

Satellite based EO/IR sensor

# Persistent ISR including Space

## Comments related to IFENG Study on Emerging Tech Impact to Japan's Security

James Bodner, November 2019

Aerodynamics Airframe Design for Gliding at High-Altitude

High Energy Laser

High Power Microwave

### EMS Domain

### Under Water Warfare

Behavioral Decision

Underwater communication

Vulnerability Inspection

Cyber resilience

### Cyber Defense

# Getting from Emerging to Employed

- Hard, complex constellation of topics
- Focus on technology & applications of mid-term relevance
  - AI, advanced computing, sensors, material science are foundational
  - These also are areas of Japanese strength
- Develop organizations and culture to effectively employ
- Address policy/ethical/legal factors from beginning and then ongoing
- International cooperation essential, and it does not just happen

**Mission applications are what matter.**

**Mid-Term: Near enough to shape. Far enough for real change.**

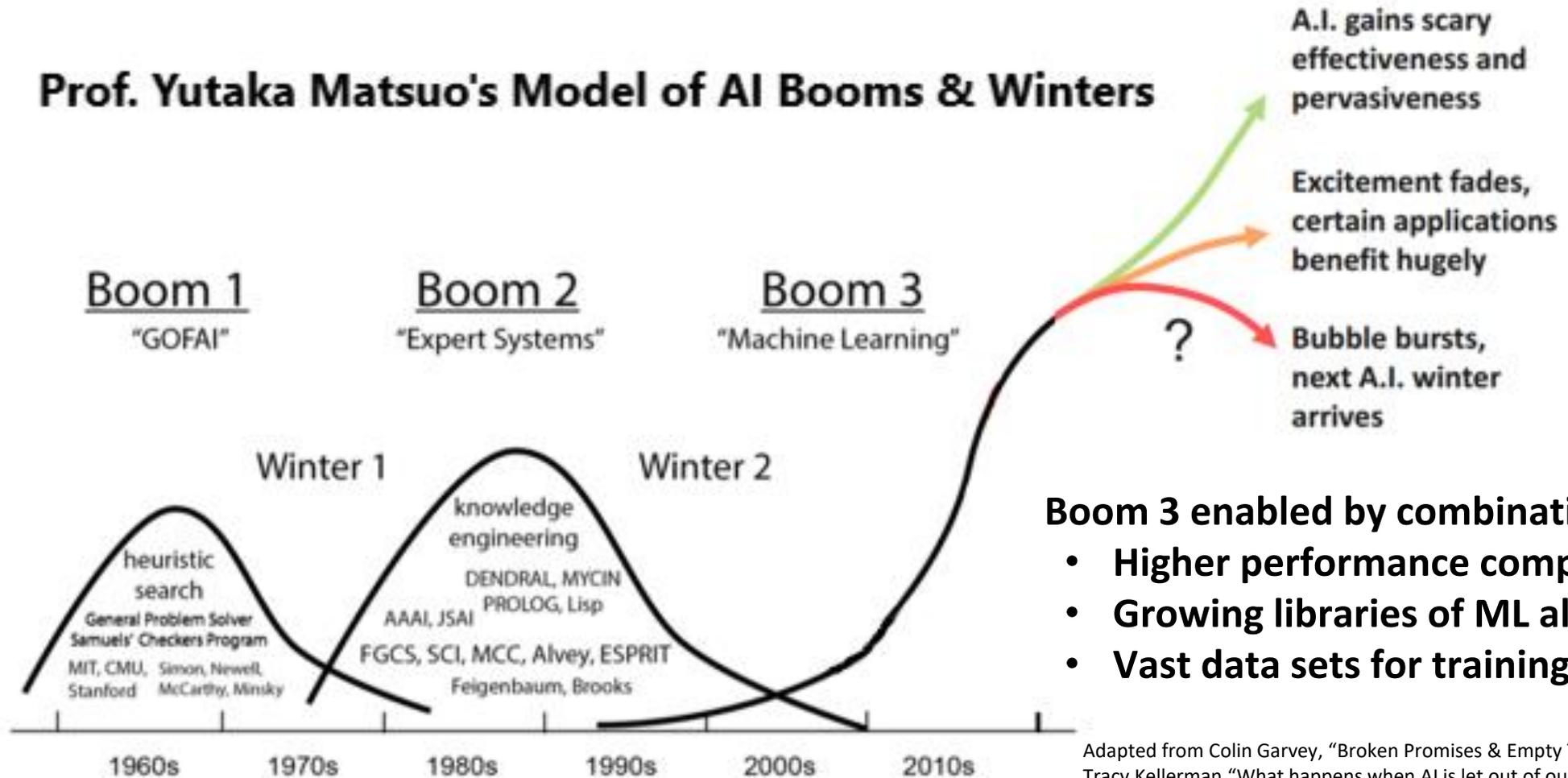
# Technologies Relevant to Capabilities

- AI
- Advanced Computing, classical & quantum
- Sensors and Machine Vision
- VR/AR/MR  XR
- High bandwidth, low-latency data comms local to global
- Materials science
- Power systems

**Integrate technologies into mission-relevant capabilities.**

# AI is not New (nor is the Hype) but 3<sup>rd</sup> Time Could be the Charm?

## Prof. Yutaka Matsuo's Model of AI Booms & Winters



# Capabilities Relevant to Missions

- Electro-Magnetic Spectrum Operations (EMSO)
  - EW/EMW operations; Spectrum Management, including dynamic access
- Hypersonics
- Directed energy systems
- Distributed, integrated ISR & effects/strike
  - Constellations of manned with (semi)autonomous unmanned systems
- Live, virtual, constructive training
  - Combined U.S.-Japan-X exercises, cyber ops training, Civ-Mil training
  - Integrated exercises spanning Indo-Pacific region

**Multi-domain operations for rapid action to control situation at specific place & time to further campaign objectives.**

# Develop Organizations & Culture to Employ

- Organizational Innovation
  - USAF 16th Air Force merges 24th Air Force (Cyber), 25th Air Force (ISR), and Air Force Weather Wing for multi-domain ops (cyber/IO, EW, ISR)
  - USAF 412th Test Wing's Emerging Technologies Combined Test Force
  - US Army Pacific Multi-Domain Task Force pilot to be permanent in 2020, another MDTF for Pacific to be activated in 2022
  - JASDF Space Domain Mission Unit – stand-up accelerated to JFY-2020
    - SSA, mission assurance, disrupt enemy C2 with joint operations capabilities
  - MOD Internal Bureau & Joint Staff Office standing up EMS departments
  - SDF Cyber Defense Grp  MOD Cyber Unit with active defense capability
- Exercise & Training Innovation
  - Advanced Naval Technology Exercises. ANTX West 2019: new tech for InfoWar, counter-ISR/targeting & strike was field tested for rapid acquisition
  - Multi-domain operations folded into Japan-US Orient Shield 19 (Sept 2019)

# Ethical, Policy & Legal Considerations

- Governments should establish AI principles, including in defense realm
  - U.S. National Security Commission on AI (Nov 2019):
    - “Defense and national security agencies must develop and deploy AI in a responsible, trusted, ethical manner.” “American way of AI must reflect American values – including having the rule of law at its core.”
  - Defense Innovation Bd “Recommendations on DoD Ethical AI Use” (Oct 2019)
  - Japan & U.S. increasingly outspoken on opposing authoritarian AI.
- Hypersonics could pose stability issues (especially nuclear armed)
- Commercial/Public/DIY Capabilities challenge Governmental Control
  - AI algorithms and applications are largely open source & readily available
  - “SIGINT for Anyone: Growing SIGINT in Public Domain” (RAND, 2017)
  - Commercial Satellite ELINT now on-orbit
- Foreign investment reviews widen to cover FDI accessing emerging tech