

Critical and emerging technologies (CETs) are a subset of advanced technologies that are potentially Significant to U.S. national security.

Two lists are below. The first contains a list of the broad areas of technology. Each identified CET area includes a set of key subfields that describe its scope in more detail, these are found on the second list. The full report from the Office of Science and Technology Policy which contains the CET list can be found [here](#).

List 1

Critical and Emerging Technologies List

The following critical and emerging technology areas are of particular importance to the national security of the United States:

- Advanced Computing
- Advanced Engineering Materials
- Advanced Gas Turbine Engine Technologies
- Advanced and Networked Sensing and Signature Management
- Advanced Manufacturing
- Artificial Intelligence
- Biotechnologies
- Clean Energy Generation and Storage
- Data Privacy, Data Security, and Cybersecurity Technologies
- Directed Energy
- Highly Automated, Autonomous, and Uncrewed Systems (UxS), and Robotics
- Human-Machine Interfaces
- Hypersonics
- Integrated Communication and Networking Technologies
- Positioning, Navigation, and Timing (PNT) Technologies
- Quantum Information and Enabling Technologies
- Semiconductors and Microelectronics
- Space Technologies and Systems

List 2

Critical and Emerging Technology Subfields

Each identified CET area includes a set of key subfields that describe its scope in more detail.

Advanced Computing

- Advanced supercomputing, including for AI applications
- Edge computing and devices
- Advanced cloud services
- High-performance data storage and data centers
- Advanced computing architectures
- Advanced modeling and simulation
- Data processing and analysis techniques

- Spatial computing

Advanced Engineering Materials

- Materials by design and material genomics
- Materials with novel properties to include substantial improvements to existing properties
- Novel and emerging techniques for material property characterization and lifecycle assessment

Advanced Gas Turbine Engine Technologies

- Aerospace, maritime, and industrial development and production technologies
- Full-authority digital engine control, hot-section manufacturing, and associated technologies

Advanced and Networked Sensing and Signature Management

- Payloads, sensors, and instruments
- Sensor processing and data fusion
- Adaptive optics
- Remote sensing of the Earth
- Geophysical sensing
- Signature management
- Detection and characterization of pathogens and of chemical, biological, radiological and nuclear weapons and materials
- Transportation-sector sensing
- Security-sector sensing
- Health-sector sensing
- Energy-sector sensing
- Manufacturing-sector sensing
- Building-sector sensing
- Environmental-sector sensing

Advanced Manufacturing

- Advanced additive manufacturing
- Advanced manufacturing technologies and techniques including those supporting clean, sustainable, and smart manufacturing, nanomanufacturing, lightweight metal manufacturing, and product and material recovery

Artificial Intelligence (AI)

- Machine learning
- Deep learning
- Reinforcement learning
- Sensory perception and recognition
- AI assurance and assessment techniques
- Foundation models
- Generative AI systems, multimodal and large language models
- Synthetic data approaches for training, tuning, and testing
- Planning, reasoning, and decision making
- Technologies for improving AI safety, trust, security, and responsible use

Biotechnologies

- Novel synthetic biology including nucleic acid, genome, epigenome, and protein synthesis and engineering, including design tools
- Multi-omics and other biometrology, bioinformatics, computational biology, predictive modeling, and analytical tools for functional phenotypes
- Engineering of sub-cellular, multicellular, and multi-scale systems
- Cell-free systems and technologies
- Engineering of viral and viral delivery systems
- Biotic/abiotic interfaces
- Biomanufacturing and bioprocessing technologies

Clean Energy Generation and Storage

- Renewable generation
- Renewable and sustainable chemistries, fuels, and feedstocks
- Nuclear energy systems
- Fusion energy
- Energy storage
- Electric and hybrid engines
- Batteries
- Grid integration technologies
- Energy-efficiency technologies
- Carbon management technologies

Data Privacy, Data Security, and Cybersecurity Technologies

- Distributed ledger technologies
- Digital assets
- Digital payment technologies
- Digital identity technologies, biometrics, and associated infrastructure
- Communications and network security
- Privacy-enhancing technologies
- Technologies for data fusion and improving data interoperability, privacy, and security
- Distributed confidential computing
- Computing supply chain security
- Security and privacy technologies in augmented reality/virtual reality

Directed Energy

- Lasers
- High-power microwaves
- Particle beams

Highly Automated, Autonomous, and Uncrewed Systems (UxS), and Robotics

- Surface
- Air
- Maritime
- Space
- Supporting digital infrastructure, including High Definition (HD) maps
- Autonomous command and control

Human-Machine Interfaces

- Augmented reality
- Virtual reality
- Human-machine teaming
- Neurotechnologies

Hypersonics

- Propulsion
- Aerodynamics and control
- Materials, structures, and manufacturing
- Detection, tracking, characterization, and defense
- Testing

Integrated Communication and Networking Technologies

- Radio-frequency (RF) and mixed-signal circuits, antennas, filters, and components
- Spectrum management and sensing technologies
- Future generation wireless networks
- Optical links and fiber technologies
- Terrestrial/undersea cables
- Satellite-based and stratospheric communications
- Delay-tolerant networking
- Mesh networks/infrastructure independent communication technologies
- Software-defined networking and radios
- Modern data exchange techniques
- Adaptive network controls
- Resilient and adaptive waveforms

Positioning, Navigation, and Timing (PNT) Technologies

- Diversified PNT-enabling technologies for users and systems in airborne, space-based, terrestrial, subterranean, and underwater settings
- Interference, jamming, and spoofing detection technologies, algorithms, analytics, and networked monitoring systems
- Disruption/denial-resisting and hardening technologies

Quantum Information and Enabling Technologies

- Quantum computing
- Materials, isotopes, and fabrication techniques for quantum devices
- Quantum sensing
- Quantum communications and networking
- Supporting systems

Semiconductors and Microelectronics

- Design and electronic design automation tools
- Manufacturing process technologies and manufacturing equipment
- Beyond complementary metal-oxide-semiconductor (CMOS) technology
- Heterogeneous integration and advanced packaging
- Specialized/tailored hardware components for artificial intelligence, natural and hostile radiation environments, RF and optical components, high-power devices, and other critical applications
- Novel materials for advanced microelectronics
- Microelectromechanical systems (MEMS) and Nanoelectromechanical systems (NEMS)
- Novel architectures for non-Von Neumann computing

Space Technologies and Systems

- In-space servicing, assembly, and manufacturing as well as enabling technologies
- Technology enablers for cost-effective on-demand, and reusable space launch systems
- Technologies that enable access to and use of cislunar space and/or novel orbits
- Sensors and data analysis tools for space-based observations
- Space propulsion
- Advanced space vehicle power generation
- Novel space vehicle thermal management
- Crewed spaceflight enablers
- Resilient and path-diverse space communication systems, networks, and ground stations
- Space launch, range, and safety technologies