

Henry J. and Erna D. Leir Research Institute for Business, Technology, and Society

Inaugural Retreat, June 20, 2018



Sponsor: Leir Charitable Foundations



The Henry J. and Erna D. Leir Research Institute for Business, Technology, and Society at NJIT conducts research to help business and industry become more sustainable, resilient and ecologically efficient, thereby creating greater shareholder and social value. The Institute's work is made possible through the generosity of the Leir Foundations and carries on the important work and legacy of Mr. & Mrs. Leir.

Retreat Agenda

- Remarks by Dr. Reggie J. Caudill
 - Remarks by Dr. Atam P. Dhawan
 - Institute Mission and Long-Term Plan
 - Year One Research Agenda
 - Breakout session on Year One Research Agenda
 - Lunch and networking
 - Presentation from breakout groups
 - Summary and next steps
- Remarks by Dr. Fadi P. Deek (tentative)

Opening Remarks

Reggie J. Caudill

Dean and Professor
Panasonic Chair of Sustainability
Martin Tuchman School of Management

Remarks

Atam P Dhawan

Vice Provost for Research
Distinguished Professor of ECE

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Global Challenges

Global Warming

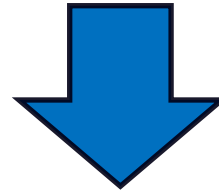
Extreme Weather

Aging Population

Natural Resource Overconsumption

Crime & Terrorism

Diseases



Sustainability

Wellbeing

Resilience

Transforming Business Goal

being competitive in the marketplace



creating real shareholder and social value
by becoming eco-efficient, resilient and
sustainable

The Mission

An integrated, dual mission of innovative business/management research and targeted outreach necessary to realize the Institute's overarching goal of helping business and industry to become more eco-efficient, resilient and sustainable

Leadership Structure

■ Executive Committee

- Director: Yi Chen
- Co-leaders

■ Advisory Board

Members from academia, industry and government

Approach:

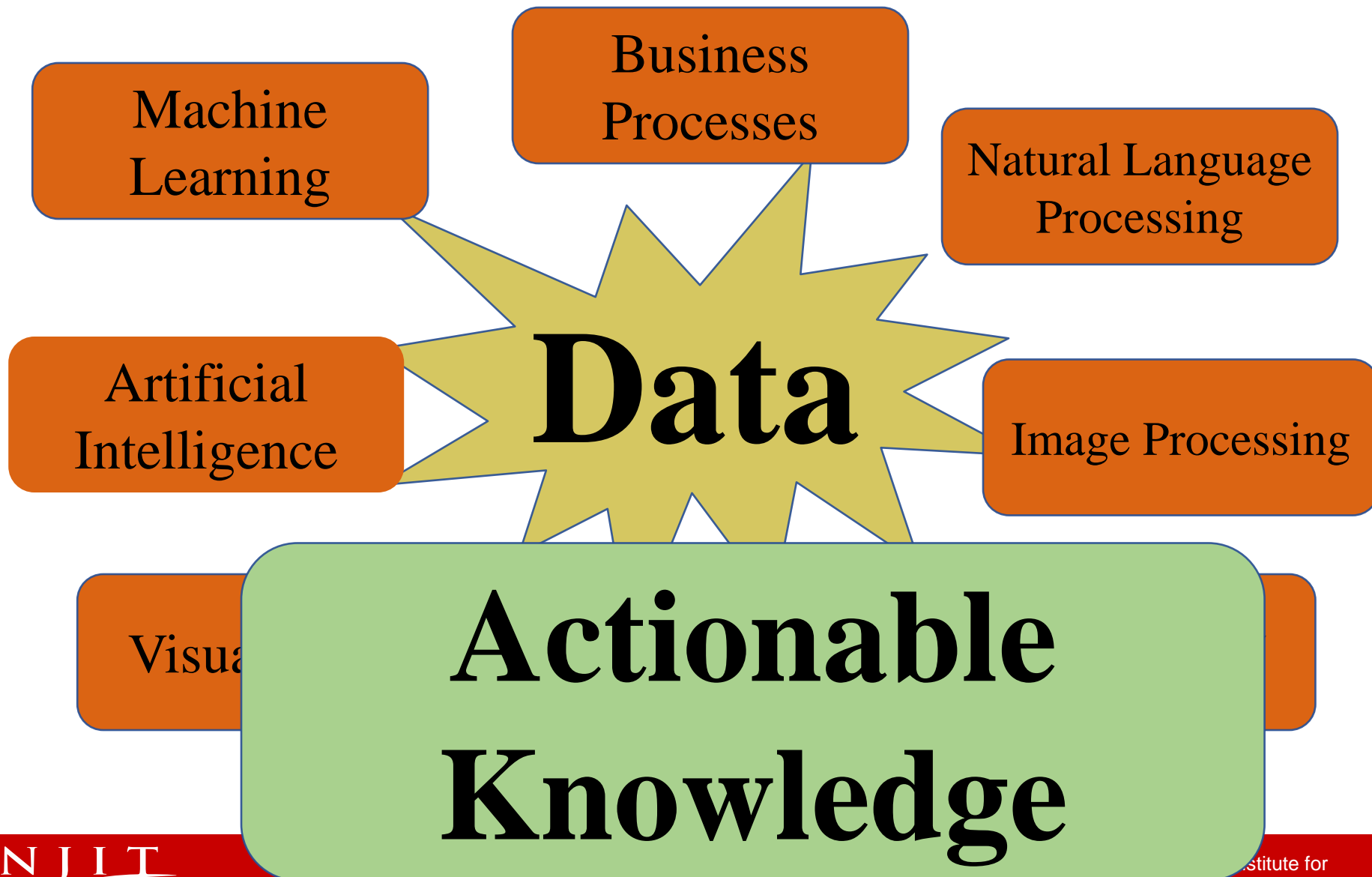
Interdisciplinary Cross-Sector Collaboration

Government
Agencies
Private
Foundations
Economic
Development
Leaders
Corporation
Academia

Leir Research Institute for Business, Technology, and Society

Operations Mgmt Marketing Business Data Science Healthcare
Finance & Economics Innovation Environmental Science Industrial Ecology

Approach: Leverage Big Data



Research Thrust Areas

- Corporate Sustainability and Resiliency
- Connected Society and Wellbeing
- Business Data Science

Corporate Sustainability and Resiliency

- Environmental impact and climate change
- Urban ecology and renewable energy
- Enterprise operations, organization behavior
- Disruptive events, vulnerabilities and consequences
- Real-time forecast supply & demand and assess value chain partner financial risks
- Risk management

Examples of Funding Opportunities

- NSF Economics

https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5437&org=SBE&sel_or_g=SBE&from=fund

- NSF Decision, Risk and Management Sciences (DRMS)

https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5423&org=SES&sel_or_g=SES&from=fund

- NSF Critical Resilient Interdependent Infrastructure Systems and Processes (CRISP 2.0)

https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=505277&org=SES&sel_or_g=SES&from=fund

Connected Society and Wellbeing

- Customer-focused business continuity
 - Digital marketing, Customer resource management
- Health and wellness
 - Treatment effectiveness, proactive care, healthcare disparity
- Safety and security
- Mobility Disadvantaged and Smart Driving Cars
- Economic opportunity, growth and new venture acceleration

Examples of Funding Opportunities

- NSF Smart and Connected Communities

<https://www.nsf.gov/pubs/2018/nsf18520/nsf18520.htm>

- NSF Smart and Connected Health (SCH)

<https://www.nsf.gov/pubs/2018/nsf18541/nsf18541.htm>

- NSF Developmental Sciences (DS)

https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=8671&org=SBE&sel_org=SBE&from=fund

- Opportunities from NIH

- Opportunities from State of New Jersey

Business Data Science

- Advanced machine learning and artificial intelligence
- Data visualization
- Real-time data analytics for IoT cyber-physical systems
- Data sharing, network and distributed systems
- Data privacy and security
- Interaction of human and systems

Examples of Funding Opportunities

- NSF: the Information Integration and Informatics (III) program and the Cyber-Human Systems (CHS) program
https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=13707

Research: Growing Convergence Research

<https://nsf.gov/pubs/2018/nsf18058/nsf18058.jsp?org=NSF>

NSF identifies Convergence Research as having two primary characteristics:

- (1) **Research driven by a specific and compelling problem.** Research requiring a convergence paradigm is generally inspired by the need to address a specific challenge or opportunity, whether it arises from deep scientific questions or pressing societal needs.
- (2) **Deep integration across disciplines.** As experts from different disciplines pursue common research challenges, their knowledge, theories, methods, data, research communities and languages become increasingly intermingled or integrated. New frameworks, paradigms or disciplines can form from sustained interactions across multiple communities.

Five-Year Research Agenda

– with input from retreat participants

Each year we will focus on one societal challenge using an interdisciplinary collaborative approach.

Some examples include:

- Addressing the disparity issue and help special-needs population. We should take a community-centric approach. Communities may be defined by differences in age, mobility, gender, income, culture, religion, beliefs and values or immigrants. We need to engage people, develop technologies for them, especially marginalized communities.
- Resilience in face of disruptions caused by extreme weather or other natural disasters, terrorism or other man-made disasters.
 - Handle disruptions in supply chain
 - Risk management
 - Emergency systems and disaster management (FEMA <https://www.fema.gov/>)
 - FinTech for handling disruption of banking system and manage wealth

Five-Year Research Agenda

– with input from retreat participants

- Sustainability in face of climate change and natural resource depletion
- Healthcare and Wellbeing
- Smart city
- Smart Driving Cars and Mobility Disadvantaged
- Data privacy
- Understand and improve Human-Technology systems. How to best use technologies for advancing cognitive and physical capabilities
(https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=505528)?
- Challenges in politic and justice systems

Expected Outcomes

– with input from retreat participants

- High-quality academic papers
- External funding support
- Beyond papers, we need to outreach to the communities, and get buy-in from communities for adoption, and explore commercialization. Translational science (from lab to markets) is required in many funding calls, e.g. NIH T grants.

Requested Support from Institute

– based on input from retreat participants

- Seed grants should allow faculty summer support to provide incentives for faculty come to campus in summer for collaboration
- Some support to PhD students in summer
- People who conduct intensive research needs in-year course reduction
- Support of organizing Hackathon of machine learning to bring people work together, e.g. to address a specific challenge

Outreach

The Institute will seek collaboration and partnerships to transfer scholarly outcomes and research innovation into everyday business practice and industrial operations, academic programs and workforce development initiatives and to accelerate outreach opportunities through new business ventures, commercialization and innovation.

Workforce Development

- Partnership with IBM for curriculum enhancement & workforce development
- MTSM Summer Financial Literacy Camp for pre-college students
- A new summer camp for pre-college students will be developed focusing on sustainability & business analytics
- Workshops for un/underemployed, active military and vets
- Henry J. and Erna D. Leir Graduate Student Research Fellowship for students at the Business Data Science PhD program
- Henry J. and Erna D. Leir Endowment for Post-Doctoral and Distinguished Research Faculty Fellows

Visibility

- Henry J. and Erna D. Leir Conferences and Symposia on Business, Technology, and Society
- Distinguished Speaker Lecturer Series

Commercialization

- NSF I-Corps site
- NJ Innovation Acceleration Center
- Innovation & Entrepreneurship Competitions (AECOM, et al.)
- NJII (New Jersey Innovation Institute)
- EDC (The Enterprise Development Center)

Overarching Goal

The overarching goal of the Henry J. Leir Research Institute for Business, Technology, & Society is to help business and industry to move beyond just being competitive in the marketplace to creating real shareholder and social value by becoming eco-efficient, resilient and sustainable.

Conferences, Symposia, and Workshops

Annual Business, Technology & Society Conference

Distinguished Speaker Lecturer Series

IBM Skills workshops for un/underemployed and active military & vets for "New Collar" workforce

New pre-college summer camp for sustainability & business analytics

Outreach Program

Novel Internet of Things (IoT) technologies

Collaborations and partnerships to transfer scholarly outcomes into everyday practice

Leverage existing NSF I-Corps Site

Enhance partnership with IBM Global University Programs and MTSM Pre-college Financial Literacy Camp

Sustainability, Resiliency, & Business Continuity Research

Environmental impact, corporate resiliency & sustainability exposure

Predictive & proactive analytics for disruptive events & vulnerabilities

Enterprise operations, org behavior, & adjacency risk

Financial & risk propagation & climate economics

Cognitive Business Analytics & Data Science Research

Advanced machine learning & autonomous intelligence with knowledge mgmt

Data & Knowledge Visualization

Real-time data analytics for IoT cyber-physical systems & network security analysis

Enterprise data visibility & security in heterogeneous legacy systems

Social Media Research & IoT Innovation

Leverage open source, social media, corporate data bases

Machine deep learning and swarm intelligence techniques for social media data & text

Real-time supply & demand with value chain financial risk mgmt

IoT innovation, business incubation and new venture acceleration

Facilities

- The Institute is housed at the second floor of MTSM
- Laboratories
 - Business Analytics Laboratory
 - Ray Cassetta Financial Analysis Laboratory,
 - Innovation Laboratory (being developed)
- Business Data Observatory to be established and prototyped in the Leir Conference Room

Participant Feedback on Outreach

Besides outreach, we should also have in-reach: courses and curriculum enhancement. E.g. including the IBM analytics and other advanced software into courses.

--- Actually we are currently in process of it and have TA to support these initiatives

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Challenge: Aging Population

- The median age of the U.S. population:
38 today → 43 by 2060
- Number of working-age adults for every retirement-age person
3.5 by 2020 → 2.5 by 2060
- This is a global challenge
Percent of population over age of 60:
 - US, Canada, Brazil, UK, about 30%
 - Japan, Singapore, Germany, Italy, about 40%

Many Research Problems call for investigation with an inter-disciplinary across-thrust approach

Combating Loneliness

- Studies show linkage between loneliness and declining health, with economic and social consequence
 - 29 percent increased risk of coronary heart disease and 32 percent increased risk of stroke
 - 64 percent increase in developing dementia
 - 26 percent increased likelihood of death.
- Older people highly likely experience loneliness.
- Studies are demanded to assess current situation, understand the causes, needs, and provide solutions
 - Social behavior analysis and intervention, community building
 - The use of technologies (IoT, social media) to provide support and encourage engagement
 - Mobility disadvantaged using smart driving car technologies

Promoting Healthy Lifestyle

- Healthy lifestyle
 - Active life
 - Diet and nutrition
 - Compliance for managing chronic disease
- How can we use IoT, social media, smart phones, gamification to promote healthy lifestyle, and a mobile and active life?

Surveillance

Chronic diseases are common to older people, how to leverage smart phone and IoT to provide real-time monitoring of daily activities with the goal of prevention and timely detection of disease onset without high cost associated with nursing homes?

- Data collection
- Data analysis

Addressing Age-Related Disorders

- Typical age-related disorder
 - Alzheimer's Diseases, cardiovascular diseases such as stroke and heart attacks, eye disorders, macular degeneration, and prostate and lung cancer.
- Provide healthcare analytics and decision support for these age-related diseases

Meeting the Needs – Use of Internet and Phone

- We rely a lot on Internet and Phone, for information seeking, entertainment, social networking, and online shopping
- Do those websites and Apps provide sufficient support to older people?
 - Content: Are there sufficient amount of support to address the needs?
 - Interface: Are they accessible and easy-to-use for older people?

Meeting the Needs – Transportation

- Older people may not prefer driving due to their mobility, vision and hearing decline
- However, public transit is often insufficient and unreliable -- a major contributor to missed healthcare appointments, and social isolation
- How to make public mobility more accessible, reliable and efficient to older adults?
 - Fixed-route transit
 - On-demand service
 - Route deviation
 - Smart driving cars

Meeting the Needs – Finance

- June 5, 2018, The Trustees for Social Security released the annual report
 - A deficit of \$85B this year and \$1.7T over the next decade
 - Social Security will be insolvent by 2034
- How to address the problems via policy changing?
- How to prevent older people facing abrupt cuts?
- How to help older people with insufficient financial support?

A more generalized challenge:

Address the disparity issue and help populations with special-needs

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Breakout Session: Input on Year One Research Agenda

Group A: Led by M. Ehrlich and D. Yu

at 4th floor conference room

- Z. Yan
- W. Rapp
- J. Geller
- J. Fjermestad
- M. Taylor
- B. Chou
- S. Taylor
- D. Walsh
- L. Nanton

Group B: Led by C. Bandera and J. Fernandez

at 2th floor Innovation Lab

- L. McVey
- C. Borcea
- R. Roy
- C. Sylla
- J. Cays
- H. Schachter
- M. Somers
- J. Casal

Discussion Summary

--- Group A

Michael Ehrlich
Dantong Yu

Addressing the Challenge of Aging Population

- Profile (who and why) the senior work force
 - Easiness: 25. Impact: 19. =44
- Study what are the new career paths for those over 65. e.g. design strategies to allow senior work force to work for less hours gradually without a cutoff retirement time, design policy to subsidize this types of workforce
 - Easiness: 19. Impact: 30. = 49
- Education and the foundation of quality of work life (e.g. Finance literary)
 - Easiness: 25. Impact: 37. = 62
- Augmenting technology and enabling devices for aging population (to compensate the sensory loss due to aging) and extending their work life span. (self-driving car, for example).
 - Easiness: 27. Impact: 34 = 61
- Partner with big company for funding and combining issues with the aging force.
 - Easiness: 17. Impact: 31 = 48
- Long term care solution by third-party county with low pay or convenient devices.
 - Easiness: 18. Impact: 32 =50

How to Help People with Special Needs

There are many types of people with special needs

- Alzheimer
- Substance abuse
- Special needs due to language barrier, race, gender.
- Vision/hearing impaired

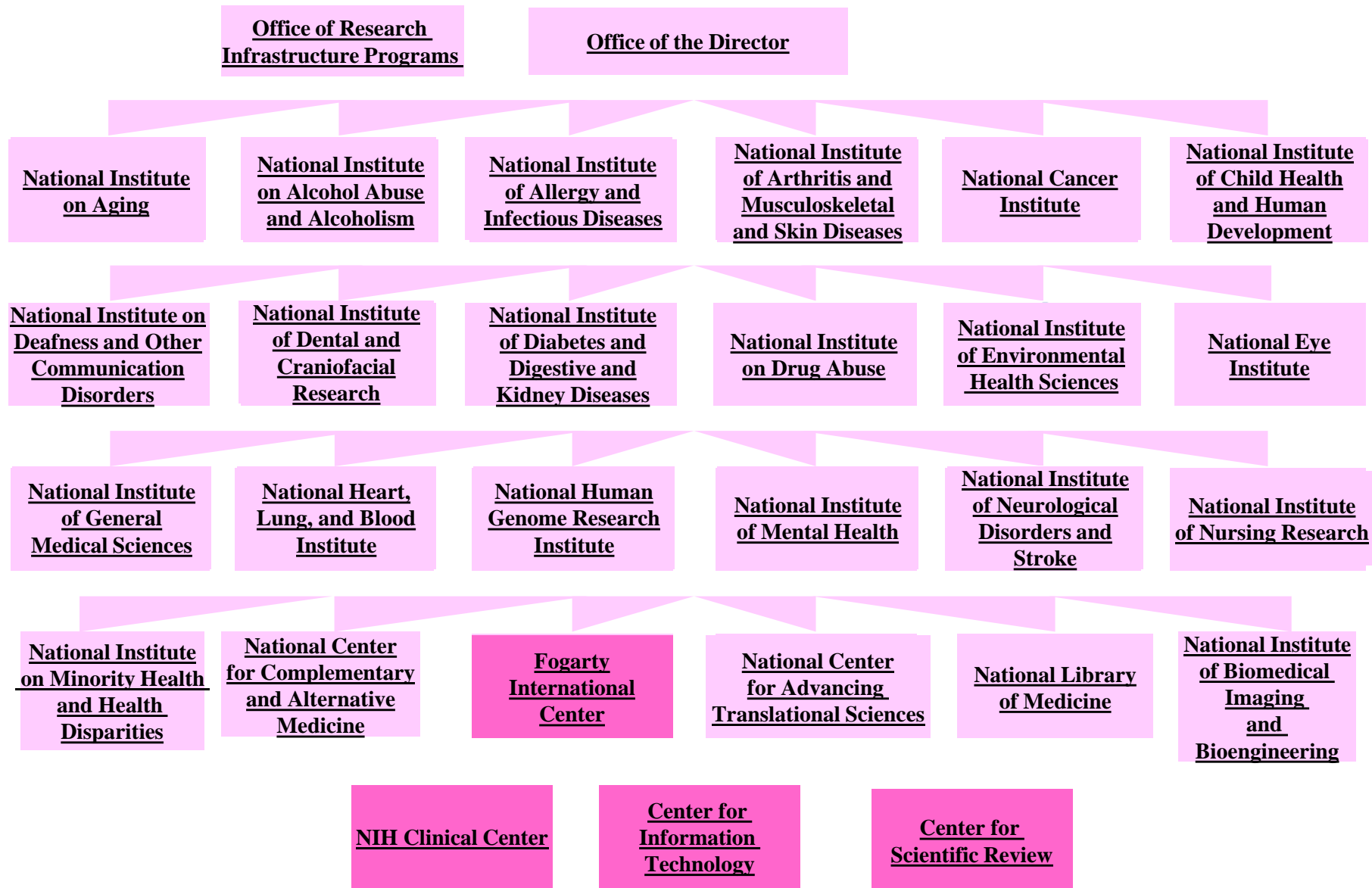
Discussion Summary

--- Group B

Cesar Bandera,
Jorge Fresneda Fernandez

Candidate (Seed) Research Notes & Topics

- NJIT (Lynn McVey) can introduce us to healthcare stakeholders
 - Providers, user communities, payers
- Assistive technology, information accessibility, e-commerce
 - Two-sided market: the (non-compliant) industry and the special needs community
 - Follow-on funding: National Institute on Aging
 - Expand to other areas (enter input disable)
- Data literacy
 - Making data impact widespread
- Mobile health
 - Exploiting data from IoT, wearables, Realtime preventive medicine
 - Follow-on funding: Most NIH Institutes, payers (wellness revenue models)
- Emergency response tools (merging with m-Health)
 - Situation awareness, just-in-time training, trustworthy telemetry



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Seed Grants

- The Institute invites proposals for seed grants that takes an inter-disciplinary approach to address a society challenge determined each year
- The timeline and level of support are the same as the seed grants from the Office of Research and Development

Seed Grants of Year One

- A Call-For-Proposals will be drafted based on the discussions at the retreat and distributed.
- Timeline:
 - FSG Proposal Due: September 5, 2018
 - Announcement of Awards: September 21, 2018
 - Period of Award: October 1, 2018– June 30, 2019

Closing Remarks

Fadi P. Deek

Provost and Senior Executive Vice President
Distinguished Professor

Thank You!

Look forward to working with you!