Upscaling the Defense Acquisition Workforce in Data Science and Data Use

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Presented to The National Academies of Sciences, Engineering and Medicine committee on *Improving Defense Acquisition Workforce Capability in Data Use*.

Prepared by

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Presenter's background and context.

Career Acquisition Officer
Defense acquisition workforce member, assigned on faculty at the Naval Postgraduate School (in an acquisition-coded billet).

Education
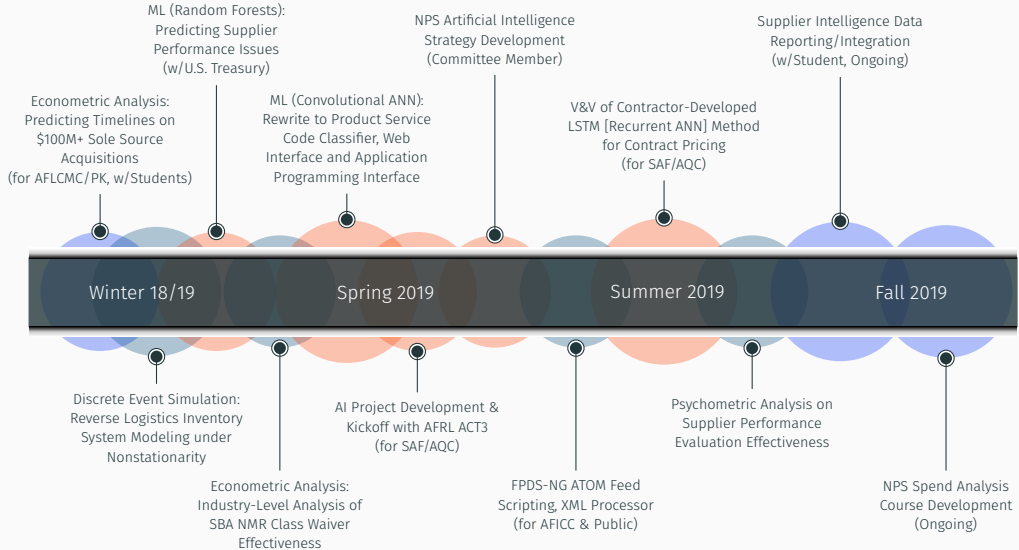|	
Ph.D., Logistics	Michigan State University
M.B.A., Enterprise Sourcing	Naval Postgraduate School
B.S., Economics	North Carolina State University

I am an active-duty U.S. Air Force Contracting Officer.

ML (Random Forests):
Predicting Supplier
Performance Issues
(w/U.S. Treasury)

NPS Artificial Intelligence
Strategy Development
(Committee Member)

Supplier Intelligence Data
Reporting/Integration
(w/Student, Ongoing)

Econometric Analysis:
Predicting Timelines on
$100M+ Sole Source
Acquisitions
(for AFLCMC/PK, w/Students)

ML (Convolutional ANN):
Rewrite to Product Service
Code Classifier, Web
Interface and Application
Programming Interface

V&V of Contractor-Developed
LSTM [Recurrent ANN] Method
for Contract Pricing
(for SAF/AQC)

| Winter 18/19 | Spring 2019 | Summer 2019 | Fall 2019 |

Discrete Event Simulation:
Reverse Logistics Inventory
System Modeling under
Nonstationarity

AI Project Development &
Kickoff with AFRL ACT3
(for SAF/AQC)

Psychometric Analysis on
Supplier Performance
Evaluation Effectiveness

Econometric Analysis:
Industry-Level Analysis of
SBA NMR Class Waiver
Effectiveness

FPDS-NG ATOM Feed
Scripting, XML Processor
(for AFICC & Public)

NPS Spend Analysis
Course Development
(Ongoing)

Environment, Objectives

Summary of the
2 0 1 8
National Defense Strategy
of
The United States of America

Sharpening the American Military's Competitive Edge
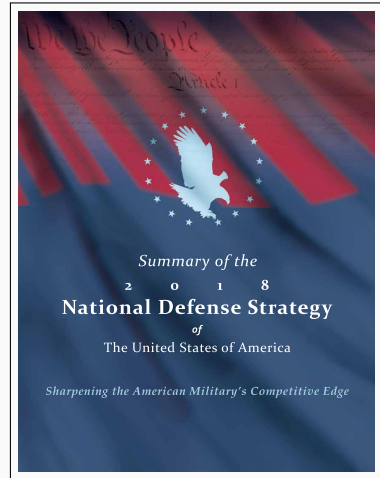
The Naval Postgraduate School (NPS) fulfills the graduate education needs of the Department of the Navy, Department of Defense, and U.S. Government.

- In-residence and distance learning
- Master's, Ph.D., Engineer, M.B.A., E.M.B.A., more
  - Biennial program reviews by flag-level DoD sponsors
  - Accreditations: WSCUC, AACSB, NASPAA, ABET
- Subspecialty and professional education
- Certificate Programs (incl. Data Science, Analytic Mgmt)
- Joint Professional Military Education (JPME)
- Non-Credit Offerings: Short Courses, Exec. Education

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The Naval Postgraduate School provides

relevant and unique advanced education and research programs to increase the combat effectiveness of commissioned officers

of the naval service to enhance the security of the United States.

In support of the foregoing and to sustain academic excellence, NPS will foster a program of relevant and meritorious thesis and research experiences for NPS students that informs the curricula, supports the needs of Navy and Department of Defense, and builds the intellectual capital of NPS faculty.

To support the core Navy mission, **NPS's programs are inherently joint, inter-agency, and international.**
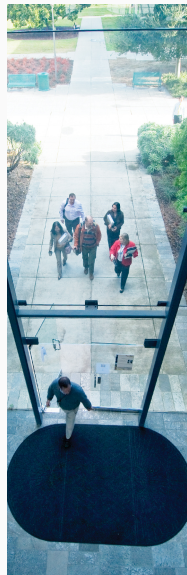
STRATEGIC PLAN
2018-2023

Domain	Action Areas	Theme 1: Emerging Fields	Theme 2: Interdisciplinary Programs	Theme 3: Institutional Effectiveness
Education Domain	Educational Improvement		🎓	🌐
	Operations Effectiveness			🌐
Human Domain	Innovation	⚛	🎓	
	Talent Management		🎓	🌐
	Ethics		🎓	
	Global Strategy	⚛	🎓	
Science & Technology Domain	Emerging Technologies	⚛	🎓	🌐
	Data Science	⚛	🎓	🌐
	Environment	⚛	🎓	
	Cyber Operations	⚛	🎓	

Thoughts on the task ahead.

SEC. 913. ESTABLISHMENT OF SET OF ACTIVITIES THAT USE DATA ANALYSIS,
           MEASUREMENT, AND OTHER EVALUATION-RELATED METHODS TO IMPROVE
           ACQUISITION PROGRAM OUTCOMES.

   (a) Establishment Required.--Not later than one year...

   (b) Types of Activities.--The set of activities established under
       subsection (a) may include any or all of the following: --

       (1) Establishment of data analytics capabilities and
           organizations within an Armed Force.

           ⋮   ⋮

       (9) Establishment of focused research and educational
           activities at the Defense Acquisition University, and
           appropriate private sector academic institutions, to
           support enhanced use of data management, data analytics,
           and other evaluation-related methods to improve
           acquisition outcomes.

Well, no. Instead, we need an acquisition workforce of

decision scientists

process experts

critical thinkers

business leaders

who can leverage data and data products (*e.g.*, data-based evidence) to improve the business of defense acquisition.

See, for a similar argument, Philip S. Anton, Megan McKernan, Ken Munson, James G. Kallimani, Alexis Levedahl, Irv Blickstein, Jeffrey A. Drezner, Sydne Newberry. 2019. *Assessing Department of Defense Use of Data Analytics and Enabling Data Management to Improve Acquisition Outcomes*. Santa Monica, CA: RAND. `doi:10.7249/RR3136`

Where do we stand on educational foundations & habits of mind?

Data foundations

- What is data?
- Types and formats
- Quality, validity, error
- Collection, storage and exchange
- Principles of data management

Analytic foundations

- What is an analysis?
- Descriptive, prescriptive, predictive
- Problems, opportunities, identifying need
- Effectively collaborating with data analysts, scientists, statisticians, researchers, etc.
- Integrating evidence into decision-making
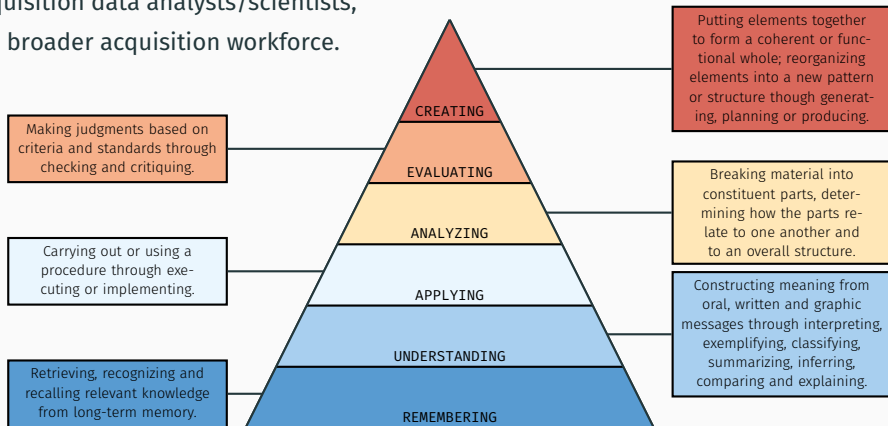
Modeling foundations

- What is a model?
- Applying models to defense acquisition
- Starting off right: assumptions, concepts, designs; documenting them
- Model validity, credibility, generalizability
- Verification, validation & accreditation (VV&A) of DoD models and simulations

Then, methodological exposure

- Spreadsheet-based analytics
- Dashboarding, plotting
- Inferential statistics
- Advanced techniques

For defense acquisition executives,
for acquisition data analysts/scientists,
for the broader acquisition workforce.

Putting elements together to form a coherent or functional whole; reorganizing elements into a new pattern or structure though generating, planning or producing.

CREATING

Making judgments based on criteria and standards through checking and critiquing.

EVALUATING

ANALYZING

Breaking material into constituent parts, determining how the parts relate to one another and to an overall structure.

Carrying out or using a procedure through executing or implementing.

APPLYING

UNDERSTANDING

Constructing meaning from oral, written and graphic messages through interpreting, exemplifying, classifying, summarizing, inferring, comparing and explaining.

Retrieving, recognizing and recalling relevant knowledge from long-term memory.

REMEMBERING

McQuire, S.Y., & McQuire, S. (2015). *Teach Students How to Learn*. Stylus: Sterling, VA.

Believe the hype: The defense acquisition workforce can do this

- In several places we already are doing this
  (see, for instance, SAF/AQC and Air Force B.I. advances)
- Strategy and vision matter ← so do resource investments

Recognize that acq. workforce's ability to capitalize on data requires:

- Access to compute resources
- Available, accessible and understandable data
- Culture ~ +information sharing, +autonomy, +leadership appetite,
              +entrepreneurship, -risk aversion, -rules-based thinking
- Good partnerships with industry, academia, FFRDCs, etc.

Thank you for your time.