MERLOT
Open Learning Materials Overview

or

Discovering OERs in Computer Disciplines

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President Emeritus, IEEE Computer Society
Past Editor-in-Chief, IEEE eLearning Library

Visiting Fulbright Specialist at IUCC/Meital
March/April 2016
Promoting OER Concepts in Israel
Outline

- What does “Open” mean?
- What are the intellectual property considerations
- Find OERS with MERLOT
  - Basic and Advanced Functionality
  - MERLOT Communities and Editorial Boards
  - Multilingual initiatives
- Computer Science (CS) and Info Technology/Systems (IT/IS)
- How can you participate?
Openness

We foresee openness to higher education teaching-learning process as an innovation transforming higher education globally. As Yuan and Powell (2013) stated, many organizations, governments, educational institutions, educators and students around the world have participated in the OER movement by offering various resources and by participating in this free online education. They clearly indicated that the teaching process in being transformed as OERs are being used more in academic circles. This they think will provide opportunities for educators to collaborate with fellow educators from other institutions and countries. Such collaborations will provide opportunities for educators to explore the pros and cons of different pedagogical approaches in different learning contexts (Yuan & Powell).
Categories of Open

1. Open Source (OS)
2. Open Access (OA)
3. Learning Objects
   - Open Educational Resources (OER)
     - Open Learning Objects
     - Open Courseware (OCW)
     - Open Textbooks

OS ≠ OA ≠ OER
1. Open Source

- Concerns software
  - Linux
  - Lucene
  - Moodle
  - Canvas (without support)
  - Instances of freeware
  - Spring Framework, Apache Web Server, Apache Tomcat, MySQL
  - ... and so many more...
Open Source Initiative

Open Source Initiative

Open Source Licenses

About Open Source Licenses

Open source licenses are licenses that comply with the Open Source Definition — in brief, they allow software to be freely used, modified, and shared. To be approved by the Open Source Initiative (also known as the OSI), a license must go through the Open Source Initiative’s license review process.

Popular Licenses

The following OSI-approved licenses are popular, widely used, or have strong communities (as defined in the 2006 Proliferation Report):

- Apache License 2.0
- BSD 3-Clause “New” or “Revised” License
- BSD 2-Clause “Simple” or “FreeBSD” License
- GNU General Public License (GPL)
- GNU Library or “Lesser” General Public License (LGPL)
- MIT License
- Mozilla Public License 2.0
- Common Development and Distribution License
- Eclipse Public License

All Approved Licenses

Many other licenses are also OSI-approved, but fall into other categories, such as special-purpose licenses, superseded licenses, or retired licenses. Complete lists that include all approved licenses are available:

- sorted by name (alphabetical)
- sorted by category

Questions?

The OSI maintains a FAQ, which includes a lot of useful background on open source licensing, including:

- Can Open Source software be used for commercial purposes?
- What is “free software” and is it the same as “open source”?
- What is “copyleft”? Is it the same as “open source”?
- What is a “permissive” Open Source license?
- Which Open Source license should I choose to release my software under?
- Is <LICENSE PROGRAM>: Open Source?
- Can I call my program “Open Source” even if I don’t use an approved license?
- Is <LICENSE NAME> an Open Source license, even if it is not listed on your web site?

For more information about open source licenses and in particular about the Open Source Initiative’s approval process, see:

- The Open Source Definition (annotated version)
- The OSI License Review Process
- Information on License Proliferation and the 2006 License Proliferation Report

OpenSource.org site content is licensed under a Creative Commons Attribution 4.0 International License. | Terms of Service
2. Open Access

- Started with journal articles – usually peer reviewed
- Trend is to include online textbooks
- Readers can retrieve articles without financial or access barriers
- No fees, registration, or membership
- Proponents argue:
  - Researchers contribute articles & review for free → their employers shouldn’t have to pay to access the articles
  - Research funded by government agencies should be available for free
What are publishers doing?

Visit: www.ieee.org/open-access
3. Learning Objects*

- “Any entity, digital or non-digital, that may be used for learning, education or training” (IEEE)

- “Any digital resource that can be reused to support learning” (David Wiley)

- "A digital self-contained and reusable entity, with a clear educational purpose, with at least three internal and editable components: content, learning activities and elements of context. The learning objects must have an external structure of information to facilitate their identification, storage and retrieval: the metadata” (Chiappe, et al)

- “Web-based interactive chunks of e-learning designed to explain a stand-alone learning objective” (RLO-CETL)

- “A digitized entity which can be used, reused or referenced during technology supported learning” (Daniel & Mason)

*Wikipedia
Characteristics of Learning Objects*

A new way of thinking about learning content. Traditionally, content comes in a several hour chunk. Learning objects can be much smaller units or building blocks for instruction and learning, typically ranging from 2-15 minutes to much longer.

They:
- Are self-contained – each learning object can be taken or used independently
- Are tagged with metadata – every learning object has descriptive information allowing it to be easily found by a search
- Can be aggregated – learning objects can be grouped into larger collections of content, including traditional course structures
- Are reusable – a single learning object may be used in multiple contexts for multiple purposes

*Wikipedia
Learning Object Standards

- IEEE Learning Technology Standards Committee (LTSC) P1484
- Sharable Content Object Reference Model - SCORM
- Advanced Distributed Learning (ADL) Initiative
- IMS (Instructional Management System) Global Learning Consortium
- AICC: The Aviation Industry CBT (Computer-Based Training) Committee
- PROMETEUS: PROmoting Multimedia Access to Education and Training in EUropean Society
- The Dublin Core: Metadata for Electronic Resource

Everything You Ever Wanted to Know About Learning Standards But Were Afraid to Ask. –Hodgins & Conner
http://www.linezine.com/2/1/features/wheyewtkls.htm
Open Educational Resources - (OER)

- “Open Educational Resources” – term first adopted at UNESCO 2002 Forum, funded by Hewlett Foundation, on Impact of Open Courseware for Higher Education in Developing Countries

- Digitized teaching and learning materials offered freely and openly for educators, students, and self-learners to use and re-use without charge for teaching, learning, and research

- OER reside in the public domain or have been released under an intellectual property license that permits their free use or re-purposing by others.

- One kind of Learning Object
Open Education Resources Examples

<table>
<thead>
<tr>
<th>OER Learning Materials are:</th>
<th>Examples</th>
</tr>
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</table>
OERs - Subset of Learning Objects

But with Wiley’s 5R permissions

The 5R Permissions of OER

- **Retain**: Make and own copies
- **Reuse**: Use in a wide range of ways
- **Revise**: Adapt, modify, and improve
- **Remix**: Combine two or more
- **Redistribute**: Share with others
OTHER KINDS OF OER

Online Textbooks

Online Courses

Open Learning Objects
Learning Object “Rights”

- Who owns “open” (OER) learning materials?
- What are the rights of the developer?
- What rights does an instructor have to use, to copy, to change a “discovered” learning material?
- Do these rights vary internationally?
- How do you know any of this if you find a material on the WWW?
Get Creative Commons updates

STATE OF THE COMMONS

State of the Commons covers the impact and success of free and open content worldwide, and it contains the most revealing account we've ever published, including new data on what's shared with a CC license. Check it out!

Mission

WHAT IS CREATIVE COMMONS?

Creative Commons helps you share your knowledge and creativity with the world.

Creative Commons develops, supports, and stewards legal and technical infrastructure that maximizes digital creativity, sharing, and innovation.

License

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There is no registration to use the Creative Commons licenses. Licensing a work is as simple as selecting which of the six licenses best meets your goals, and then marking your work in some way so that others know that you have chosen to release the work under the terms of that license.

Our license-choosing tool can help you select the right license.

Choose a License

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MERLOT - A Place to Discover OER
MERLOT's Vision
To be the premiere online community where faculty, staff, and students from around the world share their learning materials and pedagogy.
Brief History of MERLOT

- 1997 - MERLOT developed and hosted at Cal State University, Sonoma
- 1999 - University of Georgia System, Oklahoma State Regents for Higher Ed, Univ. of North Carolina System, and California State University System formed MERLOT 'cooperative'
- 2000 - January - MERLOT cooperative sponsored 48 Biology, Physics, Business and Teacher Education faculty (12 from each system) to develop peer review standards/processes for on-line teaching-learning materials
  - April - other higher ed sys/institutions invited to join MERLOT cooperative.
  - July - 23 higher ed systems/institutions become MERLOT Institutional Partners
  - New release of MERLOT website
- 2006 (August) - - 3rd release of MERLOT of website
- 2007 (June) - - 47,000+ members and 17,000 materials
- 2009 (November) - Content Builder part of MERLOT (from Carnegie)
- 2011-2012 - Over 100,000 members and 35,000 materials. - Released Translation Tool
  - Content Builder and Web Services upgrades and new Web services
- October 2013 -
  - MERLOT II released at Educause 2013. Over 42,500 materials and 117,000 members
- June 2014
  - Released new Material and member detail pages
  - Released new Join and contribute wizards
- March 2016 - materials ≈62,500 members ≈140,000
Open Resource Tool to Find:

- Learning objects
- Open courses
- Open Access textbooks
- Open Access journal articles
- With/without Creative Commons licenses

... in MERLOT and also in other collections
What is unique about the MERLOT collection?

- A Learning Object collection with more than 62,000 teaching and learning materials
- Peer reviewed materials vs a Google search
- Across 25 disciplines
- World-wide, multi-language
- All levels of education
- Free membership and free access
- Paid for by Partners
DNA from the Beginning

DNA from the Beginning is an animated tutorial on DNA, genes and heredity. The science behind each concept is explained using... see more

Material Type: Simulation
Author: Cold Spring Harbor Laboratory
Date Added: Apr 11, 2000  Date Modified: Mar 26, 2016

Biological animations and tutorials

Key biological concepts animated as narrated and stepped tutorials, along with quizzes.

Material Type: Animation
Author: Sumanas, Inc.
Date Added: Jun 23, 2005  Date Modified: Mar 19, 2016
**DNA from the Beginning**  Editors’ Choice  MERLOT Classics

DNA from the Beginning is an animated tutorial on DNA, genes and heredity. The science behind each concept is explained using...

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**Biological animations and tutorials**  MERLOT Classics

Key biological concepts animated as narrated and stepped tutorials, along with quizzes.

**Material Type:** Animation  
**Author:** Sumanas, Inc.  
**Date Added:** Jun 23, 2005  **Date Modified:** Mar 19, 2016

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**DNA Structure**
DNA from the Beginning is an animated tutorial on DNA, genes, and heredity. The science behind each concept is explained using animations related to DNA topics, an image gallery, video interviews, problems, biographies, and links related to DNA. There are three sections: Classical Genetics, Molecules of Genetics, and Organization of Genetic Material. Key features are the clear explanations of classical experiments and the excellent photographs of researchers and their labs. For information and...

More

About

Primary Audience: College General Ed
Mobile Compatibility: Not specified at this time
Technical Requirements:
Flash 3 and RealAudio
Language: English
Cost Involved: no
Source Code Available: no
Accessibility information Available: no
Copyright: yes
Creative Commons: no

Browse in Categories:

- Science and Technology / Agriculture and Environmental Sciences / Animal Sciences
- Social Sciences / Psychology / Biological
- Social Sciences / Psychology / Biological / Evolution and Behavior
- Science and Technology / Communication Sciences and Disorders / Foundations and Related
- Science and Technology / Biology / Genetics
- Science and Technology / Biology / Molecular Biology
- Science and Technology / Agriculture and Environmental Sciences / Plant Sciences
MERLOT II Function Summary

- Store Learning Object (LO) metadata
- Find Learning Objects in MERLOT and other libraries
- Join like-minded communities and find like-minded MERLOT members
- Rate and discuss LOs
- Create and share LOs
- Create and share collections of LOs
- Plan, design, build online course syllabi
- Access MERLOT through most popular LMSs
- Deploy MERLOT Web Services via any WWW application
<table>
<thead>
<tr>
<th>Collection</th>
<th>Item Description</th>
</tr>
</thead>
</table>
| IEEE Computer Society | **An Architecture for Java-Based Real-Time Distributed Visualization**  
Author: Jeffrey Mahovsky, Luigi Benedicenti  
Abstract: In this paper, we present a Java-based software architecture for real-time visualization that utilizes a cluster of conventional PCs to generate high-quality interactive graphics. Normally, a large multiprocessor comput... |
| IEEE Computer Society | **Robustness Testing of Java Server Applications**  
Author: Chen Fu, Ana Milanova, Barbara Gershon Ryder, David G. Wonnacott  
Abstract: This paper presents a new compile-time analysis that enables a testing methodology for white-box coverage testing of error recovery code (i.e., exception handlers) of server applications written in Java, using compiler-directed fault injection. The analysi... |
| IEEE Computer Society | **Complexity of Points-To Analysis of Java in the Presence of Exceptions**  
Author: Ramkrishna Chatterjee, Barbara G. Ryder, William A. Landi  
Abstract: At each program point, points-to analysis determines those objects to which a reference may refer (or a pointer may point... |
| IEEE Computer Society | **Revisiting Java Bytecode Compression for Embedded and Mobile Computing Environments**  
Author: Dimitris Saoukos, George Manis, Konstantinos Blekas, Apostolos V. Zarras  
Abstract: Pattern-based Java bytecode compression techniques rely on the identification of identical instruction sequences that occur more than once. Each occurrence of such a sequence is substituted by a single instruction. The sequence defines a pattern that is... |
| IEEE Computer Society | **A Reflective Implementation of Java Multi-Methods**  
Author: Riccardo Forax, Etienne Duris, Gilles Roussel  
Abstract: In Java, method implementations are chosen at runtime by late-binding with respect to the runtime class of just the receiver argument. However, in order to simplify many programming designs, late-binding with respect to the dynamic type of all arguments is... |
| IEEE Computer Society | **Tool Support for Testing Concurrent Java Components**  
Author: Brad Long, Daniel Hoffman, Paul Strooper  
Abstract: Concurrent programs are hard to test due to the inherent nondeterminism. This paper presents a method and tool support for testing concurrent Java components. Tool support is offered through ConAn...  
Tool support is offered through ConAn... |
| IEEE Computer Society | **Static Analysis of Object References in RMI-Based Java Software**  
Author: Mariana Sharp, Atanas Rountev
Translation in MERLOT II

MERLOT is a free and open peer-reviewed collection of online teaching and learning materials and faculty-developed services contributed and used by an international membership community of faculty, staff, students, and administrators.
<table>
<thead>
<tr>
<th>采集</th>
<th>商品描述</th>
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</table>
| ![IEEE computer society logo](image1.png) | **一个架构基于Java的实时分布式可视化**
作者：杰弗里 Mahovsky，路易吉 Benedicenti！& LT; P & GT;& LT; B & GT;摘要在本文中，我们提出了实时可视化一个基于Java的软件架构，利用传统PC集群生成高质量的交互式图形。通常情况下，一个大的多处理器COMPUT ... |
| ![IEEE computer society logo](image2.png) | **Java的服务器应用程序健壮性测试**
作者：陈富安娜 Milanova，芭芭拉·葛森莱德，戴维·Wonnacott 本文提出了一种新的编译时分析，能够为白盒覆盖的错误恢复码测试（即，异常测试方法服务器应用程序处理程序）用Java编写的，使用编译器导向故障注入。该analy ... |
| ![IEEE computer society logo](image3.png) | **爪哇或应答的分析中异常存在复杂性**
作者：Ranrkrishna 查特吉，芭芭拉·葛森莱德，威廉·兰迪 & LT; P & GT;& LT; B & GT;摘要在每个项目中，& LT;它 & GT;或指针的分析和LT;它 & GT;对于静态类型面向对象编程语言（如Java和C ++）确定这些对象到基准可以参考（或指针会指向 ... |
| ![IEEE computer society logo](image4.png) | **重温Java字节码压缩的嵌入式和移动计算环境**
作者：季米特里斯 Saouglkos，乔治·马尼斯，康斯坦丁 Blekas，阿波斯托洛斯·五 Zarras 基于模式的Java字节码压缩技术依赖于发生不止一次相同的指令序列的识别。这样的序列的每一次出现是由单个指令被取代。该序列定义一个模式是我们 ... |
| ![IEEE computer society logo](image5.png) | **Java的多方法采用反射实现**
作者：RiccardiForax，艾蒂安·杜里斯，吉尔·罗素 在Java中，方法的实现是通过相对于运行时类只是接收参数的后期绑定选择在运行时。然而，为了简化很多程序设计，对于后期绑定到的所有参数的动 ... |
Contributing LOs to MERLOT
Contribute Learning Materials
MERLOT Communities
MERLOT Academic Discipline Editorial Boards

- Agriculture
- Biology
- Business
- Chemistry
- Computer Science
- Communication Sciences
- Criminal Justice
- Engineering
- English
- Faculty Development
- Fire Safety
- Health Sciences
- History
- Information Technology

- Library and Information Services
- Math
- Music
- Physics
- Psychology
- Statistics Teacher Education
- Technical Allied Health
- World Languages
- Geosciences
- Professional Coaching
- Sociology
- Virtual Environments

Predicated on the ABET/CSAB curricula
Editorial Boards
And
Peer Review
Editorial Boards

- Organized like journal editorial board
  - Editor (may be co-editors)
  - Board Members
    - Associate Editors
    - Peer Reviewers
MERLOT vs. Journal

- Evaluate teaching materials, not research articles.
- MERLOT provides peer review tutorial
- Actual peer review appears on MERLOT site; users can read what has been evaluated
Building Editorial Boards

- Taskforce – “editorial board in-training”
  - Core group – 5+ motivated individuals including Chair

- Develop discipline taxonomy & board members submit/review ≈100 materials

- Editorial Board formed

- Timeframe (1-12 months)
  - Taxonomy – 1 month; Build Collection – 4 months
  - Training – 2 weeks - months; Oversight – 4 months

- Academic Community portal editor selected
Computer Science: Developing Task Force

CS Chair – Henry Chan – Hong Kong Poly
- Alvin Chan, Singapore Institute of Technology, Singapore
- Rosanna Chan, Chinese University of Hong Kong, Hong Kong
- Claudio Demartini, Politecnico di Torino, Italy
- Victor Lee, City University of Hong Kong, Hong Kong
- Tiziana Margaria, University of Limerick, Ireland
- Simanta Mitra, Iowa State University, USA
- Vincent Tam, Hong Kong University, Hong Kong
- Joseph So, Hong Kong Community College, Hong Kong

Volunteer participants being sought
**IT/IS:** Developing Task Force

- **Chair:** Edmundo Tovar - Universidad Politécnica de Madrid - Spain
- **Joseph A. Abandon-Sam** - Valley View University, Accra - Ghana
- **Bing-Huh Lu** - National Taipei University of Business - Taiwan
- **Geetam Singh Tomar** - University - India
- **Kalyan R. Joshi** - SPPU, formerly University of Pune - India
- **Maryam Davoudpour** - Ryerson University - Canada
- **Ricardo J. Machado** - Escola de Engenharia - Univers. do Minho - Portugal
- **Mihai-Stanislav Jacobean** - Retired - Romania
- **Manuel Castro (Joined)** - UNED Spain
- **Douglas Martin** - Seneca College, Canada
- **Seljuk Ogrenci** - Kadir Has U Fac of Engineering & Nat Sciences - Turkey

Volunteer participants being sought
The Computer Science and Info Technology/Info Systems Taxonomy Stories
Computer Science Curricula 2013

Curriculum Guidelines for Undergraduate Degree Programs in Computer Science

December 20, 2013

The Joint Task Force on Computing Curricula
Association for Computing Machinery (ACM)
IEEE Computer Society

A Cooperative Project of

IS 2010

Curriculum Guidelines for Undergraduate Degree Programs in Information Systems

Association for Computing Machinery (ACM)
Association for Information Systems (AIS)

Heikki Topi
Joseph S. Valacich
Ryan T. Wright
Kate M. Kaiser
J.F. Nunamaker, Jr.
Janice C. Sipior
G.J. de Vreede

Computer Sciences Accreditation Board
Creating a New MERLOT Taxonomy

<table>
<thead>
<tr>
<th>Category</th>
<th>Subcategories</th>
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</thead>
<tbody>
<tr>
<td>Information Technology</td>
<td>Applications, Mobile App Development, Computer Information Systems</td>
</tr>
<tr>
<td>E-commerce</td>
<td>Database, Hardware, Information Literacy</td>
</tr>
<tr>
<td>Networking</td>
<td>Networking, Operating Systems, Programming, Security</td>
</tr>
<tr>
<td>Operating Systems</td>
<td>Software Engineering, Systems Analysis</td>
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<tr>
<td>Web</td>
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</table>
Computer Science Taxonomy

CSAB Original

- Algorithms and Complexity
- Architecture and Organization
- Computational Science
- Discrete Structures
- Graphics and Visualization
- Human-Computer Interaction
- Information Assurance and Security
- Information Management
- Intelligent Systems
- Networking and Communication
- Operating Systems
- Platform-based Development
- Parallel and Distributed Computing
- Programming Languages
- Software Development Fundamentals
- Software Engineering
- Systems Fundamentals
- Social Issues and Professional Practice

MERLOT Mapping

- Computer Science - General
- Algorithms and Complexity
- Architecture and Organization
- Computational Science
- Discrete Structures
- Graphics and Visualization
- Human-Computer Interaction
- Information Assurance and Security
- Information Management
- Intelligent Systems
- Networking and Communication
- Operating Systems
- Parallel and Distributed Computing
- Platform-based Development
- Programming & Programming Languages
CSAB IT/IS Courses/Topics

IS 2010.1 Foundations of Information Systems
- Characteristics of the Digital World
- Information systems components
  - Hardware
  - Software
  - Data
  - Networks
  - Facilities
  - Personnel
  - Services
  - Partners
  - Information systems in organizations
  - Characteristics of IS professionals
  - IS career paths
  - Cost/value information
  - Quality of information
  - Competitive advantage of information
  - IS and organizational strategy
  - Value chains and networks
  - Globalization
  - What is globalization?
  - Technology enabled change
  - Digital divide
  - Cultural, ethnic, political challenges
  - Global information systems strategies
  - Valuing information systems
  - How information systems enable organizational processes
  - Making a business case for information systems
  - Productivity paradox of information systems
  - Investment evaluation
  - Multi-criteria analysis
  - Cost-benefit analysis
  - Identifying and implementing innovations
  - Information systems infrastructure
  - Hardware
  - Software
  - Collaboration and communication technologies
  - Data and knowledge
  - Faculties
  - Services
  - Personnel
  - Partnerships
  - The Internet and WWW
  - E-business
  - B-to-C
  - B-to-B
  - Intranets, Internet, extranets
  - E-government
  - Web 2.0
  - Technologies: e.g., wikis, tags, blogs, netcasts, self-publishing
  - New forms of collaboration: social networking, virtual teams, viral marketing, crowd-sourcing
  - Security of information systems
  - Threats to information systems
  - Technology-based safeguards
  - Human-based safeguards
  - Information systems security planning and management
  - Business intelligence
  - Organizational decision making, functions, and levels
  - Executive, managerial, and operational levels
  - Systems to support organizational functions and decision making
  - Information and knowledge discovery
  - Reporting systems
  - Online analytical processing
  - Data, text, and Web mining
  - Business analytics
  - Application systems
  - Executive, managerial, and operational support systems
  - Decision support systems
  - Functional area information systems
  - Collaboration technologies
  - Intelligent systems
  - Knowledge management systems
  - Information visualization
  - Visual analytics

IS 2010.2 Data and Information Management
- Database approach
- Types of database management systems
- Basic file processing concepts
- Physical data storage concepts
- File organizations techniques
- Conceptual data model
  - Entity-relationship model
  - Object-oriented data model
  - Specific modeling grammars
- Logical data model
- Hierarchical data model
- Network data model
- Relational data model
- Relations and relational structures
MERLOT IT CSAB Taxonomy

- Foundations of information systems
- Data and information management
- Enterprise systems and architecture
- IS project management
- IT infrastructure
- Systems analysis and design
- IS strategy, management and acquisition
- Application development
- Business process management
- Human-computer interaction
- IT audit and controls
- IT security and risk management
- Knowledge management
- Social informatics
Next Steps

1. **Computer Science**
   - **Grow** the Task Force
   - Review/grow the collection
   - Promote to Editorial Board

2. **IT/IS**
   - **Grow** the Task Force
   - Review/grow the collection
   - Promote to Editorial Board

DEVELOP OUR COMMUNITIES
Community Growth - 1

Welcome to the MERLOT Computer Science Portal. We hope you explore all the many resources available for teaching and learning computer science. Please join MERLOT and use the learning materials in your classroom, submit new materials for review, and create materials for others in our community to use. If you are an educator and would like to be more involved in MERLOT we invite you to become a peer reviewer.

---

**NEW MATERIALS**
- ITE 115: Introduction to Computer Applications and Concepts
- Pioneering zero textbook cost courses and degree programs since 2012, Northern...
- Automatic physiological assessment in surgery: A computer program

**NEW MEMBERS**
- Raneel Kumar
- VENKATA PERA REDDY B
- Robert Spieazio
- Leon Koutras
- Lucas Garcia Machigall

**MATERIALS BY CATEGORY**
- Algorithms and Complexity (0)
- Architecture and Organization (0)
- Computational Science (17)
- Discrete Structures (0)
- Graphics and Visualization (0)
- Human-Computer Interaction (110)
Community Growth - 2

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What can you do?

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