DARPA Overview

Kathleen Fisher
Program Manager, I20

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Computing Research Association Mentoring Workshop

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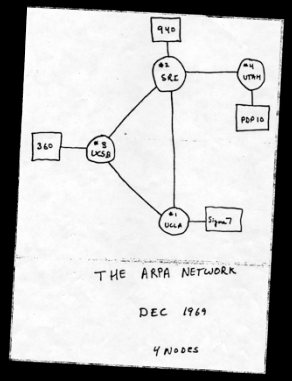
What makes DARPA unique…

1957

- Formed in 1958 to PREVENT and CREATE strategic surprise
  - Capabilities, mission focused
  - Finite duration projects
  - Diverse performers
  - Multi-disciplinary approach…from basic research to system engineering
- As the DoD's innovation engine, we are committed to the boldest, creative leaps…

DARPA



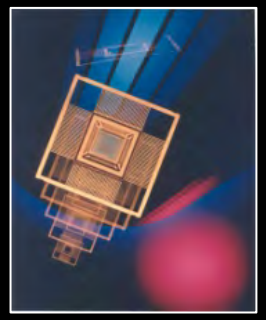
The Internet in 1969

The First Mouse

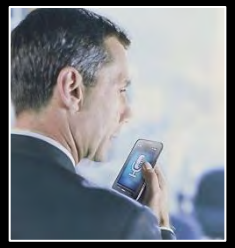
Precision guidance and navigation

Saturn V

F117 Stealth fighter



Advanced semiconductors



Altered Image

Personalized Assistant that Learns

Fully Autonomous Vehicle Race

Night vision

Predator Autonomous Vehicle

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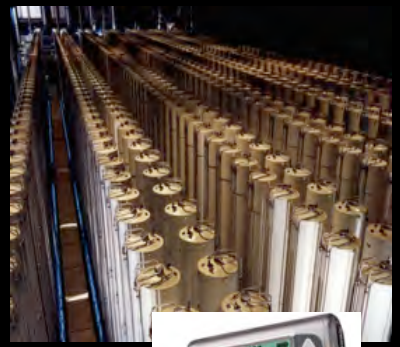
DARPA Technical Offices

DSO	MTO	I2O	STO	TTO
Physical Science	Biological Platforms	Cyber	Battle Mgmt, Command & Control	Air Systems
Neuroscience	Computing	Data Analysis at Massive Scale	Comms & Networks	Ground Systems
Materials	Electronic Warfare	ISR Exploitation	ISR	Maritime Systems
Mathematics	Manufacturing		Electronic Warfare	Space Systems
Biology	Novel Concepts		Positioning, Navigation, and Timing	
	Photonics			
	Positioning, Navigation, and Timing			
	Thermal Management			
Defense Sciences Office	**Microsystems Technology Office**	**Information Innovation Office**	**Strategic Technology Office**	**Tactical Technology Office**

Cyber

Networked embedded systems vulnerable to cyber attack

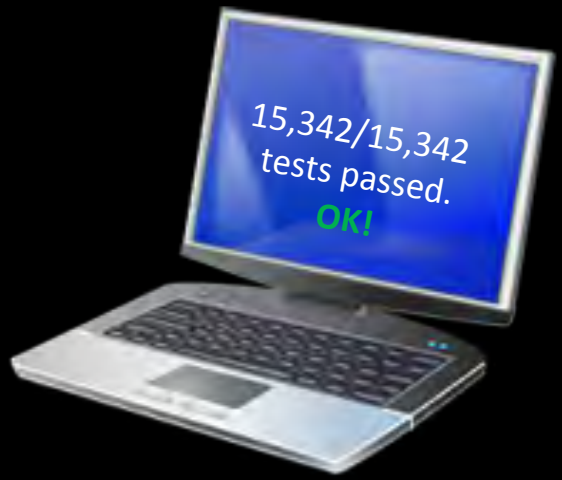


High Assurance Cyber Military Systems
Software systems correct by construction

Source: Dept. of Energy

Source: Koscher, K., et al. "Experimental Security Analysis of a Modern Automobile"

Fully-automated checks for broad classes of malicious features and dangerous flaws in software and firmware



Examples

Routers

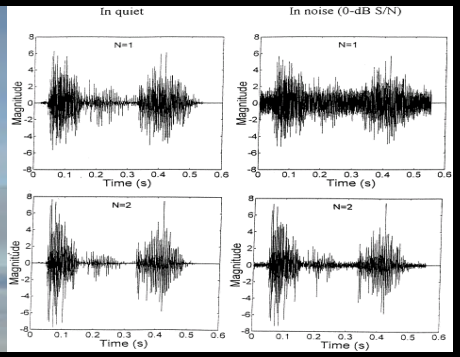
Smart Phones

Printers

Images of specific hardware are for illustration only and should not be interpreted as implying vulnerabilities

Big Data

Increase the efficiency of SIGINT



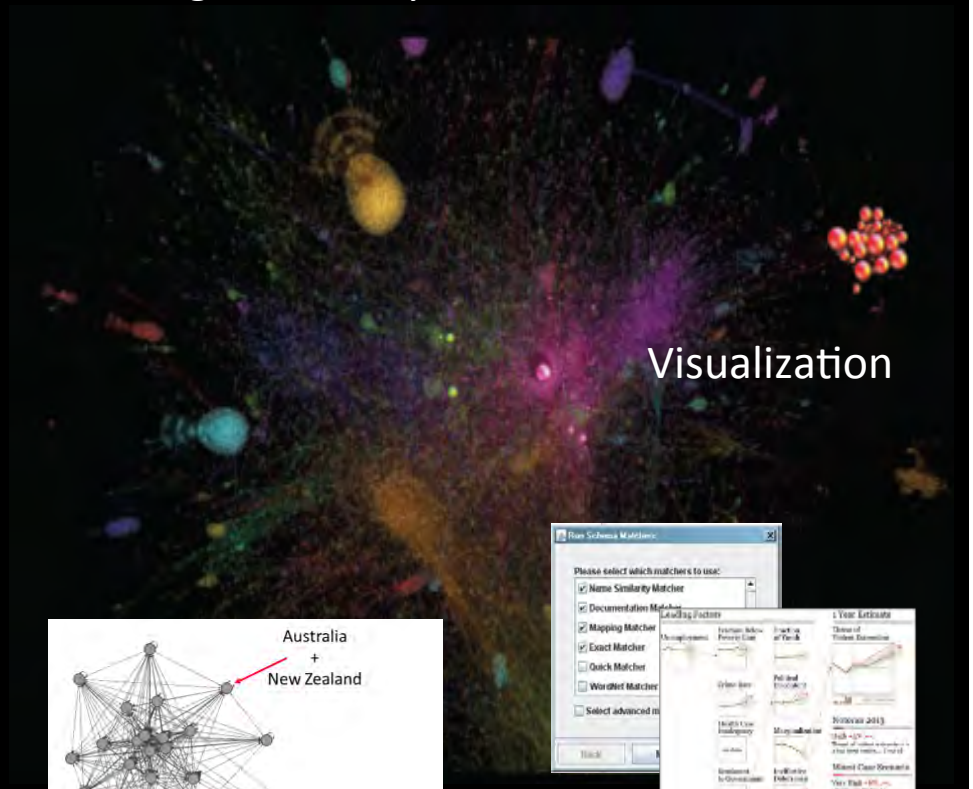
Speech Activity Detection:
Is there speech?

Language ID:
What Language?

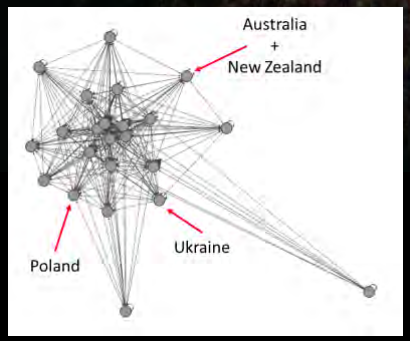
Speaker ID:
Who is it?

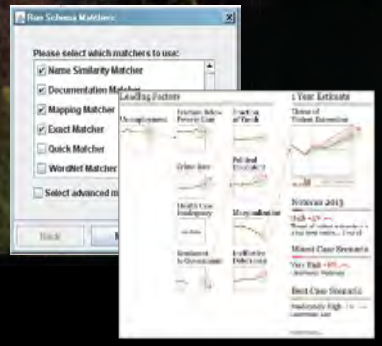
Key Word Search:
Anything important?

Big Data analytics and visualization



Visualization





Analytics

Brain Function Research

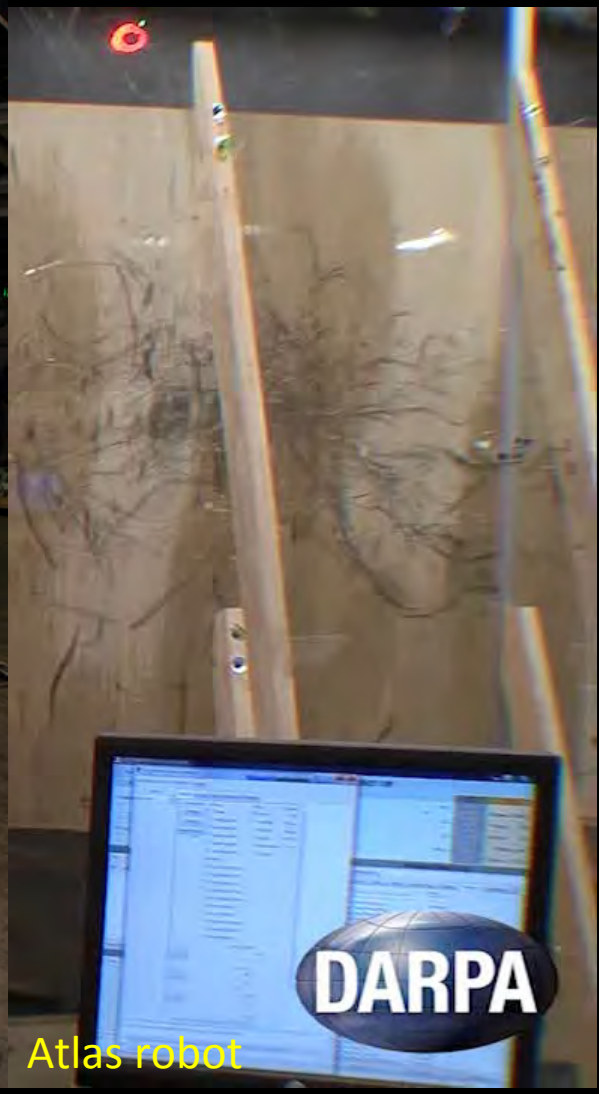
Amplify the effectiveness of humans

Implanted electrodes record neural signals to enable control of an advanced prosthetic limb

Source: Pitt/JHU APL via CBS

Robotics

Amplify unit and soldier effectiveness



Atlas robot

Grand Challenge: Autonomous Vehicle Races

Barstow to Primm

March 13, 2004

142 miles
10 hours
$1M in prizes

Desert Classic

October 8, 2005

132 miles
10 hours
$2M in prizes

Urban Challenge

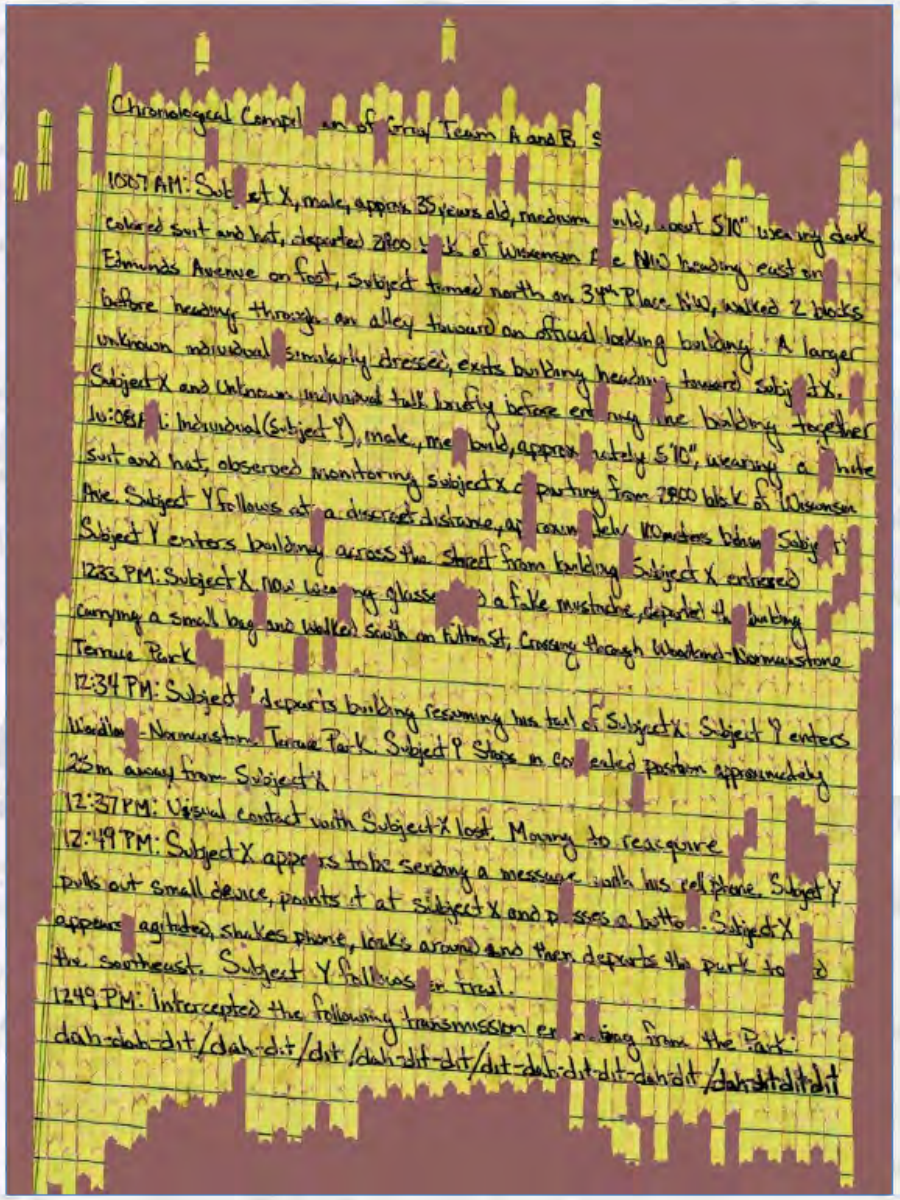
November 3, 2007

60 miles
6 hours
$2.75M in prizes

Shredder Challenge

Chronological Compilation of Gray Team A and B Surveillance Logs

TEAM A	1057 AM: Subject X, male, approx 35 years old, medium build, about 5'10" wearing dark colored suit and hat, departed 2800 block of Wisconsin Ave NW heading east on Edmunds Avenue on foot, Subject turned north on 34th Place NW, walked 2 blocks before heading through an alley toward an official looking building. A larger unknown individual, similarly dressed, exits building heading toward Subject X. Subject X and Unknown individual talk briefly before entering the building together
TEAM B	10:08 AM: Individual (Subject Y), male, med build, approximately 5'10", wearing a white suit and hat, observed monitoring subject X departing from 2800 block of Wisconsin Ave. Subject Y follows at a discreet distance, approximately 100 meters behind Subject X. Subject Y enters building across the street from building Subject X entered
TEAM A	1233 PM: Subject X, now wearing glasses and a fake mustache, departed the building carrying a small bag and walked south on Fulton St, Crossing through Woodland-Normanstone Terrace Park.
TEAM B	12:34 PM: Subject Y departs building resuming his tail of Subject X. Subject Y enters Woodland-Normanstone Terrace Park. Subject Y Stops in concealed position approximately 25m away from Subject X
TEAM A	12:37 PM: Visual contact with Subject X lost. Moving to reacquire
TEAM B	12:49 PM: Subject X appears to be sending a message with his cell phone. Subject Y pulls out small device, points it at Subject X and presses a button. Subject X appears agitated, shakes phone, looks around and then departs the park toward the southeast. Subject Y follows in trail.
TEAM A	1249 PM: Intercepted the following transmission emanating from the Park: dah-dah-dit/dah-dit/dit/dah-dit-dit/dit-dah-dit-dit-dah-dit/dah-dit-dit-dit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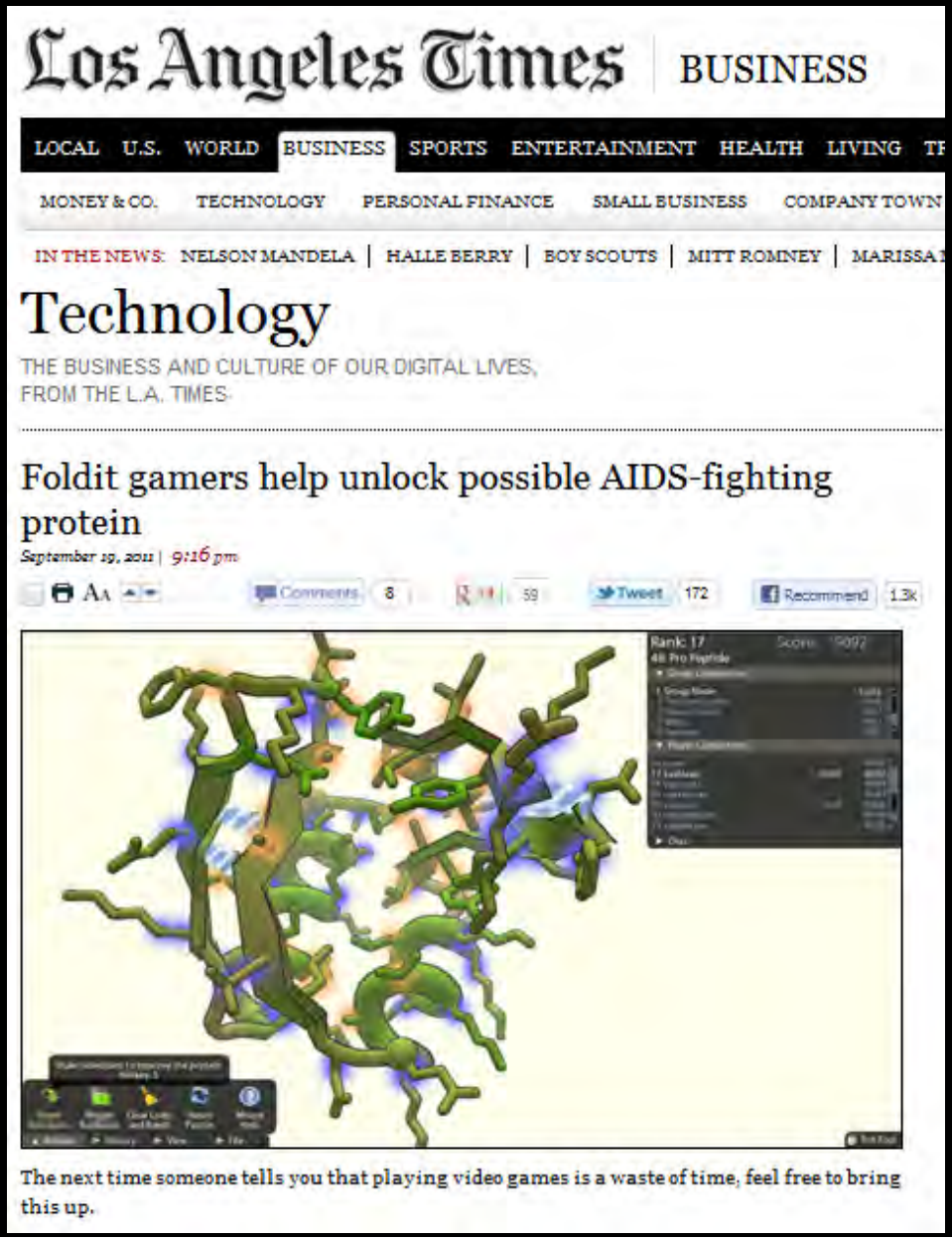
Foldit – unlock protein structure



Los Angeles Times | BUSINESS

LOCAL U.S. WORLD BUSINESS SPORTS ENTERTAINMENT HEALTH LIVING TF

MONEY & CO. TECHNOLOGY PERSONAL FINANCE SMALL BUSINESS COMPANY TOWN

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Technology

THE BUSINESS AND CULTURE OF OUR DIGITAL LIVES, FROM THE L.A. TIMES

Foldit gamers help unlock possible AIDS-fighting protein

September 19, 2011 | 9:16 pm

Comments 8 | 59 | Tweet 172 | Recommend 1.3k

The next time someone tells you that playing video games is a waste of time, feel free to bring this up.

http://latimesblogs.latimes.com/technology/2011/09/foldit-gamers-help-unlock-aids-fighting-proteins.html

Cyber Grand Challenge

Forbes · New Posts +16 posts this hour · Most Popular 5 LinkedIn Strategies

Andy Greenberg, Forbes Staff
Covering the worlds of data security, privacy and hacker culture.
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SECURITY 10/23/2013 @ 2:02PM 6,009 views

DARPA Announces $2 Million Prize In Self-Patching Software Competition

+ Comment Now + Follow Comments

Software, heal thyself.

The mad scientist wing of the Pentagon known as the Defense Advanced Research Projects Agency announced Tuesday that it's planning to hold a new "Grand Challenge" competition with a $2 million prize. The goal of that seven-figure bakeoff: To build a "fully automated cyber defense system" that protects itself from hackers, responding to attacks and even updating its own code in real-time, without the assistance of humans.

"The [Cyber Grand Challenge] seeks to engender a new generation of autonomous cyber defense capabilities that combine the speed and scale of automation with reasoning abilities exceeding those of human experts," reads the formal request for participant proposals. "In fully autonomous defense, a

I2O Tenets

1. Change the game – no tit for tat
2. High leverage to National Security (e.g., tools > applications)
3. Real problem + real data + real users = real tools
4. Diverse portfolio

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How do DARPA programs get started?

Distribution Statement A - Approved for Public Release, Distribution Unlimited

Who can apply for DARPA funding?

Distribution Statement A - Approved for Public Release, Distribution Unlimited

How do you find out about DARPA funding opportunities?

www.fbo.gov
www.grants.gov
www.darpa.mil/Opportunities/Solicitations/I2O_Solicitations.aspx

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How do you apply for DARPA funding?

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What should you expect if you win an award?

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What about seedlings and Open Office BAAs?

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Consider serving as a DARPA program manager
at some point in your career

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Questions?

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