ACAT2027

5 March 2027 - 10 March 2027

Tokyo City University

Scientific Programme

ACAT 2027 will feature a dynamic scientific program centered around plenary sessions, parallel tracks & poster sessions. It is designed to encourage exchange across disciplines and foster in-person interaction between communities working at the intersection of physics, computing, and artificial intelligence.

Main Program

Parallel Track 1: Computing Technology for Physics Research

This track covers enabling technologies that shape how physics research and data analysis are performed, from software ecosystems to large-scale computing infrastructures.

Software: language interoperability; software design, sustainability, and quality; analysis libraries, frameworks, and tools

Computing Architectures & Models: distributed and parallel computing; programming models; heterogeneous architectures (GPUs, ASICs, FPGAs, HPC systems); floating-point and numerical models; hardware abstraction layers; online and trigger-level computing; emerging paradigms such as quantum computing

Data Technologies: high-throughput data transfer; networking; storage systems; data formats, compression, and I/O optimization

Simulation & Visualization: detector and accelerator simulations (full and fast); visualization methods; event displays; interactive and immersive analysis environments

Parallel Track 2: Data Analysis — Algorithms and Tools

This track focuses on innovative algorithms, analysis strategies, and software tools that enable extracting physics results from increasingly complex datasets.

Machine Learning: neural network architectures; training strategies; hyperparameter optimization; efficient deployment and inference

Differentiable Programming: end-to-end optimization, differentiable simulations, and analysis pipelines

Statistical Methods & Inference Tools: statistical modeling, uncertainty estimation, hypothesis testing, and global analysis frameworks

Novel Reconstruction & Pattern-Recognition Algorithms: advanced tracking, clustering, and object reconstruction methods

Parallel Track 3: Computational Methods for Physics Research

This track addresses computational techniques and algorithmic advances in theoretical particle physics, astrophysics, and cosmology, ranging from precision calculations and symbolic methods to gravitational-wave techniques and large-scale numerical simulations of astrophysical and cosmological systems.

Automated Computational Systems: symbolic and numerical frameworks from amplitudes to event generators; multidimensional integration techniques; automated computational pipelines; high-precision numerical algorithms

Higher-Order and Precision Calculations: multi-loop computations; higher-order corrections; resummation; matching fixed-order calculations to parton showers; precision phenomenology

Computer Algebra and Symbolic Methods: symbolic computation techniques; algebraic reduction; automated manipulation of theoretical models and complex mathematical expressions

Computational Particle and Nuclear Theory: numerical simulations; lattice and continuum methods; many-body calculations; phenomenological simulations; algorithmic developments for theoretical studies

Computational Astrophysics, Cosmology, and Gravitational-Wave Techniques: numerical relativity; gravitational-wave modeling and computational techniques; cosmological and large-scale structure simulations; compact-object modeling; gravitational and plasma dynamics; multi-messenger astrophysics

Large-Scale Simulation and Numerical Methods: scalable numerical solvers; adaptive and multiscale methods; particle- and grid-based simulations; surrogate and reduced-order models; GPU and HPC acceleration

Nobel Symposium

Mini-Symposium #1

Mini-Symposium #2

Mini-Symposium #3

Mini-Symposium #4