申请信

尊敬的哈工大（深圳）理学院招聘委员会：

我谨慎地写此信申请贵院的教授岗位。

我于 1988 年从湖南大学取得应用数学硕士学位后留校教授工科专业的高等数学系列课程。因发表了微分方程反问题方面的三篇论文，受到来访的美国特拉华大学荣誉教授 Robert Gilbert 教授的邀请 1993 年来美留学攻读数学博士学位和后增加的计算机信息科学硕士学位。1998 年毕业后先后在两家软件公司工作，1999 起受雇特拉华州立大学付教授，主要教授计算机专业本科课程和少量研究生课程。博士阶段做应用数学及计算数学的课题，做教职后主要做数据分析的横向课题和教学软件开发。共发表论文 18 篇 (https://zhongyanlin.github.io/site/publication/)，提交课题报告三篇，大型教学过程管理系统一个，和若干个教学辅助软件，共计 110 余万行程序(https://zhongyanlin.github.io/site/), 包括我最近在谷歌应用市场里发布的教学管理、数据处理及通讯方面的 app。期间我也曾受聘于美州银行等多家机构做系统开发的咨询 。

我最长的论文是 SIAM Appl Math 上发的 29 页的论文，因为超出附件上传长度限制，我特给出文章链接 https://zhongyanlin.github.io/site/publication/siam.pdf

我自认在数学和计算机科学方面有扎实的基础，长久积累了教学经验和软件开发经验，擅长针对具体问题提供数学模型，信息数据技术和人工智能的解决方案。我在取得美国高教协会和联邦教育委员会之有效教育方法架构认证的同时（https://zhongyanlin.github.io/site/apply/ACUECertificate.pdf），也在教学技术方面有自己独特的创新。我希望用我的经验来为中国的教育事业做一点贡献。

以下是我的工作计划：

1. 教学方面
   我能够讲授数据科学人工智能领域的如下的课程或内容
   （1）数据科学引论
   （2）python 编程

（3）数据结构及算法

（4）数据挖掘

(5) 数据可视化

(6) 图像分析和特征提取

(7) 统计建模

(8) 模式识别及其应用

2. 基于我开发的软件写作论文（见 Paper-writing Plan）。主要是介绍系统设计和已经实现了的算法。这是一个弹性计划，看排课的多少而定。

3. 用我开发的教学过程管理和教学质量管理系统搭建学校自己的网络教学过程管理中心，使学校有个自己的品牌从而提升学校的形象。这个系统同时也是教学大数据中心，使大数据的科研工作有自己的原始数据。

4. 希望有机会申请大健康方面的数据分析课题。以前做过这方面的应用课题也是自己个人兴趣。

非常感谢委员会考虑我的申请。

此致

敬礼！

申请人：林中焰

Paper-writing Plan

The following is my paper-writing plan for next two years. The proposed plan is based the software development work I have already done, instead of work starting from scratch.

This plan is optional depending on the availability of time released from teaching duty.

1:

Title: Generic and Special Quadrilateral Fitting

Abstract: While the line fitting, hyperbolic fitting and circular fitting are very useful statistical modeling problems and used in data analytics, quadrilateral fitting is not a classical problem. However, it is a practical problem. The problem is stated as this: given a set of points on a plain, to find a general quadrilateral, or special quadrilateral such as rectangle, parallelogram, square, rhombus such that a certain measurement of distance between the quadrilateral and the points reaches the minimum. It is a problem of optimization and we can find a number of applications. We want to study the solvability, uniqueness and optimal algorithms.

The representation and a generic algorithm have been developed and several numeric experiments have been done using Octave.

2:

Title: An Improved Digit Recognition Based on Topologic Feature Extraction and its Application in Automatic Grading of Student's Handwritten Submissions for Quizzes

Abstract: Digit-recognition is one of the most useful AI routines. A problem has risen from a teaching practice in K-12 education: the students in a large class of K-12 submit handwritten answers to class quizzes due to the "No cell phone and PC" policy and the teachers need to grade the submissions quickly using information technology and AI. The answer sheet is in a tabular format and most text are numbers. How do we develop a solution based on existing or new AI to recognize the answers and grade them automatically? A straightforward solution might be to catch an image of hand-written answer sheet and recognize the digits. It turns out that we need an enhanced digit recognition   algorithm.   In this paper, we present such an algorithm to extract the topologic features of trajectories of the handwritten digits.

Reference: **https://play.google.com/store/apps/details?id=com.systemsonweb.grading**

This system allows instructor to collect real big data for course assessment and   student's evaluations and generates reports for the course assessment and program assessment.

Status: The system has been developed and is already working.

Time Frame: It will take two weeks to write the paper

Difficult Part: integration of references

3:

Title: A Design of Teaching and Learning Management System to Facilitate ACUE's Effective Practice Framework

Abstract: ACUE's sequence of course modules   on Effective Practice Framework does not use modern educational technologies. Without using technologies, it is difficult to engage all students to participate in discussion sessions and grade manually all student's work. This paper presents a web system that facilitates most teaching methods included in ACUE Effective Practice Framework. As a framework of web application system in general, it has the following components specifically for teaching and learning management: assignment management, classroom discussion assistant, and AI type of automatic grading engine. The assignment can be reading questions, homework, tests or project with grading rubrics. Assignment managing routines include editing, previewing, answering, grading and reviewing.   Classroom discussion assistant component enables all students, instead of the dominant talkers,to contribute to the discussion topics, and monitors, records, analyzes and displays details of student's participation and performance.

This system allows instructor to collect real big data for course assessment and   student's evaluations and generates reports for the course assessment and program assessment.

Status: The system has been developed and is already working.

Time Frame: It will take two weeks to write the paper

Difficult Part: integration of references

Target Journal for Publication: ACM Communication, or ACUE related the publication opportunities https://acue.org/media-kit/publication-opportunities/

4:

Title: A Course Scheduling Management System that Supports Instructor's Teaching Preferences.

Abstract: Course Scheduling is a very important task of administration and management for an educational institution. Manual scheduling turns out to be very time-consuming, but on the other hand, automatic scheduling is a NP-hard problem in computer science. Any progress in this problem is of significance as it potentially saves a tremendous amount of resources for institutions. Furthermore, the current scheduling method does not support instructor's preferences or does that inefficiently. Instructor's preferences include subject preference and time preferences, that is, instructors desire to be able to input their preferred course and preferred time slots to teach, and let a "smart scheduler" work out the schedule that satisfies their preferences as many as possible.

This paper presents a design of such a system, including a web user interface, a database and a back-end scheduler. The key component of the system is the back-end scheduler that deals with the NP hard scheduling problem. The strategy for developing the algorithm is "hardest task first". So-called hard task is to schedule a course session that has many requirements but has few number of choices of time slot and instructor. Essentially, user wants the smart scheduler to tell as early as possible the existence of valid schedule. An opposite scenario is that after three days of intensive computing, an inefficient scheduler reports to user non-existence of valid schedule.

Status: The algorithm and system have been developed and are already working.

Time Frame: two weeks

Difficult part: reference integration.

5:

Title: A Thick-Client-Thin-server Distributed System for Course Registration

Abstract: There are two types of architectural-level designs of web application systems, that is, thin-client-thick-server and thick-client-thin-server. A thin-client-thick-server system has a light-weight client and heavy server. A banking system is a typical thin-client-thick-server system as banks are not confident about their customer's computers for mission critical tasks while they are confident on their own system as they can put plenty of resources to develop such a system. Many universities also use thin-client-thick-server system for student's course enrollment. In this paper, we analyze such a design and conclude that such a design for course enrollment is inefficient. On the other hand, a thick-client-thin-server is a better choice, which tremendously reduces work load for server by utilizing client's computing power, this means that only inexpensive hardware for system needs to be deployed to support university's operation. In this paper we will present the thick-client-thin-server design for course enrollment, which takes a list of courses to be taken by student user and optional restrictions, and reports all valid schedules for further selection. We also present performance comparisons of two types of designs.

Status: The algorithm and program have been developed. A User interface is needed to be developed.

Time Frame: 10 days

6

Title: Enhancing the Images of Handwritten Assignment Submissions by Removing the Positioning Lines Inside

Abstract: It is a general requirement for students to submit typed papers to answer assignments on a Learning Management System. However, if a student's solutions contains complicated scientific notations or hand-drawn illustrations, or school policy prohibits students from using computers, photos of answering paper may be taken by using cell phone and submitted to the Learning Management System. Unfortunately, such images have many problems, for example, they contain unwanted ruled lines that originally come from the homework book or composition book, and they are stretched or skewed, because when students take the photos in rush, cell phones are not aligned with paper perfectly. In this paper, we list some of the issues associated with the image submissions of assignment, design and implement algorithms for processing such images to improve readability for instructors to do grading. In particular, we want to straighten the images and remove the ruled lines inside.

Our algorithm is based on Hough transform , affine transform and Newton method for finding maxima.

Nowadays many online administrative services offered from government agencies also accept customer's image submissions of application materials.

Status: Algorithms have been developed and implementation are half-way done.

Time frame: 20 days.

Targeted Journal: SIAM Journal for Image Processing

7:

Title: A Sequence of Processing Routines that Converts Paper Forms to Web Forms

Abstract: Almost any task of administration and management is executed through one or more forms. A form is a guideline for the form owner to collect information input from his/her serving customers. There are still a lot of paper forms used in administration and management in educational institutions and governments for the following reasons. (1) The cost of developing, running and maintaining web information systems is still big, (2) the form owners are unwilling to make transitions from paper form to web form because of their fear of new technologies, and (3)being used to the paper forms, customers are unwilling to transit to web forms such as the google forms because the form layout is completely different from the old forms and it takes time to train themselves to adapt new forms. However, because there are numerous advantages of web forms over paper forms, the sooner or later, agencies have to change the paper forms to web forms.

There are three primary advantages to convert existing paper forms to web forms with preserving user interface: (1) the cost of developing and maintaining the web forms is tremendously reduced (2) the form owner's transition from paper form to web form is willing and easy because their previous efforts put in the form design get preserved and (3) the customer's transition from paper form to web form is willing and easy because of the same form layout and other convenience of electronic forms.

In this paper, we present a design of a web application system that converts existing paper forms to web forms to preserve form layout and visual design effects. Our design is based on the analysis of the images of existing paper forms to recognize various form components and detect their locations. From the properties of form components and location information, we can construct web form components that resemble original components.

The key issue turns out to be pattern recognition in image analysis. Possible patterns are lines, boxes and checkboxes. Artificial intelligence is used to optimize the pattern

recognition as the engine will accumulate the knowledge of pattern recognitions and make itself "smarter and smarter" automatically so that fewer and fewer manual corrections are needed.

The system has all necessary management routines for creating, renaming, modifying forms, and managing form data and user permissions.

Status: The whole system has been developed and fully tested.

Time frame: two weeks.

8:

Title: A Web-based Presentation Tool that is more suitable for Teaching than PPT

Abstract: Microsoft Power Presentation Tool (PPT) is a dominate presentation tool in business world. However, it is not very good for teaching lectures in classroom, in particular in STEM field where scientific notations and animations are required for instructional presentations. In this paper we present a design of a web-based presentation tool (WPT) that facilitates the teaching on the computer-projector setting in classroom. In addition to the basic features such as indexing, page sorter, slide show, transition, integration of multimedia contents and remote navigation that are available in PPT, WPT has these features:

 (1) Instant LaTex displaying without compilation

(2) Unified Model Language (UML) supporting

(3) Making tables only using the Tab key

(4) Variety of animation methods

(5) Scheduling object appearing and disappearing, emerging and vanishing

(6) Context menu for rapidly formatting and decorating content blocks

(7) Online tools as cloud-computing web services for creating content blocks

(8) QRcode-enabled remote controlling by mobile device

(9) Freely dragging and zooming content blocks during presentation

This web-based presentation tool is particularly good for teaching mathematics, computer science, physics, engineering and business.

Reference: https://zhongyanlin.github.io/site/showcase/

Target Journal: Instructional Technology

Time frame: two weeks.