Additional Admissions Form Master Program in Data Science & Artificial Intelligence

Instructions for filling out this form:

- Please fill out **all** fields within this form, unless indicated otherwise.
- Please feel free to add rows to the tables in this form if necessary.
- Copy the detailed and comprehensive course descriptions of all the relevant courses you have taken and the courses you are currently taking. Copy this from your study guide and **highlight** in it (in yellow) all the key words mentioned in our admission criteria and where you think you meet these requirements. You may add a **brief** explanation if you think the official course description of your university is incomplete, but it should be very clear what is the official course description and what is your own addition. **Copy all information in this form and safe as PDF; We use this form primarily to determine whether you meet the admission requirements so study very carefully all the courses relevant to the master's that you think you meet! This will benefit your assessment!**

Personal details:

Full name (as on passport)	SHI HUI
TU/e student number	2287765

Information on bachelor's degree:

Name of bachelor's degree program	Bachelor of Science(Mathematics and Applied Mathematics)
(Expected) graduation date	01/06/2021
Name of university	Donghua University
City and country of university	Shanghai,China

Information on previous master's degree:

Name of bachelor's degree program	Master of Applied Statistics
(Expected) graduation date	01/06/2023
Name of university	East China Normal University
City and country of university	Shanghai,China

Courses showing eligibility for the Master program in Data Science & Artificial Intelligence:

Please list all courses that prove you have passed one or more courses (5 ECTS) on each of the following subjects:

- **Linear Algebra**
  - calculate with matrices and vectors
  - solve linear systems with Gauss(-Jordan) elimination
  - understand and apply rank, orthogonality, (in)dependency, eigenvalue decomposition and eigenvectors
  - implement linear algebra calculations
- **Logic**
  - propositional logic and predicate logic
  - reason with logical formulas
  - provide proofs using various proving techniques (incl. induction, case distinction, contradiction)
- **Discrete Mathematics**
  - concepts and techniques from discrete mathematics (set theory, functions, relations, orderings)
  - knowledge of basic graph theory (graphs, trees, and their properties)
  - use them in computations and using them in formal reasoning
- **Probability and Statistics**
  - introductory probability theory, knowledge of discrete and continuous random variables
  - descriptive statistics including the theory and practice of confidence intervals, hypothesis testing and estimation theory
- **Data structures and Algorithms**
  - algorithm design techniques and use of standard data structures
  - prove correctness of algorithms and reason about algorithm complexity

- **Object-Oriented Programming and Software Development**
  - write programs from scratch in imperative or object-oriented languages
  - use general algorithmic techniques (aggregation, searching, sorting, recursion)
  - apply the principles of code quality and software engineering
- **Data Modelling and Databases**
  - design data models (E-R diagrams, UML) from natural language requirements
  - querying data in relational databases based on natural language requirements

- **Machine learning/Data mining**
  - theoretical foundations of data mining and machine learning
  - apply feature selection and extraction
  - apply supervised learning (classification and regression)
  - apply unsupervised learning (clustering and matrix-factorization)
  - apply evaluation methods and understand overfitting
- **Visualization**
  - Basic principles of visualization
  - design, implement and evaluate visualization tools
  - Implement data transformation, visualizations using visual variables and interaction principles
- **Group project work, that include the skills presenting and writing.**

Required TU/e subject	**Course name, code, and description of course contents (as given in the course syllabus/course catalogue)**	**Credits of the course/total credits of bachelor** *(for example 5 out of 180)* **and final grade**
Linear Algebra	**1、Advanced Algebra I** Content description: Polynomial; Determinant(Properties and Operations of the Determinant of an n×n Matrix,Determinant Expansion,Cramer's Rule,Laplace's Theorem);	Total Credits: 10 out of 141 Advanced Algebra I：96 Advanced Algebra I： 79

	System of Linear Equations(N-dimensional vector space, linear correlation, rank of matrix, discriminant theorem of linear equations with solutions); Matrix(Matrix concept; Matrix operation; Matrix product; Inverse of matrix; Block of matrix; Elementary matrix); Quadratic Form; **2、Advanced Algebra II** Content description: Linear space(Set and mapping; The definition and properties of linear space; Dimension, basis and coordinates; Base transformation and coordinate transformation; Linear subspace; Intersection and sum of subspaces; The direct sum of subspaces; isomorphism of linear spaces); Linear transformation(Definition of linear transformation; Linear transformation operation; Matrix of linear transformation; Eigenvalues and eigenvectors; Diagonal matrix; Invariant subspace; Jordan canonical form; Minimum polynomial); λ - matrix; Euclidean space(Orthonormal basis; Orthogonal transformation; Subspace; Distance from vector to subspace • least square method; Canonical form of real symmetric matrix);	
Logic	**Fuzzy Mathematics** Content description: F set (basic concept, operation and set set of F set); F pattern recognition (paste progress of F set, F pattern recognition principle) F relation and cluster analysis (F relation definition; F matrix; Symmetry of F relation; λ	Total Credits:12 out of 141 **Fuzzy Mathematics:88** **Mathematics Analysis II:72** **Mathematics Analysis III:82**

	cut matrix) F mapping and comprehensive evaluation; Expansion principle and F number; F logic (binary logic; F propositional formula, normal form of F logic function); F language and F reasoning (definition of F language; F word and F operator; Judgment sentence, reasoning sentence and logical reasoning; F reasoning sentences in different domains; Likelihood reasoning and conditional sentences; F application of reasoning); F control; F Probability **Mathematical Analysis II** Content description: Real number set and function (interval and neighborhood; bounded set • supremum principle; function concept; four operations of function); Sequence limit (properties of convergent sequence; conditions for the existence of sequence limit); Function limit (property of function limit; proof of limit; infinitesimal quantity and infinitely large quantity); Continuity of function; Derivative and differential; Differential mean value theorem and its application (Taylor formula; Cauchy mean value theorem and infinitive limit; Rolle theorem and Lagrange theorem; extreme value discrimination of function); Completeness of real numbers (deduction and proof of interval nest theorem; equivalence between basic theorems of completeness of real numbers); Indefinite integral; Definite integral; Anomalous integral;	

	Mathematical Analysis III Content description: Number term series (convergence and proof of series; positive term series; general term series); Function series and function term series; Power series (operation of power series; power series expansion of function; convergence theorem); The limit and continuity of multivariate function; Differential calculus of multivariate functions; Implicit function theorem and its application (analysis of the existence conditions of implicit function; implicit function theorem; derivation of implicit number); Parametric integration; Curve integral; Multiple integration; Surface integral;	
Discrete Mathematics	**Theory of Real Analysis** Content description: Sets (representation of sets; operation of sets; equivalence and cardinality; countable sets; uncountable sets); Point set (metric space, n-dimensional Euclidean space; Accumulation point, interior point, boundary point; Open set, closed set, complete set; The construction of open set, closed set and complete set on the line; Cantor set); Measurement theory; Measurable function (measurable function and its properties; Yegorov theorem; construction of measurable function); Integral theory (Lebesgue integral; Riemann integral); Lp space (norm and metric of Lp space; Lp space);	Total Credits:9 out of 141 **Theory of Real Analysis** :73 **Fuzzy Mathematics:88** **Data Structures and Algorithms： 76**

	Differential and indefinite integral; The course also aims to cultivate students' abstract thinking andanalytical reasoning skills. **Fuzzy Mathematics** Content description: F set (basic concept, operation and set set of F set); F pattern recognition (paste progress of F set, F pattern recognition principle) F relation and cluster analysis (F relation definition; F matrix; Symmetry of F relation; λ cut matrix) F mapping and comprehensive evaluation; Expansion principle and F number; F logic (binary logic; F propositional formula, normal form of F logic function); F language and F reasoning (definition of F language; F word and F operator; Judgment sentence, reasoning sentence and logical reasoning; F reasoning sentences in different domains; Likelihood reasoning and conditional sentences; F application of reasoning); F control; F Probability **Data Structures and Algorithms** Content description: Introduction to data structure (research object; algorithm definition; algorithm complexity analysis); Linear table; Stack and queue; Array, matrix and generalized table; Trees and binary trees (storage structure of binary trees; traversing binary trees; trees and	

	forests; Huffman trees and their applications); Graph (concept of graph; graph correlation algorithm represented by adjacency list; graph correlation algorithm represented by adjacency matrix; graph traversal; Kruskal algorithm; Shortest path; Dijkstra algorithm; Critical path); Search (sequential search; binary search of ordered table; balanced binary tree; hash table); Sort (insert sort algorithm; bubble sort; quick sort; merge sort)	
Probability and Statistics	**Probability Theory** Content description: Event and probability; Conditional probability and statistical independence; Random variable and distribution function; Digital features and feature functions; limit theorem **Mathematical Statistics** Content description: Sampling distribution and data simplification (χ 2 distribution, t distribution and F distribution, distribution of order statistics); Point estimation (moment estimation; maximum likelihood estimation; unbiased estimation); Interval estimation (pivot variable method; confidence interval; Bayes interval estimation; Tolerance range); Parameter hypothesis testing (some basic concepts of hypothesis testing; hypothesis testing of normal population parameters; likelihood ratio test; uniformly optimal test and unbiased test; hypothesis testing and interval estimation); Nonparametric hypothesis test	Total Credits:7 out of 141 Probability Theory:79 Mathematical Statistics:71

Data Structures and Algorithms	**Data Structures and Algorithms** Content description: Introduction to data structure (research object; algorithm definition; algorithm complexity analysis); Linear table; Stack and queue; Array, matrix and generalized table; Trees and binary trees (storage structure of binary trees; traversing binary trees; trees and forests; Huffman trees and their applications); Graph (concept of graph; graph correlation algorithm represented by adjacency list; graph correlation algorithm represented by adjacency matrix; graph traversal; Kruskal algorithm; Shortest path; Dijkstra algorithm; Critical path); Search (sequential search; binary search of ordered table; balanced binary tree; hash table); Sort (insert sort algorithm; bubble sort; quick sort; merge sort)	Total Credits:4 out of 141 Score:76
Object-Oriented Programming and Software Development	**Visual Basic Programming Language** This course gives students a systematic teaching of VB language mainly focuses on the development of simple object-oriented functional modules. Introduction to Visual Basic Programming; Visual Basic language basics (constants and variables; operators and expressions); User interface design (form objects; command buttons; labels and text boxes; timers; graphic controls and methods; control arrays); Scope of processes and variables; Menu Design **Computer Programming** This course is a practical course in data structures and algorithms, primarily designed to engage	Total Credits:7 out of 141 **Visual Basic Programming Language:73** **Computer Programming :81** **Computer & Networks Techniques:73**

	students in hands-on programming. It focuses on teaching students how to write related programs and algorithms in JAVA to solve specific problems（Recursive algorithm, sorting algorithm and so on related algorithms from previous learning course《**Data Structures and Algorithms**》）. **Computer & Networks Techniques:** This course covers the management functions of operating systems, network architecture analysis, the fundamental implementation principles of network devices, as well as practical techniques and configuration methods for network system design.	
Data Modelling and Databases	**Mathematical Modeling(1)、Mathematical Modeling(2)** The main objective of this course is to enable students to use appropriate mathematical equations to model and solve various real-life or production-related problems. It aims to teach students classical models in mathematical modeling and the problem-solving thinking processes involved.Whole course system is divided into two parts,this is the second part. **Data Warehouse and Business Intelligence（My Master Course)** Content description： Database principles; Relational data model; Structured Query Language (SQL) (SQL Overview; Data definition; Single table query; Group statistics query; Connection query; Data update; Complex queries); Database objects; Data security; Standardization of relational patterns; Database design and modeling (design methods and steps for database systems; conceptual model design and ER model; basic ER elements; establishment of ER model; logical pattern design; selection index); Database application development;	**Mathematical Modeling(1)、Mathematical Modeling(2)** :total credits 4 out of 141 Score:87、88 **Data Warehouse and Business Intelligence（My Master Course)** :2 credits Score:85

Machine Learning/Data Mining	**Data Mining** Content description: Introduction to Data Mining (Data Preprocessing Stage; Association Pattern Mining; Data Clustering; Data Classification); Data preparation (feature extraction and type conversion; data cleaning; data reduction and conversion); Similarity and distance; Association pattern mining; Cluster analysis (Mainly about Unsupervised Learning, like feature selection for clustering; k-means algorithm; Hierarchical clustering algorithm; Cluster validation) Data classification (Mainly about Supervised learning, like feature selection for classification; decision tree; rule-based classifier; naive Bayes classifier; logistic regression; Support Vector Machine（SVM） ; Neural Network) Data Classification: Advanced Concepts (Multi Category Learning; Regression Models for Numerical Categories; Semi Supervised Learning; Active Learning; Ensemble Methods) **Text Mining(My Master Course)** This course primarily focuses on natural language processing (NLP) and aims to provide students with a deeper understanding of the basic concepts and methods in NLP. It offers systematic training in using deep learning models to perform NLP tasks through programming. The course covers key topics such as syntactic analysis, the principles of Word2Vec, Seq2Seq models, and the BERT model, among others. **Statistical Learning(My Master Course)** Content description: Norm; Fundamentals of machine learning (capacity, overfitting and underfitting; hyperparameters and validation sets; supervised learning algorithms; unsupervised learning algorithms; stochastic gradient descent); Deep feedforward network;	**Data Mining**: 3 credits out of 141 Score:88 **Text Mining(My Master Course)** **Statistical Learning(My Master Course)** :Total credits 4 Score:87、88

	Regularization in deep learning; Optimization in deep models; Convolutional Networks (Convolutional Operations; Pooling; Random or Unsupervised Features; Efficient Convolutional Algorithms); Sequence modeling: Recurrent and Recursive Networks (Recurrent Neural Networks, Bidirectional RNNs, Deep Recurrent Networks, Recurrent Neural Networks, Long Short Term Memory, and other Gated RNNs); Practical methodology; Applications (large-scale deep learning; computer vision; natural language processing)	
Visualization	**Data Analysis Technology** Content description: Data analysis cognition; Descriptive statistical analysis; Fundamentals of Data Visualization (Concepts of Data Visualization; Principles of Data Visualization; Processes of Data Visualization); Data acquisition and processing (public data acquisition; crawler; data cleaning; data analysis); Data presentation (basic components of data visualization; forms of data presentation; selection of visualization methods); Principles and Techniques of Data Visualization Design (Ideas and Principles of Data Visualization Design); Data visualization tool (Excel data visualization; Python data visualization; Tableau Data Visualization) **Statistical Tools and Calculation(My Master Course)** Content description: Overview (RStudio's R Markdown Guide); Introduction to Data Analysis (Motivation for Data Analysis);	**Data Analysis Technology** 2 credits out of 141 Score:94 **Statistical Tools and Calculation(My Master Course)** 2 credits Score:89

	Describe the data (dataset and variables; continuous variables; categorical variables); Central tendency and dispersion (measures of central tendency: mode, mean, and median; measures of dispersion); Univariate and bivariate description of data (5 views of univariate data; box plot (bivariate); Is there a correlation between variables; Data transformation; Some principles of data display (integrating graphics and text; displaying causal relationships; establishing intuition); Essentials of Probability Theory; Confidence intervals and hypothesis testing; Compare; Controlled comparison	
Group project work	**Applied Business Data Analytics(My Master Course)** This course primarily focuses on specific business scenarios and statistical applications. It covers the well-known credit scoring card model, including the principles of the scoring card, its development process, practical applications, and involves group assignments where students complete a scoring card model project. **Practice of Mathemat** This course primarily teaches students how to use MATLAB for mathematical modeling. Students will select a relevant topic as a group project to conduct hands-on mathematical modeling and programming, and will also be required to write a course paper each group based on their work.	**Applied Business Data Analytics(My Master Course)** 3 credits Score:83 **Practice of Mathemat** 1.5 credits out of 141 Score:84

Due to having graduated for many years and the fact that the school did not provide official course introductions at that time, the above course introductions were based on textbook catalogs and my own study experiences.