21世纪高等教育计算机规划教材

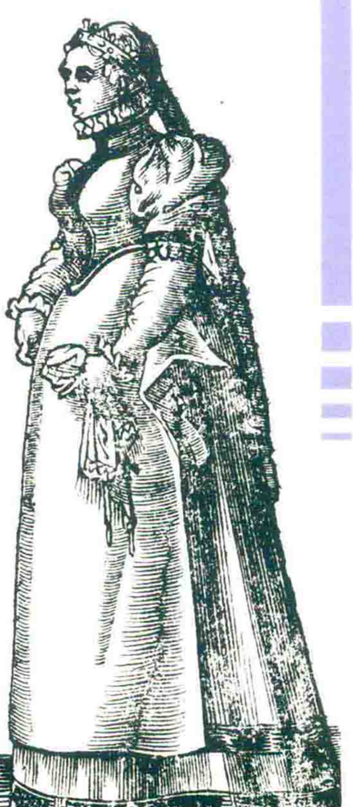
COMPUTER

计算机英语

Computer English

米波 刘颖 蔡志鹏 蒲树桢 编著

- 选材广泛，内容丰富
- 图文并茂，课文与习题相呼应
- 详细讲解英语阅读、写作、讲演的技巧



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内 容 提 要

本书是针对计算机英语教学所编写的专业技术教材，涉及计算机科学与技术的基本概念、计算机软硬件体系结构、编程与仿真、计算机网络及通信、多媒体、人工智能、信息安全与隐私保护、计算机发展等内容，涵盖了当前计算机领域的最新应用和技术。全书共九章，每章均对一些关键性词汇给出了注释并附有习题，且针对专业英语某一方面的学习技巧进行了详细介绍。

该书可作为高等院校计算机及相关专业研究生、本科生“计算机英语”课程教材，也可供参加计算机水平考试的考生和广大工程技术人员参考。

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前　言

计算机学科发展迅猛，国内外信息类学习、科研资料层出不穷，各种学术会议、产品交流活动也越加频繁，作为计算机及 IT 业的行业性语言，专业英语的熟练运用无疑将成为研究生、本科生在未来科研、工作中发展潜力的决定性因素，而各大有远见的高校也纷纷开设了“计算机英语”的必修或限选课程。然而，考虑到信息技术发展的前沿性,以及市面上很多计算机英语类教材并非计算机专业教师编写，其针对性不强的问题，编者整合了目前最新的计算机学科相关资料，既注重相关理论及专业术语的涵盖，又注意做到图文并茂，课文与习题相呼应，且有具体的阅读、写作、讲演等技巧的讲解，广泛适用于有科研、资料阅读与书写、会议交流、文献翻译、软硬件开发等需求的研究生、本科生，以提高他们的专业英语水平。

本书选材广泛，内容丰富，涵盖计算机概论、计算机硬件体系结构、软件体系结构、编程与仿真、计算机网络及通信、多媒体、人工智能、信息安全与隐私保护、计算机发展等相关内容。考虑到专业外语较强的实用性，每一章节中正文所占篇幅不大，但其后习题与正文紧密相关，且图文结合，有助于学生加强记忆与理解。针对计算机英语的学术性特点，书中还详细介绍了科技英语特点、数学公式的读法、计算机英语的词汇构成、翻译技巧、阅读、写作、演讲等实用方法，并附有计算机常用英语词汇表。

本书由米波和刘颖等编著。全书共九章，其中米波编写了第一章、第七章及 Basics and Learning Skills 部分，刘颖编写了第二章、第三章和第四章，蔡志鹏编写了第五章、第六章和第九章，蒲树桢编写了第八章，全书统稿由米波完成。

本书得到了“重庆交通大学研究生创新基金”资助。

由于编者水平有限，书中难免有不当之处，敬请读者批评指正。

编　者

2015 年 1 月于重庆

目 录

Chapter One
Computer Science

Text One

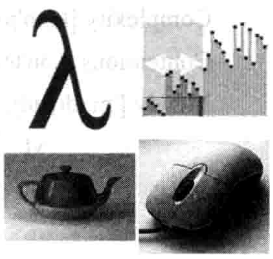
Philosophy of Computer Science

A number of computer scientists have argued for the distinction of three separate paradigms in computer science. Peter Wegner argued that those paradigms are science, technology, and mathematics. Peter Denning's working group argued that they are theory, abstraction (modeling), and design Amnon H. Eden described them as the "rationalist paradigm" (which treats computer science as a branch of mathematics, which is prevalent in theoretical computer science, and mainly employs deductive reasoning), the "technocratic paradigm" (which might be found in engineering approaches, most prominently in software engineering), and the "scientific paradigm" (which approaches computer-related artifacts from the empirical perspective of natural sciences, identifiable in some branches of artificial intelligence).

Exercises

1. Translate the following text into Chinese using your own words.

Computer science deals with the theoretical foundations of information and computation, together with practical techniques for the implementation and application of these foundations, such as programming language theory, computational complexity theory, computer graphics and human-computer interaction.



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2. Fill in the blanks with appropriate words or phrases found behind the text.

Computer science is considered by some to have a much closer relationship with ________ than many scientific disciplines, with some observers saying that computing is a mathematical science. Early computer science was strongly influenced by the work of mathematicians such as Kurt Gödel and Alan Turing, and there continues to be a useful interchange of ideas between the two fields in areas such as mathematical logic, category theory, domain theory, and ____________.

The relationship between computer science and software engineering is a contentious issue, which is further muddied by disputes over what the term "software engineering" means, and how computer science is defined. David Parnas, taking a cue from the relationship between other engineering and science disciplines, has claimed that the principal focus of ____________ is studying the properties of ____________ in general, while the principal focus of ____________ is the design of specific computations to achieve practical goals, making the two separate but complementary disciplines.

a) software engineering

b) algebra

c) mathematics

d) computation

e) computer science

Vocabulary

Philosophy [fə'lɒsəfi] n. 哲学，哲学思想

Distinction [dɪ'stɪŋkʃn] n. 区别，特质

Paradigm ['pærədaɪm] n. 范例，样式，模范

Theory ['θiəri] n. 理论，学说

Rationalist ['ræʃnəlɪst] n. 唯理论者，理性主义者

Prevalent ['prevələnt] adj. 流行的，盛行的

Deductive reasoning [di'dʌktiv 'ri:zənɪŋ] 演绎推论

Technocratic [ˌteknə'krætɪk] adj. 技术层面的，由技术专家官员组成的

Prominently ['prɒmɪnəntlɪ] adv. 显著地，重要地

Artifact ['ɑ:təˌfækt] n. 人工制品，手工艺品，加工品

Empirical [ɪm'pɪrɪkl] adj. 凭经验的，经验主义的

Complexity [kəm'pleksətɪ] n. 复杂性

Contentious [kən'tenʃəs] adj. 引起争论的，有争论的

Muddy ['mʌdɪ] adj. 泥泞的，暗的，模糊的，糊涂的
vt. 使沾上泥，把……弄糊涂
vi. 变得泥泞，沾满烂泥

Text Two

What is Computer Science?

Computer science or computing science (abbreviated CS or CompSci) is the scientific and practical approach to computation and its applications. A computer scientist specializes in the theory of computation and the design of computational systems.

Its subfields can be divided into a variety of theoretical and practical disciplines. Some fields, such as computational complexity theory (which explores the fundamental properties of computational problems), is highly abstract. Whilst fields such as computer graphics emphasize real-world visual applications. Still other fields focus on the challenges in implementing computation. For example, programming language theory considers various approaches to the description of computation, whilst the study of computer programming itself investigates various aspects of the use of programming language and complex systems. Human-computer interaction considers the challenges in making computers and computations useful, usable, and universally accessible to humans.

Exercises

Reading the text above and answering the following questions.

1. What is the definition of computer science in this text? And how do you define computer and computer science?

2. What are the subfields of computer science mentioned in the text? More you know?

3. Which curriculums have you learned related to computer science?

Vocabulary

Discipline	['dɪsəplɪn] n.	学科，纪律
Complexity theory	[kəm'pleksɪti: 'iəri]	复杂性理论
Whilst	[waɪlst] conj.	同时，当……的时候
Emphasize	['emfəsaɪz] vt.	强调，着重
Universally	[ˌju:nɪ'vɜ:səli] adv.	普遍地，一般地，人人，处处
Curriculum	[kə'rɪkjələm] n.	课程，全部课程

Text Three

Areas of Computer Science

As a discipline, computer science spans a range of topics from theoretical studies of algorithms and the limits of computation to the practical issues of implementing computing systems in hardware and software. CSAB, formerly called Computing Sciences Accreditation Board—which is made up of representatives of the Association for Computing Machinery (ACM), and the IEEE Computer Society (IEEE-CS)—identifies four areas that it considers crucial to the discipline of computer science: theory of computation, algorithms and data structures, programming methodology and languages, and computer elements and architecture. In addition to these four areas, CSAB also identifies some other fields as important areas of computer science, such as software engineering, artificial intelligence, computer networking and communication, database systems, parallel computation, distributed computation, computer-human interaction, computer graphics, operating systems, and numerical and symbolic computation.

Exercises

Reading the text above and answering the following questions.

1. True/False

1) Computer science is a discipline which covers both theoretical and practical fields. ( )

2) Four critical aspects of computer science discipline are theory of computation, data structures and algorithms, programming languages and methodology, and computer elements and architecture. ( )

3) Numerical and symbolic computation is a part of mathematics according to Amnon H. Eden's opinion. ( )

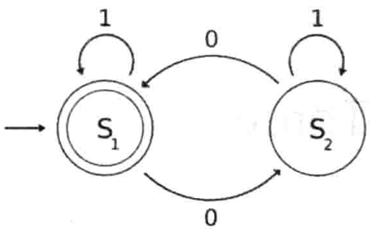
2. Reading the following material and fill in the subtitle of each paragraph with appropriate phrases given below.

3. Translate the subtitles and image annotations into Chinese.

____________________ ____________________

According to Peter J. Denning, the fundamental question underlying computer science is, "What can be (efficiently) automated?" The study of this field is focused on answering fundamental questions about what can be computed and what amount of resources are required to perform those computations. In an effort to answer the first question, computability theory examines which computational problems are solvable on various theoretical models of computation. The second question is addressed by computational complexity theory, which studies the time and space costs associated with different approaches to solving a multitude of computational problems.

The famous "P=NP?" problem, one of the Millennium Prize Problems, is an open problem in this field.



Automata theory

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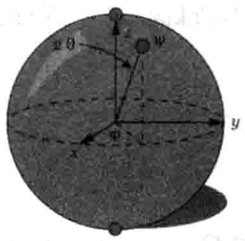

Quantum computing theory

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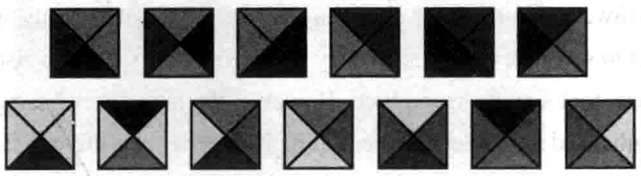

Computability theory

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P=NP?

Computational complexity theory

GNITIRW-TERCES

Cryptography

______________ ______________

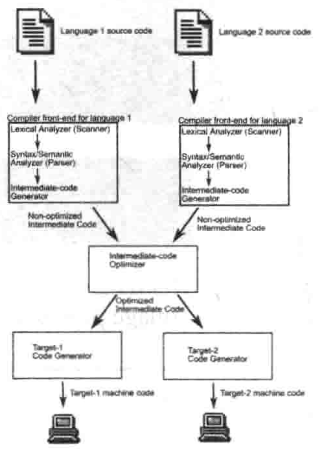
______________ ______________

This theory is related to the quantification of information. Information theory was developed by Claude E. Shannon to find fundamental limits on signal processing operations such as compressing data and on reliably storing and communicating data. Coding theory is the study of the properties of codes (systems for converting information from one form to another) and their fitness for a specific application. Codes are used for data compression, cryptography, error detection and correction, and more recently also for network coding. Codes are studied for the purpose of designing efficient and reliable data transmission methods.

______________ ______________

It is a branch of computer science that deals with the design, implementation, analysis, characterization, and classification of programming languages and their individual features. It falls within the discipline of computer science, both depending on and affecting mathematics, software engineering and linguistics. It is an active research area, with numerous dedicated academic journals.

$\Gamma \vdash x : \mathrm{Int}$ Type theory ______________


Language 1 source code
Language 2 source code
Compiler front-end for language 1
Compiler front-end for language 2
Lexical Analyzer (Scanner)
Syntax/Semantic Analyzer (Parser)
Intermediate-code Generator
Non-optimized Intermediate Code
Intermediate-code Optimizer
Optimized Intermediate Code
Target-1 Code Generator
Target-2 Code Generator
Target-1 machine code
Target-2 machine code

Compiler design

```
def add5(x):
    return x+5

def dotwrite(ast):
    nodename = getNodename()
    label=symbol.sym_name.get(int(ast[0]),ast[0])
    print '    %s [label="%s' % (nodename, label),
    if isinstance(ast[1], str):
       if ast[1].strip():
          print '= %s"];' % ast[1]
       else:
          print '"]'
     else:
       print '"];'
       children = []
       for  in n, childenumerate(ast[1:]):
          children.append(dotwrite(child))
       print ,'    %s -> {' % nodename
       for  in :namechildren
          print '%s' % name,
```

Programming languages

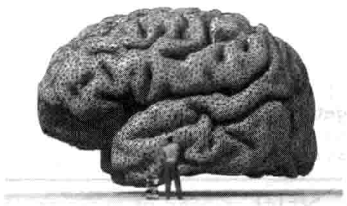
______________ ______________

______________ ______________

These methods are a particular kind of mathematically based technique for the specification, development and verification of software and hardware systems. The use of these methods for software and hardware design is motivated by the expectation that, as in other engineering disciplines, performing appropriate mathematical analysis can contribute to the reliability and robustness of a design. They form an important theoretical underpinning for software engineering, especially where safety or security is involved. Formal methods are a useful adjunct to software testing since they help avoid errors and can also give a framework for testing. For industrial use, tool support is required. However, the high cost of using formal methods means that they are usually only used in the development of high-integrity and life-critical systems, where safety or security is of utmost importance. Formal methods are best described as the application of a fairly broad variety of theoretical computer science fundamentals, including not only logic calculi, formal languages, automata theory, and program semantics, but also type systems and algebraic data types to problems in software and hardware specification and verification.

____________________ ____________________

This branch of computer science aims to or is required to synthesise goal-orientated processes such as problem-solving, decision-making, environmental adaptation, learning and communication which are found in humans and animals. From its origins in cybernetic sand in the Dartmouth Conference (1956), AI research has been necessarily cross-disciplinary, drawing on areas of expertise such as applied mathematics, symbolic logic, semiotics, electrical engineering, philosophy of mind, neurophysiology, and social intelligence. AI is associated in the popular mind with robotic development, but the main field of practical application has been as an embedded component in areas of software development which require computational understanding and modeling such as finance and economics, data mining and the physical sciences. The starting-point in the late 1940s was Alan Turing's question "Can computers think?", and the question remains effectively unanswered although the "Turing Test" is still used to assess computer output on the scale of human intelligence. But the automation of evaluative and predictive tasks has been increasingly successful as a substitute for human monitoring and intervention in domains of computer application involving complex real-world data.


Machine learning

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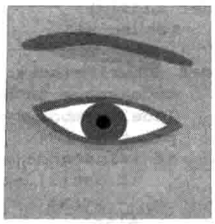
Computer vision

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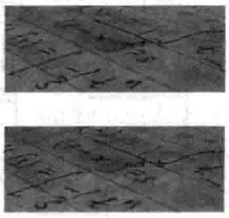
Image processing

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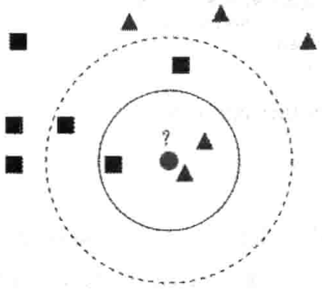

Pattern recognition

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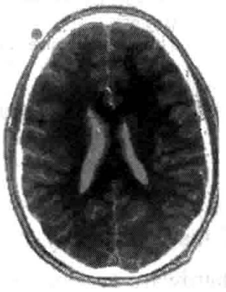
Cognitive science

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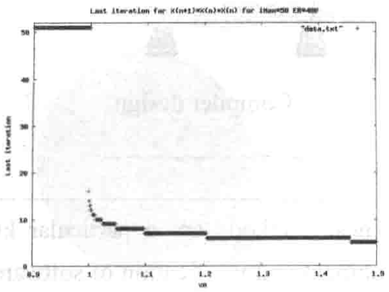
Data mining

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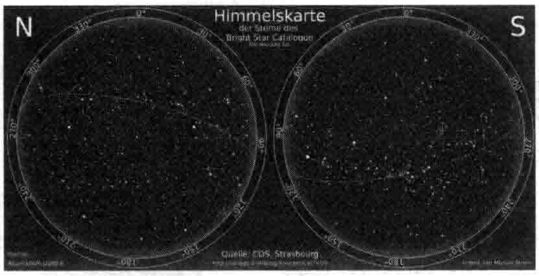
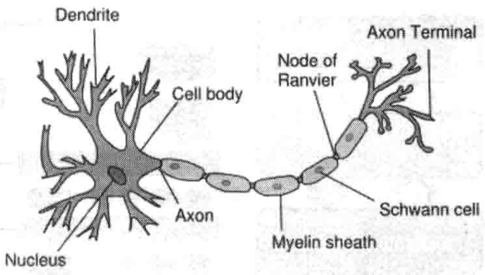
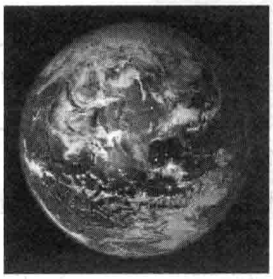


Evolutionary computation

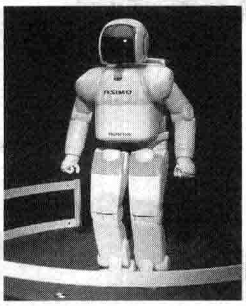


Knowledge representation

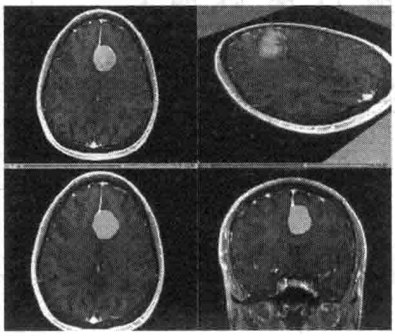


Information retrieval

Natural language processing

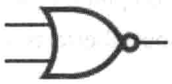


Robotics

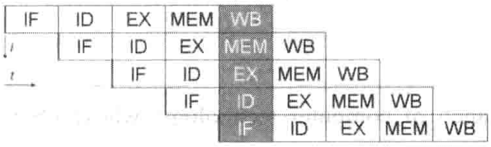


Medical image computing

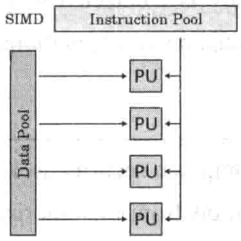
Computer architecture, or digital computer organization, is the conceptual design and fundamental operational structure of a computer system. It focuses largely on the way by which the central processing unit performs internally and accesses addresses in memory. The field often involves disciplines of computer engineering and electrical engineering, selecting and interconnecting hardware components to create computers that meet functional performance, and cost goals.



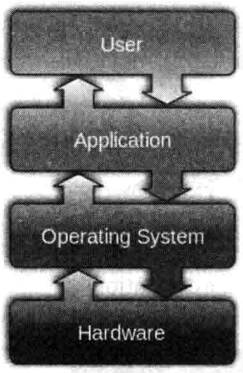
Digital logic



Microarchitecture



Multiprocessing



Operating systems

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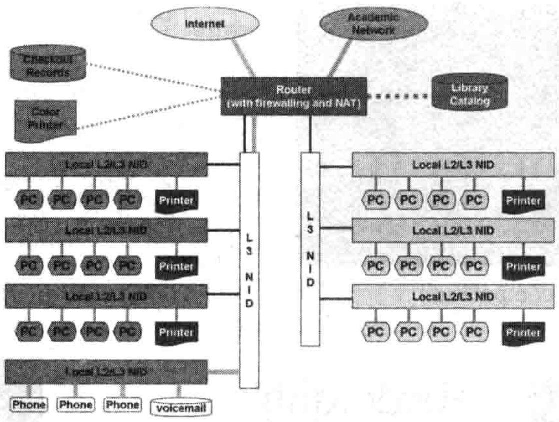

Computer networks

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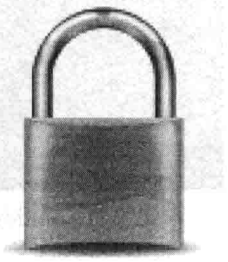

Information security

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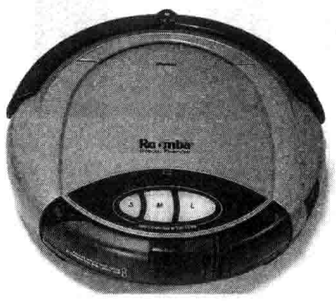

Ubiquitous computing

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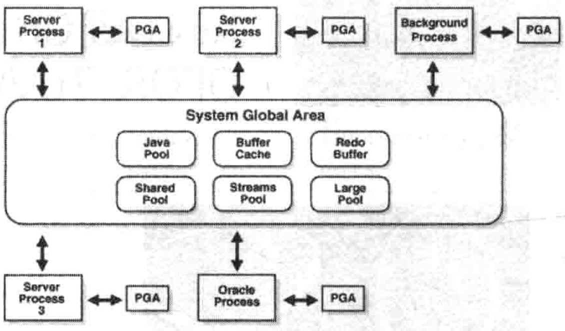

Systems architecture

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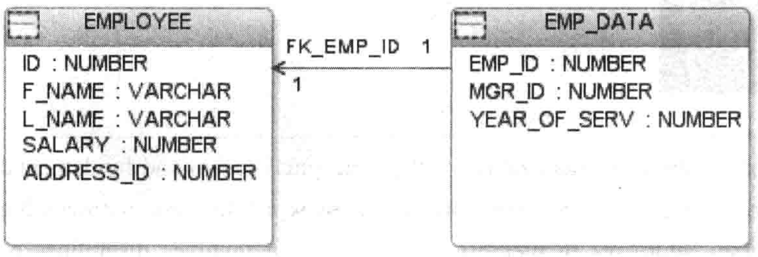

Databases

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________ ________

It is the study of digital visual contents, and involves synthesis and manipulations of image data. The study is connected to many other fields in computer science, including computer vision, image processing, and computational geometry, and is heavily applied in the fields of special effects and video games.

________ ________

Computer security is a branch of computer technology, whose objectives include protection of information from unauthorized access, disruption, or modification while maintaining the accessibility and usability of the system for its intended users. Cryptography is the practice and study of hiding (encryption) and therefore deciphering (decryption) information. Modern cryptography is largely related to computer science, for many encryption and decryption algorithms are based on their computational complexity.

______________________ ______________________

It is the field of study concerned with constructing mathematical models and quantitative analysis techniques and using computers to analyze and solve scientific problems. In practical use, it is typically the application of computer simulation and other forms of computation to problems in various scientific disciplines.

Numerical analysis

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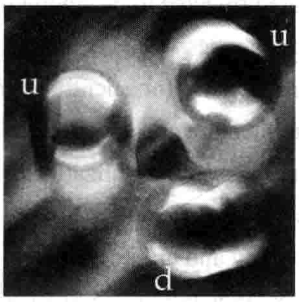

Computational physics

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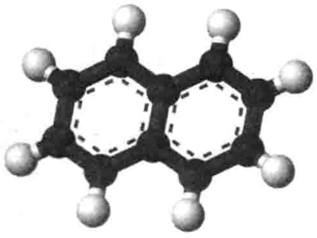
Computational chemistry

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Bioinformatics

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This branch of computer science aims to manage networks among computers worldwide.

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Concurrency is a property of systems in which several computations are executing simultaneously, and potentially interacting with each other. A number of mathematical models have been developed for general concurrent computation including Petri nets, process calculi and the Parallel Random Access Machine model. A distributed system extends the idea of concurrency onto multiple computers connected through a network. Computers within the same distributed system have their own private memory and information is often exchanged amongst themselves to achieve a common goal.

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A database is intended to organize, store, and retrieve large amounts of data easily. Digital databases are managed by byusing database management systems to store, create, maintain, and search data, through database models and query languages.

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In computer science, it deals with computational techniques for solving problems in health care.

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It is the study of designing, implementing, and modifying software in order to ensure it is of high quality, affordable, maintainable, and fast to build. It is a systematic approach to software design, involving the application of engineering practices to software. It deals with the organizing and analyzing of software-it doesn't just deal with the creation or manufacture of new software, but its internal maintenance and arrangement. Both computer applications software engineers and computer systems software engineers are projected to be among the fastest growing occupations from 2008 to 2018.

a) Artificial intelligence

b) Computational science (or scientific computing)

c) Computer architecture and engineering

d) Computer graphics and visualization

e) Computer Networks

f) Computer security and cryptography

g) Concurrent, parallel and distributed systems

h) Databases and information retrieval

i) Formal methods

j) Health Informatics

k) Information and coding theory

l) Programming language theory

m) Software engineering

n) Theory of computation

Vocabulary

Accreditation[əˌ'kredi'teiʃən]n. 制证，鉴定合格

IEEE abbr. Institute of Electrical and Electronics Engineers 电气与电子工程师协会

Algorithm ['ælgərɪðəm] n. 算法，运算法则

Artificial Intelligence [ˌɑ :ti'fiʃəl in'telidʒəns] 人工智能

Parallel Computation ['pærəlel ˌkɔmpjʊ'teɪʃən] 并行计算

Distributed Computation [dis'tribju:tid ˌkɔmpjʊ'teɪʃən] 分布式计算

Symbolic [sɪm'bɒlɪk] adj. 符号的，象征的

Characterization [ˌkærəktəraɪ'zeɪʃn] n. 特征描述，刻画

Linguistics [lɪŋ'gwɪstɪks] n. 语言学

Underpinning ['ʌndəˌpiniŋ] n. 基础材料，（学说、理论等的）基础

Formal methods 形式化方法

Adjunct ['ædʒʌŋkt] n. 附件，助手
adj. 附属的

Calculi ['kælkjʊlaɪ] n. 微积分学；结石

Semantics [sɪ'mæntɪks] n. 语义学，词义学

Synthesise ['sɪnθɪsaɪz] vt. 综合，使合成

Cybernetics [ˌsaɪbə'netɪks] n.	控制论
Draw on	利用，凭借，（时光）荏苒
Semiotics [ˌsemi'ɒtɪks] n.	符号学；症状学
Neurophysiology [ˌnjʊərəʊfɪzɪ'ɒlədʒɪ] n.	神经生理学
Intervention [ˌɪntə'venʃn] n.	介入，干预，调解
Synthesis ['sɪnθəsɪs] n.	合成，综合
Geometry [dʒɪ'ɒmətrɪ] n.	几何学，几何形状
Unauthorized [ʌn'ɔ:θəraɪzd] adj.	未经授权的
Encryption [ɪn'krɪpʃn] n.	加密
Decryption [di:'krɪpʃn] n.	解密，译码
Simulation [ˌsɪmju'leɪʃn] n.	模仿，模拟
Simultaneously [ˌsɪməl'teɪnɪəslɪ] adv.	同时地

Basics and Learning Skills

Topic One：科技英语的特点

科技文章的文体、修辞手段与文艺小说、新闻报道等截然不同。科技文章崇尚严谨周密，概念准确，逻辑性强，行文简练，重点突出，句式严整，少有变化，常用前置性陈述，即在句中将主要信息尽量前置，通过主语传递主要信息。

一、复杂长句多

科技文章要求叙述准确，推理谨严，因此一句话里包含三四个甚至五六个分句的，并非少见。译成汉语时，必须按照汉语习惯破成适当数目的分句，才能条理清楚，避免洋腔洋调。这种复杂长句居科技英语学习的难点之首，要学会运用语法分析方法来加以解剖，以便以短代长，化难为易。例如：

Factories will not buy machines unless they believe that the machine will produce goods that they are able to sell to consumers at a price that will cover all cost.

这是由一个主句和四个从句组成的复杂长句，只有进行全面的语法分析，才能正确理解和翻译。现试译如下：

除非相信那些机器造出的产品卖给消费者的价格足够支付所有成本，否则厂家是不会买那些机器的。

节译：*要不相信那些机器造出的产品售价够本，厂家是不会买的。*

后一句只用了 24 个字，比前句 40 个字节约用字 40%，而对原句的基本内容无损。可见，只要吃透原文的结构和内涵，翻译时再在汉语上反复推敲提炼，复杂的英语长句，也是容易驾驭的。

二、被动语态多

英语使用被动语态大大多于汉语，如莎士比亚的传世名剧《罗密欧与朱丽叶》中的一句就两次用了被动语态：

Juliet was torn between desire to keep Romeo near her and fear for his life, should his presence be detected.

朱丽叶精神上受到折磨，既渴望和罗密欧形影不离，又担心万一让人发现，罗密欧难免有

性命之忧。

科技英语更是如此，有三分之一以上用被动语态。例如：

(a) *No work can be done without energy.*

译文：*没有能量决不能做功。*

(b) *All business decisions must now be made in the light of the market.*

译文：*所有企业现在必须根据市场来作出决策。*

三、非谓语动词多

英语每个简单句中，只能用一个谓语动词，如果涉及几个动作，就必须选出主要动作当谓语，而将其余动作用非谓语动词形式，才符合英语语法要求。

非谓语动词有三种：动名词、分词（包括现在分词和过去分词）和不定式。例如：

要成为一个名符其实的内行，需要学到老。

这句中，有"成为"、"需要"和"学"三个表示动作的词，译成英语后为：

To be a true professional requires lifelong learning.

可以看出，选好"需要"（require）作为谓语，其余两个动作："成为"用不定式形式 to be，而"学"用动名词形式 learning，这样才能符合英语语法要求。

四、词性转换多

英语单词有不少是多性词，即既是名词，又可用作动词、形容词、介词或副词，字形无殊，功能各异，含义也各不相同，如不仔细观察，必致谬误。例如，light

名词:	（启发）	*in (the)light of*	由于，根据
	（光）	*high light(s)*	强光，精华
	（灯）	*safety light*	安全指示灯
形容词:	（轻）	*light industry*	轻工业
	（明亮）	*light room*	明亮的房间
	（淡）	*light blue*	淡蓝色
	（薄）	*light coating*	薄涂层
动词:	（点燃）	*light up the lamp*	点灯
副词:	（轻快）	*travel light*	轻装旅行
	（容易）	*light come, light go*	来得容易去得快

诸如此类的词性转换，在科技英语中屡见不鲜，几乎每个技术名词都可转换为同义的形容词。词性转换增加了英语的灵活性和表现力，读者必须从上下文判明词语在句中的词性和含义，对全句进行准确无误的理解。

Topic Two：数学公式的读法

一、逻辑（Logic）

$\exists$	there exists
$\forall$	for all
$p \Rightarrow q$	p implies q
	if p, then q
$p \Leftrightarrow q$	p if and only if q
	p is equivalent to q