COLORADO TECHNICAL UNIVERSITY

2018 DOCTORAL SYMPOSIUM

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CHALLENGES FACING COMPUTER SCIENTISTS IN THE 21ST CENTURY

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LEARNING OUTCOMES

• Review the history of computing
  • Discuss the social, educational, and business impact
• Identify the computer science disciplines and sub-disciplines
  • Discuss the impact of the colliding disciplines
• Learn the challenges facing computer scientists today
  • Explore how these challenges drive the decisions of business and technology leaders
  • Discuss what this means for the job market (top technology jobs) and the skillset required
SESSION AGENDA

BRIEF HISTORY OF COMPUTING
BROADER IMPACTS OF TECHNOLOGY
SPECIFIC IMPACTS ON BUSINESS
BUSINESS-DECISION DRIVERS
JOBS, SKILLS, AND OPPORTUNITIES
A LITTLE HISTORY

In the beginning, there was . . .
A LITTLE HISTORY

And then there was . . .
And now we have...
CURRENT CS DISCIPLINES

- Computer Science
- Computer Architecture
- Machine Architecture & Machine Language
- Algorithms
- Databases & Data Structure
- Artificial Intelligence & Robotics
- Operating Systems
- Software Engineering
- Computation Theory
- Human Interaction
- Networking & Internet
- Cybersecurity
- Graphics
- Machine Architecture & Machine Language
- Artificial Intelligence & Robotics
- Databases & Data Structure
- Algorithms
- Operating Systems
- Software Engineering
- Computation Theory
- Computer Science
SOCIAL IMPACT
SOCIAL IMPACT

Some Things Haven’t Changed
SOCIAL IMPACT

Some Things Have
In 2016, 31% of students were enrolled in at least one online class.
BUSINESS IMPACT
BUSINESS IMPACT


Silent generation
Baby-boom generation
Generation X
Generation Y
Generation Z
WHAT HAS CHANGED?

Cloud Platforms
- Tasks traditionally performed on corporate computers are not being moved to online services, such as SaaS, IaaS, PaaS, DaaS, and DBaaS.

Big Data
- Business look for insights from huge volumes of data from Web traffic, e-mail messages, social media content, wearables, and transactional data that require new data management tools to capture, store, and analyze.

Mobile Computing
- Smart devices are able to download hundreds of thousands of applications to support collaboration, located-based services, and communication with colleagues.
HOW HAS IT CHANGED?

Collaborative Technology

• Online collaboration and social networking software are adopted to improve coordination, collaboration, and knowledge sharing for project management, administration, communication, and online communities.

BI

• Powerful data analytics and interactive dashboards provide real-time performance information to managers and executives for enhanced decision-making.

VR

• Managers adopt videoconferencing and Web conferencing technologies to reduce travel time and cost, while improving collaboration and decision making.
WHERE HAS IT CHANGED?

Social Business

• Businesses use social networking sites, Web tools, and online communities to deepen interactions with employees, customers, and suppliers. Employees use blogs, wikis, e-mail, texting, and messaging to interact in online communities.

Business Boundaries

• The Internet, laptops, smartphones, and tablets make it possible for growing numbers of people to work away from the physical office. It is estimated that 55% of U.S. businesses have some form of remote work program.

Business Value

• Sources of business value shift from products to solutions and experiences, and from internal sources to external partnerships and collaboration with customers. Supply chains and product development become more global and collaborative, customer interactions help firms define new products and services.
## BUSINESS-DECISION DRIVERS

### Business
- Business Architecture
- Strategy
- Capabilities
- Resource Management
- Business Rules and Processes
- Business Value

### Technology
- Technology Architecture
- IT Strategy
- Capabilities
- Management Information Systems
- Governance
- Business Driver
BUSINESS-DECISION DRIVERS

Data Collection and Storage

Transformation into Business Systems

Dissemination

Business Processes

Supply Chain Management

Enterprise Management

Customer Management

Knowledge Management

Information Processing Activities

Management Activities

Business Value

Planning

Coordinating

Controlling

Modeling and Decision Making

Firm Profitability and Strategic Position
CS/IT/IS CAREERS
JOB OPPORTUNITIES
SKILLS & CAPABILITIES

General
- Business Acumen
- Analytical Skills
- Problem-Solving Skills
- Creativity
- Critical Thinking
- Communication Skills
- Domain Knowledge

Specialized
- Mathematical Skills
- Programming (R, Python, Java, C, etc.)
- Statistics
- Linguistics
- Psychology
- Web Application Development
ADDITIONAL RESEARCH OPPORTUNITIES

- Disruptive Technology
- Security and Internet of Things (IoT)
- Distributed Programming & Cloud Computing
- Mobile Computing
- Talent Acquisition
- Emerging Computer Technologies
- Computer Architectures
- Programming Paradigms & User Interfaces

- Computational Models
- Performance Measures & Complexity
- Artificial Intelligence
- Robotics
- Ethics
- Algorithmic Bias
- Encryption
- Quantum Computing
SUMMARY

• Technology has come a long way
• Disciplines are merging
• IT is a business-value driver, rather than a cost center
• It is a great time to be in technology!
REFERENCES


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