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What is a manifold?

13 Calabi Yau Manifolds~~Calabi-Yau Manifold~~ ~~3D Stereogram of a Calabi-Yau Manifold~~ Hidden Dimensions: Exploring Hyperspace *Calabi-Yau Manifold*

David Morrison: Calabi–Yau manifolds, Mirror Symmetry, and F-theory - Part I

FilmCow Tutorials: How to Draw a Calabi-Yau Manifold~~Brief history of Calabi-Yau manifold related to string theory~~ Birational Calabi-Yau manifolds have the same small quantum products - Mark McLean *David Morrison: Calabi–Yau manifolds, Mirror Symmetry, and F-theory - Part II* **Canonical coordinates for Calabi Yau manifolds I - Sean Keel** ~~Geometry and Arithmetic of Calabi-Yau Manifolds by Philip Candelas FRS~~ ~~Equivariant geometry and Calabi-Yau manifolds - Daniel Halpern-Leistner~~ ~~Calabi-Yau Manifold Crystal~~ ~~Calabi-yau manifold~~

Shing-Tung Yau \u0026 Steve Nadis - String Theory and the Universes's Hidden Dimensions**A Grand Tour of the Universe That Will Make You Look at Reality in a Completely Different Way Diamox - Calabi-Yau Manifold** Kyoto Univ. \"Moduli of Calabi-Yau manifolds and mirror symmetry\" Atsushi Kanazawa **Calabi Yau Manifolds And Related**
In algebraic geometry, a Calabi–Yau manifold, also known as a Calabi–Yau space, is a particular type of manifold which has properties, such as Ricci flatness, yielding applications in theoretical physics. Particularly in superstring theory, the extra dimensions of spacetime are sometimes conjectured to take the form of a 6-dimensional Calabi–Yau manifold, which led to the idea of mirror symmetry. Their name was coined by Candelas et al. (1985), after Eugenio Calabi (1954, 1957) who ...

Calabi–Yau manifold - Wikipedia
Calabi-Yau Manifolds and Related Geometries Lectures at a Summer School in Nordfjordeid, Norway, June 2001

Calabi-Yau Manifolds and Related Geometries | SpringerLink
The second studies Calabi-Yau manifolds and mirror symmetry, using algebraic geometry. The final part describes compact hyperkahler manifolds, which have a geometric structure very closely related to Calabi-Yau manifolds. The book is an introduction to a very active field of research, on the boundary between mathematics and physics.

Calabi-Yau Manifolds and Related Geometries: "Lectures At ...
Gross, Mark, Daniel Huybrechts, and Dominic Joyce. 2003. Calabi-Yau Manifolds and Related Geometries. Edited by Geir Ellingsrud, Loren Olson, Kristian Ranestad, and Stein A. Strømme. Springer. Copy Chicago Style Tweet. Print. Access Document. Publisher copy: 10.1007/978-3-642-19004-9 ...

Calabi-Yau manifolds and related geometries - ORA - Oxford ...
This book is an excellent introduction to current research in the geometry of Calabi-Yau manifolds, hyper-Kähler manifolds, exceptional holonomy and mirror symmetry.

Calabi-Yau Manifolds and Related Geometries - Lectures at ...
Calabi-Yau Manifolds and Related Geometries: Lectures at a Summer School in Nordfjordeid, Norway, June 2001: Authors: Mark Gross, Daniel Huybrechts, Dominic Joyce: Editors: Geir Ellingsrud, Loren...

Calabi-Yau Manifolds and Related Geometries: Lectures at a ...
'Calabi-Yau manifolds and related geometries', by Mark Gross, Daniel Huybrechts and Dominic Joyce There are many texts concerning the aspects of mirror symmetry having to do with variations of Hodge structure and counting curves, but only difficult research articles about the more recent geometry of mirror symmetry having to do with D-branes, homological mirror symmetry and torus fibrations.

Review of 'Calabi-Yau manifolds and related geometries'
Moore (2007) has shown that Calabi-Yau manifolds with complex structure located at an attractor fixed point on the moduli space exhibit interesting arithmetic properties. Calabi-Yau Manifolds in Physics. Calabi-Yau manifolds admit Kähler metrics with vanishing Ricci curvatures. They are solutions of the Einstein field equation with no matter. The theory of motions of loops inside a Calabi-Yau manifold provide a model of a conformal field theory.

Calabi-Yau manifold - Scholarpedia
One benefit of the Calabi-Yau manifolds was that the geometry of the folded dimensions gives rise to different types of observable particles in our universe. If the Calabi-Yau shape has three holes (or rather higher-dimensional analogs of holes), three families of particles will be predicted by the Standard Model of particle physics.

String Theory and Calabi-Yau Manifolds - dummies
In particular, a Calabi-Yau (CY) manifold ia a (compact) Ka¨hler manifold with vanishingRicci curvature and so a vacuum solutionof the Einsteinequations. They have a prominent role in superstringtheory and have been a central focus in bothcontemporary mathematicsand math- ematical physics.

Calabi-Yau Manifolds, Hermitian Yang-Mills Instantons and ...
The second studies Calabi-Yau manifolds and mirror symmetry, using algebraic geometry. The final part describes compact hyperkahler manifolds, which have a geometric structure very closely related to Calabi-Yau manifolds.

Calabi-Yau Manifolds and Related Geometries | Mark Gross ...
The goal was to introduce the students to some of the basic geometry of Calabi-Yau manifolds and lead into mirror symmetry.

Calabi—Yau Manifolds and Mirror Symmetry | SpringerLink
Calabi-Yau Manifolds and Related Geometries Softcover reprint of the original 1st ed. 2003 Edition by Mark Gross (Author), Daniel Huybrechts (Author), Dominic Joyce (Author), 4.5 out of 5 stars 2 ratings ISBN-13: 978-3540440598

Calabi-Yau Manifolds and Related Geometries: Gross, Mark ...
Calabi-Yau manifold. The coupling to the standard E,-algebra-valued flux-loop operator, as well as an analogous E,-invariant operator, is argued to be related to certain Yukawa couplings. A vacuum expectation value of the latter operator is shown to give masses to

Flux-lines through Calabi-Yau manifolds and related couplings
As special classes of compact complex manifolds, Calabi-Yaus and Fanos admit some features that make them easier to study than other classes. Calabi-Yaus satisfy a particularly strong PDE that Ric = 0, the Ricci tensor of a metric vanishes.

How are Calabi-Yau manifolds and Fano manifolds related ...
Yau's so-lution of the Calabi conjecture [22] produces a unique Calabi-Yau metric in each K ahler class on a compact K ahler manifold Xwith vanishing rst Chern class. These metrics have local holonomy group contained in SU(n). They are fundamental objects in geometry. Yau's original construction is based on solving a fully nonlinear complex

Collapsing of Calabi-Yau metrics and degeneration of ...
Calabi-Yau Manifolds and Related Geometries: Lectures at a Summer School in Nordfjordeid, Norway, June 2001: Ellingsrud, Geir, Olson, Loren, Ranestad, Kristian ...

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Buy Calabi-Yau Manifolds and Related Geometries by Geir Ellingsrud, Mark Gross from Waterstones today! Click and Collect from your local Waterstones or get FREE UK delivery on orders over £20.

This is an introduction to a very active field of research, on the boundary between mathematics and physics. It is aimed at graduate students and researchers in geometry and string theory. Proofs or sketches are given for many important results. From the reviews: "An excellent introduction to current research in the geometry of Calabi-Yau manifolds, hyper-Kähler manifolds, exceptional holonomy and mirror symmetry....This is an excellent and useful book." --MATHEMATICAL REVIEWS

Calabi-Yau spaces are complex spaces with a vanishing first Chern class, or equivalently, with trivial canonical bundle (canonical class). They are used to construct possibly realistic (super)string models and are thus being studied vigorously in the recent physics literature.In the main part of the Book, collected and reviewed are relevant results on (1) several major techniques of constructing such spaces and (2) computation of physically relevant quantities such as massless field spectra and their Yukawa interactions. Issues of (3) stringy corrections and (4) moduli space and its geometry are still in the stage of rapid and continuing development, whence there is more emphasis on open problems here. Also is included a preliminary discussion of the conjectured universal moduli space and related open problems. Finally, several detailed models and sample computations are included throughout the Book to exemplify the techniques and the general discussion.The Book also contains a Lexicon (28 pages) of 150 assorted terms, key-words and main results and theorems, well suited for a handy reference. Although cross-referenced with the main part of the Book, the Lexicon can also be used independently.The level of mathematics is guided and developed between that of the popular Physics Reports of Eguchi, Gilkey and Hanson and the book Superstrings (Vol. 2) by Green, Schwarz and Witten on one end and Principles of Algebraic Geometry of Griffiths and Harris on the other.This is the first systematic exposition in book form of the material on Calabi-Yau spaces, related mathematics and the physics application, otherwise scattered through research articles in journals and conference proceedings.

Can artificial intelligence learn mathematics? The question is at the heart of this original monograph bringing together theoretical physics, modern geometry, and data science. The study of Calabi–Yau manifolds lies at an exciting intersection between physics and mathematics. Recently, there has been much activity in applying machine learning to solve otherwise intractable problems, to conjecture new formulae, or to understand the underlying structure of mathematics. In this book, insights from string and quantum field theory are combined with powerful techniques from complex and algebraic geometry, then translated into algorithms with the ultimate aim of deriving new information about Calabi–Yau manifolds. While the motivation comes from mathematical physics, the techniques are purely mathematical and the theme is that of explicit calculations. The reader is guided through the theory and provided with explicit computer code in standard software such as SageMath, Python and Mathematica to gain hands-on experience in applications of artificial intelligence to geometry. Driven by data and written in an informal style, The Calabi–Yau Landscape makes cutting-edge topics in mathematical physics, geometry and machine learning readily accessible to graduate students and beyond. The overriding ambition is to introduce some modern mathematics to the physicist, some modern physics to the mathematician, and machine learning to both.

String theory says we live in a ten-dimensional universe, but that only four are accessible to our everyday senses. According to theorists, the missing six are curled up in bizarre structures known as Calabi-Yau manifolds. In The Shape of Inner Space, Shing-Tung Yau, the man who mathematically proved that these manifolds exist, argues that not only is geometry fundamental to string theory, it is also fundamental to the very nature of our universe. Time and again, where Yau has gone, physics has followed. Now for the first time, readers will follow Yau's penetrating thinking on where we've been, and where mathematics will take us next. A fascinating exploration of a world we are only just beginning to grasp, The Shape of Inner Space will change the way we consider the universe on both its grandest and smallest scales.

The main subject of this book is the connection between Calabi-Yau threefolds and modular forms. The book presents the general theory and brings together the known results. It studies hundreds of new examples of rigid and non-rigid modular Calabi-Yau threefolds and correspondences between them. Conjectures about the possible levels of modular forms connected with Calabi-Yau threefolds are presented. Tables of newforms of weight four and large levels are compiled and included in the appendix.

Covering an exciting and active area of research at the crossroads of several different fields in mathematics and physics, and drawing on the author's previous work, this text has been written to explain the advanced mathematics involved simply and clearly to graduate students in both disciplines.

This is a combination of a graduate textbook on Riemannian holonomy groups, and a research monograph on compact manifolds with the exceptional holonomy groups G2 and Spin (7). It is the first book on compact manifolds with exceptional holonomy, and contains much new research material and many new examples.

The main goal of this book is the construction of families of Calabi-Yau 3-manifolds with dense sets of complex multiplication fibers. The new families are determined by combining and generalizing two methods. Firstly, the method of E. Viehweg and K. Zuo, who have constructed a deformation of the Fermat quintic with a dense set of CM fibers by a tower of cyclic coverings. Using this method, new families of K3 surfaces with dense sets of CM fibers and involutions are obtained. Secondly, the construction method of the Borcea-Voisin mirror family, which in the case of the author's examples yields families of Calabi-Yau 3-manifolds with dense sets of CM fibers, is also utilized. Moreover fibers with complex multiplication of these new families are also determined. This book was written for young mathematicians, physicists and also for experts who are interested in complex multiplication and varieties with complex multiplication. The reader is introduced to generic Mumford-Tate groups and Shimura data, which are among the main tools used here. The generic Mumford-Tate groups of families of cyclic covers of the projective line are computed for a broad range of examples.

This book, one of the first on G2 manifolds in decades, collects introductory lectures and survey articles largely based on talks given at a workshop held at the Fields Institute in August 2017, as part of the major thematic program on geometric analysis. It provides an accessible introduction to various aspects of the geometry of G2 manifolds, including the construction of examples, as well as the intimate relations with calibrated geometry, Yang-Mills gauge theory, and geometric flows. It also features the inclusion of a survey on the new topological and analytic invariants of G2 manifolds that have been recently discovered. The first half of the book, consisting of several introductory lectures, is aimed at experienced graduate students or early career researchers in geometry and topology who wish to familiarize themselves with this burgeoning field. The second half, consisting of numerous survey articles, is intended to be useful to both beginners and experts in the field.

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