

ELEC 694

COMP 694

Introduction

Scott Cutler
cutler@rice.edu
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Objectives

- Develop skills to rapidly learn a new technology
 - See how this technology affects and is affected by other technologies
 - Consider technical *and* business impact
 - Think utilizing a multi-year time horizon
- Effectively communicate findings, both orally and visually



Methods

- Create a vision of the personal computing and personal digital electronics fields 5 years out.
 - Extrapolating component trends
 - Identifying disruptive technologies
 - Identifying
 - Synergies
 - Interdependences
 - Bottlenecks

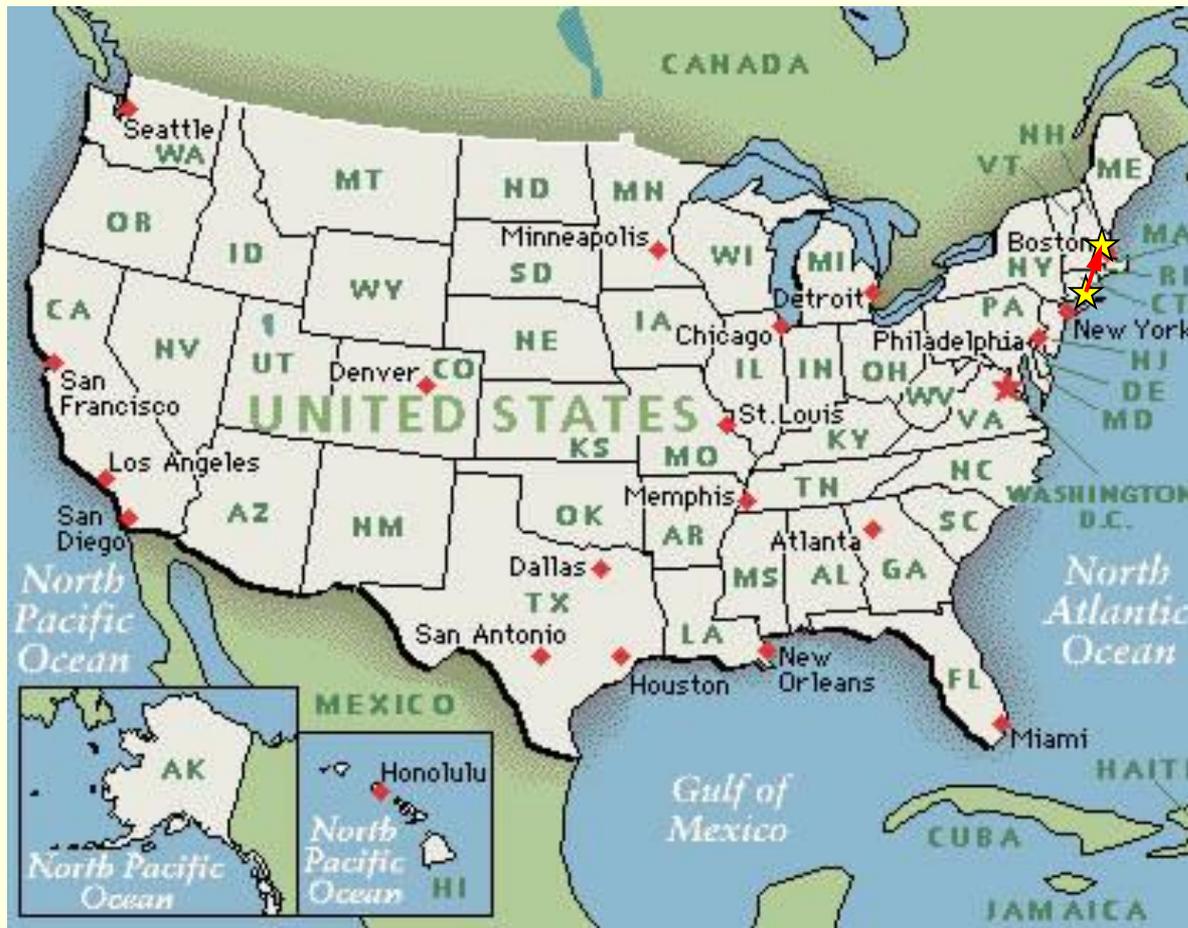
- Think like a CTO



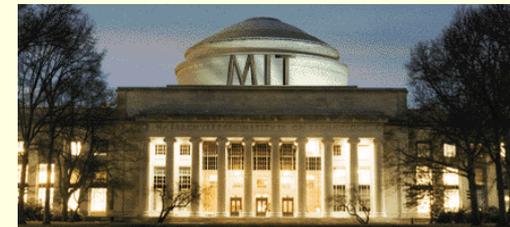
Who am I?



MIT



Cambridge, MA



BS	1973
MS	1973
Ph.D.	1976
Zork	1979



GE Research and Development



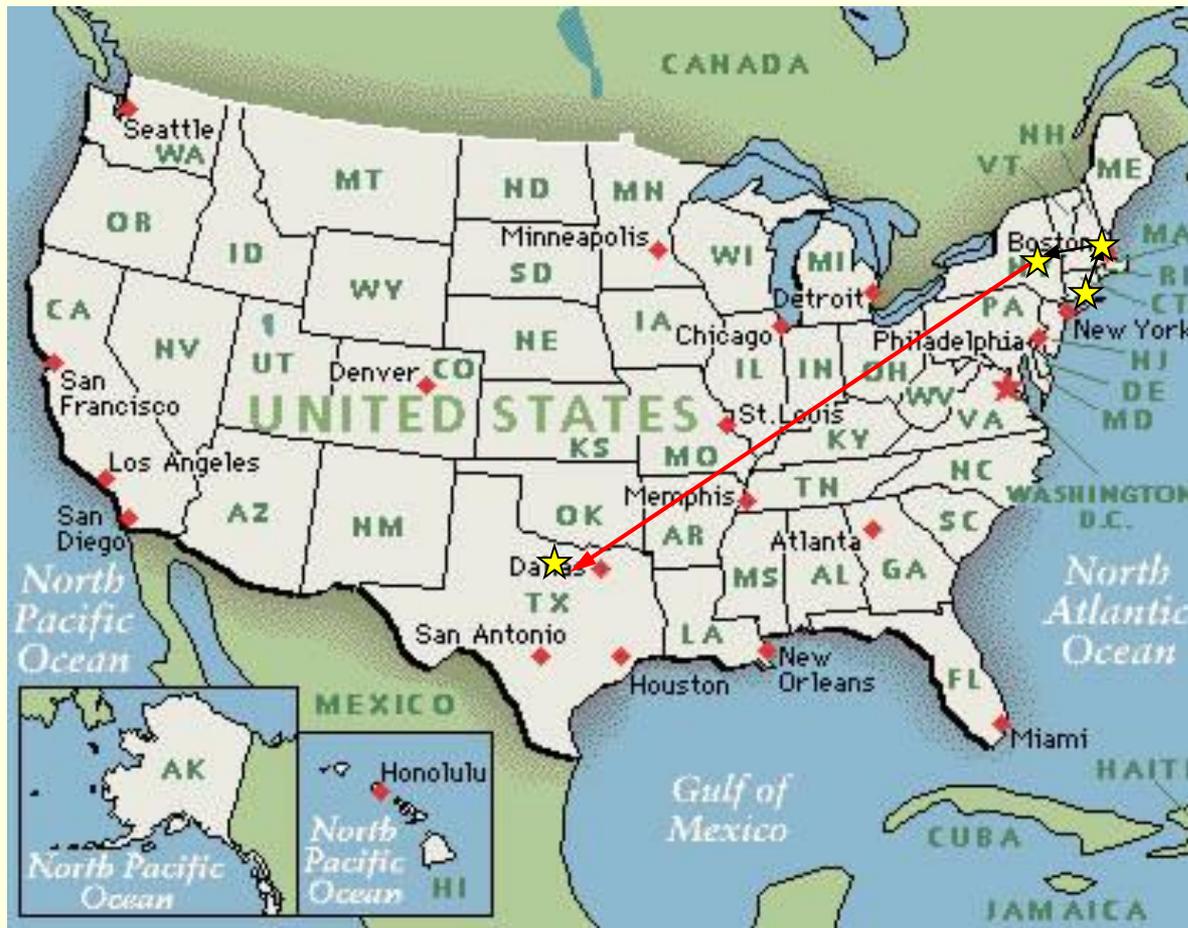
Niskayuna, NY



First business use of PC (TRS-80) in GE



Tandy Electronics (Radio Shack)



Fort Worth, TX

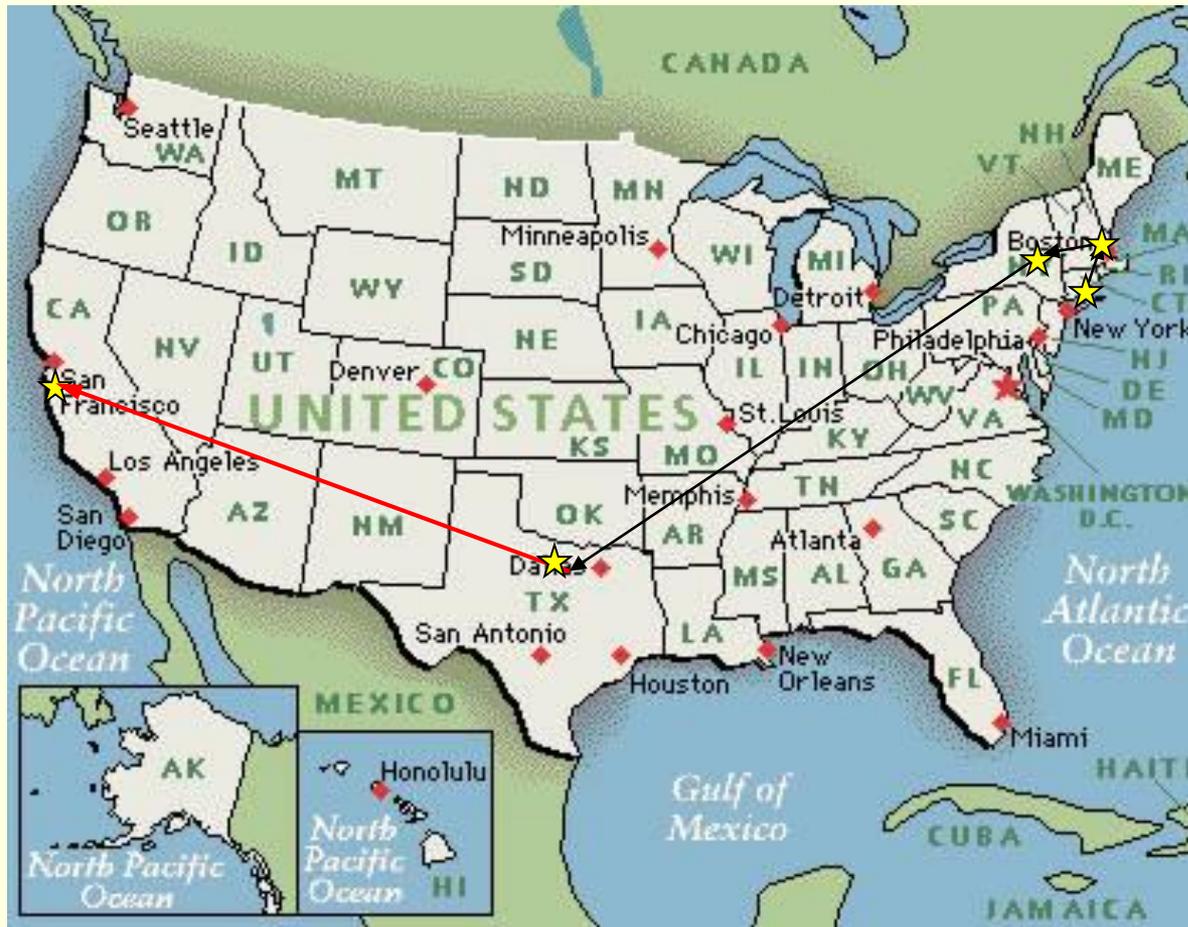


Deskmate

- First graphical Quicken
- First graphical Lotus
- Foundation for AOL



Chips and Technologies



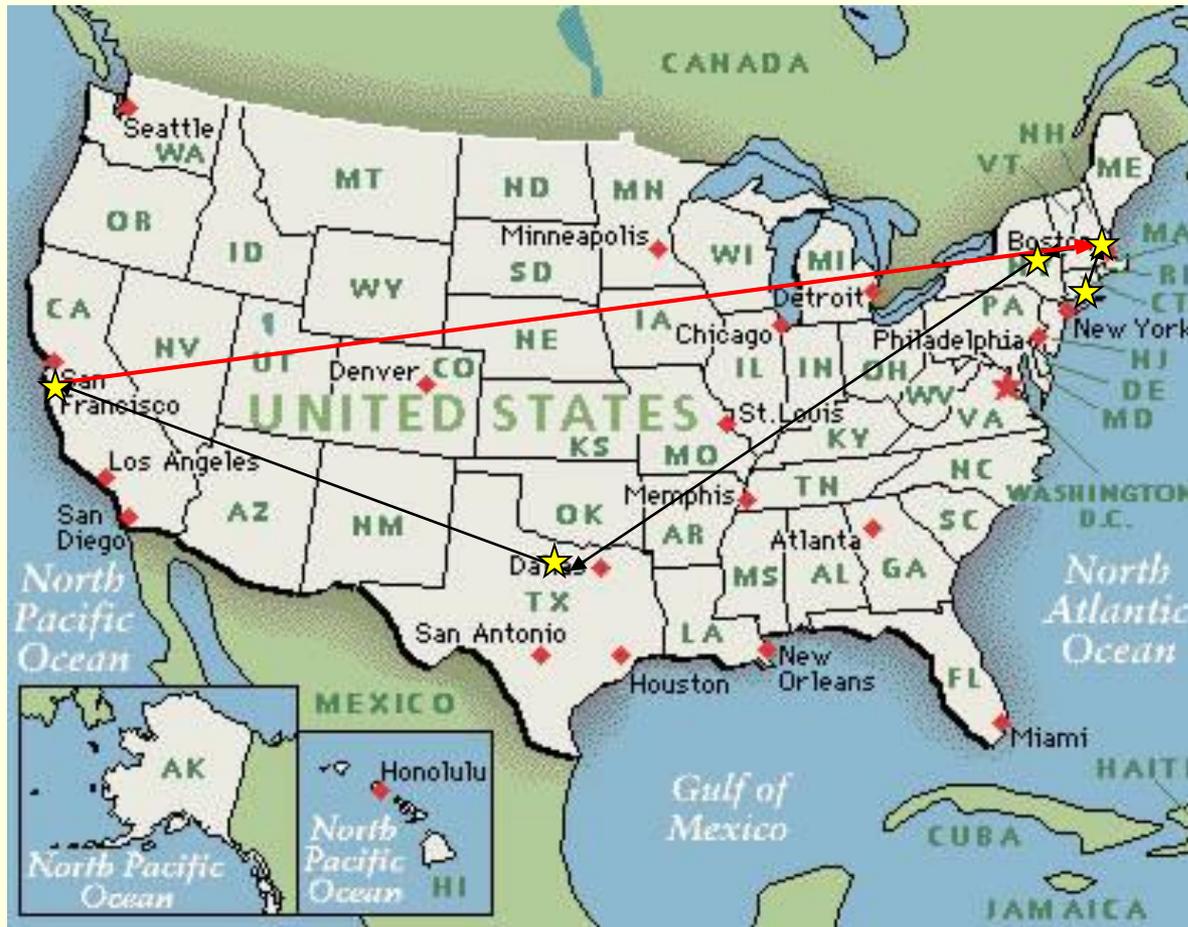
San Jose, CA



Wingine Windows Graphics



Digital Equipment Corporation



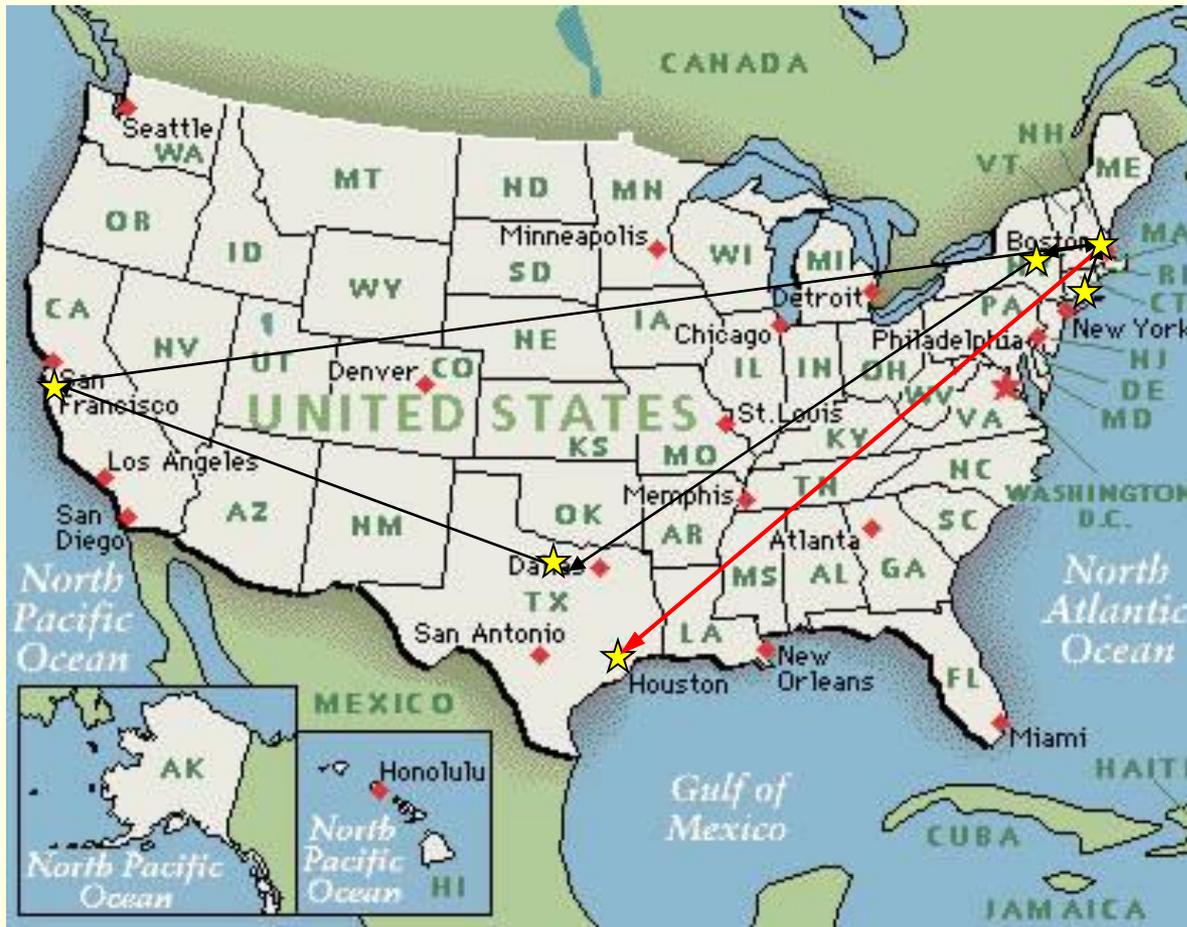
Boston, MA



CTO – PC Group



Compaq



Houston, TX

COMPAQ

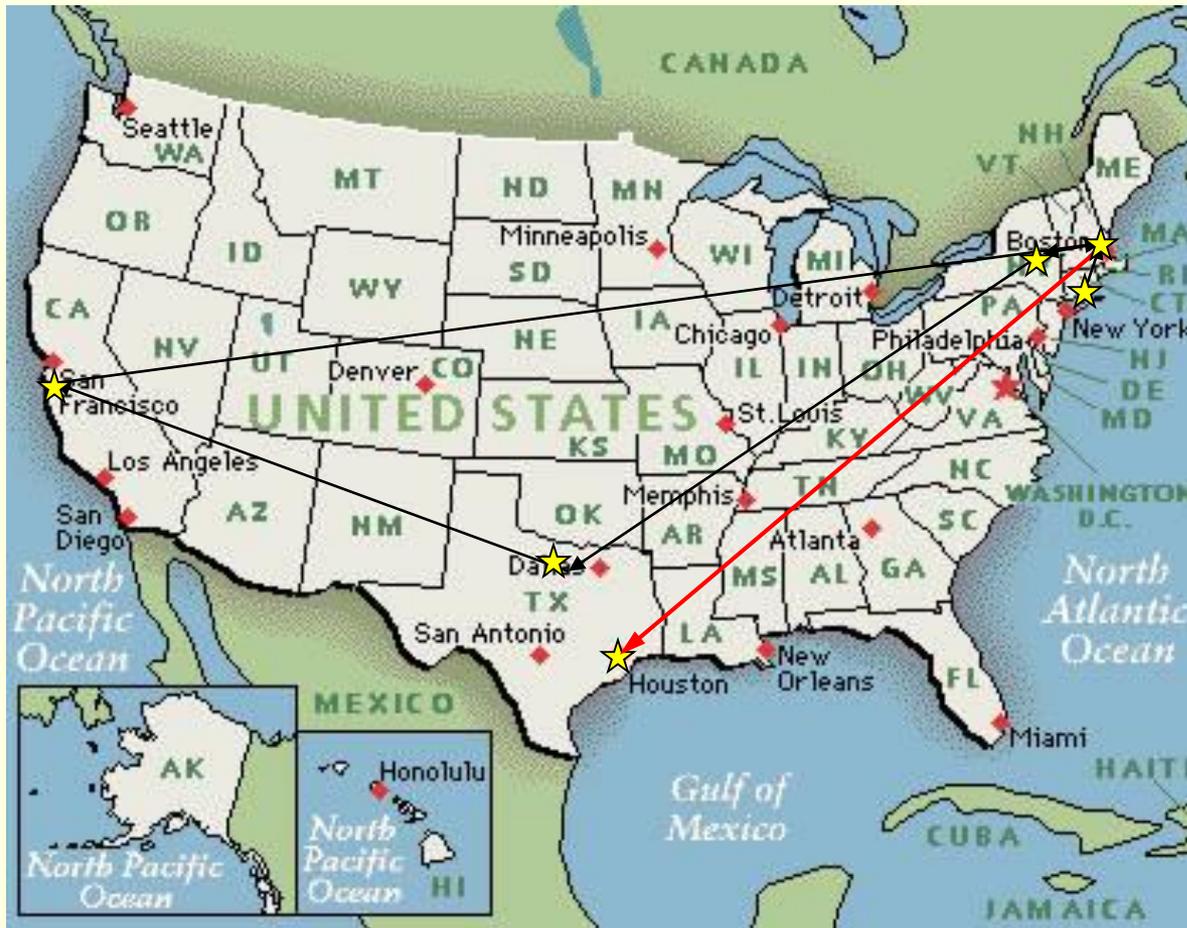
CTO – PC Group



Compaq iPAQ
Desktop Personal Computer



Rice University (2001 – Present)



Houston, TX

RICE UNIVERSITY

COMP / ELEC 694

Future Personal Computing Technology

COMP / ELEC 446

Mobile Applications Development Project

Digital Media

Personal Electronics



Who are you?



Current Roster



■ Ryan Artecona



■ Jianbo Chen



■ Rob Bauer



■ Ahmed Haque



■ Enoch Chang



■ Zhiyoung Tan



Course Motivation



Modeled after MIT's Area Exam

- Acts as the qualifying exam for the Ph.D. program.
 - Taken after the Master's degree and after the Ph.D. qualifying oral and written exams
 - Taken before completing Ph.D. thesis.
- Short term exercise to become fluent in a new technology
- Assess the interrelationships between the new technology and its broader "area".



Area Exam Mechanics

- Provided a topic in a field quite different to your thesis area, but still in the general department area.
- Provided three papers relevant to the specific topic.
- Student lives, eats, sleeps, drinks, etc. that topic for three to four weeks and writes a paper summarizing the new topic.
- Student appears before a committee of professors to defend and discuss the topic and paper followed by oral questions in a broad range of area topics.
- Successful students get to stay – others have to leave before completing their thesis (~ 15% IIRC) .



Area Exam Experience and Value

■ Pressure

- Often a feeling of being over whelmed at the beginning with little grasp of what is even important in assigned topic or what is important while knowing that they are to defend the topic in front of experts that have the power to deny continued study.

■ Learning

- Which way is up by the end of the first week.
- High level of understanding and comfort by end of second week.
- Limited domain expert by end of third week.

■ Takeaways

- Students get through exam understanding that they can learn new topics quickly and to not let first impressions make them give up.
- Importance of broad knowledge of field.
- Skill used repeatedly through my career.



Events of the Week

- The second part of the Area Exam dealt with random questions in your general area
- Brought out the need to balance breadth with depth and an awareness of surroundings
- We will start half of our classes with a 10 minute ***Events of the Week*** discussion where you let me know what significant events relevant to the personal electronics area took place over the prior week.
 - For weeks without events of the week, we will pick a topic for group discussion. Topic will be assigned at end of previous class.



Required Abilities of a CTO

- Ability to understand a broad range of technical topics in area of the company
 - For large companies, breadth often more important than depth
- Ability to learn new topics quickly
- Ability to sense what is happening in the industry and how it will impact company's technology in the future
- Ability to effectively communicate a concept and plan to the executive team



ELEC / COMP 694 Format

- First seminar goes over background, process, pace of technology innovation.
- Second seminar discusses disruptive technologies.
- Third seminar focuses on making great presentations.
- Next 8 classes are a series of student led seminars each covering a technology or set of related technologies and products.
- Next to last class is a group discussion on competing ecosystems.
- Last class consists of group projects covering a vision of a relevant technology / product 5 years out.
- A futuristic paper typically on same topic as your talk
 - Due last day of classes; can be submitted anytime after presentation.



Seminar Preparation Meetings

- 6 one-on-one preparation meetings prior to seminar.
 - First meeting five weeks before seminar to discuss general area and potential readings. (~15 minutes)
 - Second meeting, four weeks before seminar, reviews outline of presentation (~1 hour)
 - PowerPoint outline with slide titles and no content
 - Third meeting, three weeks before seminar reviews a first draft of presentation (~1 hour)
 - Draft contains some content, < 50% complete
 - Solid flow of topic presentation
 - Fourth meeting, two weeks before seminar reviews a first draft of presentation (~1 hour)
 - Draft contains significant content, 90% complete
 - Strong conclusion fully supported by body of presentation
 - Fifth meeting, one week before seminar reviews final draft of presentation. (~1 hour)
 - Completed presentation
 - Sixth meeting, communications review scheduled for Friday prior to presentation with Dr. Tracy Volz (~1.5 hours)



Communications Review

- Mandatory practice session with Dr. Tracy Volz
 - Senior Lecturer of Professional Communication from the Dean of Engineering's / RCEL office.
 - Help develop and improve presentation skills
- Logistics
 - Email final draft to tmvolz@rice.edu one week prior to presentation.
 - Contact Dr. Volz two weeks prior to seminar to schedule your review
 - Best times for review is the Friday before your talk.



Grading

- 70% Individual Topic Presentation
 - Content and delivery
 - Includes Communications evaluation
- 10% Discussion Participation
- 10% Final Presentation
- 10% Final Paper



Logistics

- **Typical technology seminar format**
 - 0:25 status update and current topics
 - 0:45 presentation on technology including discussion
 - 0:05 preview of next topic and selected papers to read
 - 0:15 often used for initial 15 minute meeting
- Office hours: DH 2063, typically on Wednesday with some Tuesday or Thursday sessions as needed.
- Website: <http://www.ece.rice.edu/Courses/694.html>
- Email: Cutler@rice.edu
- Phone: 281-364-0210 (or Rice office 713 348-2526)



Context of Student Talks

- When presenting, you are the CTO of a company in a field related to your topic
- You are to convince the audience that the subject topic is relevant and provides a threat and/or opportunity to your company.
- Rest of the class represents the various functional elements. I will act as CEO. You will pretend you are the heads of engineering, marketing, sales, manufacturing, etc.



Seeing the Future

- Most people have difficulty predicting technology 6 months out, let alone 2 to 5 years.
 - Tendency to wait until something can be touched before starting development
- People have even more difficulty seeing the impact on their area from future developments of other technologies
- Often possible to buy your way to 6 months out from where it is easier to predict 12 months out.



Examples

- Edison demonstrated the phonograph in 1877
- Henirich Hertz demonstrated transmission and reception of radio waves in 1888.
- Who would have predicted from that radio, television, LCD displays, VCRs, DVDs, Blu-Ray, 3D, camera phones?



Rapid Technical Advances (and declines)

- Airplanes from the Wright brothers to the 787
- War rockets to Sputnik to walking on the moon
- Telegraph to telephone to mobile radio to billions of cell phones
- The rapid growth of Microsoft, the Internet, Google, Amazon and Facebook
 - The rapid fall of so many major companies because of the Internet.



Big Changes Coming

- What can you enable when you connect a wireless cellular modem to a GPS through the car's diagnostic port?
- Will TiVo and iPods destroy network TV and the recording industry, or will it just reinvent them?
- When will Solid State Drives go mainstream?
- Will the CD and DVD go the way of the vinyl record and the 8-Track?
- What will the 8th generation iPhone or 6th generation Android look like?
- Will everything be in the cloud?



Choosing a Topic

- You are about to be given a list of possible topics to learn.
 - You will have cursory knowledge of many if not all of the topics.
- You should pick a topic of interest to you, but
 - it should ***not*** be a topic you know well
 - I want you to feel lost and overwhelmed during first week



Candidate Topics – Spring 2013

- Advanced Computer Inputs – Kinect, Touch Screens
- ARM vs. x86 for mainstream usage and/or Intel vs. NVIDIA
- Automotive Electronics beyond the engine including GPS, XM audio, XM data, cellular data
- Cloud Computing
- ~~Consumer Medical Devices / Electronic Medical Records (consumer)~~
- Digital Living Room - AirPlay and dLNA, networked receivers
- HTML 5
- ~~Identity theft / phishing~~
- Intellectual Property, patent trolls, law suits, DRM for movies / TV ad revenue model
- ~~Internet of things, Embedded cellular data modems, Ultra low powered computing~~
- Internet Video / Netflix / Google TV, Apple TV, repurposed game machines
- Main Stream Processors and Chipsets / Parallel, multi-core technology for consumer uses
- NFC and Mobile Payments
- Shared Metered 4G LTE Data Plans
- Social Media – specifically Facebook long term or quick rise/fall or Twitter business model
- ~~Storage – SATA, Solid State Drives, Flash, RAID, Backup, disk in the clouds~~
- Voice Recognition Assistants
- Windows 8 / 8RT



Schedule for Spring 2012

- **01/09/13** Introduction and Accelerating Technology (*Cutler*)
- **01/16/13** Disruptive Technologies (*Cutler*)
- **01/23/13** Creating and Delivering Great Presentations (*Volz*)
- **01/30/13** Consumer Medical Electronics (*Ahmed Haque*)
- **02/06/13** Identity Theft / Phishing (*Enoch Chang*)
- **02/13/13** TBD (*Ryan Artecona*)
- **02/20/13** Topic 4 ()
- **02/27/13** *No Class - Rice midterm recess*
- **03/06/13** Topic 5 ()
- **03/13/13** Topic 6 ()
- **03/20/13** Topic 7 ()
- **03/27/13** Topic 8 ()
- **04/03/13** TBD ()
- **04/10/13** Ecosystem Group Discussion (*All*)
- **04/17/13** Final Projects - Final Papers Due (*All*)
- **04/21/13?** Possible Optional Off-site (a.k.a. end of semester party)



Preparation Schedule

Date	Class	Topic#	Topic Name	Presenter	Preparation Meetings					
					Volz	Final Draft	Second Draft	First Draft	Outline	Initial
12/26/2012										Haque
1/2/2013									Haque	Chang
1/9/2013	1		Introduction and Technology Acceleration	Cutler				Haque	Chang	S3
1/16/2013	2		Disruptive Technologies	Cutler			Haque	Chang	S3	S4
1/23/2013	3		Creating and Giving Great Presentations	Volz	Haque	Haque	Chang	S3	S4	S5
1/30/2013	4	1	Consumer Medical Devices	Haque	Chang	Chang	S3	S4	S5	S6
2/6/2013	5	2	Identity Theft / Phishing	Chang	S3	S3	S4	S5	S6	S7
2/13/2013	6	3	T3	S3	S4	S4	S5	S6	S7	S8
2/20/2013	7	4	T4	S4	S5	S5	S6	S7	S8	TBD
2/27/2013			No Class - Spring Break							
3/6/2013	8	5	T5	S5	S6	S6	S7	S8	TBD	
3/13/2013	9	6	T6	S6	S7	S7	S8	TBD		
3/20/2013	10	7	T7	S7	S8	S8	TBD			
3/27/2013	11	8	T8	S8	TBD	TBD				
4/3/2013	12		TBD	TBD						
4/10/2013	13		Group Discussion	All						
4/17/2013	14		Final Group Projects	All						
4/21/2013			Tentative date for Off-Site (Optional)							



Discussion



Seminar #2

- Disruptive Technologies
- Logistics
 - Wednesday, January 16, 9:30 – 11:00, DH-2014
- Optional Reading - **Kurzweil - The Law of Accelerating Returns**
 - <http://www.kurzweilai.net/articles/art0134.html?printable=1>
- Prep for Topic #1 (Second Draft Presentation, schedule Communications review)
 - Ahmed Haque
 - Consumer Medical Electronics – January 30, 2013
- Prep for Topic #2 (First Draft)
 - Enoch Haque
 - Identity Theft / Phishing – February 06, 2013
- Prep for Topic #3 (Presentation Outline)
 - Ryan Artecona
 - Internet of Things– February 13, 2013
- Prep for Topic #4 (Initial Discussion)
 - TBD
 - TBD – February 20, 2013

