Randy K. Avent
NC State University

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EDUCATION

2005 **Greater Boston Executive Program**
MIT Sloan School of Management

1986 **Ph.D., Biomedical Mathematics and Engineering**
University of North Carolina, Chapel Hill

1986 **M.S., Electrical Engineering**
North Carolina State University

1984 **M.S., Biomedical Mathematics and Engineering**
University of North Carolina, Chapel Hill

1980 **B.S., Zoology**
University of North Carolina, Chapel Hill

WORK HISTORY

North Carolina State University
(2012-pres) Associate Vice Chancellor for Research Development
(2011-pres) Professor, Department of Computer Science
(2013-pres) Founding Director, Data Science Institute (in planning)

Synstreams, LLC
(2012-pres) Cofounder & CEO

Office of Secretary of Defense, Office of Basic Research
(2009-2011) Chief Scientist (IPA)

Massachusetts Institute of Technology, Lincoln Laboratory
(2006-2009) Associate Chief Technology Officer
(2002-2005) Founding Leader, Airborne Communications Laboratory
(1999-2002) Founding Leader, Advanced Decision Theory Laboratory
(1998-1999) Associate Leader, Adaptive Beamforming Laboratory
(1996-1998) Assistant Leader, Adaptive Beamforming Laboratory
(1990-1996) Principal Investigator, Real-time Discrimination Laboratory
(1986-1990) Research Scientist, Bistatic Scattering Phenomenology

BBN Technologies Inc.
(2005-2006) Vice President

Aventure Pharmaceutical Consulting
(1980-1983) Founder & CEO

EXPERIENCE

ADMINISTRATIVE LEADERSHIP

1. Current position is Associate Vice Chancellor of Research Development, where I am in the final stages of reorganizing along three themes: Opportunity Development, Infrastructure Development, and Proposal Development.

2. Opportunity Development focuses on identifying and preparing faculty for funding opportunities.
    a. Leading effort to increase faculty use of commercial packages to help find funding solicitations matched to their individual research interests.
    b. Created a new faculty-training program to help early career faculty improve grantsmanship skills, learn more about federal agencies by participating in panel discussions, and receive individual mentoring on a proposal of their choice.
    c. Creating a new faculty-training program focused on "Team Science" and building interdisciplinary research programs.
    d. Improving Limited Submission program through tighter integration with proposal development, proactive planning of cyclical large proposals, and a more strategic approach to internal competitions.
    e. Analyzing performance of current seed funding efforts and proposing new initiatives like travel funding and quick-turnaround seed funds.
    f. Formed a new charter for the standing University Research Committee to represent the faculty voice on research matters, and to vet and advise on emerging issues related to research. I often use the URC to find faculty "pain points" our office should be addressing and to communicate new initiatives to faculty.

3. Infrastructure Development is a new role for this office and focuses on improving the horizontal structures within the university like Centers and Institutes (C/Is), and Laboratories and Cost Centers.
    a. Increasing oversight of C/Is with the goal of reviewing all C/Is that have not been reviewed in the last five years. Also building instrumentation to track research funding and student education in each C/I, developing a plan to refresh our C/Is, and discussing new organizational structures around interdisciplinary C/Is and how F&A is returned to them.
    b. Rolling out new program to allow faculty to share equipment and vote on university investments in new equipment. Analyzing laboratory equipment and service cost centers to develop a plan to make them more sustainable and efficient.

4. Proposal Development helps faculty with all aspects of developing large interdisciplinary winning proposals. Our Proposal Development Unit (PDU) works only on proposals over $1M (FY12 average size was $8.75M) and has a hit rate approaching 50%.

a. Developing plan to grow the PDU impact by helping new faculty struggling to get their first grant through a mentoring program that includes three phases: planning, budgeting, and review using interns.
b. Improving the integration and alignment of the PDU with Colleges hiring internal proposal developers and Research Administrators.

5. Played various roles in several leadership programs:
    a. Participated in a Strategic Transformational Leadership Program for university administrators.
    b. Led leadership effectiveness training at MIT Lincoln Laboratory; helped create educational offsite to improve leadership, collaboration, interpersonal skills, and to promote cross-disciplinary interactions.
    c. Developed program to better equip emerging leaders for their new roles.
    d. Led internal committee that responded to leadership issues.
    e. Helped develop a nationally known outreach extension course for educating national security leaders in new and important technology areas.

6. Served in the Office of Basic Research in the Office of the Assistant Secretary of Defense for Research and Engineering (ASD(R&E)) through an Interagency Personnel Agreement (IPA) from MIT.
    a. Appointed as Chief Scientist and provided scientific oversight for research programs in the defense component offices (ONR, AFOSR, ARO, DTRA, and DARPA).
    b. Responsible for strategic planning and co-ordination with other federal research agencies like NSF, NIH, DoE, and NASA.
    c. Maintained awareness of the international research community to prevent "technology surprise".
    d. Acted as a liaison to universities and often interacted with congressional staff to discuss strategies and specific programs.

7. ASD(R&E) lead on an effort to review and grow the use and engagement with both Federally Funded Research and Development Centers (FFRDCs) and University-Affiliated Research Centers (UARCs).
    a. Developed new management plans and operating regimes for both types of these important national laboratories.
    b. Started an annual meeting to grow collaborations and discuss impediments to the efficient use of these important national laboratories.

8. Helped build a new Chief Technology Office for a $740M MIT laboratory focused on applied research and technology development.

9. Routinely tasked to lead new research groups in crucial technology areas deemed important to MIT.
    a. Built three laboratories in nine years, growing each to over 70 staff and ~ $20M in annual funding.
    b. Attracted twenty new researchers from top engineering universities. Inspired, motivated, developed, and mentored junior researchers and staff.

TECHNICAL LEADERSHIP

ANALYTIC SCIENCES

1. Recently won the largest research program ($60.75M) in the history of NC State University to build a government funded Laboratory for Analytic Sciences (LAS).
    a. Identified and built an interdisciplinary team consisting of faculty from seven different Colleges and three different universities.
    b. Led negotiations with industry partners to include SAS, IBM, Cisco, Signalscape, and Tigerswan. Overseeing issues related to subcontracts like IP policies, flow-downs, …
    c. Authored the final proposal to win both the construction and research contracts. Since then, won an administrative task order and built a strong administrative team.
    d. Overseeing construction of government facility on campus designed to grow translational research in analytics. The laboratory houses both government analysts and researchers, where they work hand-in-hand with faculty and industry to develop advanced analytics for national security applications.
    e. Worked with our Compliance and General Counsel office on several issues related to this facility including modifications to the existing research policy, application for an NC State Secure Facility Clearance, pre-publication review policy, and many others.
    f. As the Principal Investigator, led an FY13 research proposal that included eight research thrusts in analytic sciences. Made subawards from that proposal to 28 faculty members across eight Departments, two partner universities (Duke and UNC), and three industry partners. Award included both fully funded and seed funded efforts. Currently working on an FY14 plan.

2. Heavily involved in local leadership around "Big Data" and Analytics to include:
    a. Working with Greater Raleigh Convention and Visitors Bureau to develop an impactful event for Raleigh centered on Big Data.
    b. Helping NC Datapalooza, an open-data competition to build new applications and catalyze economic impact - judged first competition and am now part of the planning committee.
    c. Participate in, and often brief, the Triangle-Area Analytics Group, an association of Research Triangle Park companies in big data and analytics that regularly meets to discuss issues like recruiting, developing talent, and opportunities.
    d. Working with Duke and UNC to develop a consortium that combines the complementary strengths of each institution to strengthen the existing cluster economy in data science within Research Triangle Park.

3. Currently building a multi-departmental research Data Science Institute at NC State University.

a. Created and led an analytics working group to integrate departmental visions and efforts in analytics.
b. Held two major faculty events to increase collaborations, garner support, and develop a strategic plan to balance research opportunities with faculty talents.
c. New institute houses both fundamental research in formal methods and applied work in industry funded sectors (e.g., national security, health care, energy, education, and business). Institute will also devote a percentage of its budget and staff to help internal faculty struggling with large data sets in their research.
d. Developing new course in Data Science to be co-taught by Computer Science and Statistics.

4. Won an internal cluster hiring initiative through the Chancellor's Faculty Excellence Program.
    a. Chairing search to hire four senior faculty members in Data Science to strengthen our education and research programs in this important area.
    b. Hires include Discrete Math (Mathematics), Analytics (Statistics), Data Storage (Computer Science), and Machine Learning (Computer Science).

5. Developed an ASD(R&E)-led program in unstructured text mining to identify, learn, and highlight classified text in documents. This program addressed a presidential executive order in declassification research.

6. Worked with federal agencies (NSF, NIH, DoE, NASA, DNI) to coordinate investments in "Big Data" as part of a national program. Office of Science & Technology Policy (OSTP) initiated this effort, but I took the lead in visiting other agencies to develop mechanisms for coordination.

7. Developed and led a major multi-institutional program focused on "Data-to-Decisions". Identified this problem as a key strategic technology area for the ASD(R&E). Defined a six-year program aimed at developing crosscutting science and technology in this area. This program primarily focused on developing advanced analytics for unstructured spatial, spectral, temporal, and textual data sources.

CONVERGENCE (AKA "NEW BIOLOGY")

1. Developed concept for a jointly owned "Convergence Center" that combines medical and life sciences research at UNC Chapel Hill with physical and engineering sciences at NC State University.
    a. Highlighted need for this initiative by analyzing trends in: (a) MA, NJ, CA, and NC biotech industries; (b) Venture Capital funding; (c) emergence of new institutes dedicated to Convergence Sciences.
    b. Briefed this concept to senior leaders at several venues to gain support, e.g., NC Biotechnology Center, Research Triangle Foundation, RTI International, The Hamner Institute, UNC Partnership Council Meeting, NC State and UNC Vice Chancellors and Duke Vice Provost, and others.

c. Portions of this concept were incorporated into the most recent UNC General Administration Strategic Plan.

2. Concept being adopted by two efforts to renew and modernize Research Triangle Park:
    a. Continue to hold discussions with a non-profit institution planning to build new thrusts and facilities to catalyze convergence research in Computational Biology.
    b. Approached by Foundation Board Member to represent academic interests in building a new convergence facility that houses faculty from Duke, NC State, UNC, and local biotech industry.

3. Participated on National Academies Study on "Key Challenges in the Implementation of Convergence".

STRATEGIC INITIATIVES

1. Working with our Smarter Campus Partnership and Energy Councils to develop a sustainable plan and roadmap for growing a Smart Grid Testbed.
    a. Testbed includes a large solar array, storage, DC distribution network, and technology developed within our FREEDM NSF Engineering Research Center.
    b. Plan provides a translational path to bridge laboratory developments and commercial industry on a smaller scale at NC State's Centennial Campus.

2. Working with faculty to help advance several initiatives in advanced manufacturing:
    a. Invited by MIT to hold teaming discussions, developed a plan for how to work with them on several thrusts.
    b. Participated in joint Duke, NC State, UNC, Wake Forest, and RTI planning discussions on the National Network for Manufacturing Initiatives (NNMI).
    c. Supported faculty efforts to develop three proposals out of NC State for NNMI.

3. Participated in the National Academies of Engineering Grand Challenges Summit on "The New Engineering Frontier: Manufacturing for the Grand Challenges".

INTERDISCIPLINARY RESEARCH

1. Developed concept to bring together a team of social scientists from the School of Public and International Affairs and the Triangle Security Studies Institute with Computer Scientists conducting research in visual analytics, sentiment analysis, and geospatial analytics to do in-depth real-time analysis of current world events.

2. Responsible for growing interactions between MIT campus and Lincoln Laboratory through several formal and informal committees.
    a. Worked regularly with campus to identify joint research areas and build collaborations.
    b. Organized several venues, like offsites and seminars, aimed at increasing collaboration within the MIT community.
    c. Generated a new operating model based on translational research that integrated basic research with end-users.

INDUSTRY FUNDED RESEARCH

1. Helped build the Eastman Chemical Center of Excellence at NC State, which includes $10M in industry research funding across six years, an industrial partnership located on Centennial Campus, and outreach activities through a yearly gift.
    a. Helped negotiate Master Research Agreement and IP rights terms. Program was partially responsible for NC State re-engineering our licensing and IP policies to become more industry friendly.
    b. Developed operating approach and processes to fund both strategic research and emerging opportunities in chemistry, chemical engineering, materials, and forest biomaterials. Approach teams internal "Eastman Champions" with faculty to maximize translation from campus into Eastman products.
    c. Chair the Research Steering Team that oversees all efforts and policies resulting from this award.

2. Hired new staff and proposed development of an industry engagement strategy that grows our corporate research funding. Effort was later transitioned to our developing Partnership Office.

3. Regularly meet with potential industry teams that visit Centennial Campus to discuss partnership opportunities. In active discussions with teams from Aerospace, Analytics, Publishing, Information Technologies, Biotech, and others.

STRATEGIC PLANNING

1. Led strategic plan for growing defense research at NCSU that focused on three important trends in DoD: (a) lack of national security strategy drove increases in basic research; (b) agile threats require translational research programs with rapid developments; and (c) aging federal STEM workers increases need for workforce replacement programs.

2. Leading strategic plan for the Research Development Office to grow our support of faculty research. Plan sets four goals around: (a) strategic research advancement; (b) increasing interdisciplinary collaborations for solutions to grand challenges; (c) improving instrumentation and laboratory infrastructure; and (d) provide more services to aid faculty in finding and winning grants. Each goal consists of several objectives that each includes Action Items assigned to staff members.

3. Led a National Computer Science Research Initiative to identify key research grand challenges in computer science. Study was initiated to reinvigorate research in the computer sciences and outlined important research areas, key technical issues, support mechanisms, and policy issues surrounding computer science research. Two key initiatives were taken from this study for focused investments from ASD(R&E).

4. Developed a basic research strategy that balanced need-driven research objectives with opportunity-driven ones. The plan highlighted more than a dozen important S&T areas for focused defense investment and was used to help shape the ASD(R&E)'s DOD strategic technology investments.

5. Led a global technology study that examined research advances in leading international countries and identified critical areas where US technical advances were deteriorating. Developed a 10-year strategic plan that identified important future technology areas for MIT and Lincoln Laboratory and then realigned internal investments to stimulate innovation in these science and technology areas. Key pieces of the plan for Lincoln Laboratory centered on growing computer science research, with specific emphasis on computer network defense, and led to the creation of a new Division at LL. Plan also identified requirements for student core competencies and curriculums and developed an implementation roadmap.

6. Led a strategic committee that responded to critical issues surrounding the growth, administration, and fiscal management of MIT Lincoln Laboratory.

7. Developed a corporate strategic growth plan for BBN that expanded their core technologies (acoustics, speech, and signal processing) into new funding organizations: launched this expansion by generating four significant proposals in vital areas.

ENTREPRENEURSHIP

1. Teamed with Duke and UNC on an NSF I-Corps Node proposal to grow entrepreneurship programs within the Research Triangle Park.

2. Co-founded a small company (Synstreams, LLC) to transition select machine learning applications in behavioral analytics for mobile devices. Initial applications focus on detecting distracted driving and building an active authentication application.

3. Developed new program to stimulate patent production and technology transition at MIT/LL. Worked with the MIT Entrepreneurship Center and Communications Office to develop new approaches for transitioning technology to high-tech small businesses. Also worked with the MIT Technology Licensing Office to streamline internal processes and encourage patent applications.

4. Built a start-up consulting company in pharmaceutical engineering before returning to graduate school.

FISCAL MANAGEMENT

1. Helped manage annual internal research (seed funds) and infrastructure investments of $53.3M/year. Developed a basis for investing these funds built on acquiring specialized assets that secured long term funding for new research areas.

2. Took control of a struggling laboratory operating in the red and turned it into a success within two years by reducing cost, defining a vision, setting goals to achieve that vision, creating teams to focus on those goals, and providing technical oversight. I also reduced operating costs, implemented a number of initiatives to help researchers minimize administrative overhead, refocused the research agenda, and made stronger connections to the sponsoring community.

3. Created and managed program budgets and spending profiles for each group; raised funds, oversaw proposals, developed sponsor relationships, and administered all programs and personnel to comply with federal research guidelines.

POLICY

1. Lead the University Research Committee (URC) of faculty representatives from each College to discuss university policies and issues related to research. Led effort to streamline and update NC State's university Research Policy.

2. Worked on numerous policy issues while serving as the Chief Scientist in DoD that affected university operations including:
    a. Helped rewrite "troublesome clauses" policy to prevent publication restrictions on basic and applied research at universities. This new policy addressed flow-down clauses and mandated that each agency provide guidance on implementation.
    b. Reviewed research portfolios across the DoD enterprise to identify gaps and duplicative efforts.
    c. Worked on OMB Administrative caps, Murtha IDC limits, uniform Research Performance Progress Report (RPPR), …

3. Serve on the IEEE R&D Policy Committee that addresses numerous issues that affect STEM fields like:
    a. H1B Visa
    b. STEM Education
    c. Education mismatch between academia and industry
    d. R&D Tax Credit
    e. Export Control

RESEARCH EXPERIENCE (SELECT EXAMPLES)

1. Developed numerous superresolution approaches to improve image reconstruction for analytics - techniques resulted in a doubling in ROC performance and was responsible for turning a failed program into a transition success.

2. Pioneered many advances in Automatic Target Recognition (ATR) including vector-quantized templates, persistence-weighted classification, spatial and spectral fusion techniques. Also developed concepts for exploiting angular and frequency signatures to type scatterers and use that for improved classification.

3. Derived fundamental theory for image analytic performance bounds as a function of added domains; helped develop fundamental contrast ratio measurements. Used this work to identify the most important sensing parameters for future sensors. Also used this work to highlight new algorithmic approaches.

4. Pioneered innovative architecture for multi-sensor fusion that used multi-spectral data for foundation feature extraction and maximum likelihood classification for vehicles. Fusion was accomplished using a directed acyclic graph that incorporated contextual information. System was transitioned to an operational site and provided a high p_d, low false alarm rate approach for their operational requirements.

5. Made significant advances in building robust trackers for video and GMTI data. Led a program that pioneered the use of multi-aspect profiles of moving vehicles for identification. Developed new approaches to tracking that combined vehicle features with kinematics.

6. Developed additional key concepts in analytics for moving vehicles. Concept centered on detecting abnormal behaviors using a sampled system. Demonstrated their use and performance using Norfolk traffic data.

7. Developed new architectural approaches for building social networks from motion, image and factual data sources.

8. Analyzed interferometric and stereo SAR approaches for generating 3D images. Derived bounds for 3D image classification and developed several algorithms that used this information to provide more robust classification.

9. Developed game-theoretic approach for autonomous reasoning and learning.

10. Developed trend detection and prediction techniques for biomedical monitoring systems; created Markov population models for endangered plant species.

SERVICE

BOARD MEMBERSHIPS

2013	Advisory Board, UNC Applied Physical Sciences Program Chapel Hill, NC
2012	Board Member, Institute for Rare, Orphaned & Neglected Diseases (IRON) The Hamner Institute, Research Triangle Park, NC
2012	Board Member, Tigerswan, Inc. Apex, NC
2012	Advisory Board, UNC Kenan Planning Advisory Board Chapel Hill, NC
2011	Advisory Board, Center for Homeland Defense & Security (CHDS) Fayetteville State University, Fayetteville, NC

SEARCH COMMITTEES

2013	Chair, Search Committee for Associate Vice Chancellor of Sponsored Programs.
2012	Chair, Cluster Hire in Data-Driven Science to hire four senior faculty members in Discrete Mathematics, High Performance Data Storage, Analytics, and Machine Learning and Natural Language Processing.
2012	Member, Search Committee to hire senior Statistics faculty member in Forensic Sciences.
2012	Member, Search Committee for Deputy Director, Renaissance Computing Institute.

GENERAL COMMITTEES

2012	Member, Centennial Campus Visioning Committee
2012	Panel Chair, Biomedical Sensing, Innovations in Biomedical Materials
2011	Member, NC State Defense Network (DEFNET) Steering Group
2011	Development Committee, Southeastern Universities Research Association
2011	Member, UNC-GA Defense Applications Group (DAG)
2010	Member, IEEE-USA Research and Development Policy Committee
2010	Judge, IEEE Autonomous Robotics Speedway Competition
2009	Chair, IEEE Sensors Council, Eastern USA Member Chapter
2009	Member, Strategic Planning Committee for DoD STEM Education
2009	Member, National Security Science and Engineering Faculty Fellowship (NSSEFF) Selection Committee
2008	Appointed to MIT Interaction Committee
2006	Appointed to MIT Defense Core Advisory Committee

STUDY COMMITTEES

2009	Member, Defense Threat Reduction Agency (DTRA) Basic Research Review Panel
2009	Member, Air Force Office Scientific Research Review Panel
2009	Chair, National Computer Science Research Initiative
2008	Technical Chair, DDR&E Global Technology Study
2006	Member, Air Force Research Laboratory Oversight Committee
2005	Member, NGA Peer Review Panel
2005	Member, Non-imaging Infrared Study Committee
2004	Member, Decision Theory Study
2004	Co-chair, DARPA Cognitive Technology Panel
2003	Member, OSD Joint Decision Support Study Panel
2003	Member, Defense Science Board on Space Based Radar
2003	Co-chair, Integrated Sensing and Decision Support Conference
2003	Chair, Group Leaders Forum
2002	Technical Chair, Space Based Radar Summer Study
2002	Chair, Radar Data Processing Study Panel
2001	Member, MIT Management Effectiveness Committee
2001	Member, National Cruise Missile Defense Study Panel
2001	Member, Air Force Scientific Advisory Board on Time Critical Strike
2000	Chair, Joint Advisory Committee on Surveillance
2000	Member, National Air Defense Advisory Study
1999	Member, Army Science Board on Future Combat System
1998	Appointed to MIT Management Offsite Committee
1998	Member, SAR Exploitation Methodologies National Panel
1998	Appointed to Defense Technology Seminar Committee

CONTINUING EDUCATION

2009	Introduction to Defense Acquisition, DAU
2004	Negotiation for Senior Executives, Harvard University
2004	Dealing with Difficult People and Difficult Situations, Harvard University
2003	Developing a Successful Product and Technology Strategy, MIT
2002	Fundamentals of Finance for Technical Executives, MIT
2000	Project Management, MIT

AWARDS

2005	Distinguished Graduate of the Graduate School, University of North Carolina
1986	Governor's Fellowship Award, University of North Carolina
1984	Graduate Teaching Award, North Carolina State University

SOCIETY MEMBERSHIP

1. Institute of Electrical and Electronic Engineers, Senior Member
2. American Association for the Advancement of Science
3. National Industrial Defense Association

COMMUNITY SERVICE

2008	Facilitator, Communities for Restorative Justice
2008	Built furniture for needy family as part of ABC's Extreme Makeover, Home Edition
2007	Member, Committee to establish a C4RJ program in Acton, MA

SPONSORED GRANTS AND CONTRACTS

1. **Title:** LABORATORY FOR ANALYTIC SCIENCES
   Funding Agency: US Government
   PI: Randy Avent
   Amount: $60750K

2. **Title:** OPTICAL DATA FUSION
   Funding Agency: US Government
   PI: Randy Avent
   Amount: $4000K

3. **Title:** MULTI-SENSOR FUSION ON A MANIFOLD
   Funding Agency: US Government
   PI: Randy Avent, Keith Sisterson, Michael Toups
   Amount: $3200K

4. **Title:** DECISION SYSTEMS ON AIRBORNE PLATFORMS
   Funding Agency: Air Force (ESC)
   PI: Randy Avent, Joe Chapa
   Amount: $3062K

5. **Title:** GAME THEORETIC APPROACH TO UAV CONTROL
   Funding Agency: Congressional Line
   PI: Randy Avent, Dan Morales
   Amount: $50K

6. **Title:** COMPLEX ANALYSIS OF UNMANNED SURVEILLANCE SYSTEMS
   Funding Agency: Air Force

PI: Randy Avent, Al Bernard
Amount: $2860K

7. **Title:** SPACE BASED RADAR EXPLOITATION ANALYSIS
   Funding Agency: NGA
   PI: Randy Avent, Joe Chapa
   Amount: $1500K

8. **Title:** AIRBORNE COMMUNICATION MULTI-BAND PHASED ARRAYS
   Funding Agency: Air Force (ESC)
   PI: Randy Avent, Kevin Kelly, Edward Taylor
   Amount: $9750K

9. **Title:** PASSIVE RANGING FOR CONTACT MANAGEMENT
   Funding Agency: DARPA
   PI: Randy Avent
   Amount: $550K

10. **Title:** DYNAMIC PROBABILISTIC ANALYSIS FOR SURVEILLANCE ARCHITECTURES
    Funding Agency: DARPA
    PI: Randy Avent, Bob Atkins, Mike Shatz
    Amount: $1000K

11. **Title:** COGNITIVE DECISION THEORY PANEL
    Funding Agency: DARPA
    PI: Randy Avent
    Amount: $100K

12. **Title:** ATYPICAL BEHAVIOR DETECTION
    Funding Agency: Congressional Line
    PI: Randy Avent
    Amount: $85K

13. **Title:** MULTI-STATIC RADAR EXPLOITATION
    Funding Agency: DARPA
    PI: Randy Avent, Mark McClure
    Amount: $450K

14. **Title:** SYMBIOTIC CONTROL TECHNOLOGIES
    Funding Agency: DARPA
    PI: Randy Avent, Mark McClure
    Amount: $200K

15. **Title:** COMPUTER VISION FOR SEEKERS
    Funding Agency: Army Research Laboratory
    PI: Randy Avent, Bob Atkins, Brian Zuerndorfer
    Amount: $220K

16. **Title:** NON-COOPERATIVE MULTI-STATIC IMAGE RECONSTRUCTION
    Funding Agency: DARPA
    PI: Randy Avent, Mark McClure
    Amount: $250K

17. **Title:** PHENOMENOLOGY AND ALGORITHMS FOR RADAR-BASED DAMAGE INDICATION
    Funding Agency: DARPA
    PI: Randy Avent, Andy McKellips
    Amount: $500K

18. **Title:** 3D POLARIMETRIC ANALYSIS
    Funding Agency: DARPA
    PI: Randy Avent
    Amount: $45K

19. **Title:** SYMBIOTIC COMMUNICATIONS
    Funding Agency: DARPA
    PI: Randy Avent, Mark McClure
    Amount: $6000K

20. **Title:** GRAPH-THEORETIC MULTI-SENSOR FUSION
    Funding Agency: Congressional Line
    PI: Randy Avent, Keith Sisterson
    Amount: $3775K

21. **Title:** ADVANCED ISR MANAGEMENT
    Funding Agency: DARPA
    PI: Randy Avent
    Amount: $700K

22. **Title:** AUTOMATIC VERIFICATION FOR MOVING VEHICLES
    Funding Agency: DARPA
    PI: Randy Avent, Shawn Verbout, Ron Levin
    Amount: $300K

23. **Title:** MOVING TARGET AUTOMATIC RECOGNITION
    Funding Agency: DARPA
    PI: Randy Avent, Mark McClure, Ron Levin
    Amount: $2400K

    Title: TEMPLATE-BASED AUTOMATIC TARGET RECOGNITION
    Funding Agency: DARPA
    PI: Randy Avent, Jerry Benitz, Greg Owirka
    Amount: $800K

24. **Title:** RADAR COMPLEX DATA EXPLOITATION
    Funding Agency: DARPA
    PI: Randy Avent, Andy McKellips, Mark McClure

Amount: $1300K

25. **Title:** HIGH DEFINITION VECTOR IMAGING
    Funding Agency: US Government
    PI: Randy Avent, Jerry Benitz
    Amount: $700K

26. **Title:** COUNTER-SNIPER RADAR ARRAY
    Funding Agency: DARPA STTR with TSA
    PI: Randy Avent
    Amount: $264K

27. **Title:** HIGH-RESOLUTION, MULTI-POLARIZATION SAR PHENOMENOLOGY
    Funding Agency: US Government
    PI: Randy Avent
    Amount: $1000K

28. **Title:** FUNDAMENTAL AUTOMATIC TARGET RECOGNITION BOUNDS
    Funding Agency: Congressional Line
    PI: Randy Avent, Larry Horowitz, Gary Brendel
    Amount: $3345K

29. **Title:** WIRELESS INTRUSION DETECTION
    Funding Agency: US Government
    PI: Randy Avent
    Amount: $3140K

30. **Title:** INTERIOR IMAGING PHENOMENOLOGY
    Funding Agency: US Government
    PI: Randy Avent
    Amount: $800K

31. **Title:** BANDWIDTH EFFICIENT MODULATION
    Funding Agency: US Government
    PI: Ed Bucher, Randy Avent
    Amount: $4125K

32. **Title:** FOPEN COHERENT CHANGE DETECTION
    Funding Agency: DARPA
    PI: Serpil Ayasli, Randy Avent
    Amount: $285K

33. **Title:** FOPEN MOVING TARGET
    Funding Agency: DARPA
    PI: Serpil Ayasli, Bob Atkins, Randy Avent
    Amount: $1200K

34. **Title:** COLLABORATIVE EXPLOITATION

Funding Agency: NGA
PI: Allen Waxman, Randy Avent
Amount: $112K

35. **Title:** TERRAIN CHARACTERIZATION
Funding Agency: DARPA
PI: Serpil Ayasli, Keith Sisterson, Randy Avent
Amount: $1500K

36. **Title:** TARGETS UNDER TREES
Funding Agency: DARPA/AFRL
PI: Serpil Ayasli, Randy Avent
Amount: $930K

37. **Title:** AIRBORNE VEHICLE IDENTIFICATION
Funding Agency: Air Force (ESC)
PI: Bob Atkins, Randy Avent
Amount: $2790K

38. **Title:** RCS MODELING
Funding Agency: Navy
PI: Bob Atkins, Randy Avent
Amount: $3000K

39. **Title:** ADAPTIVE SEARCH AND CONTEXT EXPLOITATION
Funding Agency: AFOSR
PI: Allen Waxman, Randy Avent
Amount: $1100K

40. **Title:** PASSIVE UNDERWATER ACOUSTICS
Funding Agency: Navy
PI: Tom Green, Randy Avent
Amount: $3200K

41. **Title:** FUSED MULTI-SPECTRAL FEATURE EXTRACTION
Funding Agency: NGA
PI: Allen Waxman, Randy Avent
Amount: $700K

42. **Title:** 3D MULTI-SENSOR IMAGE FUSION AND DATA MINING
Funding Agency: US Government
PI: Allen Waxman, Randy Avent
Amount: $3230K

43. **Title:** DATA FUSION FOR NIGHT VISION
Funding Agency: DARPA
PI: Allen Waxman, Randy Avent
Amount: $1551K

44. **Title:** SENSOR ECCM
    Funding Agency: DARPA
    PI: Allen Waxman, Randy Avent
    Amount: $1637K

45. **Title:** FOLIAGE PENETRATION PHENOMENOLOGY
    Funding Agency: DARPA
    PI: Serpil Ayasli, Randy Avent
    Amount: $4800

46. **Title:** ADVANCED ANTENNA TECHNOLOGY
    Funding Agency: US Government
    PI: Irv Stiglitz, Randy Avent
    Amount: $7843

47. **Title:** SUPERRESOLUTION IMAGING
    Funding Agency: US Government
    PI: Jerry Benitz, Irv Stiglitz, Randy Avent
    Amount: $353K

RECENT INVITED & KEYNOTE TALKS

1. Avent, R., "NC State University Initiatives in "Big Data"", *Securboration Conference on Cyberdefense*, 2013.
2. Avent, R., "Analytics in Health Care", *Center for Personalized Health Care Annual Conference*, Ohio State University, 2013.
3. Avent, R., "Convergence of Life Sciences and Physical Sciences", *ASGSR Conference*, New Orleans, LA.
4. Avent, R., "Advanced Analytic Methods for Defense Applications", *Draper Laboratory Symposium on Analytics*, Cambridge, MA, 2013.
5. Avent, R., "Advanced Analytic Methods for Defense Applications", *Triangle Area Analytics Group*, 2012
6. Avent, R., "Basic Research in Nanotechnology", *Conference on Nanoelectronic Devices for Defense and Security*, 2009.
7. Avent, R., "Cross Conference Panel on Advanced Sensing and Data Analytics", *SPIE Defense Security and Sensing*, 2011.
8. Avent, R., "Trends in Defense Basic Research Funding", *2011 Engineering Research Annual Conference*, American Association for Engineering Education, 2011.
9. Avent, R., "Operations Research and Data Analytics in National Security", *INFORMS 2011 Northeastern Conference*, 2011.
10. Avent, R., "Data-to-Decisions", *68th Automatic Target Recognition Working Group on Activity-Based Intelligence Analysis*, 2011.

BIBLIOGRAPHY

A list of over 150 papers, technical reports, and talks is available upon request.