Computers and Knowledge

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Course Overview

- Computers and Knowledge
- Knowledge Acquisition, Representation, and Manipulation
- Knowledge Organization, Retrieval and Presentation
- Knowledge Exchange and Interaction; Usability and Knowledge Management
- Ethical and Social Dimensions of Knowledge
- Discussion

Background FJK

- Diplom and PhD in Computer Science from TU München
- PostDoc ICSI, Berkeley
- Neuroinformatik, Uni Ulm
- New Jersey Institute of Technology
- Concordia University, Montreal
- California Polytechnic State University, San Luis Obispo (Cal Poly SLO)

Cal Poly San Luis Obispo

- California State University campus on the Central Coast
  - half-way between San Francisco and Los Angeles
- about 18,000 students
  - 63 undergraduate programs
  - 25 graduate programs (mostly Master's degrees)

http://www.elcorralbookstore.com/images/large/590403_large.jpg

http://calpolynews.calpoly.edu/general_images/collage4.jpg

Colleges

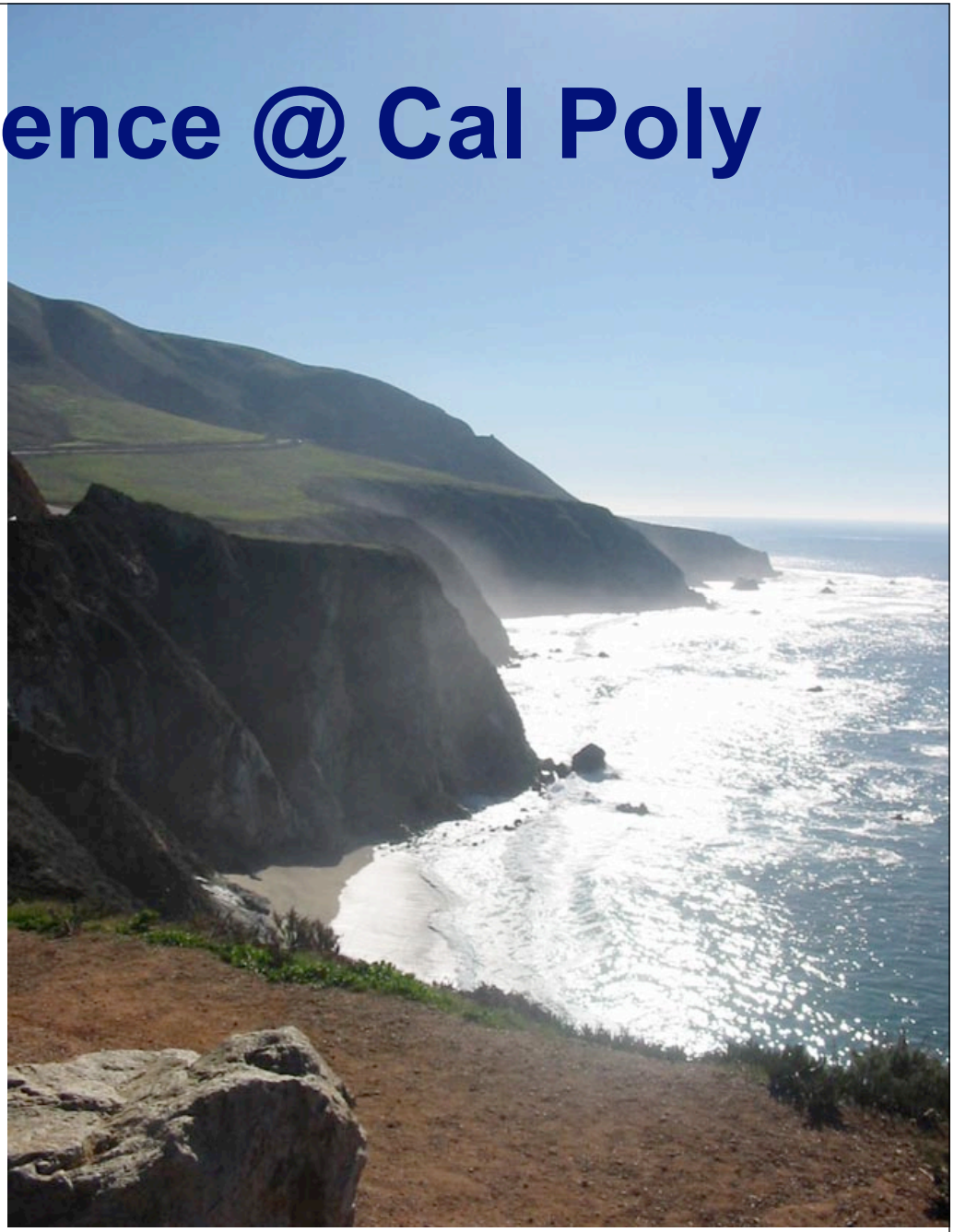
- Agriculture
- Architecture and Environmental Design
- Business
- Engineering
- Liberal Arts
- Science and Mathematics
- University Center for Teacher Education

http://santalucia.sierraclub.org/images/sanluis.JPG

http://www.sloproperty.com/Images/P0000697.jpg

Computer Science @ Cal Poly

- about 1 000 students in three programs
- bachelors in
  - Computer Science
  - Software Engineering
  - Computer Engineering
    - jointly with the Electrical Engineering Department
- Master's in Computer Science
  - about 80 students



http://leikam.com/mc/dec04coast/IMG_0004.jpg

CSC Faculty

- about 23 professors
  - plus about 10 semi-retired faculty still teaching courses
  - most actively involved in research
- about a dozen lecturers
- some teaching by graduate students
  - mostly courses for non-majors

http://www.inetours.com/CA-Coast/images/SLO/Cal_Poly_Pano.jpg

CSC Faculty at Work

Computers and Knowledge

- terminology
  - data, information, knowledge, wisdom
- main usage
  - storage/retrieval, reasoning, ...
- open issues
  - semantic gap, performance, tacit knowledge, ...
- benefits
  - storage capacity, calculations, ...
- drawbacks
  - knowledge acquisition, consistency, transparency, ...

Knowledge Acquisition, Representation and Manipulation

- transfer of knowledge from humans to computers
- extraction of knowledge from data collections
  - data mining
- representation of knowledge in computers
  - rules, frames, scripts, RDF, meta-data
- generating new knowledge from existing knowledge
  - inference, reasoning

Knowledge Organization

- establishing relations among knowledge items
  - explicit vs. implicit
  - special relations
    - is-a, part-of, contains, similarity, ...
- methods for organizing knowledge
  - hierarchies, categorization schemes, descriptors, ontologies, meta-data, Semantic Web, ...

Knowledge Retrieval

- finding and retrieving relevant knowledge items from large collections
  - syntax-oriented vs. semantics-oriented
  - feature-based retrieval
  - similarity-based search
- retrieval techniques
  - information retrieval
  - search engines
  - relevance ranking
  - relevance feedback

Knowledge Presentation

- presentation of relevant knowledge items to the user
  - text, graphics, animation
  - visualization techniques, alternative presentation methods
  - Human-Computer Interaction and usability aspects

Knowledge Exchange

- transfer of knowledge between agents
  - internal representation of knowledge
  - levels of abstraction
  - knowledge exchange languages
- sharing knowledge between computers and humans
- sharing knowledge between computers

Knowledge-Centric Interaction

- support for the utilization of computer-based knowledge
  - processes
    - Delphi method, process modeling
  - technology
    - Semantic Web, Wiki, RSS

Constrained Access

- Access to knowledge under circumstances that limit interaction
  - situational
    - environment or context prevents some interaction methods
  - individual
    - user preferences or limitations
- Alternative input methods
  - speech, alternative text entry or pointing devices
- Alternative output methods
  - computer-generated speech
  - printouts (paper)
  - special-purpose displays (headsets, glasses)
  - augmented reality (displays are integrated with the environment)