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Recent trends and Strategic Implications of IEEE AISC International AI Standardization

Five Impact Areas, Five Differences: Why Open, First-Principles Standards Matter for Future AI Infrastructure and Ecosystems

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ICT Standards and Intellectual Property:
Shaping the Physical AI

주최 과학기술정보통신부 지식재산처 주관 국립전파연구원 TTA IITP KEA kista ETRI

C/AISC at a glance

IEEE Computer Society Artificial Intelligence Standards Committee

Scope	Standardization efforts for all AI-related works in the IEEE Computer Society
Established	2020; one of the fastest-growing standards committees in IEEE; 60+ active working groups
Collaboration	Government agencies, international organizations and other standards development organizations
Portfolio	70+ PARs/projects across six tiers; five strategic impact areas
Officers	Chair Dr. Richard Tong · Vice-chair Dr. Jeanine DeFalco · Secretary Amy Jiang · Program Manager Christy Bahn, IEEE

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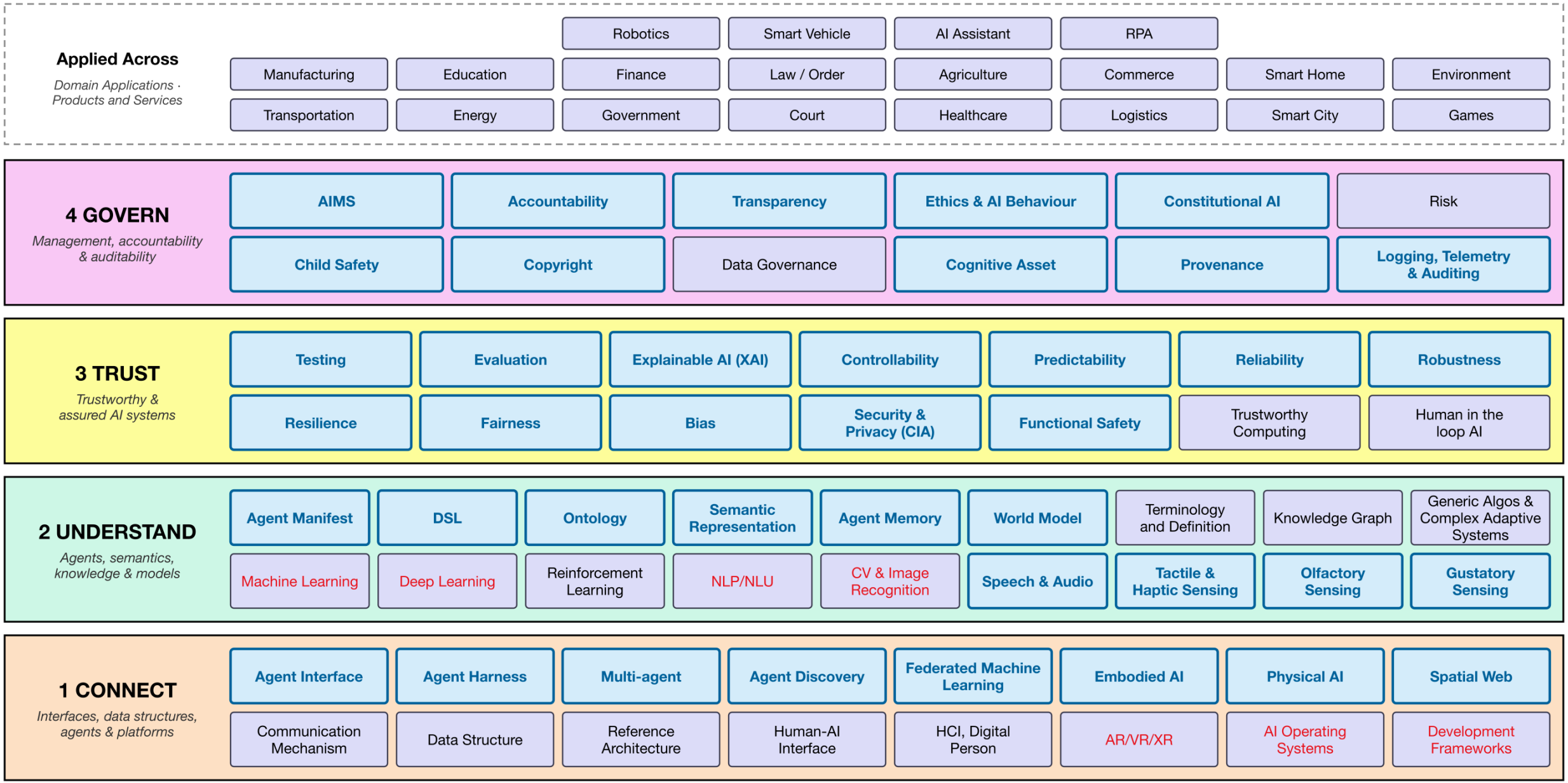
AISC vision: open infrastructure and trust

Interoperability and policy standards across the AI ecosystem

Vision	Seamless ecosystem integration, governance leadership and adaptive standards for future AI, including AGI
Policy thread	Cognitive sovereignty, transparency, open ecosystem; first-principled risk, safety, trustworthiness; constitutional and human-centered AI
Interoperability thread	AI systems across sectors and architectures work together, from applications to foundational architectures for ML, generative AI, LLMs and agents
Anchors	Policy: P3396, P3395, P2861 · Interoperability: P2874, P3394, P3417, P2961
Unique advantages	Technical expertise, global position and industry advocacy across academia and industry

Standards are products: adoption, independent implementations, trust and measurable return.

AREAS OF AI STANDARDIZATION



New focus area Priority area

IEEE ARTIFICIAL INTELLIGENCE STANDARDS COMMITTEE

PAR pipeline

Representative 2026 pipeline (statuses reflect source quarterly inventory)

Approved (12)

P7804 Agentic food waste management in schools
P3998 Time series data records, Part 1
P4501 Physical AI in manufacturing
P4502 Physical AI for smart mandibular devices
P3933 AI agents for materials research
P3936 Audio large language models
P3942 Smart power data query
P3952 Large models in logistics supply chain
P3971 Scientific agent interoperability
P3931 Agent discovery and registry
P4152 Data quality for mineral exploration
P4154 Edge model deployment APIs

NesCom review, September (8)

P4135 Multimodal data annotation, power grid
P4165 Evaluation of agriculture LLMs
P4166 Data for agriculture LLMs
P4167 AI datasets, rail transit equipment
P4110 Photovoltaic power large models
P4182 Federated ML in trusted data space
P4211 Lifecycle governance of generative AI
P4213 Observability of AI systems

October agenda (2)

P4126 Evaluation of AI world models
P7032 Conversational AI safety

Statuses per the 9 September 2026 PARs and standards report. A PAR is a project, not a published standard.

Six tiers: four levels of standardization utility

Levels of utility, not sequential stages

Application verticals
Manufacturing · Healthcare · Education · Finance · Transportation · Government

Govern · Level 4
Rights · Ownership · Control · Accountability · Oversight

Trust · Level 3
Risk · Safety · Evaluation · Assurance · Responsibility

Understand · Level 2
Ontologies · Knowledge · Semantics · World Models

Interoperate · Level 1
Interfaces · Protocols · Identity · Session Models

Foundational technologies
Machine Learning · Foundation Models · Generative AI · Data · Compute · Edge

Four questions an ecosystem must answer

What is the system?
Concepts, semantics, world models

How does it operate?
Interfaces, protocols, sessions

What consequences does it create?
Risk, safety, evaluation

Who controls and verifies it?
Governance, rights, assurance

Presenter's framework; levels are of utility, not sequential stages.

PAR portfolio mapped to the six tiers

82 PARs and projects; bold blue marks key PARs for the five impact areas

Application verticals 27 PARs	P3348 P3350 P3354 P3374 P3398 P3410 P3423 P3428 P3484 P3378.6 P3378.7 P3481 P3482 P3489 P3507 P7804 **P4501** **P4502** P3933 P3942 P3952 P4152 P4135 P4165 P4166 P4167 P4110
Govern · Level 4 10 PARs	**P2863** P3376 P7018 **P3395** P3462 **P7999** **P7999.1** **P7999.2** P4211 **P7032**
Trust · Level 3 13 PARs	**P3396** **P3511** P3128 P3157 P3198 **P3338** P3378 P3419 P3417 **P3445** **P4213** **P4126** **P4182**
Understand · Level 2 7 PARs	**2807.6** P3123 P3426 P3429 P3430 P3514 P7015
Interoperate · Level 1 9 PARs	**P3394** **P3931** **P3971** **P4154** P2874 P3110 P3427 P3447 P3458
Foundational technologies 16 PARs	P2961 P3127 P3142 P3181 P3193 P3347 P3342 P3375 P3379 P3549 P3540 P3488 P3497 P3403 P3998 P3936

Placement is a first pass by title, to be corrected by working group chairs. PARs are projects in development.

Global AI standards landscape

Complementary roles: international consensus, guidance, regulation and implementation

ISO/IEC SC 42	Terminology (22989), AIMS (42001), risk (23894), impact (42005): international consensus
NIST	AI RMF and agent standards initiatives: voluntary risk guidance
EU AI Act	Risk-based legal duties and conformity assessment: legally binding
Industry	MCP (tools/context) and A2A (agent tasks): deployed protocols
IEEE C/AISC	Engineering standards across interfaces, trust, safety and governance

IEEE differentiates through testable technical contracts, not by replacing ISO, NIST, EU law or industry protocols. Montreal outcomes not reflected.

Five strategic impact areas and differences

Established PARs anchor an agenda; proposed extensions are not yet approved standards

Impact area	Tiers	Key PARs	Proposed difference
1 Agentic AI	Connect / Understand	P3394; P3931; P3971	MCP/A2A comparison: semantic, session and governance contracts (proposed)
2 Physical AI / world models	Understand / Trust	P4501; P4502; P4126	Cross-vendor world-model representations, exchange and evaluation (proposed)
3 Human–AI combined agency	Trust / Govern	P3396; P3511; P4213	Explicit combined-system consequence and responsibility assessment (proposed)
4 Cognitive assets	Govern	P3445; P3338; P4182 (adjacent)	Provenance, rights, portability and cognitive sovereignty (proposed)
5 Independent assurance	Trust / Govern	P3395; P4213 (adjacent)	Safeguards plus reproducible evidence and independent assessment (proposed)

Selection and placement are proposals for chairs to confirm.

Area 1 | Agentic AI interoperability

P3394: beyond compatibility of messages and tool calls

MCP	Tools, resources, prompts and context
A2A	Agent collaboration, discovery, messaging, tasks and artifacts
P3394 direction	Semantic contract, session continuity and accountability across channels
Caution	Neither MCP nor A2A should be caricatured as lacking security or tasks
Proposed difference	Ontology-aware semantics, lifecycle continuity and neutral governance across protocols

Fundamental question: can agents share meaning, authority, execution state and evidence, not only messages?

P3394 | Reference interoperability contract

Proposed engineering profile layered with, not replacing, existing protocols

Illustration	A procurement agent calls enterprise data through MCP and delegates supplier verification via A2A
Shared meaning	Agent manifest, ontology/capabilities and typed intent
Session + authority	Identity, permissions, delegation and task continuity
Evidence	Traceable outcomes and conformance tests
Profile carries	Supplier ontology, permissions, context, cross-agent session ID, audit evidence

Open implementations should validate interoperability across models, vendors and runtimes. Separate current PAR scope from design proposals.

Area 2 | Physical AI and world models

Beyond isolated domain models and AI terminology

Applied Physical AI	P4501 (manufacturing) and P4502 (smart mandibular devices)
World-model evaluation	P4126, on the October NesCom agenda
Established terminology	ISO/IEC 22989: foundational AI terminology, not a universal world-model protocol
Proposed gap	Exchangeable environment representations and action semantics
Proposed outputs	Representation · Exchange · Validation (prediction fidelity, generalization, physical safety)

Fundamental question: can embodied systems exchange an actionable understanding of reality?

World models | An interoperability agenda

Build on physical AI use cases, without claiming approved general-purpose formats

Example	Two robots from different vendors share a manufacturing scene
Must agree on	Coordinate frames, object identities, dynamic state, permissible actions, uncertainty, safety constraints
Data model	Objects, dynamics, uncertainty and provenance
Protocol	Synchronize observations, constraints and state
Testing	Cross-vendor compatibility and safe action outcomes

Proposed work: world-model representation profile, exchange protocol, evaluation profile and physical-agent interfaces.

Area 3 | Human–AI combined unit of agency

P3396: consequences arise from operational configurations

Effective unit	A human with many AI agents, tools and permissions inside an organization
Already covered	NIST AI RMF, ISO/IEC 42001/42005 and the EU AI Act already consider context, human factors and impacts
Proposed difference	Explicit system boundary and measurable combined human–agent consequences
Assess	Capability and access · Consequences (benefits, harms, cascades, affected parties) · Responsibility
Responsibility	Developer, deployer, operator and human oversight

U = (Human, Agents, Tools/Authority, Environment, Governance): a proposed analytical construct.

P3396 | Comparison of risk frameworks

Complementing existing frameworks with an explicit human–AI unit

Framework	Established focus	Already covers	Proposed IEEE difference	Measurement
NIST AI RMF	Govern / Map / Measure / Manage	Context, human roles, impacts	Combined-unit boundary and agency	Outcomes / interventions
ISO 42001 / 42005	AIMS and AI impact assessment	Organizational controls and impacts	Dynamic multi-agent configuration	Before / after deployment
EU AI Act	Legal risk and conformity duties	Provider/deployer obligations	Operational consequence profile	Evidence by use scenario

Comparison is additive: current frameworks already address context and human oversight; this proposed P3396 profile makes combined agency explicit.

Area 4 | Cognitive assets and sovereignty

Beyond privacy, model weights and technical distillation

Reusable assets	Knowledge, ontologies, memories, skills, verified workflows and experience
Legal position	Privacy, IP, contracts and trade-secret law address different rights; no universal ownership arises solely from labeling an asset cognitive
Identity + lineage	Trace origin, derivation, validation and contribution
Rights + control	Machine-readable use permissions and custody
Portability	Move skills, memory and knowledge across platforms

Proposed governance: provenance, contribution, permitted use, portable representations, responsibility. Proposed study-group scope.

Distillation, privacy and cognitive rights

Different technical and legal questions must not be conflated

First-principles distinction

Distillation is a technical learning process. Privacy regulates personal information; copyright, trade secrets and contracts govern different interests. Cognitive-asset standards could describe origin, authority, transformations, permissions and portability without purporting to create new legal rights.

The adoption loop

1 Originate
Human expertise, data sources and existing model contributions

2 Transform
Fine-tuning, inference, distillation, workflows and learning

3 Validate
Evidence of accuracy, lineage, licenses and authorization

4 Transfer
Portable manifests, usage policies and accountable deployment

A technical standards opportunity: cognitive assets need traceable identity, governance and portability.

Area 5 | P3395 and independent assurance

Beyond provider self-evaluation: proportional verification across the deployment lifecycle

Provider evaluation	Internal testing and safeguards are essential but may present conflicts of interest and limited external reproducibility
IEEE P3395	PAR addresses safeguards, controls and preventive techniques for AI models; independent certification is not its existing mandate
Independent evidence	Proposed: reproducible test records, assessor competence, external benchmarking, independence when consequence warrants
Runtime assurance	Proposed: telemetry, control effectiveness, incident records, reassessment, accountable deployment decisions

Proposals are not P3395 requirements; assurance proportional to consequence.

Open, first-principles standards for human–AI intelligence

Five impact areas → five differences → one open, trustworthy and adaptive AI ecosystem

Agentic AI	Shared meaning, authority, state and evidence, beyond messages
Physical AI	Exchangeable world models, beyond definitions
Combined agency	Consequences of human–AI configurations, beyond model-centric risk
Cognitive assets	Provenance, rights and portability, beyond privacy and distillation
Assurance	Independent, proportional evidence, beyond self-evaluation