KØBENHAVNS UNIVERSITET
UNIVERSITY OF COPENHAGEN

YUAN CHEN

cpr. 250496-3473

har den 24. marts 2023 opnået kandidatgraden i *has on 24 March 2023 been awarded the degree of Master of Science in*

datalogi *Computer Science*

og titlen *and the title*

cand.scient.
candidatus scientiarum

Katrine Krogh Andersen
Dekan/*Dean*

Karen Rønnow
Studiechef/*Director of Studies*

DET NATUR- OG BIOVIDENSKABELIGE FAKULTET
FACULTY OF SCIENCE

KØBENHAVNS UNIVERSITET
DET NATUR- OG BIOVIDENSKABELIGE FAKULTET

Yuan Chen
Cpr.: 250496-3473

har gennemført kandidatuddannelsen i
datalogi
24. marts 2023

Oversigt over prøver og bedømmelser side 1 af 2

Følgende resultater er opnået	Resultat 7-trinsskala	Resultat ECTS-skala	ECTS point
Speciale			
Event Manipulation Language, Modeling a Domain-Specific Language for Managing Explicit Causal Inconsistencies in Asynchronous Event-based Distributed Systems: A Microservice Architecture Approach	12	A	30,0
Eksamenssprog engelsk			
Generel profil i datalogi			
Advanced Programming	02	E	7,5
Eksamenssprog engelsk			
Advanced Algorithms and Data Structures.....	4	D	7,5
Eksamenssprog engelsk			
Advanced Computer Systems	02	E	7,5
Eksamenssprog engelsk			
Natural Language Processing.....	02	E	7,5
Eksamenssprog engelsk			
Projekt uden for kursusregi.....	7	C	15,0
Process Visualization and Analysis of Careers on League of Nation			
Eksamenssprog engelsk			
Software Engineering and Architecture.....	12	A	15,0
Eksamenssprog engelsk			

18. april 2023

Betina Kongsbak
SCIENCE Uddannelse

KØBENHAVNS UNIVERSITET
DET NATUR- OG BIOVIDENSKABELIGE FAKULTET

Yuan Chen
Cpr.: 250496-3473

har gennemført kandidatuddannelsen i
datalogi
24. marts 2023

Oversigt over prøver og bedømmelser side 2 af 2

Følgende resultater er opnået	**Resultat** 7-trinsskala	**Resultat** ECTS-skala	**ECTS** point
Mobile Computing *Eksamenssprog engelsk*	7	C	7,5
Vision and Image Processing *Eksamenssprog engelsk*	Bestået		7,5
Web Science *Eksamenssprog engelsk*	7	C	7,5
Machine Learning *Eksamenssprog engelsk*	7	C	7,5

Adgangsgrundlaget til kandidatuddannelsen
Udenlandsk bachelor, University of Minnesota, USA

18. april 2023

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24. marts 2023

Kompetenceprofil for uddannelsen

Efter endt uddannelse har en kandidat i datalogi tilegnet sig følgende:

Viden om:
- State-of-the-art-principper for program- og systemudvikling, herunder hensigtsmæssig brug af struktureringsmetoder og programmeringsparadigmer
- Relevante matematiske, statistiske og logiske fundamenter til udarbejdelse af effektive løsninger på en række computerrelaterede problemer
- Videnskabelig litteratur, terminologi, traditioner og forskningsmetoder inden for datalogi i almindelighed og inden for den enkeltes specialisering i særdeleshed
- Relevante anvendelser af datalogi og informationsteknologi i praksis, f.eks. i erhvervslivet, inden for sundhedssektoren, på miljøområdet og i andre samfundsmæssige sammenhænge.

Færdigheder:
- Identificere muligheder for principiel anvendelse af teoretiske eller grundlæggende datalogiske resultater eller metoder i praktiske eller anvendelsesorienterede sammenhænge
- Designe, implementere og vedligeholde store og/eller komplekse programmer eller systemer, som er underlagt eksterne kvalitets- og ydelsesbegrænsninger
- Tilpasse og anvende generelle matematiske modeller til analyse og klassifikation af data
- Kombinere relevant datalogisk viden og anden viden med henblik på at analysere et problem med en betydelig beregnings- eller informationsbehandlingsrelateret komponent samt vurdere tidligere forsøg på løsning af samme problem og dermed forbundne problemer
- Udvælge, kombinere og om nødvendigt udvikle eller forbedre teorier og metoder og ved hjælp af disse bidrage til at løse datalogiske problemer eller bidrage til en øget videnskabelig forståelse heraf
- Evaluere forslag til løsningen af et problem på objektiv og systematisk vis, og - I givet fald med inddragelse af eksperimenter - analysere de tilfælde, hvor løsningen er vellykket, og hvor den er mislykket, samt identificere løsningens svagheder, styrker og konsekvenser
- Dokumentere egne forskningsresultater og opdagelser på en måde, der opfylder kravene til videnskabelige publikationer
- Anvende og formidle viden om informationsteknologi og deltage i generelle debatter om emnet.

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har gennemført kandidatuddannelsen i
datalogi
24. marts 2023

Kompetencer:
- Tilegne sig et overblik over komplekse videnskabelige eller organisatoriske kontekster, identificere og analysere beregnings- eller informationsbehandlingsrelaterede problemer, der opstår i sådanne sammenhænge, og nedbryde eller transformere problemerne til en form, hvori de kan løses ved hjælp af relevante datalogiske metoder
- Anvende generelle teoretiske resultater og metoder i et omfang og på et formalitetsniveau, der er passende i forhold til den konkrete opgaves kompleksitet og vigtighed
- Formulere, strukturere og stå i spidsen for forskningsbaserede projekter og datalogisk udviklingsarbejde samt løse andre avancerede opgaver inden for informationsteknologi
- Deltage i større program- eller systemudviklingsteams, anvende de relevante principper for modulær softwarekonstruktion korrekt og forstå, hvordan det samlede produkts korrekthed og funktionsdygtighed er et resultat af de enkelte komponenters egenskaber
- Tage professionelt ansvar for kvaliteten af en fuldført analyse-, design-, implementerings- eller evalueringsopgave baseret på en solid forståelse og anvendelse af relevante vurderingsmetoder
- Tilegne sig ny viden på effektiv og systematisk vis og løbende holde sig ajour med udviklingen inden for forskellige datalogiske fagområder på et højt videnskabeligt niveau.

18. april 2023

Betina Kongsbak
SCIENCE Uddannelse

UNIVERSITY OF COPENHAGEN
FACULTY OF SCIENCE

Yuan Chen
Cpr.: 250496-3473

has completed the Master's programme in
Computer Science
24 March 2023

Summary of examinations and grades page 1 of 2

The following grades were awarded	Grade 7-point scale	Grade ECTS scale	ECTS credits
Master's Thesis			
Event Manipulation Language, Modeling a Domain-Specific Language for Managing Explicit Causal Inconsistencies in Asynchronous Event-based Distributed Systems: A Microservice Architecture Approach	12	A	30,0
Exam language English			
General Profile in Computer Science			
Advanced Programming	02	E	7,5
Exam language English			
Advanced Algorithms and Data Structures.....	4	D	7,5
Exam language English			
Advanced Computer Systems	02	E	7,5
Exam language English			
Natural Language Processing.....	02	E	7,5
Exam language English			
Project outside Course Scope.....	7	C	15,0
Process Visualization and Analysis of Careers on League of Nation			
Exam language English			
Software Engineering and Architecture.....	12	A	15,0
Exam language English			

18 April 2023

Betina Kongsbak
SCIENCE Study Administration

UNIVERSITY OF COPENHAGEN
FACULTY OF SCIENCE

Yuan Chen
Cpr.: 250496-3473

has completed the Master's programme in
Computer Science
24 March 2023

Summary of examinations and grades page 2 of 2

The following grades were awarded	Grade 7-point scale	Grade ECTS scale	ECTS credits
Mobile Computing *Exam language English*	7	C	7,5
Vision and Image Processing *Exam language English*	Passed		7,5
Web Science *Exam language English*	7	C	7,5
Machine Learning *Exam language English*	7	C	7,5

Requirements for the graduate programme
International bachelor's degree, University of Minnesota, USA

18 April 2023

Betina Kongsbak
SCIENCE Study Administration

UNIVERSITY OF COPENHAGEN
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has completed the Master's programme in
Computer Science
24 March 2023

Skills profile for the programme

On completion of the programme, an MSc in Computer Science has acquired the following:

Knowledge about:
- State-of-the-art principles for program and system development, including appropriate use of structuring methodologies and programming paradigms
- The relevant mathematical, statistical, and logical foundations for constructing effective and efficient solutions to a variety of computational problems
- Academic literature, terminology, traditions and research methods within computer science in general, and their area of specialization in particular
- Relevant real-world applications of computer science and information technology, e.g. in business, cultural, health, environmental, and other societal contexts.

Skills to:
- Identify opportunities for principled application of theoretical or foundational computer-science results or methods within practical or applied contexts
- Design, implement, and maintain large and/or complex programs or systems, subject to external quality and performance constraints
- Adapt and apply general mathematical models for analysis and classification of data
- Combine relevant computer-science and other knowledge in order to analyse a problem with a significant computational or information-processing component, as well as assess previous attempts at solving the same problem and related problems
- Select, combine, and where appropriate develop or refine theories and methods, and use these to make a significant contribution to solving computer-science problems or to promoting a scientific understanding of the problems
- Evaluate a proposed solution to a problem objectively and systematically, and - where appropriate involving experiments - analyse the areas in which the solution is successful and unsuccessful, and identify its weaknesses, strengths and consequences
- Document their own research results and discoveries in a manner that meets the requirements for academic publications
- Apply and disseminate knowledge about information technology and participate in general debates on the subject.

18 April 2023

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Competences to:
- Acquire a comprehensive overview of complex scientific or organizational contexts, identify and analyse the computational or information-processing problems arising in such contexts, and decompose or transform the problems into a form amenable to solution by relevant computer-science methodology
- Employ general theoretical results and methods to an extent and level of formality appropriate to the complexity and criticality of the concrete task at hand
- Formulate, structure, and run research-based projects, computer-science development work and other advanced assignments within information technology
- Participate in larger program- or system-development teams, properly applying the relevant principles for modular software construction, and understanding how the correctness and performance of the full product follows from those properties of the individual components
- Take professional responsibility for the quality of a completed analysis, design, implementation, or evaluation task, based on a sound understanding and application of the relevant assessment methodologies
- Acquire new knowledge in an efficient and systematic manner, and familiarise themselves with evolving computer-science subject areas at a high scientific level.

18 April 2023

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Diploma Supplement

The purpose of the Diploma Supplement is to provide sufficient independent data to improve the international 'transparency' and fair academic and professional recognition of qualifications (diplomas, degrees, certificates etc.). It is designed to provide a description of the nature, level, context, content and status of the studies that were pursued and successfully completed by the individual named on the original qualification to which this supplement is appended. It is free from any value judgements, equivalence statements or suggestions about recognition. This Diploma Supplement model was developed by the European Commission, Council of Europe and UNESCO.

1. INFORMATION IDENTIFYING THE HOLDER OF THE QUALIFICATION

1.1. Family name(s): Chen

1.2. Given name(s): Yuan

1.3. Date of birth: 25 April 1996

1.4. Danish civil registration number: 250496-3473

2. INFORMATION IDENTIFYING THE QUALIFICATION

2.1. Name of qualification and title conferred *(in Danish):* Cand.scient. i datalogi, candidatus scientiarum

Name of qualification and title conferred *(in English)*: Master of Science (MSc) in Computer Science, candidatus scientiarum

2.2. Main fields of study: Computer Science

2.3. Name and status of awarding institution: Name: Københavns Universitet/University of Copenhagen
Status: The University of Copenhagen is a state-recognised higher education institution, regulated according to the Ministry of Higher Education and Science. The University of Copenhagen is a university that has undergone external quality assurance by the Danish Accreditation Institution (in Danish: Danmarks Akkrediteringsinstitution), that is certified to follow the European Standards and Guidelines through registration in EQAR and membership in ENQA, in Denmark.

2.4. Name and status of institution administering the studies (See 2.3.)**:** Same as above

2.5. Language(s) of instruction/examination: Primarily English and to some extent Danish

3. INFORMATION ON THE LEVEL OF THE QUALIFICATION

3.1. Level of qualification: Master's degree at NQF/EQF Level 7 referring to Second Cycle in the Bologna QF.

3.2. Official length of programme: 2 years = 120 ECTS credit points

3.3. Access requirements: A completed Bachelor's degree in Computer Science or another relevant Bachelor's degree.

4. INFORMATION ON THE CONTENTS AND RESULTS GAINED

4.1. Mode of study: Full time study

4.2. Programme learning outcomes: Please refer to the enclosed skills profile.

4.3. Programme details and individual grades/marks/credits obtained: Please refer to the enclosed grade transcript.

4.4. Grading scheme and if applicable grade distribution information: Please refer to the enclosed explanation of the Danish education system and the grading scale.

4.5 Overall classification of the qualification: Not applicable for Danish qualifications.

5. INFORMATION ON THE FUNCTION OF THE QUALIFICATION

5.1. Access to further study: A completed Master's degree in Computer Science gives access to further study within the field of Natural Science at NQF/EQF level 8 referring to Third Cycle in the Bologna QF.

5.2. Professional status: The MSc Programme in Computer Science qualifies students for a PhD programme, and depending on the academic specialisation it may also be targeted at business functions and/or areas such as: Research, development, and consulting within the Information and Communication Technology sector, and IT development and support within other sectors, such as the financial or biomedical industry, or in public administration.

6. ADDITIONAL INFORMATION

6.1. Additional information: Founded in 1479 by the Danish King Christian I, the University of Copenhagen is Denmark's oldest and largest institution of research and higher education. More than 37,000 students are enrolled in undergraduate and graduate programmes, plus an additional 2,500 PhD students. Staff members number 9,000. The University is divided into six faculties: Theology, Law, Social Sciences, Health and Medical Sciences, Humanities and Science; all situated in the capital of Denmark.

6.2. Further information:

Faculty of Science
Bülowsvej 17
DK - 1870 Frederiksberg C

Phone +4535332828
E-mail: science@science.ku.dk

General information on higher education in Denmark can be obtained from the following two homepages:
Ufm.dk Uddannelses- og Forskningsministeriet – The Ministry of Higher Education and Science
Enic-naric.net The National Academic Recognition Information Centres and the European National Information Centre on Academic Recognition and Mobility (ENIC/NARIC)

7. CERTIFICATION OF THE SUPPLEMENT

7.1. Date: 18 April 2023

7.2. Betina Kongsbak

7.3. Head of Studies

UNIVERSITY OF COPENHAGEN

8. INFORMATION ON THE DANISH HIGHER EDUCATION SYSTEM

June 2016

Public higher education institutions in Denmark are regulated by national legislation concerning degree structures, teacher qualifications and examinations. Accreditation in higher education is undergoing transition from programme-based accreditation to institutional accreditation. Programmes and institutions are accredited by national, independent accreditation agencies and the Accreditation Council.

Higher education institutions

Higher education is offered by five types of higher education institutions:

1. Business academies (Erhvervsakademi) offering professionally oriented short cycle and first cycle degree programmes.
2. University Colleges (Professionshøjskole) offering professionally oriented first cycle degree programmes.
3. Maritime Education and Training Institutions offering professionally oriented short cycle and first cycle degree programmes.
4. General and specialised research universities (Universitet) offering first, second and third cycle degree programmes in academic disciplines.
5. University level institutions offering first, second and third cycle degree programmes in subject fields such as architecture, design, music, and fine and performing arts.

Most higher education institutions are regulated by the Ministry of Higher Education and Science (type 1-5).

The Ministry of Culture regulates a number of higher education institutions offering programmes within fine and performing arts (type 5).

Qualification framework

The qualification levels form the basis for the Danish National Qualifications Framework for Higher Education, which is certified in accordance with the overarching Bologna Framework according to the principles adopted by the European Ministers of Higher Education. Danish higher education qualifications at levels 5-8 of the Danish Qualifications Frame-work for Lifelong Learning (NQF) correspond with levels 5-8 of the European Qualifications Framework (EQF).

Admission and progression

General access to higher education in Denmark requires an Upper Secondary School Leaving Certificate or comparable qualifications. Admission to some particular programmes requires entrance examination or submission of a portfolio of artistic work. Holders of an Academy Profession degree can obtain a Professional Bachelor's degree within the same field of study through a top-up programme. Completion of a first cycle degree qualifies students for admission to the second cycle.

Ordinary Higher Education degrees

The Academy Profession degree is awarded after 90-150 ECTS and includes a period of work placement of at least 15 ECTS. The programmes are development-based and combine theoretical studies with a practical approach. Programmes are, among others, offered within Marketing Management, Computer Science and Chemical and Biotechnical Science. The Danish title is field of study followed by the abbreviation AK and the English title is AP Graduate in [field of study].

Overview of degrees in the Danish Higher Education System

Danish higher education institutions use the European Credit Transfer System (ECTS) for measuring study activities. 60 ECTS correspond to one year of full-time study.

Danish qualifications levels	Ordinary higher education degrees	Adult/Continuing higher education degrees	Qualifications Framework for the European Higher Education Area – Bologna Framework	European/National Qualifications Framework for Lifelong Learning – EQF/NQF
Academy Profession level	Academy Profession degree (90-150 ECTS)	Academy Profession degree (60 ECTS)	Short cycle	Level 5
Bachelor's level	Professional Bachelor's degree (180-240 ECTS)*	Diploma degree (60 ECTS)	First cycle	Level 6
	Bachelor's degree (within fine arts) (180 ECTS)			
	Bachelor's degree (180 ECTS)			
Master's level	Master's degree (within fine arts) (120-180 ECTS)	Master degree (60-90 ECTS)	Second cycle	Level 7
	Master's degree (120 ECTS)**			
PhD level	PhD degree (180 ECTS)		Third cycle	Level 8

** Can be obtained through a full regular bachelor's programme (180-240 ECTS) or a top up bachelor's programme (90 ECTS) following an Academy Profession degree. A few Professional Bachelor programmes are 270 ECTS.*
*** A few Master's programmes are up to 180 ECTS.*

The Professional Bachelor's degree is awarded after 180-270 ECTS and includes a period of work placement of at least 30 ECTS. The programmes are applied programmes. They are development-based and combine theoretical studies with a practical approach. Examples of professional bachelor's degree holders are nurses, primary and lower secondary school teachers and certain types of engineers. The Danish title is Professionsbachelor i [field of study] and the English title is Bachelor of [field of study].

The Bachelor's degree from a university is awarded after 180 ECTS. The programmes are research-based and are offered in all scientific fields. The Danish title is Bachelor (BA) i [field of study] or Bachelor (BSc) i [field of study] and the English title is Bachelor of Arts (BA) in [field of study] or Bachelor (BSc) of Science in [field of study].

The Bachelor's degree (within fine arts) is awarded after 180 ECTS. The programmes are based on research and artistic research. Programmes are offered within the fine arts. The Danish title is Bachelor (BA) i [field of study], Bachelor i musik (BMus) [field of study] or Bachelor i billedkunst (BFA) [field of study] and the English title is Bachelor of Arts (BA) in [field of study], Bachelor of Music (BMus) [field of study] or Bachelor of Fine Arts (BFA) in [field of study]. A higher education degree within theatre or filmmaking is awarded after 3-4 years of study (180-240 ECTS).

The Master's degree is awarded after 120 ECTS. The programmes are research-based and are offered in all scientific fields. The Danish title is abbreviated to Cand.[latin abbreviation of academic area] i [field of study]. The English title is Master of Arts (MA) in [field of study] or Master of Science (MSc) in [field of study].

The Master's degree (within fine arts) is awarded after 120-180 ECTS. The programmes are based on research and artistic research. The Danish title is abbreviated to Cand.[latin abbreviation of academic area] [field of study]. The English title is Master of Arts (MA) in [field of study], Master of Music (MMus) [field of study] or Master of Fine Arts (MFA) in [field of study]. Music Academies offer a specialist degree of 2 to 4 years following the master's degree.

The PhD degree is awarded after 180 ECTS. PhD programmes are offered by the universities and some university level institutions offering degrees in the artistic and cultural field.

Detailed descriptions of degree levels can be found in the Danish Qualifications Framework at www.nqf.dk. Please consult the relevant Diploma Supplement for information about the learning outcome of any specific degree.

Adult and continuing higher education

- The programmes normally consist of 2 years of part-time study, equivalent to 1 year of full-time study (60 ECTS credits). Certain master programmes require 1½ years of full-time study (90 ECTS credits). Admission requirements are a relevant educational qualification and at least 2 years of relevant work experience.
- Adult and continuing education is available at levels corresponding to qualifications of the ordinary higher education system.
- The Further Adult Education degree (videregående voksenuddannelse/akademiuddannelse) is awarded after studies at short cycle level and gives access to diploma programmes.
- The Diploma degree (diplomuddannelse) is awarded after studies at first cycle level and gives access to master programmes.
- The Master degree (masteruddannelse) is awarded after studies at second cycle level.

The 7-point grading scale

The grading system used in all state-regulated education programmes as of September 2007 is the 7-point grading scale. Apart from the 7-point grading scale, pass/fail assessment may also be used. 02 is the minimum grade for passing an exam.

Description of grades: 12: For an excellent performance displaying a high level of command of all aspects of the relevant material, with no or only a few minor weaknesses; 10: For a very good performance displaying a high level of command of most aspects of the relevant material, with only minor weaknesses; 7: For a good performance displaying good command of the relevant material but also some weaknesses; 4: For a fair performance displaying some command of the relevant material but also some major weaknesses; 02 For a performance meeting only the minimum requirements for acceptance; 00: For a performance which does not meet the minimum requirements for acceptance; -3 For: a performance which is unacceptable in all respects.