning technology which involves the training of a number of deep neural network structures, detection and positioning of texts in natural scenarios, certification, internet images and videos, as well as end-to-end sequence recognition.

**Mentor Profile:** [He] graduated from the Automation Institute of Chinese Academy of Sciences with a doctor's degree in pattern recognition and AI. [He] mainly engages in theoretical and applied research in image recognition, target detection and tracking. [He] has published four papers in key academic conferences and periodicals and made two related patent applications. [He] has worked on file OCR, natural scenario OCR application research and proposed text detection methods based on detecting text background area and adaptive hierarchical clustering. [His] research results yielded two US patent applications, two Japanese patent application and five patent applications in China. [He] is currently working on certificate recognition and natural scenario text recognition.

## **Direction 2: Natural Language Processing**

### **Subject 2.1: Research on File Theme Extraction Based on Deep Learning**

During the course of training, students will engage in research on natural language processing based on deep learning technology. This will involve learning the presentation of sentences, paragraphs and chapters of text; and developing related deep learning algorithm for in-depth pairing of related text blocks. On one hand, it requires deep understanding of granular text (sentence, paragraph) and on the other, it requires accurate extraction of theme information blocks in less granular (chapter) text. The key is to achieve breakthroughs in text presentation and deep learning matching algorithm.

**Mentor Profile:** *Tencent's expert researcher, graduate of the Cluster and Grid Computation Lab of Huazhong University of Science and Technology.* With over a decade-long experience in data mining, [his] main research area is data mining and big data application. [He] was involved in data analysis and mining and product optimization for QQ VoIP, SmartGET, PC Manager and other products. [He] spearheaded the development and business analysis of WeChat data metrics system and profile data. [He] is currently working on research related to product credit investigation modeling and product data application.

## Subject 2.2: Research on File Reading Comprehension Based on Deep Learning

Main research direction of this subject is deep learning-based file reading comprehension, including sentence-level information extraction, general and local theme relationship modeling and semantic matching-based reading comprehension Q&A.

**Mentor Profile:** *Graduate of University of Science and Technology of China.* [He] has extensive experience in computer advert engine and machine learning parallel training and has spearheaded advert users' business interest data mining projects. [He] is currently working on file reading comprehension research, including automatic file abstract generation and file-based smart Q&A.

## Subject 2.3: Research on Dialog Robot-Related Technologies

Building dialog robot development platform is a means of “cold start”, which intends to enable regular developers to quickly structure a dialog robot and speed up its implementation.

The key areas to be explored are:

- 1) Present in a simple way a task-oriented dialog robot, e.g., filling out a task form or semi-automatically convert/revise the task form based on a developed similar template for dialog robots;
- 2) Write a task form reader and operator to carry out multiple rounds of dialogs to complete the task;
- 3) Support interaction between task-oriented QA robots and casual chat robots; use the context of dialogs to connect important slots and intents to make dialog robots smarter. For instance, switching between small talk, enquiring about film Q&As and booking film tickets.

**Mentor Profile:** *Tencent's expert researcher, PhD graduate of Language Technologies Institute of Carnegie Mellon University.* [He] primarily engages in voice recognition, machine translation, semantic analysis and related research work. [He] has worked at Nuance Communications, SRI International; published papers at conferences, including ACL, NIPS, IEEE and Interspeech; and holds several US patents.

## **Direction 3: Voice Technology**

### Subject 3.1: Research on Models Related to Voice Recognition

Students will primarily engage in research on voice recognition with the options of linguistic model or acoustic model. Basis of the research will be deep learning algorithm, with an aim to optimize recognition rate.

**Mentor Profile:** *Tencent's expert researcher, graduate of Acoustics Institute of Chinese Academy of Sciences with a PhD in Information and Signal Processing.* [He] mainly engages in theoretical and applied research on voice recognition, has published 10 papers at important academic conferences and periodicals, and has five patent applications pending. [He] spearheaded the development of a number of features for Tencent's social media products, including voice search of contacts, speech input and conversion of voice into text.

### **Subject 3.2: Research on Speech Synthesis-Related Technologies**

Students will primarily engage in research on speech synthesis during the training process, covering deep learning-based speech synthesis, emotion-based speech synthesis, specific human voice synthesis and song/melody synthesis.

**Mentor Profile:** *Graduate of the Voice Lab of University of Science and Technology of China with a PhD in Information and Signal Processing.* [He] primarily engages in research on voice recognition, sound wave and language identification. [He] has performed outstandingly at NIST SRE/LRE tests on several occasions; and published a series of essays at ICASSP and INTERSPEECH, among other conferences. [He] was awarded ISCSLP 2010 Best Paper and is the owner of several US patents. [He] is currently focusing on voice recognition and deep learning.

## **Direction 4: Machine Learning and Related Applications**

### **Subject 4.1: Deep Text Comprehension Technology and Applied Research**

This subject revolves around studying and exploring deep text comprehension technology based on semantic analyses and knowledge inference, and its application in open-domain chatting and other scenarios.

**Mentor Profile:** *Tencent's expert researcher, graduate of the Department of Computer Science and Technology of Tsinghua University.* [His] research focuses on semantic comprehension and smart man-machine interaction. [He] has published over 20 papers at international conferences, including ACL, EMNLP, WWW, SIGIR, CIKM and AAAI. [He] has served on the procedural panel of ACL, EMNLP, WWW, AAAI, etc., besides being the reviewer of periodicals including TOIS and TKDE.

#### **Subject 4.2: Applied Research on Machine Learning in Image/Text Data Mining**

Main research areas include image processing and machine learning (including deep learning), with the aim of achieving breakthroughs in the automatic extraction of image features, image comprehension (including type and style) and image-text affinity modeling.

**Mentor Profile:** *PhD graduate of the Department of Automation of Tsinghua University.* [He] has devoted his time to AI-related research and published around 15 papers in the aforementioned area in top periodicals (SCI & EI) and international conferences. [He] currently works on research related to social media big data credit modeling.

#### **Subject 4.3: Research on Knowledge Graph Building Based on Deep Learning**

Under the deep learning framework, this subject focuses on building a knowledge graph by using remote monitoring to extract physical entities, concepts and their relations from texts. The research will also cover the application of knowledge graphs in Q&A systems, especially how to efficiently process noise in graphs.

**Mentor Profile:** *Tencent's expert researcher, graduate of State University of New York, Buffalo Campus with a PhD in Theoretical Physics.* [He] mainly engages in research related to natural language processing and information retrieval. [He] has published a number of papers at ACL, SIGIR, IJCAI, WWW and other conferences and holds several US patents.

#### **Subject 4.4: Research on Real-Time Neural Machine Translation Systems**

Given the strengths and potential of NMT, there is clear demand for real-time machine translation. This subject includes but is not limited to systematic studies on the complete solutions addressing translation problems, such as sequence adjusting, redundant/missing translation, data sparsity, decoding speed, etc.

#### **Subject 4.5: Research on Distributed Machine Learning Algorithm Platforms**

At present, machine learning (not limited to deep learning) is widely applied across business areas, necessitating the establishment of parallel distributed machine learning algorithm platforms. The purpose of this subject is to cross the boundaries of system and algorithm and design flexible, scalable, portable and efficient distributed machine learning systems, in order to develop the ability of supporting various machine



learning model training, model compression and online forecasting based on large quantities of data in an efficient and flexible manner.

**Mentor Profile (Subjects 4.4-4.5):** *Graduate of Dalian University of Technology with a PhD in Computer Science.* [His] main research areas include machine learning algorithm improvement and parallel implementation. [He] has published eight academic papers in SCI & EI periodicals and conferences and has extensive research experience in the field of machine learning. [He] is currently responsible for research and development efforts in machine learning platform and its application.

#### **Subject 4.6: Research on Deep Neural Network-Based Conversion Path Modeling and Conversion Rate Estimation**

In online advert scenarios, we need to adjust the sequence of online adverts based on the possibility of the ad generating a conversion (e.g., account registration, paid downloading, purchase order placement) to optimize the results of paying clients. The concept of conversion involves a series of user behaviors, which range from seeing the advert and clicking on it to the eventual conversion. Current industry practice of conversion rate estimation usually builds models based on conversion rate from clicking to conversion; overlooking the conversion from clicking on information and direct modeling exposure to conversion. This subject aims at exploring the possibility of modeling the conversion path and proposing innovative conversion rate estimation plan to increase the accuracy of estimation.

This research subject shall include, without limitation, the following contents:

1. Deep neural network-based feature presentation and monitored learning; and
2. Conversion path modeling based on the tiered structure of neural network.

**Mentor Profile:** *Graduate of Shanghai Jiaotong University, majoring in Applied Computer Technology.* [He] mainly engages in research related to data mining and machine learning. To date, [he] has published six papers at international conferences, for two of which [he] was the primary author (published in CIKM and AAI, respectively). [He] is currently responsible for estimating conversion rates in social media adverts and is involved in developing conversion optimization strategies. [He] has worked on and spearheaded projects that won company technological breakthrough awards.

#### **Subject 4.7: Applied Research on AI Technology in Real-Time Combat Games**

Real-time combat games, such as League of Legends, King of Glory and StarCraft, are fairly popular among players for their good operating sensation and entertainment

value. At the same time, the complex decision-making environment and extensive user data mean that these types of games can serve as the ideal AI technology experiment platforms. This subject focuses on studying the application of AI technology in real-time combat games, covering (but not limited to) real-time decision-making, application of game theory in multi-player combat and multiple intelligent agent collaboration.

**Mentor Profile:** *PhD graduate of National University of Singapore.* [He] mainly engages in research related to data mining and machine learning. [He] has extensive experience in recommendation system, precision marketing, user management and other application areas. The projects [he] was responsible for have won company-level awards on several occasions. [He] is currently responsible for implementation and application of data mining and machine learning in Tencent-developed games.

## **Direction 5: Research on Data Mining and Related Applications**

### **Subject 5.1: Applied Research on Cross-Modal Search and its Application in Advertising**

In Tencent's ecosystem, user behavior comes in all shapes and forms, the majority of which involve multi-modal contents, such as text, image and video. At the same time, advertising materials also constantly evolve in format—from text and image-based adverts in the early days to the present-day short video adverts. In the meanwhile, advertising material itself is multi-modal and multiple modes could even exist in a single piece of material. Multi-modal and cross-modal are key traits of big data and we must provide tailored solutions to related issues if we want to make the most of big data and increase placement precision in advertising scenarios. For this subject, in particular, we would like to address cross-modal searching, where we project texts, images and videos into the same space, i.e., we project users and adverts into the same space to achieve efficient and precision searching, the result of which can be used across the advertising recommendation journey.

**Mentor Profile:** *Tencent's expert researcher, PhD graduate of Beijing University of Aeronautics and Astronautics.* [He] has been dedicated to research and optimization of effect advertising algorithms and is mainly responsible for designing and implementing click rate estimation programs. With the trinity of data + algorithm + system, [he] pursues the optimal combination of technology and business and seeks to foster growth in company advertising through precision recommendations.

### **Subject 5.2: Application of Sequence Behavior in Advert Recommendation**

Under a recommendation scenario, users would access the platform multiple times. However, the platform is only able to choose one particular visit to display the advert, which will remain the same in a foreseeable period of time. In order to optimize user experience while ensuring platform revenue and seeking the optimal timing for advert display, models need to be built based on user's previous behaviors and user's click-through rate if scenario changes in future.

**Mentor Profile:** *Graduate of Huazhong University of Science and Technology with a PhD in Applied Mathematics and Biopharmaceutical Engineering. [He] mainly engages in research on regularization methods for medical imaging reconstruction algorithm, optimization algorithm and missing data in image reconstruction. [He] has published three papers in Class A periodicals as the primary author, and is currently working on click rate estimation and social media communication algorithm.*

### **Subject 5.3: Research Related to Social Media Structure Mining**

This subject revolves around research on the structural traits and attributes of social media, including user traits on social media, user similarity and user influence. The subject's technological areas include machine learning, complex network, network representation learning, user influence modeling and influence maximization.

**Mentor Profile:** *Tencent's expert researcher, graduate of Sichuan University, majoring in Applied Mathematics. [He] has over a decade-long experience in internet big data application and focuses on applying machine learning, complex network and other technologies into social media data mining. [He] is currently responsible for social media product user data mining and leads a number of key projects, including precision orientation of social media product adverts, networking credit investigation and socialized communication.*

### **Subject 5.4: Research on Forecasting Marital/Child-Rearing Status of Extensive User Base**

Tencent's social media advertising platform accommodates a large number of affluent advertising clients for match-making and mother & baby products. Therefore, precision placement of adverts of wedding dresses, pregnancy and baby products to users with corresponding demand will have a major impact on significantly increasing advertising revenue. However, users are highly averse to adverts of the aforementioned types as many married users do not wish to be shown match-making

adverts and single users can be put off by adverts showing pregnant women. Therefore, accurate depictions of the marital/child-rearing status of Tencent's large user base (including being single, in a relationship, newly married, married, having children [including age of the child]) have a major impact on precision target setting of match-making/mother & baby adverts, enhancing results for advertising clients and optimizing user's advertising experience.

Leveraging Tencent's proprietary data on the behavior of its large user base (QQ groups, mobile APP, adverts, QQ Space, WeChat, etc.) and modeling through data mining to forecast marital/child-rearing status of billions of Tencent users is the key problem to be addressed in this research, including but not limited to the following assignments:

- 1) Training sample collection building based on PU-Learning;
- 2) Trait mining and trait system building; and
- 3) User status modeling.

**Mentor Profile:** *Tencent's expert researcher, graduate of Fudan University with a PhD in Computer Vision, postdoctoral researcher of Princeton University. [He] has spent many years working on data mining, analysis and optimization, among other research areas, and has presented several research papers at top-tier data mining conferences. [He] is currently responsible for developing basic orientation for Tencent's social media adverts.*

Appendix 2:

## Application Form for 2017 Tencent Rhino Bird Elite Graduate Program

General Information				
<b>Name</b>		<b>Gender</b>		<b>D.O.B.</b>
<b>Mobile Number</b>				
<b>WeChat Account</b>				
<b>Email</b>				
<b>Correspondence Address</b>				
Educational Background				
Degree	From ... to ...	School/Research Institute	Discipline	GPA, Ranking
Undergraduate				
Postgraduate				
Doctorate				
Elite Program-Related				
<b>Do you apply to join "Elite Group"?</b>		Yes/No		
<b>Desired Research Subject</b>		(Fill out the ref. number of two subjects based on priority level; Subject 1 will be given priority consideration in review)		
<b>Time Available for Research at the Company</b>		(Choose between 3 and 12 months)		
<b>Time Planned for Company Visit</b>		(Detailed down to months; final visit duration TBD)		

<b>Personal Introduction</b>	(Including main research areas, key papers co-authored, research programs, accomplishments achieved, etc.)
<b>Publications</b>	(Specify title of essays, time of publication, title of periodical or conference, whether being the primary author, CCF classification of the periodical, etc.)
<b>Patent Applications</b>	(Specify name of patent, time of approval, patent number, etc.)
<b>Previous Projects</b>	(Specify project name, duration, authority approving initiation, main duties, etc.)
<b>Tutor Profile</b>	(Tutor's main research areas, accomplishments in past two years, etc.)



## Appendix 4:

# Introduction to "Elite Group"

"Elite Group" is based on Tencent Lexiang. It is an online community targeting Rhino Bird elite graduates, which users need to register with real names. Tencent Lexiang is a corporate cloud APP based on Tencent's best knowledge management practice. At Tencent, sharing and learning have become an integral part of employees' work life. As many as 60% of employees take the initiative to log into knowledge management platforms on a daily basis, generating over 400 pieces of knowledge. Employees use the platform to review work-related files, inquire experts about product's technological challenges and discuss new product ideas with co-workers.

The Lexiang platform represents the culmination of our knowledge management practice and experience accumulated over eight years of working at Tencent. Knowledge flows freely via Lexiang platform and effectively links people with knowledge and knowledge with knowledge, thereby enhancing the abilities and influence of every individual and the team as a whole.



Through Tencent's practice, we have found that circles with shared interest or common goals are the best for knowledge sharing and dissemination. Lexiang has inherited Tencent's unique knowledge management model—what we call the "K Bar" (Knowledge Bar). At K Bar, sharing knowledge is as easy and pleasant as everyone chatting casually by the bar counter.

If you can't find a K Bar you would like to join in Lexiang, you may create one of your own. You get to play to your strengths in a K Bar, develop your organization and communication skills and enhance your influence at the company. Based on user scenario, Lexiang has three types of pre-designed K Bars, namely knowledge accumulation, project management and social events, which offer Tencent's



most-used file templates to see you through the first step to knowledge management.  
Act now and log into Lexiang! Knowledge movement is just one “liking” a file away!