50th Anniversary
Department of Computer Science
Rutgers – The State University of New Jersey
Historical Tour: From the 1980's to Now

Casimir A. Kulikowski

Board of Governors Professor of Computer Science

And All Contributing Students and Faculty – Former and Present!

Rutgers – The State University of New Jersey,

New Brunswick, New Jersey, USA

Hyatt Hotel, New Brunswick

October 27, 2016

DCS in the 1980's: From AI-centric to Multipolar

- LCSR supports major node for ARPANET, Hedrick carries out timesharing research
- Amarel switches from NIH to DARPA support
- Kulikowski PI of AI in Medicine Resource
- Amarel pursuit of DCS move to SoE meets strong opposition
- Kulikowski elected DCS Chair - 1984
- Amarel takes leave from Rutgers - to DARPA

NJ Governors Commission on Industrial Productivity and the Founding of CAIP _

- Amarel, Kulikowski and Mitchell on NJ Governors Commission suggest CAIP for Rutgers and it is approved
- Mitchell is first CAIP Director
- CAIP designated primarily SoE - Herbert Freeman hired as CAIP Director and Chair of new Computer Engineering attached to EE

DCS in the 1980's:
State of NJ Bond for Higher Education

- Governor Kean supports Higher Ed and floats a successful bond issue providing Rutgers with considerable funding increases

- Rutgers President Bloustein and VP Alex Pond strongly support Computer Science
- Felix Browder, RU VP for Research supports NSF DIMACS Center Proposal with Math Department Chair Daniel Gorenstein and DCS Chair Kulikowski

DCS: Early 1980's

- DIMACS is funded by NSF with Gorenstein as Director and many new CS and Math faculty hired aided by NJ Bond issue for Higher Education
- DCS enrollment sky-rockets after RU Federated Plan completed, and "Reagan-Recovery" helps
- Ken Kaplan as Vice-Chair with Barbara Ryder introduces non-Major Introduction to CS course with enrollments over thousand (3K/year at peak)

DCS: Mid - 1980's

- DCS introduces many new Major and Minor courses
- Faculty hiring push in Systems Area is slowed by industry competition
- Computer Theory hires many top candidates
- CAIP and CE relations become increasingly fraught at the upper level

DCS: Late - 1980's

- DCS rises in departmental rankings
- Kulikowski 2nd Term as Chair, elected to Institute of Medicine, NAS
- Continuing hiring in Theory balanced by other CS hires
- Amarel returns to DCS from DARPA and proposes a $14 Million grant on Hypercomputing and Design

DCS: Planning for new CORE Building adjacent to Hill Center

- New Computer Research and education (CORE) Building to house CAIP, DIMACS, LCSR, DCS, EE and IE
- Competition for space is very fierce
- Design of building is changed many times to accommodate changes in promised space allocations

Computer Research & Education (CORE) Building under construction – ca. 1990

Programming Languages and Systems DCS Faculty of the 1980's

- Barbara Gershon Ryder(Programming Languages and Systems) Bell Labs
- Apostolos Gerasoulis (Numerical Methods, Search Systems)
- Bahman Kalantari (Numerical Methods, Polynomiography)
- Tomasz Imielinski (Data Bases, Logic)
- Badri Nath (Systems, Mobile & Wireless)

Barbara G. Ryder

DCS Ph.D.student: 1977-82
CS Faculty: 1982-2008

- A.B. Applied Math from Brown (1969
- M.S. Computer Science from Stanfor
- (1971);
- 6 years at Bell Labs, Murray Hill (1971-1976)
- Returned to grad school to finish my Ph.D. in program analysis
- Joined DCS as assistant professor Aug 1982

Barbara G. Ryder

- Supervised 15 Ph.D. & 3 M.S. students at Rutgers DCS to degree completion
- Mentored women students in WCS (Women of Computer Science)
- ACM leadership (e.g., SIGPLAN Chair, General Chair – FCRC 2003, ACM VP 2010-2012)
- 2nd tenure-track female DCS faculty hired

Ryder: Noteworthy Activities

- Ryder established first Rutgers course in computer literacy 1982 (CS110)
  - Started with 750 students per term and grew to 1250 per term
  - Required by several non-science/non-engineering Rutgers departments
  - Taught spreadsheets (VisiCalc), word processing, some Basic programming on a single PDP-11 time sharing machine
  - Paper at ACM SIGCSE 1984

Noteworthy Activities

- Ryder co-founded (1995) and led MASPLAS
  - Mid-Atlantic Student Conference on Programming Languages and Systems – annual meeting moved among East Stroudsburg U, SUNY New Paltz, Loyola College, U Delaware, IBM Research, Pace U, Haverford College, Seton Hall U.
  - MASPLAS keynotes at Rutgers:

    Fellow of Royal Society of Canada, Dr. Laurie Hendren (McGill University)

    Turing Award winner, Dennis Ritchie (Bell Labs)

Noteworthy Activities

- Ryder introduced peer-led, team-learning in CS110 with instructor Pradip Hari
  - Collaborative NSF grant with 7 other universities/ colleges to explore “new approach to increase the number of undergrad women and minorities who obtain CS degrees”
  - Institutions: U Wisconsin - Madison, Beloit College, Loyola College, Georgia Tech, U Wisconsin - Milwaukee, Duke U, Rutgers
  - Statistically significant results reported in ACM SIGCSE 2009 paper

Barbara Ryder @ Virginia Tech
Chair of Computer Science

Apostolos Gerasoulis

- BS Ioannina, Greece
- PhD SUNY Applied Mathematics
- Algorithms/Numerical Methods/Search Technologies
- Supercomputing/Parallel Computing – PYRROS with PhD Tao Yang

Apostolos Gerasoulis

- Test of time Award—25 years: PYRROS: scheduling and code generation for messag multiprocessors ACM SIGARCH. 2014
- Award for providing a solution to Trummer's problem: A fast algorithm for Trummer's problem.,1987
- **Teoma Startup**, CEO and CTO 2001. One of the most successful technology startup from Rutgers University, 2000. CTO & Exec Ask.com, 2001 to 2008.
- TV star in the ask.com commercials 2005.

Gerasoulis' Doctoral Students

- Israel Nelken, Ph.D, 1989.
- Srimat Chackradar, Ph.D, 1990
- Tao Yang, Ph.D, 1993
- Jia Jao, Ph.D, 1996

Bahman Kalantari

- My degrees: Ph.D in Computer Science in 1984 from University of Minnesota, a thesis on optimization under advising of Prof. J.B. Rosen, M.S. in Operations Research, M.S. in Math, also from U of M, and B.S. in math and physics from University of Wisconsin.
- I joined Rutgers after receiving my Ph.D, recruited by Prof. Michael Grigoriadis. In the early nineties Mike and I recruited world-renowned Leonid Khachiyan.
- Research areas : Optimization, Computational Geometry, Polynomial Root-Finding, Numerical Analysis, Machine Learning, Game Theory, and *Polynomiography*.

Polynomiography

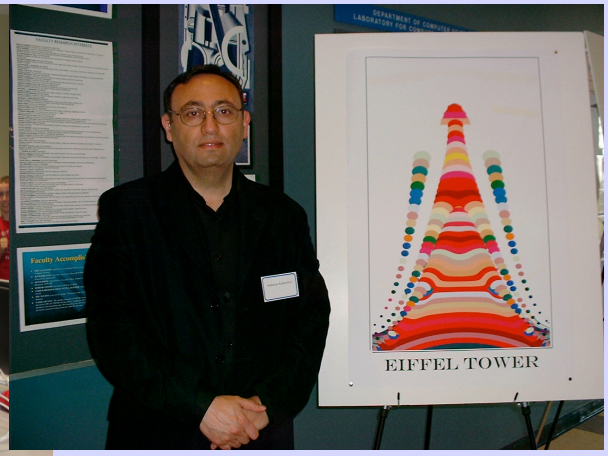
- In 1990's making up an MS exam question got me interested in solving equations. Freedom at Rutgers CS, and personal risk-taking, led to *Polynomiography* (2000): algorithmic visualization in solving equations.

- While I became known to colleagues as artist, I have strived to integrate it into STEM and art at many levels.

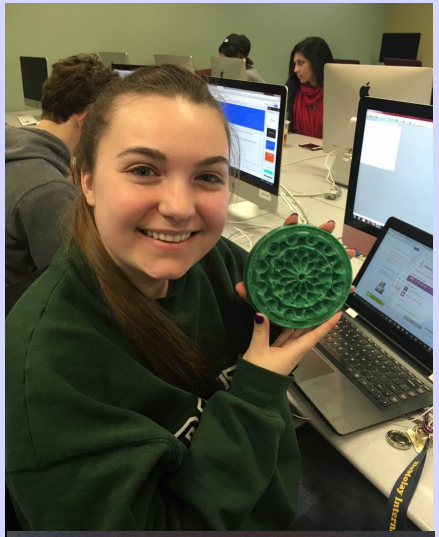
- Have delivered over 100 lectures in 15 countries to diverse audiences: 5-year olds, K-12 and college students, educators, academicians, artists, and the general public.

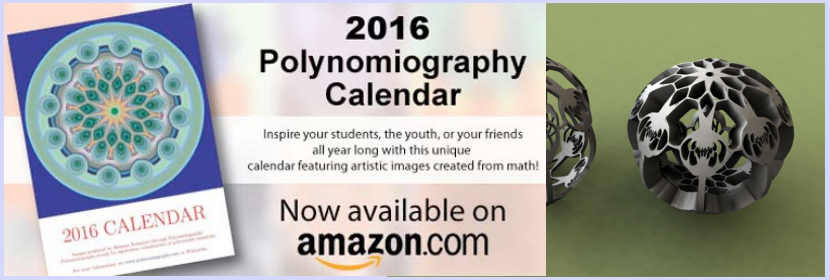
- I like to have the opportunity to give interactive exhibitions in museums: like music, polynomiography can be enjoyed by all. But It also inspires STEM and art.

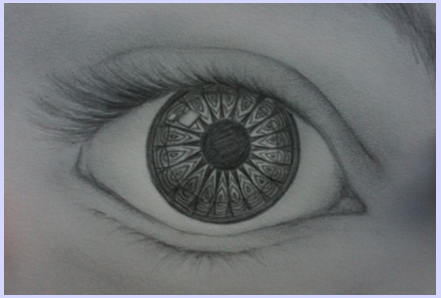
Polynomiography Courses/Lectures

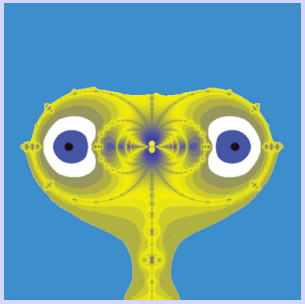


Polynomiography Future?









Students

- Have taught many different courses in CS, also Byrne First-Year Seminar, and SAS Honors
- Ansuman Bagchi (Ph.D)
- Celina Imilienska (Ph.D)
- Yi Jin (Ph.D)
- Sergio de Biasi (promising Ph.D student - passed away)
- Several M.S students who have written theses.
- I have worked with individual undergraduates on projects on theory of polynomials and polynomiography.
- I also have academic children such as Elizabeth Sergison who got me invited to her middle school in New Jersey to give a talk on polynomiography. She is now a Ph.D student at Dartmouth College in genetics.

Distinctions

- Article selected for ***Best Writing on Mathematics, 2014***, Princeton University Press.
- Polynomiography featured in ***Star-Ledger***, ***New Jersey Savvy-Living***, ***Science News***, ***Discover Magazine***, science and math magazines in Spain, Finland, Korea.
- U.S. patent for polynomiography, 2005 - through Rutgers.
- Author of a book: ***Polynomial Root-Finding and Polynomiography,*** 2008, World Scientific.

Badrinath, Kulikowski, Gong and Amarel – Foreground: Kalantari Polynomiography Poster

When Saul talks we all Listen!

Tomasz Imielinski

- BEE, Gdansk Polytechnic
- PhD, Polish Academy of Sciences
- Chair of DCS 1996-2003
- Co-founder of Connotate Technologies in 2000
- VP of Ask-com and VP of Pronto

Dataman Project

Tomasz Imielinski, Badri Nath, David Goodman

imielins@cs.rutgers.edu, badri@cs.rutgers.edu

Funding from Darpa

Over 6 Million Dollars + 3 test of time best paper awards

Dataman – pioneering effort….what if phone became computer?

- Along with Berkeley – first mobile computing research effort/group in the country (**started in 1991)**
- Mobidata conference in **1994** – first on mobile data (resulting in early book on Mobile computing)
- What if phone became a computer? (then phantasy, now reality)
- One of the few leading efforts in mobile computing in the country in 1990s and 2000-2007

- Three Test of Time Awards
  - 2002 VLDB (10 year best paper award), 2015 INFOCOM (10 year best paper award), 2016 Mobicom (one of top 11 papers over 35 years)
- 10 PhD students graduated
- Over 100 publications
- Implementations I-TCP (Satellite networks), cellular networks
- Help organized first ACM Mobicom coference, program chairing in 1999, Mobidata 1996 conference at Rutgers

Profesor Badri Nath

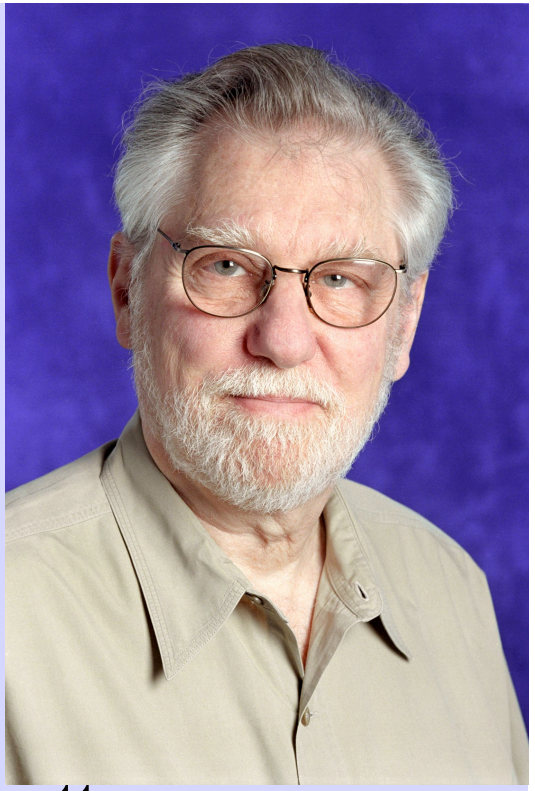
- MS, IISC, Bangalore; PhD, UMASS, Amherst (1989)
- Joined CS department in 1989
- Co-director Dataman Lab
  - Mobile & Wireless Computing
  - Indoor localization
- Notable PhD Thesis
  - Indirect TCP , Ajay Bakre
  - Forwarding and positioning problems in Ad-hoc networks, Dragos Niculescu

- Three Test of Time Awards
  - 2002 VLDB (10 year best paper award)
  - 2015 INFOCOM (10 year best paper award)
  - 2016 Mobicom (test-of-time award, one of 11 papers over 35 years)
- Outstanding achievement in research award, UMASS, Amherst (2015)
- 10 PhD students graduated

Young Tomasz Imielinski & Saul Amarel at DCS Healthy Fruit Party…

Tomasz:
"Where is
The tasty
fattening
food?"
Saul:
"Just grin
and bear it –
Think
of Rutgers"

DCS in the 90's



- **Ken Kaplan,** Chair of DCS 1991-96
- Amarel DARPA Hypercomputing

Grant largest ever at Rutgers - $14 Million

- President Lawrence funds University Committee to Stimulate Research in Computing
- Cognitive Science Center (RUCCS) includes DCS
- Faculty in Systems grows dramatically
- **Tomasz Imielinski**, Chair 1996-2003

“Four Old Chairs”

Kulikowski, Amarel, Kaplan, Imielinski

A function of Coffee
Richter, Amarel, Grigoriadis, Kalantari

Saul Amarel – 1990's

- Receives the Allen Newell Award from the Association for Computing Machinery (ACM)
- Elected Fellow of the IEEE
- Celebrates his 70th Birthday in 1998

Saul Amarel's 70th Jubilee
VP Haska, Sussman (MIT), Sims, Riddle (Amarel PhDs), (Columbia), Mitchell (CMU), Amarel, Feigenbaum (Stanford), Kulikowski, Shank (Northwestern), Hirsh

1990's: Three Chairs with VP Haska - Kulikowski, Amarel, Imielinski

DCS Faculty of the 1990's

- Martin Farach-Colton, U Md (Bioinformatics, Theory)
- Haym Hirsh, Stanford (AI)
- Uli Kremer, Rice (Systems)
- Liviu Iftode, Princeton (Systems)
- Matthew Stone, U Penn (Natural Language – Discourse Analysis)

Martin Farach-Colton @ Rutgers 1991 - present

- MD from Johns Hopkins in 1988, PhD in Computer Science from the University of Maryland, 1991 (Amihood Amir, advisor)
- Started at Rutgers as a postdoc at DIMACS
- Joined DCS in 1993
- My thesis was on string matching and in the 90s I worked on Bioinformatics

Coming here

- DIMACS was a great place to be a theory postdoc.
- Rutgers had an amazing theory group.
- And my husband is a classic music critic, so I've gotten used to the commute from Manhattan to New Brunswick!

Excursions (time away from Rutgers)

- 1997-98: A year at Bell Labs
- 2000-2002: My time at Google
  - Early days when they still hadn't figure out how to make money
  - It changed my research!
- 2007-2010: Started up Tokutek, a company that commercialized my researche
  - I sold it last year. Clients included Walmart, Cisco, and several banks.

Students

Students profs at Case Western Reserve, Pace University, Virginia Tech, Louisiana State, Rowan College. Others at NIH, JP Morgan.

Postdocs profs at CMU (2x), UC San Diego, Princeton, Harvey Mudd College.

Other…

- Grad student teaching award twice
- Sloan Foundation Fellowship
- Best Paper at FAST 2016
- Test of Time award at LATIN 2000

- and… a Bronze Medal at the 2015 World Master Jiu-Jitsu Championship!

Haym Hirsh

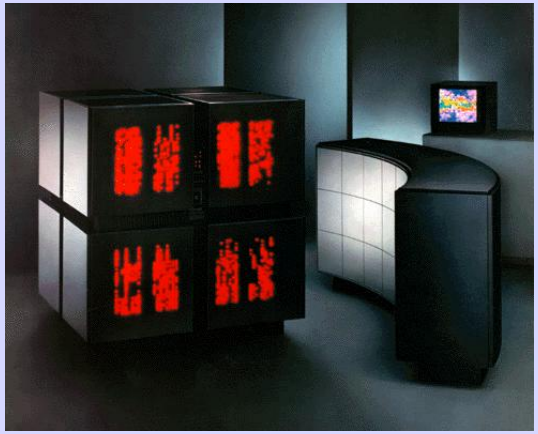
- BS MS UCLA, PhD Stanford
- Tom Mitchell & Lou Steinberg encouraged Haym to come to Rutgers
- Enjoyed juggling outside Hill Center
- Saul Amarel was his mentor
- Don Smith was his administration advisor
- Tomasz Imielinski convinced him to run for Chair of DCS – became Chair 2003-2006 & 2012-2013 – later Dean at Cornell

Haym with son, Kaz and Jerry

Ulrich Kremer
1995 - 1998

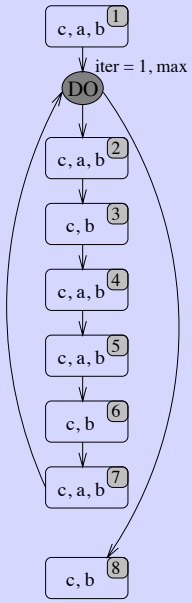
Automatic Parallelization of Fortran
Fortran D / HPF

PhD. Rice University, 1995
Advisor: Ken Kennedy
Thesis topic: Automatic Data Layout for Distributed-Memory Machines

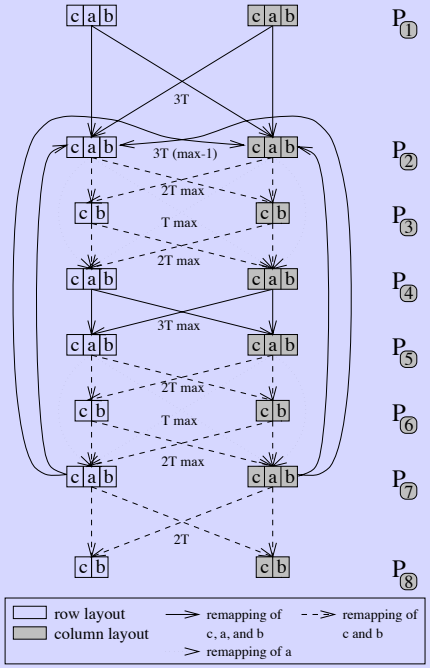


Connection Machine

Intel iPSC/2

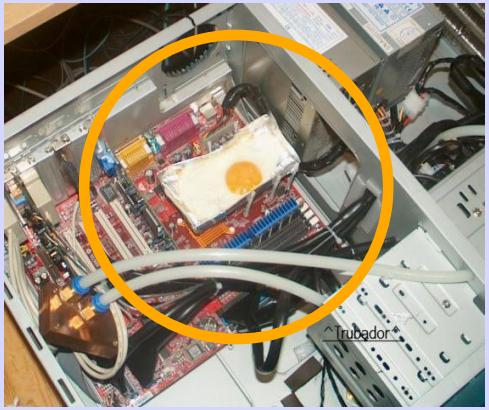


PCFG



DLG

Power, Energy, Thermal Management

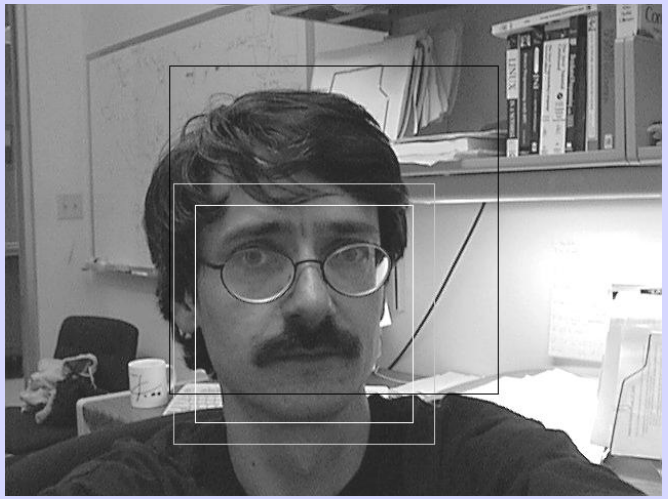


Compiler and Runtime Techniques

1. Dynamic voltage and frequency scaling
2. Resource hibernation
3. Remote task execution
4. Quality-of-Service tradeoffs

2000:

Compaq's iPAQ with MIT Oxygen Project camera sleeve



Face Detection and Face Recognition on battery-operated hand-held iPAQ

Programming Opportunistic Networks SpatialViews and Sarana

Collaborative computing

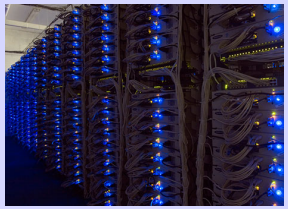
Exploiting multiple services

Sensor data collection/processing

QoR vs. resource consumption tradeoff

Green data/computing clouds

Fewer power, thermal, and environmental issues



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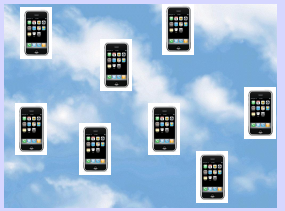
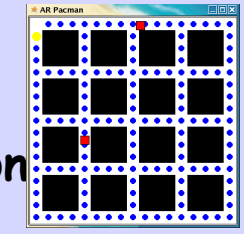


Augmented-reality gaming

Physical world attached with virtual information



Ulrich Kremer 2007 - today

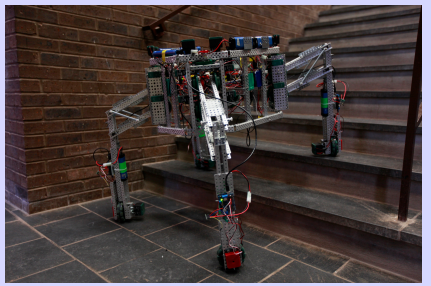
Programming Architectures for Autonomous and Service-Based Systems

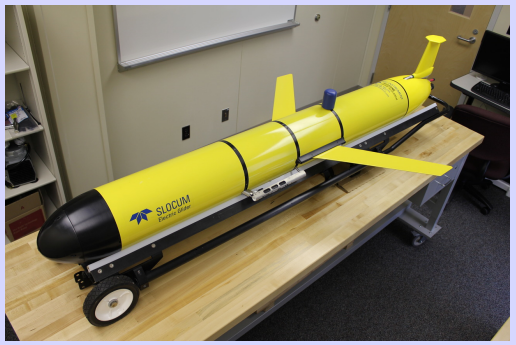
EEL Lab
Computer Science

1. New programming languages and compilers for buoyancy-driven AUVs (Autonomous Underwater Vehicles)
2. Faster-than-real time simulator (Trilobite$_G$) for the Slocum Glider

http://algaesim.cs.rutgers.edu

3. Power and energy models, path planning tools
4. Approximation and redundancy management





Liviu Iftode
@ Rutgers 1997 - present

- PhD in Computer Science from the Princeton University
- I chose Rutgers over the other offers because I could not resist department chair's (Tomasz Imielinski) persuasion ☺
- I was told that, besides theory and AI, the department wants to grow in systems. And we did it!
- My interest shifted over years from OS and distributed systems to mobile systems and security, pervasive computing, and, more recently, vehicular computing and networking.
- I graduated 10 Ph.D. students, and I hosted at Rutgers 16 international students from all over the world (France, Spain, Italy, Finland, Japan, India and Romania), I co-advised some of them towards their degree in their home country, and organized four workshops between Rutgers and a foreign university.

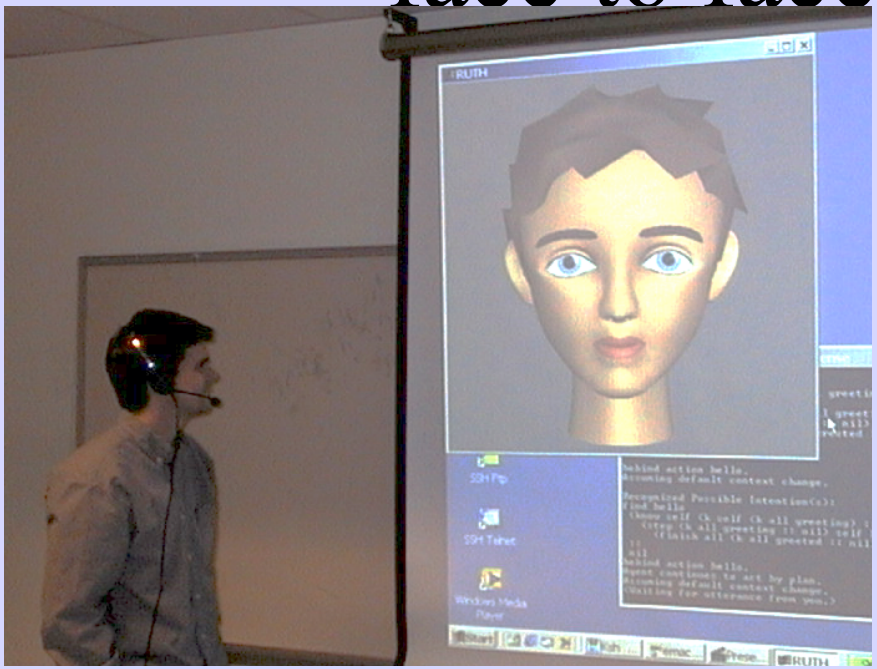
Iftode: What I learned about international collaboration

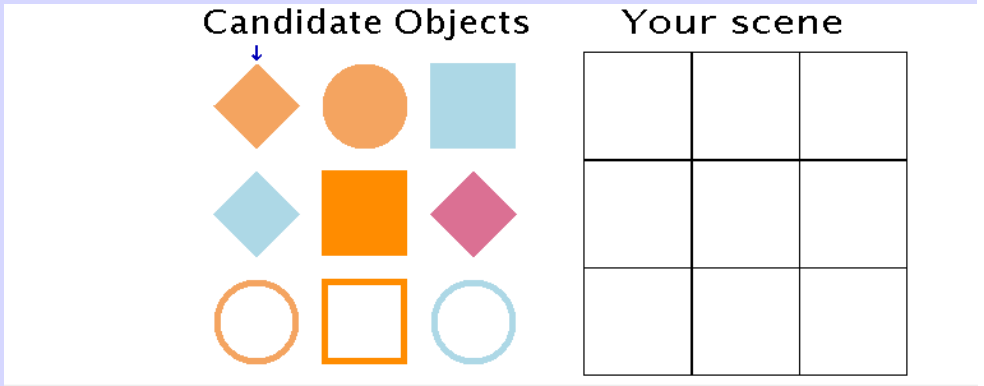
- It is always an exciting experience
- Beneficial for both sides, especially for the students
- Its value is obviously growing
- Funding agencies and the university should do more to make it possible
- Getting small amounts of money for international exchanges should be simple to obtain: once upon a time, NSF offered supplements to their ITR grants for international collaboration; I had one, thanks NSF!

Matthew Stone

- At Rutgers since 1998.
- PhD U. Penn (advised by Mark Steedman)
- Joint appointment with
  Center for Cognitive Science

Research on meaningful face to face conversation





[Agent clicks Continue (next object)]
Agent: is the target blue?
c1: no
c1: color is orange
c1: shape is diamond
Agent: ok
Agent: click continue
Agent: done

Interdisciplinary Connections

Semantics students working with formal models of information—Rutgers style!

- David DeVault (CS PhD 2008 now ICT)
- Adrian Brasoveanu (Ling PhD 2006 now UCSC)
- Sarah Murray (Ling PhD 2010 now Cornell)
- Gabe Greenberg (Phil PhD 2011 now UCLA)
- Una Stojnic (Phil PhD 2016 now Columbia)

Undergraduate Research
Perceptual Science REU 2011-2014

Thu D. Nguyen @ Rutgers 1999 - present

- Currently serving as Dept. Associate Chair
- Also serving as Associate Director of Cyberinfrastruture for RDI2
- Ph.D. in Computer Science and Engineering from the University of Washington, 1999
- Member of Technical Staff @ AT&T Bell Labs 1988-1991
- Director of Web Crawling at Ask.com 2006-2007
  - Brought back to Rutgers experience of building systems to handle billions of Web pages running on thousands of servers

Current research

- Green computing:
  - Reduce CO2 emission through use of renewable energy
  - Reduce energy consumption using technologies such as “free-cooling”
- Personal information management and search
  - How do I find an email I remember getting?
- Computer Science education
  - How to scale to handle rapid increase in enrollment?
  - How to increase diversity?

First Ph.D. graduate and … after defense

Left to right:
Ricardo Bianchini
Thu D. Nguyen
Craig Nevill-Manning
Richard Martin
Francisco Matias Cuenca-Acuna
(the new Ph.D. graduate)

Ahmed Elgammal
@ Rutgers 2002 - present

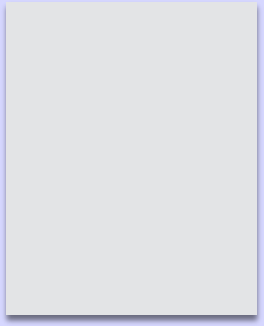
- My story with Rutgers started in 1996
- I started @ Rutgers in 1996 as a graduate student for 1 academic year.
- I took 4 great courses with Alex Borgida, Thorn McCarty, Leonid Khachiyan, Diane L. Souvaine
- Attended the data mining reading group with Tomasz Imieliński.





Going to UMD and back to Rutgers

- Decided to go to U. of Maryland College Park to join Azriel Rosenfeld Computer Vision Lab.
- Did my Ph.D. with Larry Davis “Efficient Nonparametric Kernel Density Estimation for Real-Time Computer Vision”
- Invited for an interview at Rutgers by Dimitris Metaxas and Tomasz Imieliński (April 28th 2002)
- Joined Rutgers in August 2002
- It was great to come back to Rutgers and to be a colleague to such great faculty



Ramana Isukapalli
Lucent

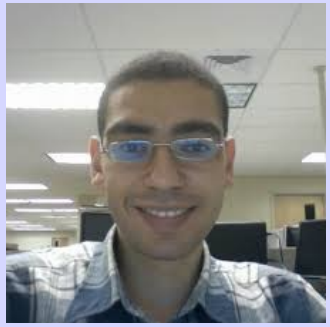
Chan-Su Lee
Yeungnam Univ.

Zhipeng Zhao
Symantec

Marwan Torki
U. of Alexandria

Toufiq Parag
Harvard - Postdo

Edinah Gnang
Johns Hopkins



Ali Elqursh
Google

Ishani Chakraborty
SRI

Turgay Senlet
Google

Tarek El-Gaaly
Apple

Chetan Tonde
Amazon

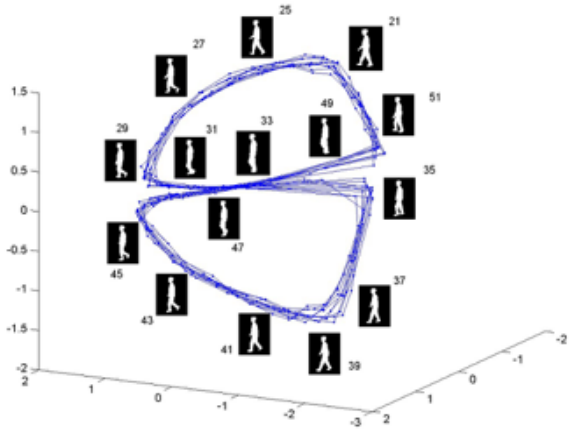
Amr Bakry
Amazon

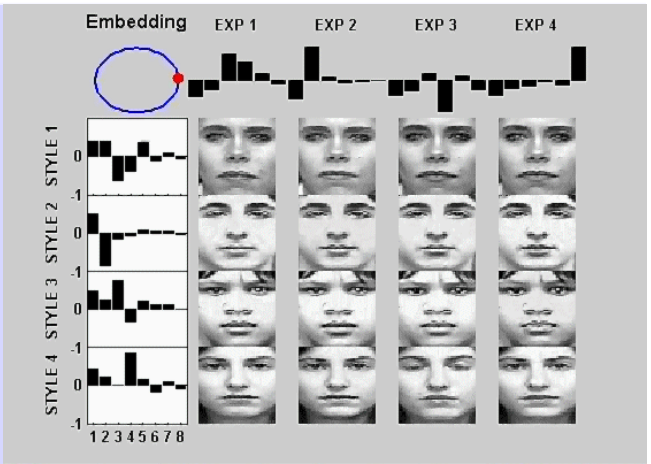
Mohamed Elhoseiny
Facebook AI Research

Babak Saleh

Computer Vision Research

- Human Motion Analysis and Understanding
- Research on Object Recognition
- Intersection between Vision & Language
- Data Science in Digital Humanities
- 7 NSF-funded projects over the past 14 years.





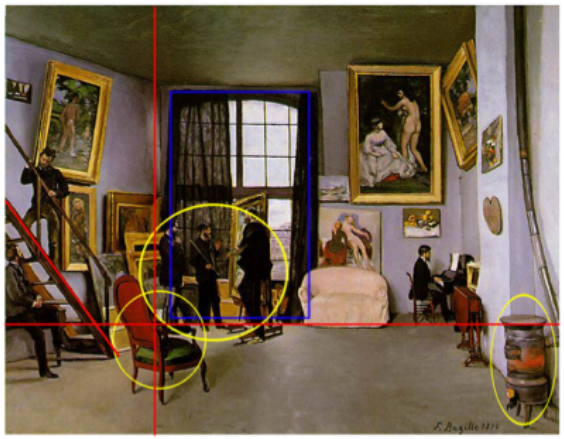
HOME RESEARCH PUBLICATIONS PEOPLE PRESS AND MEDIA ABOUT US SITEMAP

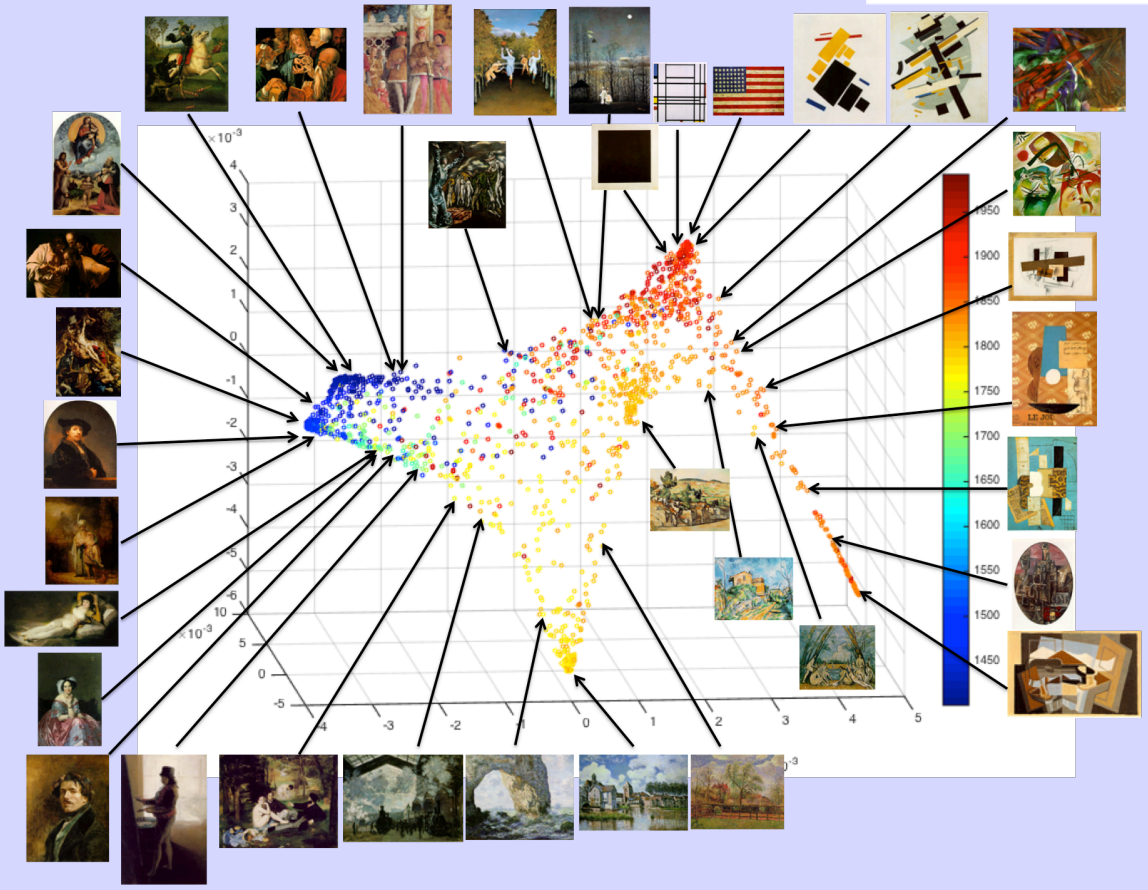
The Art and Artificial Intelligence Laboratory at Rutgers: Advancing AI Technology in the Digital Humanities

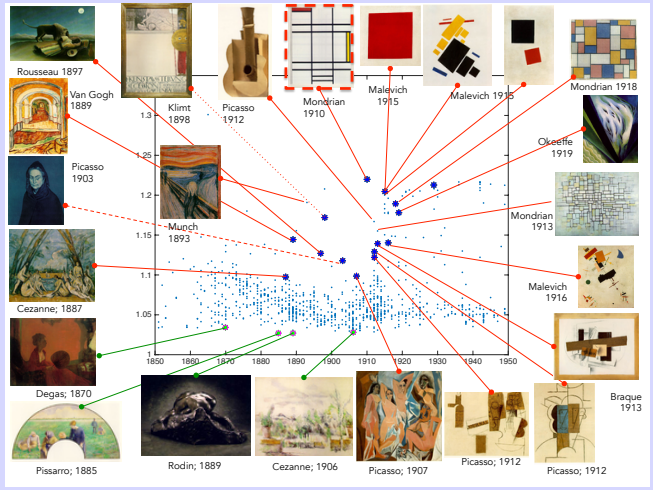
The Art and Artificial Intelligence Laboratory at Rutgers is conducting research on the intersection between the two disciplines. Our aim is to push the envelope of computer vision and artificial intelligence by investigating perceptual and cognitive tasks related to human creativity. We are focused on developing artificial intelligence and computer vision algorithms in the domain of art.

digihumanlab.rutgers.edu

The machine can see a lot of interesting things when looking at art at the macro level!







- **Cutting edge, multidisciplinary research on data science for digital humanity**
- **World-wide recognition in main-stream media, science media and art media**

- **Seeking Alumni Sponsorship…**

Michael L. Littman @ Rutgers 2002-2012

- PhD in Computer Science from Brown, 1996 (Leslie P. Kaelbling advisor)
- Faculty at Duke 1996-99, but wanted to be back in NJ. Interviewed at Rutgers by Haym (search chair) and Tomasz (chair).
- AT&T Labs Research 2000-02 with Rebecca Wright (now DIMACS director) until AI layoffs.
- Haym (now chair) convinced dean to reinstate my offer. Came to Rutgers (sans title, salary).

Time at Rutgers

- Taught ML here. Class now available via Udacity (shared with 10s of thousands of students).
- Ran Rutgers Laboratory for Real-Life Reinforcement Learning (RL^3).
- Served as chair 2009-2012. (Physical sciences began having its own graduations. Badri won a mug. Football was briefly important.)

My Group at a Defense in 2009

Alexander Strehl (Facebook), John Asmuth (Google), me, Ari Weinstein (DeepMind), Brian Russell, Lihong Li (Microsoft), Monica Babes Vroman, Tom Walsh, Michael Wunder, Chris Mansley (Apple) and Sergiu Goschin (Google). Not shown: Carlos Diuk (Facebook), Ali Nouri, Bethany Leffler Edmunds, Fancong, Vukosi Marivate.

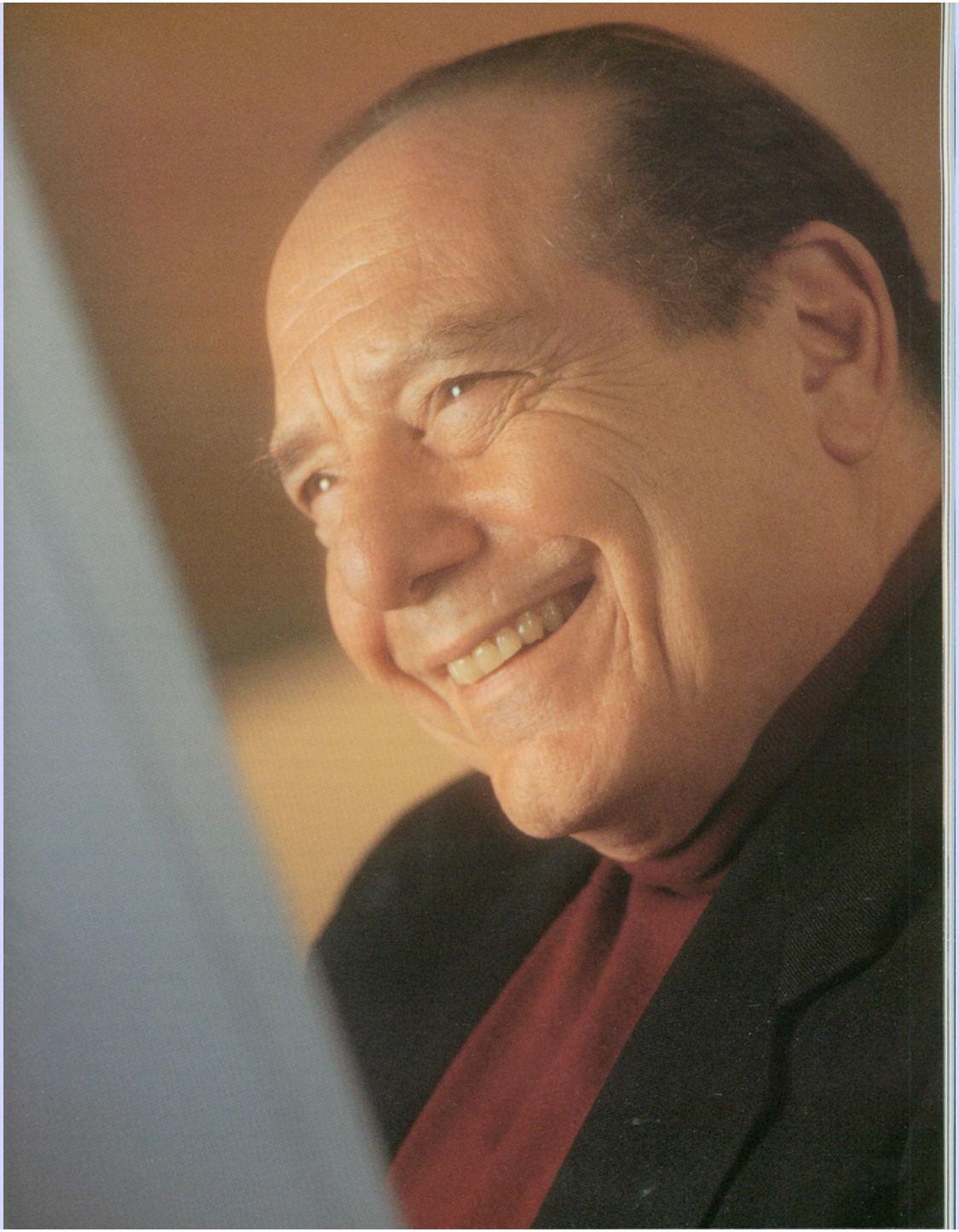
Saul Amarel Passes Away – December 18, 2002

- Saul dies from a heart attack at home in Princeton, following a six-year battle with cancer.
- This occurred just as the celebration of his retirement from Rutgers University was under preparation for December 20, 2002.
- It became a celebration of his life and a tribute to his leadership of DCS

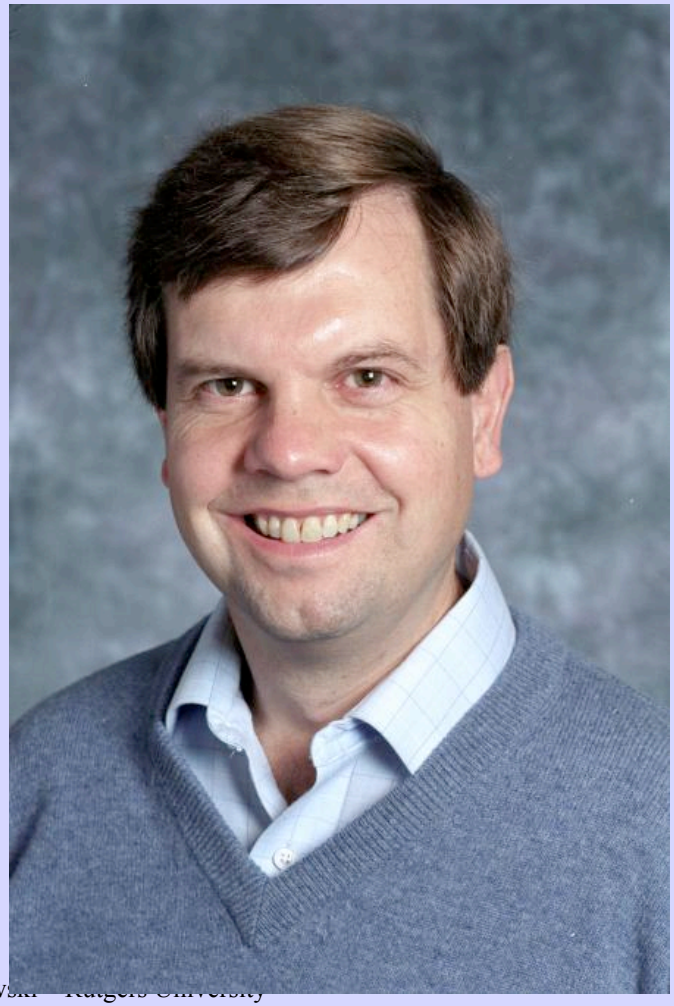
In Memoriam

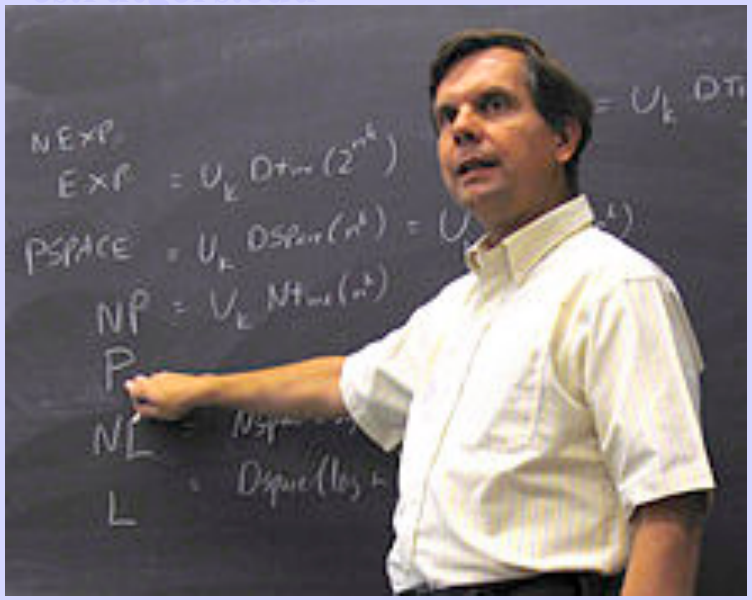
Saul Amarel

1928 - 2002



Eric Allender DCS Chair 2006- 2009





Michael Littman DCS Chair 2009 - 2012

Dimitri Metaxas DCS Chair 2013 - Present

DCS Convocation, 2013

Metaxas, Grigoriadis, Steinberg, Kulikowski, Mitchell, Vichnevetsky