The "Pizza Party"

University of Victoria
Department of Computer Science
Undergraduate Programs and Options

Information Session

ECS 660/668
Oct 14, 2009
12noon--2pm

Agenda

- Introduction (Dr Whitesides)
- Computer Science Major (Dr Stege)
  - also: Bioinformatics, Psychology and CS, courses
- Software Engineering (Dr Weber)
  - also: SE degree, option and courses
- Honor's, Co-Op, MATH/STAT/PHY (Dr Olesky)
  - also: Numerical Methods and Analysis
- Theory/Algorithms (Dr Ruskey)
  - Theory, proposed Theory option, CAG, courses

Agenda

- Computer Architectures (Dr Serra)
  - also: Computer Hardware, VLSI, etc
- Computer Systems (Dr Cheng)
  - also: Mechatronics, Embedded/RT, OS, etc
- Computer Networks (Dr Ganti)
  - also: Wireless/Mobile, P2P, QoS, MM, DS, OR
- Computer Graphics (Dr Bruce Gooch)
  - also: Visual Arts/CS, Games option courses

Agenda

- Human Computer Interaction (Dr Damian)

  – also: Visualization, CSCW, SE courses

- Data Management (Dr Thomo)

  – DB, Graduate programs, Scholarships/Fellowships

- Information Retrieval (Dr Tzanetakis)

  – PL, ML, AI, Music and CS

- Extracurricular Activities

  – CSCU, WECS, BCNET BIC, ACM ICPC, etc

- Hi-Tech Jobs in Victoria (Dr Barrodale)

Dr Sue Whitesides, Chair

UVic Computer Science

Theory+Systems+Applications

Why is Computer Science so exciting?

This is only a partial list of our programs, options and areas. Please refer to the UVic Calendar for complete information on our offerings and areas.

Dr Sue Whitesides
theory group

Interests: graph algorithms, computational geometry, motion planning, layout problems

Courses: algorithms, computational geometry, linear programming; topics courses: graph drawing

Opportunity: looking for research students to work on graph and diagram layout problems in collaboration with SAP Business Objects in Vancouver; send email to sue@uvic.ca

Dr Ulrike Stege

Computer Science Major
Bioinformatics
Psychology and CS

Computer, creatures, and mind...

Computer Science Major Programs @UVic

Computer Science Major Programs @UVic

- Major

- Major and Honours

- Software Engineering Option

- Business Option

- Mechatronics and Embedded Systems Option

- Bioinformatics Option

- Computer Communications & Networks Option

- Computer Graphics and Gaming Option

- Theory Option

Computer Science Combined Degree Programs @UVic

- CS & Mathematics

- CS & Statistics

- CS & Physics

- CS & Health Information Science

- CS & Visual Arts

- CS & Psychology

- CS & Geography

- CS & Music

Bioinformatics Option

Bioinformatics Option

Sequences: A) Probabilistic Modeling; B) Biochemistry

- Common First Year
  - General Biology I (BIOL 190 A)
  - Fundamentals of Chemistry (CHEM 101) or Engineering Chemistry (CHEM 150)
  - CSc 110, 115, 212 (106), ENGL 115 or 135, Math 100, 101, 122
  - One elective

Bioinformatics Option; Year 2

Sequence A:
Probabilistic Modeling

- **BIOC 299**
- **BIOL 230**
- **CHEM 231**
- CSC 225
- MATH **200**, 211, 222
- SENG 265
- STAT 260, **261**

Sequence B:
Biochemistry

- **BIOL 225**
- **BIOL 230**
- **CHEM 231**
- CSC 225
- MATH 211, 222
- SENG 265
- STAT 260, **261**
- ENGR 240

Bioinformatics Option; Year 3

**Sequence A:
Probabilistic Modeling**

- **BIOL 362**
- CSC 230, 320, 370
- CSC 340 or 349A
- ENGR 240
- MATH 201, **352, 452**
- One elective

**Sequence B:
Biochemistry**

- **BIOL 362**
- **BIOC 300A, 300B**
- **CHEM 232 or 235**
- CSC 230, 320, 370
- CSC 340 or 349A
- MATH 201 or 202
- One elective

Bioinformatics Option

- Common Fourth Year
  - Molecular Evolution (BIOL 435)
  - Computational Biology Algorithms (CSC 428)
  - Bioinformatics Project (CSC 498)
  - Four electives

Psychology & Computer Science Combined Degree Programs

Psychology & Computer Science Combined Degree Programs

- Basic Biology (Biology/Ecology)
- 1-4th year Psychology (Intro, research methods, biological psychology)
- Statistics
- More psychology courses in 300 and 400 level (choice)

Dr Jens Weber

Bachelor of Software Engineering
Software Engineering Degree Option
Some Software Engineering Courses

Nowadays, everything is a piece of software...

Bachelor of Software Engineering Program and Software Engineering Option

Jens H. Weber

What is Software Engineering?

Software Engineering is the application of a systematic, disciplined, quantifiable approach to the development, operation, and maintenance of software, and the study of these approaches; that is, the application of engineering to software.

slides from jens

Option compared to Program

- The Bachelor of Software Engineering Program is a joint venture of CSC and ECE.
  - Accredited by CEAB -> licensure as P.Eng.
  - Options: Security, Biomedical, Networks, Gaming, Mechatronics, Technology Policy, Management
- CSC with SE Option
  - CSC Major with emphasis on SENG courses

CSC SENG Option

Year 3	
CSC 320, 330, 355, 360, 370	7.5
CSC 340 or 349A	1.5
4.5 units from SENG 310, 321, 330, 371	4.5
Elective	1.5

Year 4	
SENG 401	1.5
6.0 units of SENG courses at the 400 level	6.0
Other Courses	7.5

- Human-Computer Interaction
- Requirements Engineering and Formal Specs
- Object-Oriented Design
- Software Evolution
- Professional Practice
- SENG Technical Electives

Dr Dale Olesky

Computer Science Honor's
Computer Science Co-Op
CS and MATH/STAT/Physics
Numerical Methods and Analysis

Computer, first it's a better calculator...

NUMERICAL ANALYSIS
DALE OLESKY

- the study of **algorithms** for solving problems of **continuous mathematics**
  - **continuous mathematics**
    - means that **real or complex variables** are involved
    - floating-point numbers , roundoff error
  - **algorithms**
    - most problems of continuous mathematics cannot be solved by finite algorithms using only + — * /
    - approximate algorithms are required
    - truncation error

COURSES

- CSC 340   NUMERICAL METHODS
  - BSc Major or Honours

- CSC 349A   NUMERICAL ANALYSIS
  - All Engineering degrees
  - Combined CSc and Math / Stats / Physics

- CSC 445   OPERATIONS RESEARCH : LINEAR PROGRAMMING

- CSC 449   NUMERICAL LINEAR ALGEBRA

RELEVANCE OF NUMERICAL ANALYSIS

- accuracy of floating-point computations
- applications in other CSc courses
  - Graphics : numerical solution of differential equations, splines
  - Music information retrieval and analysis : singular value decomposition
- Google's page rank algorithm : the internet is modeled as a Markov chain, and the entries in an eigenvector give the importance ranking of a page

Honours degree program

- I am the Honours degree program advisor
    - Honours CSc degree : requires a GPA of at least 6.0 in all required second year CSc, SEng, Math and Stats courses
    - Honours Combined CSc and Math/Stats/Physics : similar requirements (see Calendar)
    - CSc 499 : Honours seminar and project course

Combined CSc and Math/Stats/Physics

- Major BSc in Combined CSc and Math/Stats/Physics
  - no admission requirements
  - combination of required courses from two departments
  - register in the Faculty of Science (not Engineering)

CSc/Math Co-op programs

- I am the Faculty advisor for the CSc/Math Co-op programs
    - registered in any Major, Honours or Combined degree
    - Co-op designation : complete 4 work terms
    - Work Experience designation : 2 work terms

Dr Frank Ruskey

Theory/Algorithms
Combinatorial Algorithm Group
Some Theory/Algorithms Courses

- Mathematics: The Queen and Servant of Science.

- Many people believe that CS is the new math.

- See: How the algorithmic perspective is changing the sciences   (Christos Papadimitriou)

Theory Faculty Members

- Bruce Kapron (Logic is King)
- Valerie King (Let's throw some dice)
- Wendy Myrvold (Decorating donuts)
- Dale Olesky (Continually about error)
- Frank Ruskey (Venn and wow)
- Ulrike Stege (Analyze this)
- Venkatesh Srinivasan (Complexity is good)
- Sue Whitesides (Plan your motions)
- Other faculty with theoretical interests
      (Bill Wadge, Jon Muzio, Alex Thomo, …)

What is theory?

- From MIT: Theory of Computation (TOC) is the study of the inherent capabilities and limitations of computers: not just the computers of today, but any computers that could ever be built. By its nature, the subject is close to mathematics, with progress made by conjectures, theorems, and proofs. What sets TOC apart, however, is its goal of *understanding computation* -- not only as a tool but as a fundamental phenomenon in its own right.

Theory is

- Deep (P vs. NP; one of 7 Clay $1M problems)

- Useful (RSA, Akamai, Google, Computational Economics – Mechanism Design.)

- Fun (Computational Origami, Complexity of Games, Analysis of Puzzles) [*".... pleasure has probably been the main goal all along. But I hesitate to admit it, because computer scientists want to maintain their image as hard-working individuals who deserve high salaries. Sooner or later society will realise that certain kinds of hard work are in fact admirable even though they are more fun than just about anything else." – Don Knuth]*

THEORY OPTION (proposed)

The HOW and WHY of programs

* draft, proposed

DO YOU LIKE

- Problem solving?
- Math puzzles and abstract reasoning?
- Understanding exactly how and why something works?

* draft, proposed

THE THEORY OPTION (proposed)

CSC 225

CSC 320
Models of
computation

CSC 326
Alg & DataS

CSC 322
Logic

CSC 349A
Scientific
computing

* draft, proposed
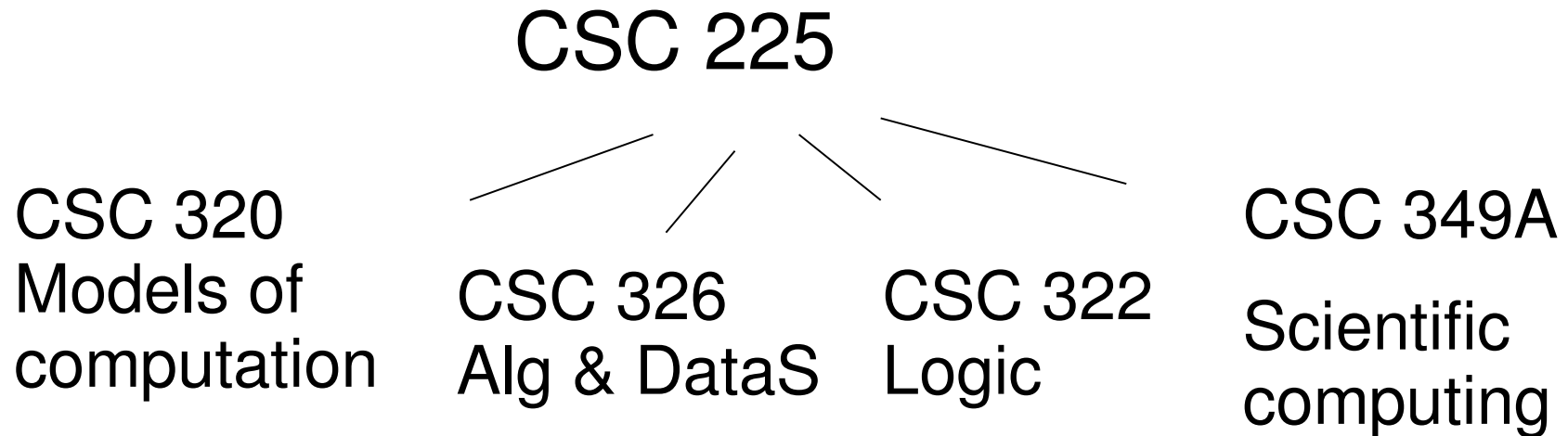
Fourth year
Choose 3 numbered courses below

CSC 225

CSC 320
Models of
computations

CSC 326
Alg & DataS

CSC 322
Logic

CSC 349A

Scientific
computing

429 Cryptography
482 Complexity
482 Coping with
    Intractability

422 Graph algs,
423 Randomized Alg
426 Comp. Geometry
428 Comp. Biology
428A Combin. Alg.

Verification,
VLSI, AI,
 Database,
Concurrency,
Compilers

Numerical
Analysis,
Optimization4
45 Linear
Prog.

37

* draft, proposed
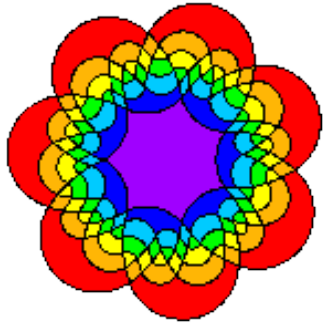
Join the listserv to get talk notices for the:

COMBINATORIAL ALGORITHMS GROUP
University of Victoria

http://www.cs.uvic.ca/~wendym/cag
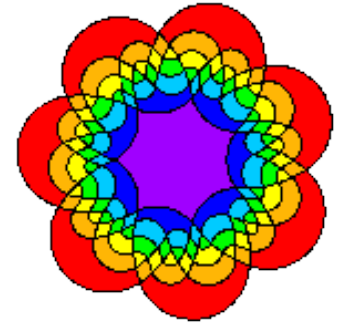
Our research interests include:
- Graph Theory and Graph Algorithms
- Combinatorics and Combinatorial Algorithms
- Computational Geometry
- Randomized Algorithms
- Computational Complexity
- Network Reliability
- Topological Graph Theory
- Computational Biology
- Cryptography
- Design Theory

We welcome problems which require our expertise. We run a weekly seminar series.

Contact: Wendy Myrvold (wendym@cs.uvic.ca)

slides from wendy
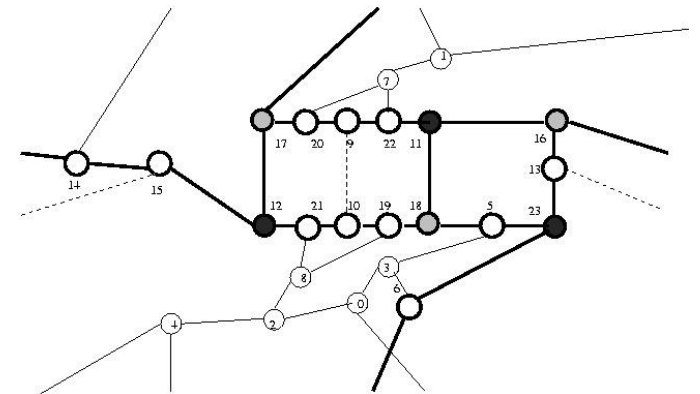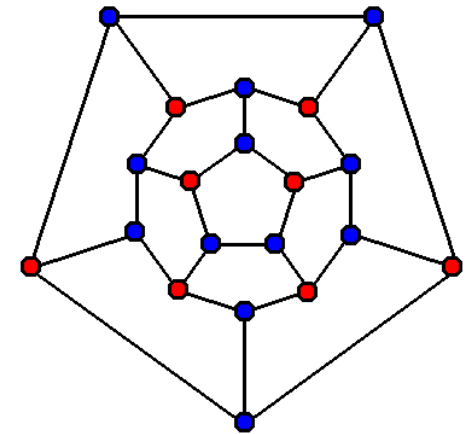
Some cross-listed courses (482x)

- Parameterized Complexity (Stege)
- Algorithmic Mechanism Design (King)
- Zeroes and Ones (Ruskey)
- Knuth Vol. 4.

CSC 482/582: Summer 2010, Wendy Myrvold

An introduction to graph theory and graph algorithms. The only prerequisite is CSC 225 and 3rd or 4th year standing.

The grading scheme includes assignments and you will work under my supervision on an original research project. No exams.

The class is designed both for students with an interest in algorithms and for students who will use graph theory as part of some other discipline (graphics, networks, software engineering, …).

This class is a continuation of the graph algorithms taught at the end of CSC 225.

The topics in the class will include some of my research interests:

Graph theory and graph algorithms, generating graphs and other combinatorial objects up to isomorphism, network reliability, embeddings of graphs on surfaces, graph algorithms for chemistry, practical algorithms for NP-hard problems such as independent set, and Latin squares.
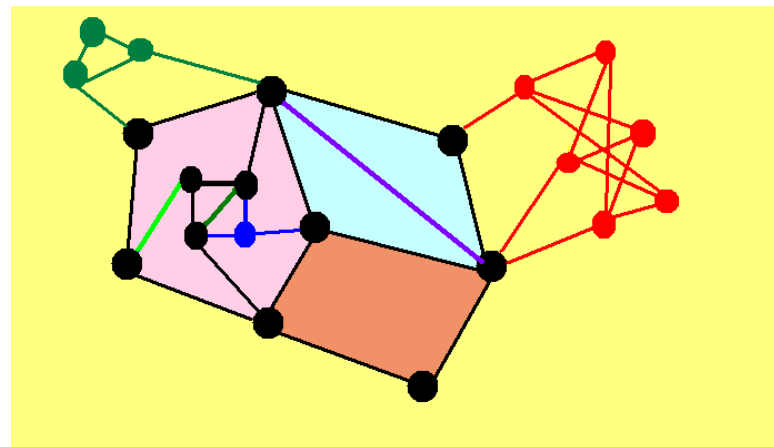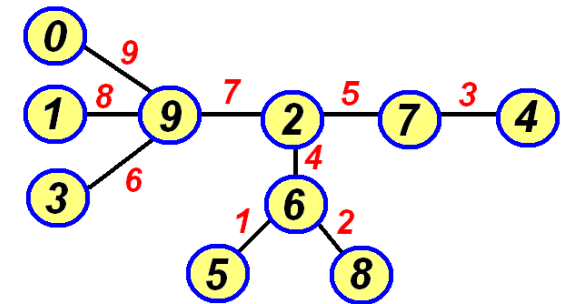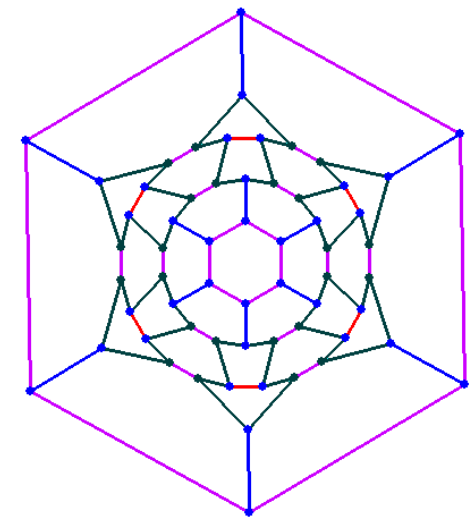
Dr Micaela Serra

Computer Architectures
Computer Hardware
VLSI Design and Verification

The <u>hard</u> side of Computer Science...

Dr Mantis Cheng

Computer Systems
Embedded/Realtime Systems
Operating Systems

Where hardware meets software...

Mechatronics and Embedded Systems Option

Dr. Mantis Cheng

Dept. of Computer Science

14 October 2009

What is mechatronics?

- Integration of <u>mecha</u>nical and elec<u>tronics</u> systems.

- Examples include Hard Drives, Walkman, VCRs, CD/DVD players, Cameras, etc.

- Today, many such systems use sophisticated software to provide essential control functions.

What is an embedded system?

- There are ten times more embedded systems than desktop computers, e.g., (over 500M) cellphones, MP3 players, network routers, microwave ovens, washers/dryers, GPS, automobile engine control, etc.

- Embedded systems are ubiquitous; they are everywhere and invisible.

Engineering Constraints

- Instant-on or always-on
- Fail-safe and immune to noises
- Low power
- Timing sensitive
- High performance/cost ratio
- Often integrate sensors/actuators with software and electronics

Engineering Know-How

- In MECH, it includes Control Theory, Sensors/Actuators, Electromechanical Systems, and Automation.

- In ELEC, it includes Control Theory, Circuit Theory and Design, Signal Processing, Hardware/Software Design and Interfacing, microcontroller programming.

What does CS get to do with it?

- CS doesn't cover Differential Equations, Control/Circuit Theory, Hardware Design, or Automation.

- New applications, such as wireless sensor networks, intelligent mobile robots, and iPhone/Blackberry, all require sophisticated software.

- Software enables immense expansion and progress in these areas, due to advances in microcontroller technologies.

Job Opportunities

- Automation and Robotics
- Medical and Health Monitoring Systems
- Avionics/Automobile Engine Control
- Consumer Product Development (e.g., cell phones, gaming devices, networking equipment, GPS, security and surveillance systems, etc.)

Relevant 4th Year Courses

- Understanding real time and concurrent software design is crucial in these areas.
- <u>CSC 460</u>: Design and Analysis of Real Time Systems
- <u>CSC 464</u>: Concurrency

Other Non-CS Courses

- <u>ELEC 250</u>: Linear Circuits
- <u>ELEC 260</u>: Signal Analysis
- <u>SENG 440</u>: Embedded Systems
- <u>SENG 321</u>: Requirements Engineering
- <u>ELEC 365</u>: Applied Electronics and Electrical Machines
- <u>MECH 458</u>: Mechatronics

Other Non-CS Courses

- <u>ELEC 466</u>: Systems on Chip

- <u>MECH 466</u>: Micro-Electrical-Mechanical Systems (MEMS)

- <u>SENG 466</u>: Software for Mechatronics and Embedded Systems

- <u>ENGR 466</u>: Integrated Mechatronics and Embedded System Project

Further Details …

- Check out my personal home page:

  http://webhome.csc.uvic.ca/~mcheng/samples/personal/About%20Me.html

- Or just google "Mantis Cheng".

CSC 375
Sept – Dec 2010

Instructor: Mary Sanseverino

Email msanseve@uvic.ca for more info

CSC 375: Introduction to Systems Analysis

- Learn new analytic skills
- Work in a CSC course with students from outside Computer Science
- Work with clients from around UVic, government, NGOs, business, and the public sectors
- Learn and practice valuable communication skills
- Create and take away a portfolio-building project

slides from mary

Email msanseve@uvic.ca for more info!

Dr Sudhakar Ganti

Computer Networks
Wireless Mobile Networks
Peer-to-Peer Networking
Network Traffic/Quality of Service

Anything not networked yet?

Why Networks Option

- It's a "weird" world out there (oops, "wired")
- Communications and connectivity are key for day to day jobs – achieved thru numerous networks
- High-speed, low-speed, wired, wireless …
- Learn the technology …
- Program the technology …
- Have *FUN* with technology ….
  - It's *F*un to *U*nderstand *N*etworks!

  - http://www.csc.uvic.ca/networks

Networks Option

- Job interviews: Expect questions on networks
- Jobs in Telecomm industry (Telus, AT&T, Nortel, Alcatel), equipment manufacturers (Cisco, Juniper, Broadcomm, Linksys)
- Learn all about Networks through this option!!

  - http://www.csc.uvic.ca/networks

CSC 361: Computer Networks

- To understand the **principles** and **practice** of designing, building, and operating computer networks, particularly the Internet, with **hands-on** experience.

  – Introduction: Internet, CA*Net4, BCNET, UVicNet...

  – Application Layer: HTTP/Web, DNS, etc

  – Transport Layer: TCP, UDP, and your own protocol!

  – Network Layer: IP addressing and routing, NAT

  – Link Layer: Ethernet, Wi-Fi, etc

  – Play with WRT54GL/OpenWRT/WireShark in Lab

More Systems/Networks courses!

- Operating Systems (CSC360)
- Computer Networks (CSC361)
- Real-time Systems (CSC460)
- Multimedia Systems (CSC461)
- Distributed Computing (CSC462)
- Wireless Mobile Networks (CSC463)
- Overlay and Peer-to-Peer Networking(CSC466)
- Switching, Network Traffic and QoS (CSC467)

Computer Communications and Networks
Degree Option:

- – 3 units from CSC 463, 466, 467
- – 3 units from CSC 461, 462, 446

CSC 463: Wireless and Mobile Networks

- An introduction to selected issues in wireless and mobile networks.
- Radio basics
- Mobility models
- Location management
- Handoff
- QoS (Quality of Service)
- MAC (Medium Access Control)
- Routing, and transport protocols over different types of wireless and mobile networks

CSC 466: Overlay and Peer-to-Peer Networking

- This course focuses on Layer 3 and above, and the control plane of the Internet, particularly with overlay and peer-to-peer networking.

  – Review of TCP/IP networking

  – Overlay network architectures

  – Peer-to-peer application models

  – End-to-end control mechanisms

  – Inter and intra-domain routing protocols

  – IPTV/VoIP service provisioning

  – Network measurement basics

CSC 467: Switching, Network Traffic and Quality-of-Service

- Review of Networking (parts can be new)
  - Internet as an example
  - Connection based and Connectionless
- Switch / Router Architectures (Data path focus)
- Traffic Management and Traffic Engineering
  - Quality and Class-of-Service aspects
  - Traffic policing, scheduling
- Data and Control Plane
  - Recent advances (e.g., Network Processors, VPNs, VPLS)
  - MPLS, QoS routing aspects and Protocols (OSPF-TE, BGP-TE)
- Media Services
- Optical Networks
  - Wavelength Division Multiplexing (WDM)
  - GigE as transport

Emphasis on aspects of Practical Networking, Equipment Design, Traffic Issues

CSC 446/546: Operations Research: Simulations

- Introduction to Discrete-Event Simulation
- Elementary Probability and Queueing Theory
- Basic techniques of discrete event simulation
- Generating Random Numbers and Random Variates
- Input/Output modeling
- Simulation Programming using general purpose languages and also special purpose simulation tools
- Analysis of Simulation results

CSC 461: Multimedia Systems

- Introduction to multimedia systems and applications.
- Topics include multimedia system design issues, representation, processing and retrieval of temporal and non-temporal media types
- Data compression techniques
- Multimedia system architecture, operating systems, networking, quality of service and database system issues, object-oriented multimedia programming, user interface, virtual worlds.

CSC 462: Distributed Computing

- Review of computer networking.
- Mechanisms including interprocess communication and remote procedure call.
- Distributed operating systems design problems: kernels and microkernels, process models, virtual memory, naming and protecting.
- Distributed file systems.
- Fundamental problems in distributed computing: naming, ordering of events, replication and atomicity.
- Case studies

Dr Bruce Gooch

Computer Graphics
Visual Arts + CS
Computer Games
Computer Graphics and Gaming Option

Graphics and Games!!!

CSC 305   Course Objectives

1. **Help students understand some fundamental algorithms, data-structures and maths for computer graphics.**

4. **Prepare students for advanced courses: Modelling, Rendering and Animation**

3. **Through the labs. provide an understanding of OpenGL API and the use of a GUI (E.g. Qt/IGLUT etc.)**
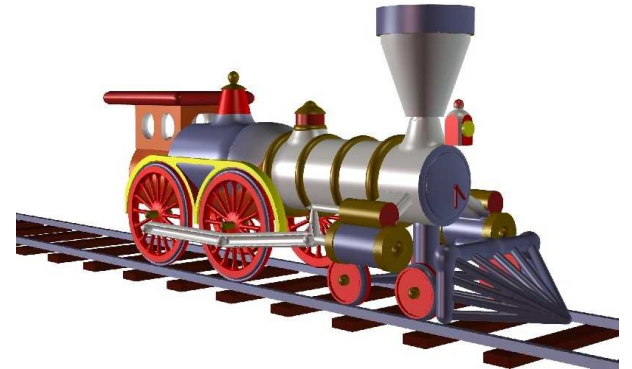
By the end of the Course …
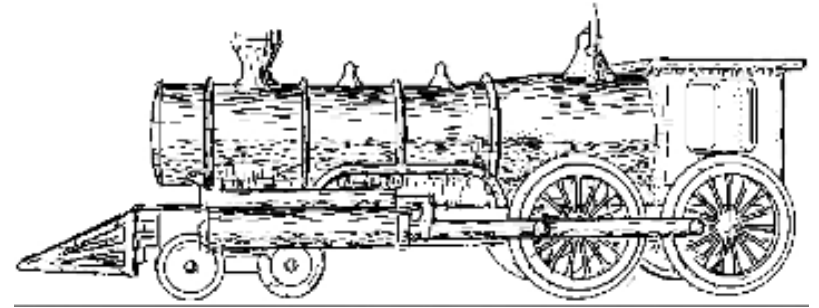
You should be able to program graphics applications:
e.g.   **A simple modeller (including curves)**
        A simple renderer (ray tracer)

Frozen Fire
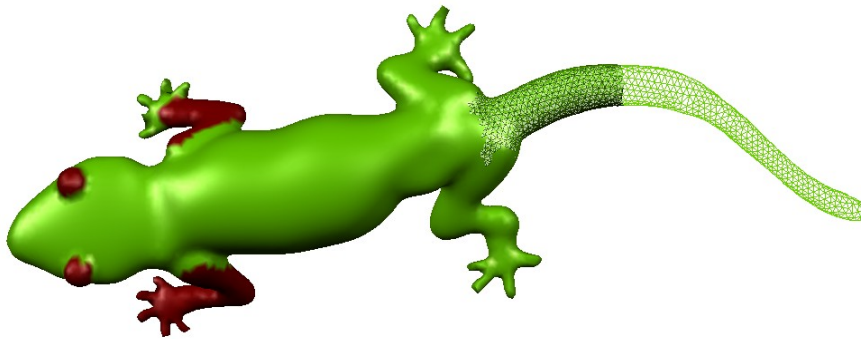
CSC 473 **Fundamentals of Computer Animation**

- Computational approaches for producing computer animation.

- Computer graphics programmers who want to learn the basics of computer animation programming.

- Full 3D computer animation + useful algorithms and techniques to move objects in interesting ways.

- E.g. Physics based animation.
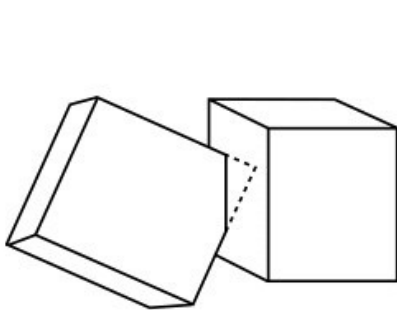
Vertex inside a polyhedron
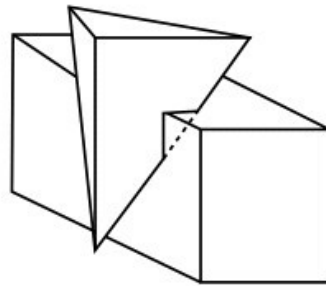
Object penetration without a vertex of one object contained in the other
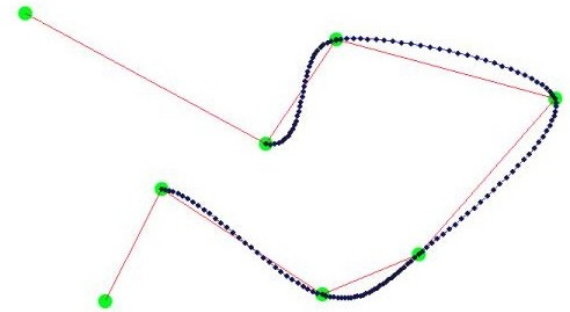
By the end of the Course …

You should be able to program animation applications:

e.g.
- **Control acceleration and orientation of 3D object smoothly around a curve.**

- **Animate complex system e.g. double pendulum using physically based techniques.**
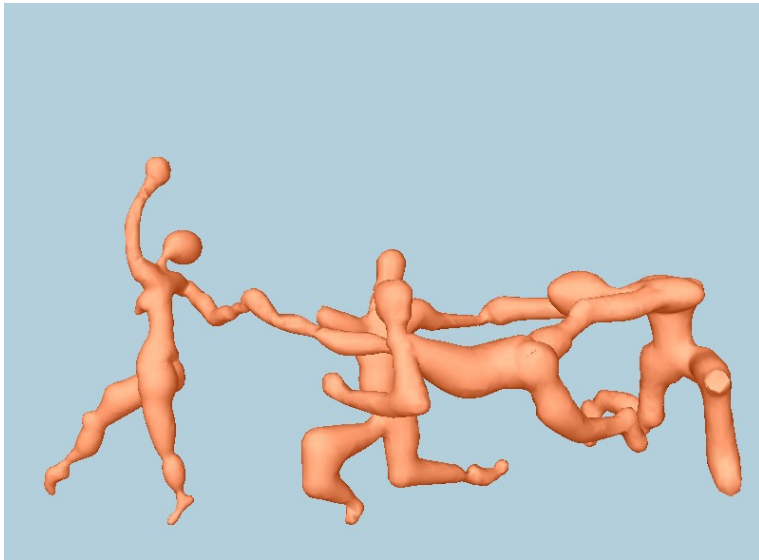
- **Animate rigid bodies colliding in space.**
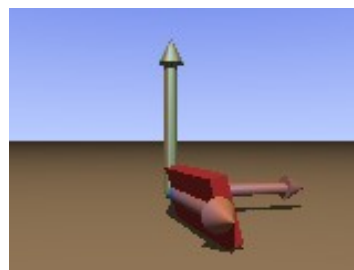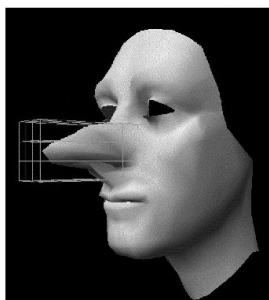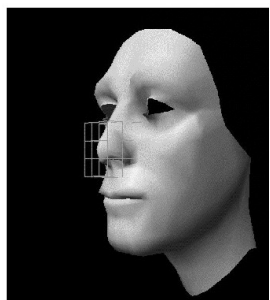
Lagrange

$$\frac{\partial L}{\partial \theta_i} - \frac{d}{dt}\frac{\partial}{\partial \dot{\theta}_i} = 0$$

CSC 472 Fundamentals of Computer Modeling

1. Help students understand some fundamental algorithms, data-structures and maths of modeling for computer graphics.

2. Give practcal help in implementation of algorithms.

this Next Step juli 2008

shapeshop / modo / photoshop

By the end of the Course …

You should be able to program modeling applications: e.g.

- **Interactive parametric patch, implicit surfaces or mesh deformation editor.**

- **Extend your CSC305 ray tracer to include Constructive Solid Geometry.**

- **Program procedural and generative models. (e.g. L-systems, fractals, iterated function system).**
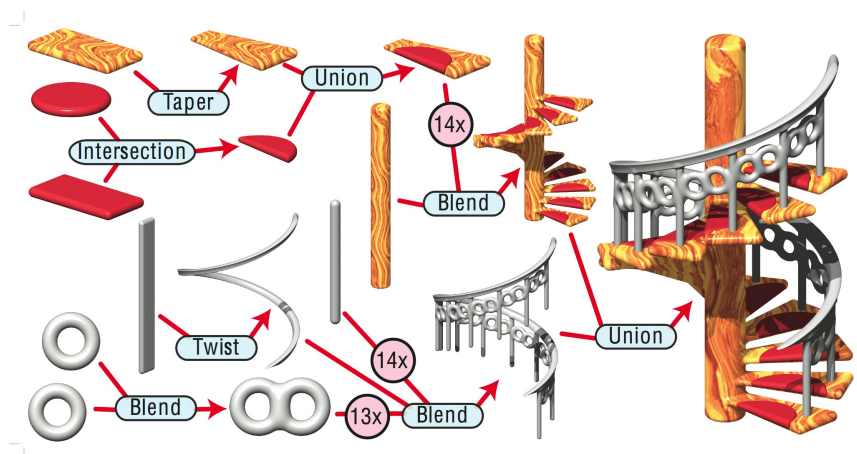
slides from brian
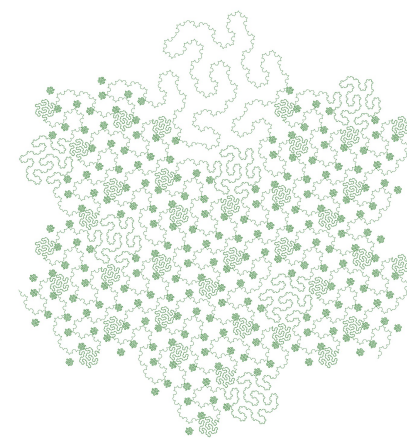
Dr Daniela Damian

Human Computer Interaction
Information Visualization
Computer-Supported Collaborative Work
Some Software Engineering Courses

The human factor...

Human-computer interaction, Computer-supported Cooperative Work, Information Visualization and Software Requirements Engineering

Professors:
Melanie Tory
Margaret Anne Storey
Daniela Damian

Courses offered:

SENG 310: Human Computer Interaction (HCI) (M. Tory, D. Damian and M-A. Storey)

CSC 578xx/ CSC 485xx/SENG 435: Topics in Computer-Supported Collaborative Work (CSCW) (M-A. Storey)

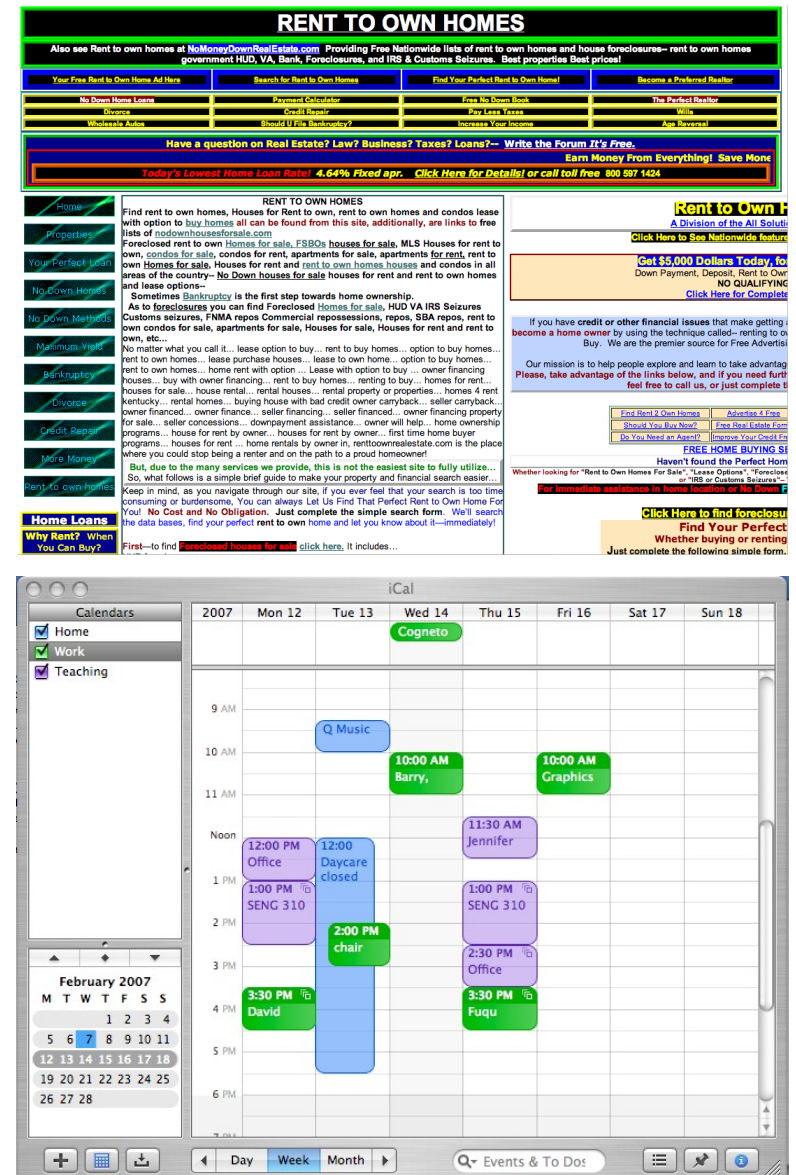CSC 586xx/SENG 480A Information Visualization and Knowledge Management (M. Tory, M-A. Storey)

SENG321: Requirements Engineering (D. Damian, M. Zastre)

SENG 310: Human Computer Interaction

- How can we design effective computer interfaces?

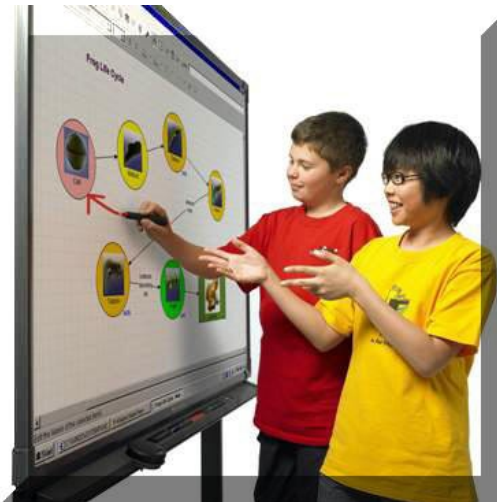- SENG 310 introduces methods and design guidelines to help you

Are these interfaces effective?

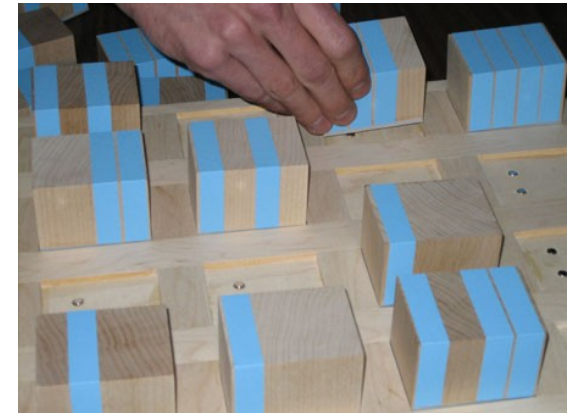# Thinking beyond the desktop

- We consider computer interfaces broadly – not just GUIs and desktop machines

CSC 578A/CSC 485E/SENG 435: Computer-Supported Cooperative Work

Topics

- Computer mediated communication
- Awareness and coordination
- Distributed cognition
- CSCW frameworks
- Empirical methods in CSCW

Technologies
- Groupware
- Mobile devices
- Large and shared displays
- Collaborative visualization
- Collaboratories
- Knowledge management
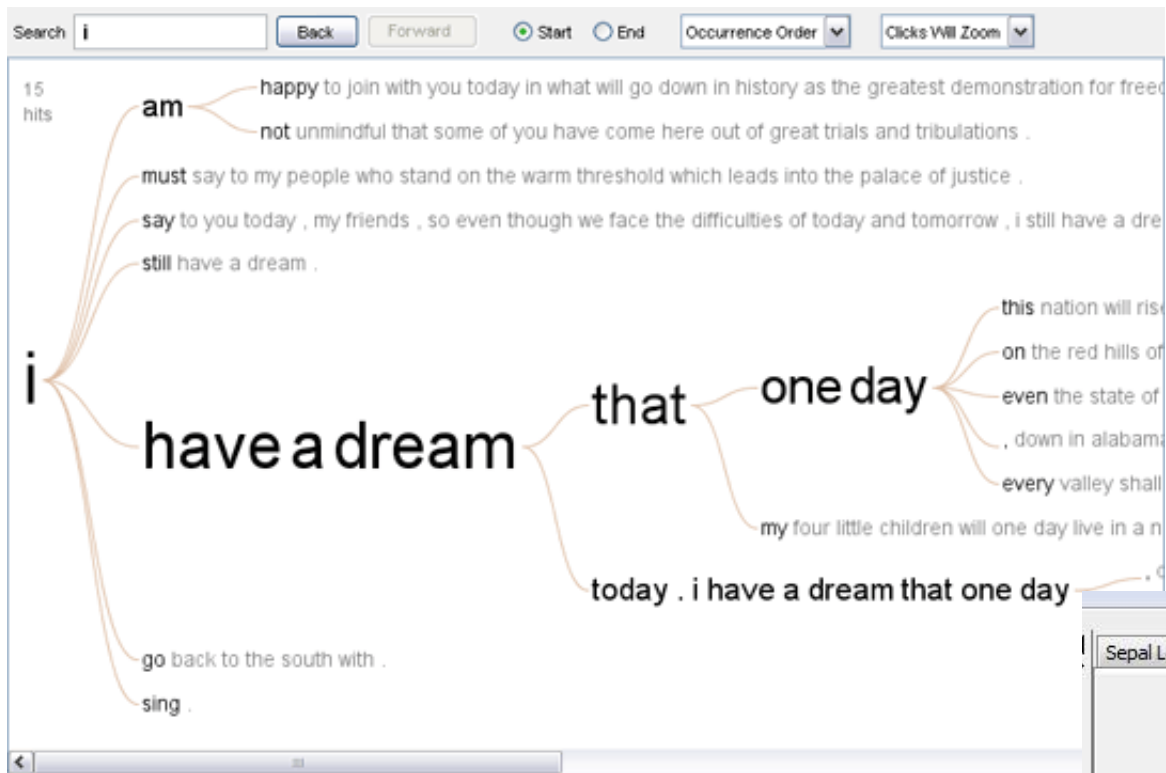- Instant messaging
- Social network analysis
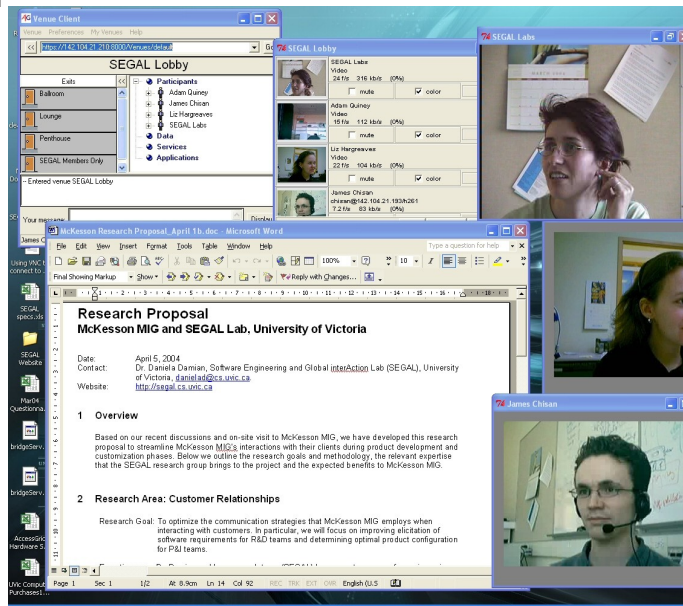
CSC 586xx/SENG480A: Information Visualization

- How can we best display and interact with data so that users can analyze it?

- Depends on data, user goals, perceptual psychology…

Hierarchies
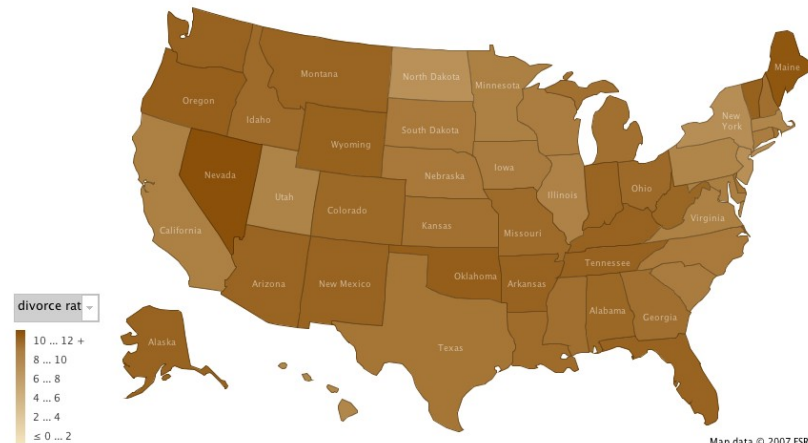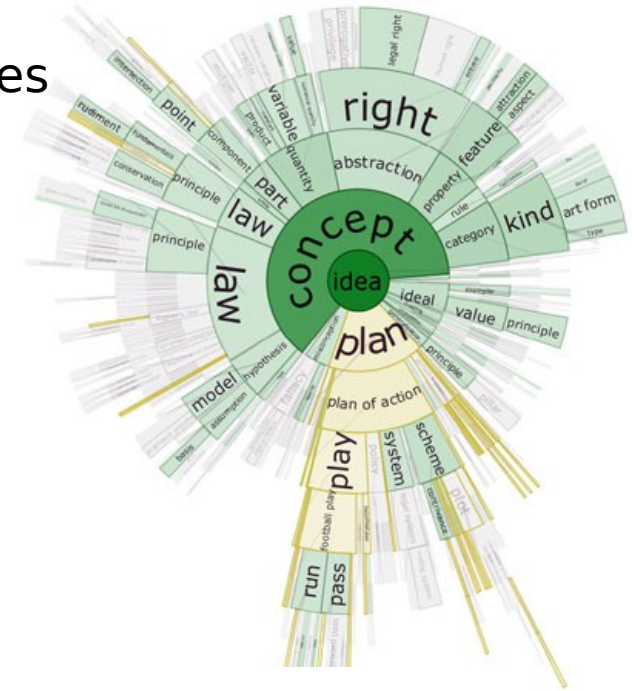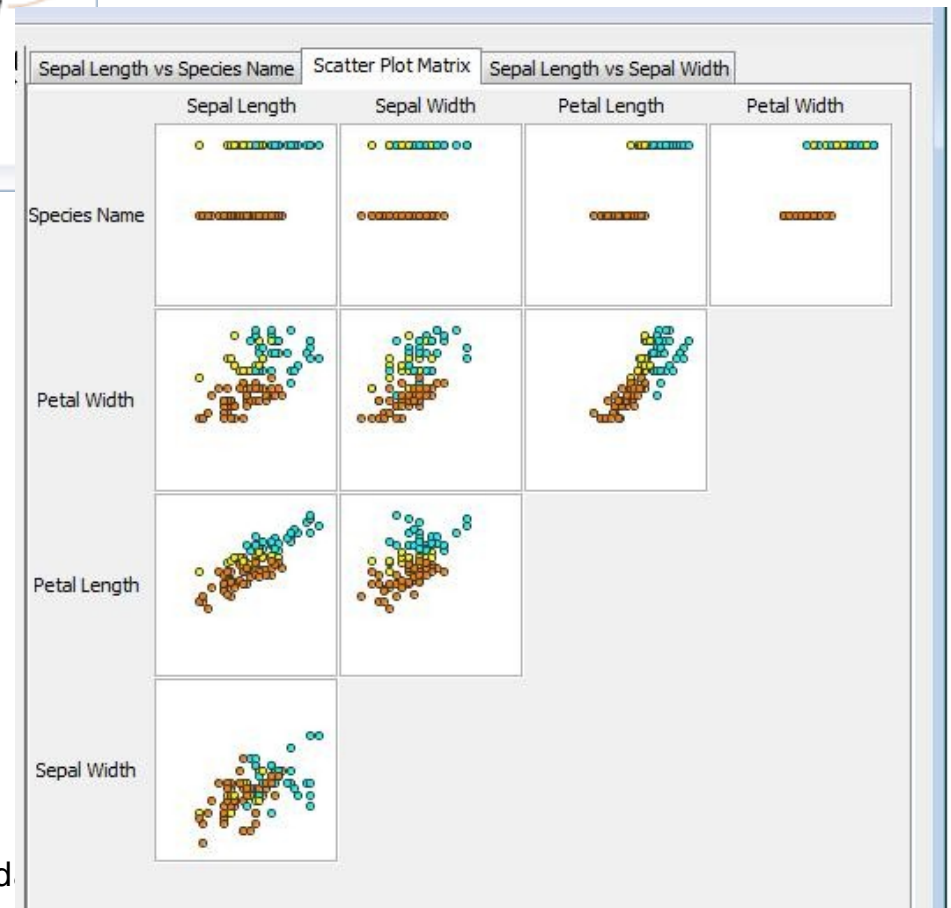
Geographic data (here divorce rates by state)

Text

Multidimensional data

slides from d

Multiple views can be combined and coordinated to solve a problem
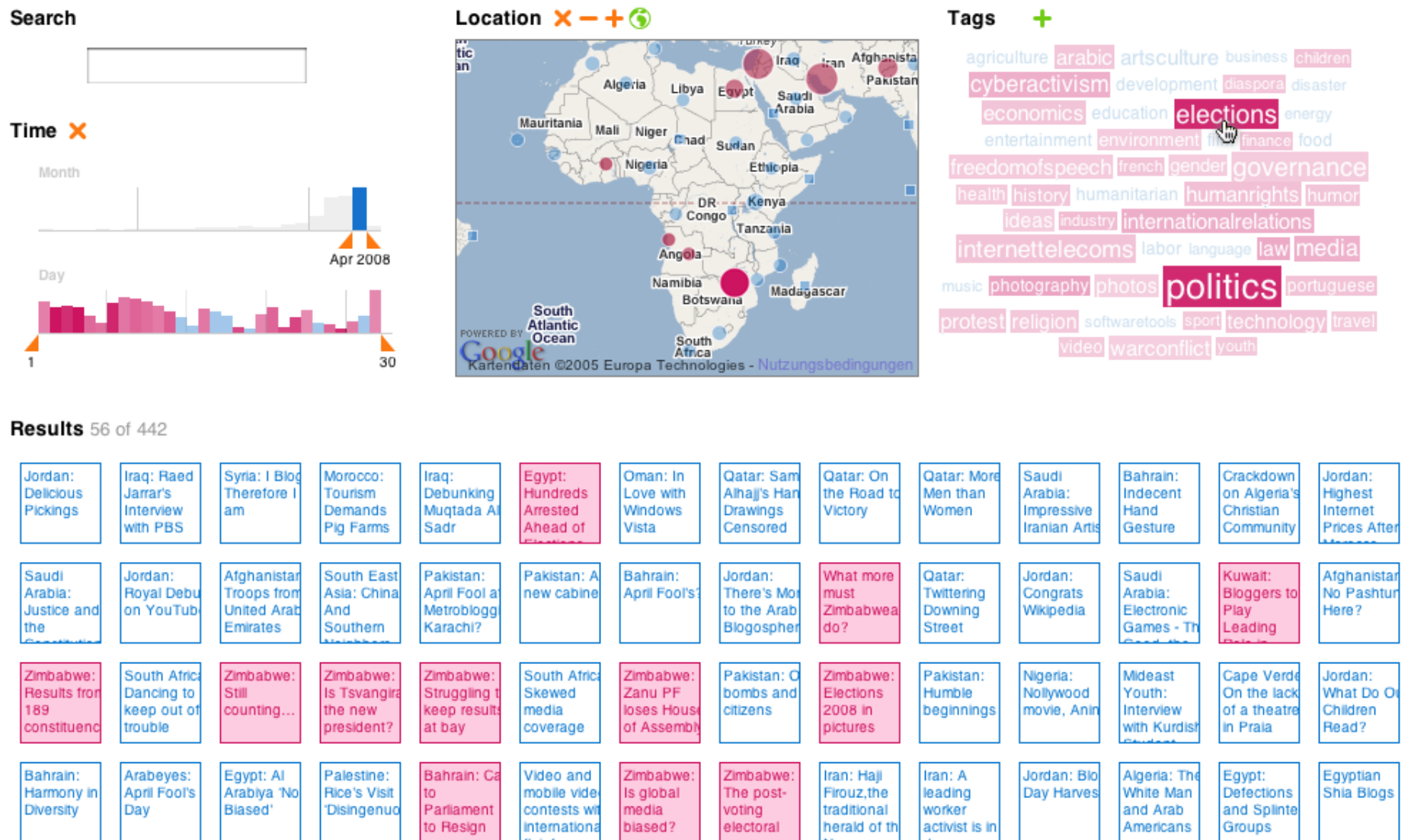
SENG 321: Requirements Engineering

Teasing out the human factor in requirements engineering activities

Topics

- Developer-client contracts
- Developer-client negotiations
- Requirements elicitation, analysis and specifications
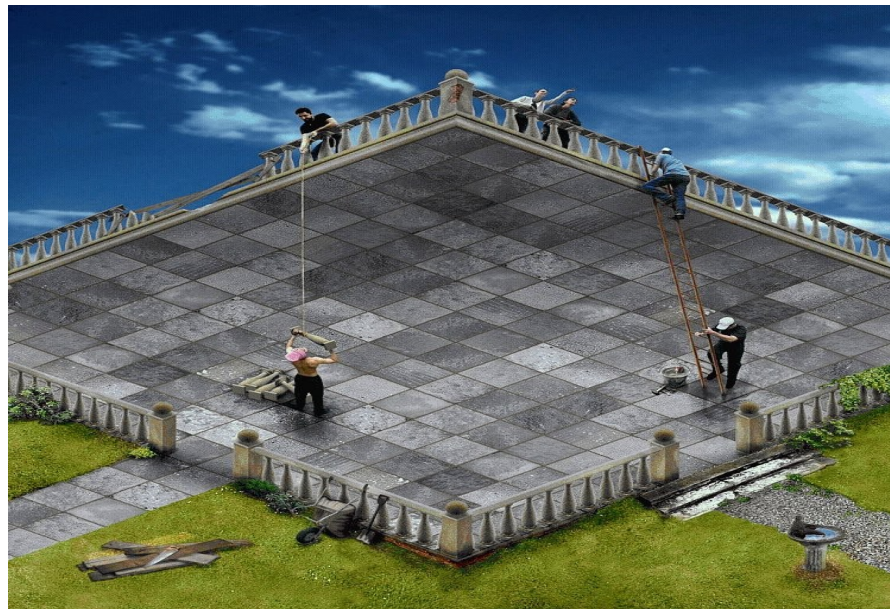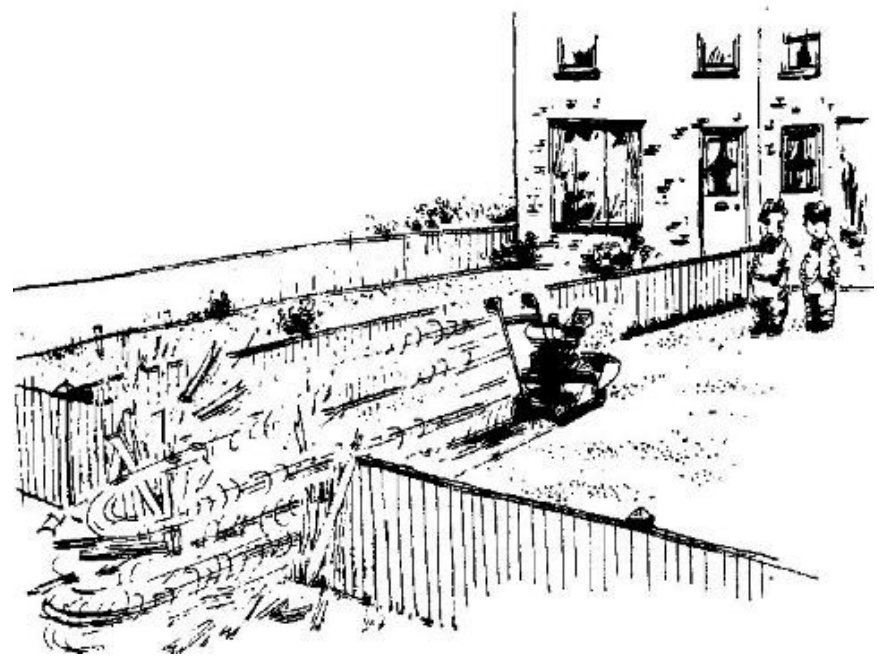
Dr Alex Thomo

Database Systems
Data Management
Graduate Programs
Scholarships/Fellowships

Computer is to process data...

Dr. Alex Thomo

Databases & Data Mining

"databases are the foundation of western civilization"
Bruce Lindsay, IBM Fellow

if databases were to stop right now, you wouldn't be able
to shop, fly, call, google, twitter...

SENG 474 - Data Mining

- Automatically discover useful information in large data repositories.

SENG 480D/CSC 485D/571 Advanced Databases

- How to build databases?
- How to efficiently mine very large databases?

Pathologies of big data

Random, disk	316 values/sec
Sequential, disk	53.2M values/sec
Random, SSD	1924 values/sec
Sequential, SSD	42.2M values/sec
Random, memory	36.7M values/sec
Sequential, memory	358.2M values/sec

Axis: 10, 100, 1000, 10^4, 10^5, 10^6, 10^7, 10^8
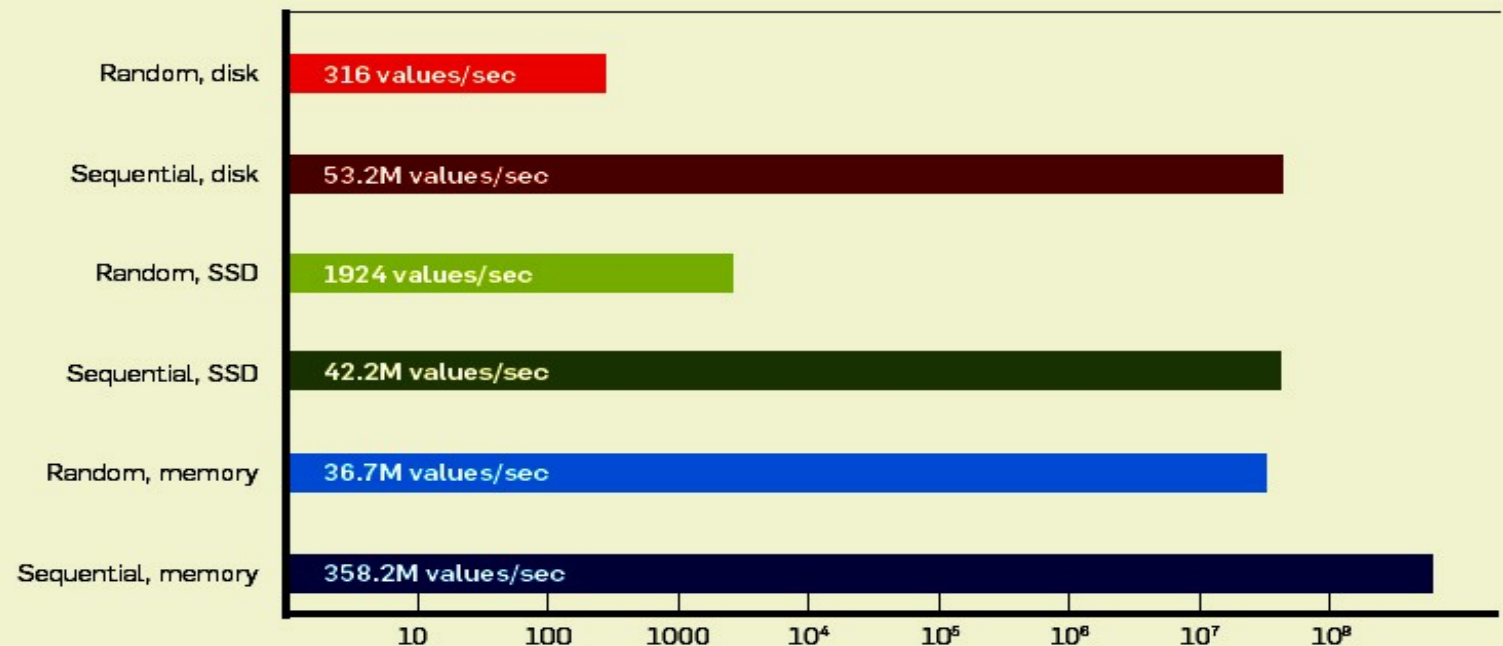
* Disk tests were carried out on a freshly booted machine (a Windows 2003 server with 64GB RAM and eight 15,000RPM SAS disks in RAID5 configuration) to eliminate the effect of operating-system disk caching. SSD test used a latest generation Intel high-performance SATA SSD.

Graduate Programs

- MSc with thesis
- MSc with project
- PhD

- Financial Support
  - NSERC Scholarship (PGS-M, D)
  - UVic Fellowships, RA, TA, Co-op & MITACS

Dr George Tzanetakis

Information Retrieval
Programming Languages
Artificial Intelligence
Music and CS

... but ultimately human beings care about information, knowledge and intelligence.
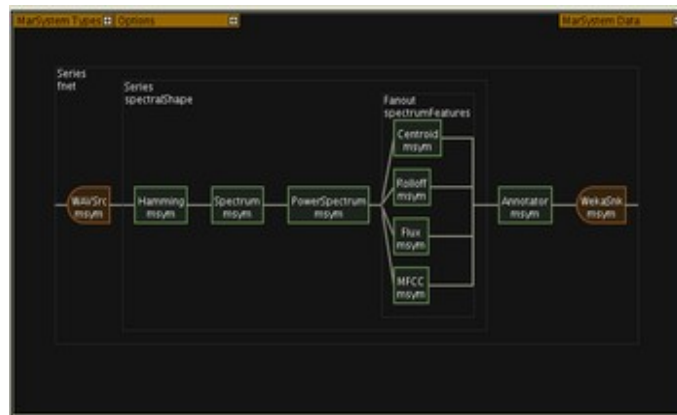
Dr George Tzanetakis

- Research Interests
- Audio Signal Processing
- Machine Learning
- Human-Computer Interaction
- Music Information Retrieval
- Sensors and actuators for music performance
- Computational ethnomusicology
- Computer-assisted music instrument tutoring

Music Research @ UVic
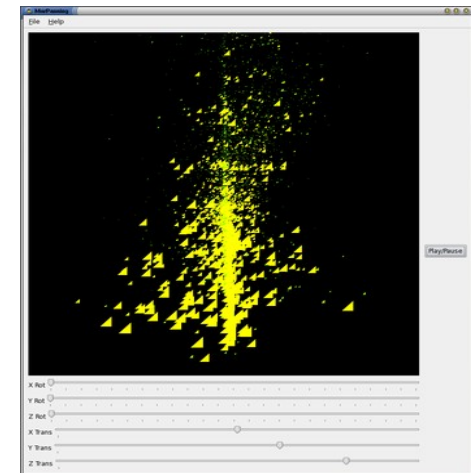
CSC475

- Music Information Retrieval
  - Audio Feature Extraction (Short-Time Fourier Transform, Wavelets, Perceptual Audio Compression)
  - Machine Learning (Decision Trees, Hidden Markov Models, Support Vector Machines)
  - Visualization (Principal Component Analysis, Self-Organizing Maps)
  - Applications (classification, segmentation, beat tracking, similarity retrieval, browsing)
- Heavily project-based
- Projects are personalized and require integration of ideas from many disciplines

SENG474

- Data Mining
  - Classification
  - Association Analysis
  - Cluster Analysis
  - Anomaly Detection
- Project can be customized to particular area of interest
- Lots of interesting ideas that can be applied to any field
- Previous projects: spam filter, stock prediction, statistics canada, many others

CSC421

- Artificial Intelligence
- Representative topics:
  - Intelligent searching
  - Constraint Satisfaction Problems
  - Adversarial Search
  - Logic reasoning
  - Knowledge Representations
  - Probabilistic Reasoning
  - Probabilistic Reasoning over time
  - Knowledge in Learning
  - Statistical Learning Methods
  - Perception

Dr Nigel Horspool

CSC435: Compilers

From what you say to what computer does...

CSc435
Compiler Construction

Nigel Horspool

The best all round subject in CS

- Compilers are a vital component of system performance
- A complex example of software engineering
- A microcosm of computer science ...

Major CS Topics

Finite automata & pushdown automata

Graph colouring

Heuristic search

Graph algorithms

Data structures

Hashing & perfect hashing

Computer architecture

Applications in a Compiler

Scanning & Parsing

Register allocation

Instruction scheduling

Symbol table organization

Keyword lookup

Code generation

Code optimization

Runtime memory layout

CSc485x/SEng480x
Implementation of Virtual Machines

Nigel Horspool

Why?

- VMs are used to implement many languages including Java, C#, Perl, Python, Prolog, Forth, Small-talk, ...
- VMs offer portability and security.
- A closely related topic is emulation of a computer architecture.

Who?

The course is targeted at those who

- have reasonable programming ability, and
- interested in knowing how things work, and/or
- want to write efficient code.

What?

The topics covered include:

- Interpretation *vs* JIT compilation
- The Java VM
- VM design choices
- Bytecode verification
- Garbage collection
- Efficient interpretation
- Feedback-Directed Optimization for JIT compilers
- Virtualization *vs* VM

Computer Science Course Union

Aurora

http://cscu.csc.uvic.ca

Women in Computer Science

Anissa (by Aurora)

*WECS strives to reach a new level of diversity, inclusivity and professionalism in our faculty
*Membership in WECS is not gender based
* Events:
* LEGO Robotics Workshops
* Lunch and Learn
* Check the website for more!

http://wecs.uvic.ca

BCNET Broadband Innovation Challenge (BIC) Competition

Anthony

http://www.bc.net/news_events_publications/competitions.htm

Real Cash?!

UVic

Winners

2009 and 2008

3AD Framework

Adaptive, Automated,
Audio Description

Anthony Theocharis
2009

3AD Framework

audio tagging & searching

MIR, machine learning, P2P

predicts tags

help users index their audio, so they can search
more effectively

3AD Solution

content searching

natural language tags

manual and automatic tagging

pros:
    intuitive
    simple
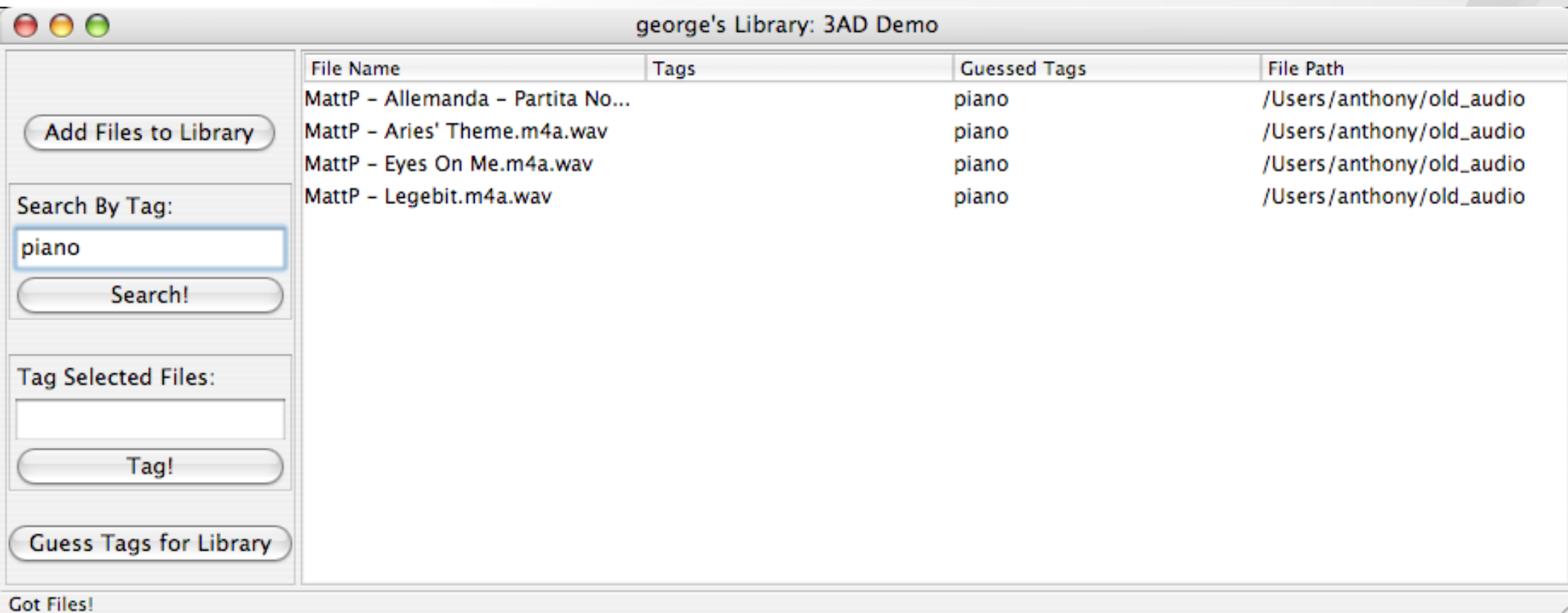   avoids "cold start" problem

cons:
    tag classifiers require training data
    analysis is computationally expensive

Interface

Architecture

1) GUI

2) Analysis Plugins

3) Learning Model

4) P2P Object Storage

5) Distributed Analysis

Commercial/Community Uses

```
recording artists/audio engineers
     large libraries
     single instrument
     lazy file naming


radio/film
     enormous libraries
     constant need for new programming


the web
     streaming site
     search-interface (jamendo / last.fm)
```

Summary

Combination of MIR / Machine learning / P2P

Content aware, simple, intuitive searching mechanism

Solves the "cold start" problem

Recording Engineers, Radio Stations, Online Services

P2P storage

Distributed processing

END

ACM International Collegiate Programming Contest (ICPC)

Sean
falconer.sean@gmail.com

http://icpc.baylor.edu/

ACM International Collegiate Programming Contest (ICPC)

- World wide programming contest
  - Compete on teams of 3
  - Team to solve most problems in least amount of time wins

- First round next month at UBC
  - Top 3 teams go to world finals (Harbin, China)

ACM International Collegiate Programming Contest (ICPC)

- Interested?
  - Practice every Wednesday, ECS 242, 5-8pm
  - We can send up to 3 teams

- Alberta Collegiate Programming Contest
  - October 17th, this Saturday
  - Two UVic teams competing

Dr Ian Barrodale

Hi-Tech Jobs in Victoria

Why is Computer Science in high demand?

Finding an interesting hi-tech job in Victoria:

A Presentation to UVic Computer Science students by

Ian Barrodale

President BCS

Adjunct Professor, UVic Dept. of Computer Science

October 14, 2009

BCS

slides from iar

Greater Victoria's Tech Sector

- 900 companies

- Over 13,000 direct employees

- $1.7 billion in annual revenues

- **#1 private industry in Greater Victoria**

- Second-largest technology region in BC

- Fastest-growing!

slides from ia

Number of known companies by sector:

- **New media/Internet technology (168)**

- **Software (112)**

- **Information technology (69)**

- **Environmental technology (68)**

- **Advanced manufacturing (64)**

- **Ocean science/marine technology (59)**

- **Telecommunications and wireless communications (45)**

- **Life sciences (34)**

- **Electronics and peripherals (29)**

- **Engineering technology (29)**

- **Energy technologies (12)**

- **Semi-conductors (1)**

- **Services (212)**

BCS

slides from ia

Common Technology Positions in Victoria

1. Accountant
2. Business Analyst
3. Customer Service Representative
4. Database Analyst
5. Engineer, Mechanical
6. Engineer, Electrical
7. Engineering Manager
8. Field Service Technician
9. Human Resources Manager
10. Production Manager
11. Marketing Manager
12. Network Administrator
13. Project Manager
14. Purchasing/Shipping clerk
15. Quality Assurance – Software (Black Box)
16. Software Analyst
17. Software Application developer
18. Software Developers
19. Systems Engineer
20. Supply chain manager
21. Technical Sales
22. Technical Writer
23. Technician, Production Assembly
24. Technician, Electrical
25. Technician, Mechanical

How can you enter the technology industry?

- Apply for positions on the VIATeC job board

- Attend VIAfest and other networking events

- Go to Island Tech at the Victoria Conference Centre on November 13, 2009

- Attend Sidney Breakfast Club

- Questions? www.viatec.ca & info@viatec.ca

- Take some practical courses! For example, see

https://www.ibm.com/developerworks/wikis/display/

IDS101/Informix+in+a+Box

slides from ia

What is VIATeC?

- VIATeC is the conduit that connects people, knowledge and resources to grow a successful technology sector in Greater Victoria

- VIATeC stands for 'Victoria Advanced Technology Council'

- VIATeC is the business association for technology companies (and their service providers) in Greater Victoria

- Students can join for a modest fee

slides from ia

CONTACT INFORMATION:

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For more information about BCS, please visit:

http://www.barrodale.com

Thanks!

For more info, check

http://www.csc.uvic.ca

Undergraduate Advisor: Jane Guy

This session is brought to you by a group of volunteers, with support from Natural Sciences and Engineering Council (NSERC) of Canada

*Standard disclaimer: The views/opinions expressed here are those of their sources, not necessarily those of NSERC.

+ icon from http://www.ala.org/img/alonline/computer%2520guy.jpg