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Proposal: Quality in the Open Scholarly Communication of Latin America

Juan Pablo Alperin, Gustavo Fischman, John Willinsky

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A Brief Study of Open Source Graph Databases

- Robert McColl, David Ediger, Jason Poovey, Dan Campbell, David A. Bader

With the proliferation of large irregular sparse relational datasets, new storage and analysis platforms have arisen to fill gaps in performance and capability left by conventional approaches built on traditional database technologies and query languages. Many of these platforms apply graph structures and analysis techniques to enable users to ingest, update, query and compute on the topological structure of these relationships represented as set(s) of edges between set(s) of vertices. To store and process Facebook-scale datasets, they must be able to support data sources with billions of edges, update rates of millions of updates per second, and complex analysis kernels. These platforms must provide intuitive interfaces that enable graph experts and novice programmers to write implementations of common graph algorithms. In this paper, we explore a variety of graph analysis and storage platforms. We compare their capabilities, interfaces, and performance by implementing and computing a set of real-world graph algorithms on synthetic graphs with up to 256 million edges. In the spirit of full disclosure, several authors are affiliated with the development of STINGER.

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Towards an optical potential for rare-earths through coupled channels

G. P. A. Nobre, F. S. Dietrich, M. Herman, A. Palumbo, S. Hoblit, D. Brown

The coupled-channel theory is a natural way of treating nonelastic channels, in particular those arising from collective excitations, defined by nuclear deformations. Proper treatment of such excitations is often essential to the accurate description of reaction experimental data. Previous works have applied different models to specific nuclei with the purpose of determining angular-integrated cross sections. In this work, we present an extensive study of the effects of collective couplings and nuclear deformations on integrated cross sections as well as on angular distributions in a consistent manner for neutron-induced reactions on nuclei in the rare-earth region. This specific subset of the nuclide chart was chosen precisely because of a clear static deformation pattern. We analyze the convergence of the coupled-channel calculations regarding the number of states being explicitly coupled. Inspired by the work done by Dietrich \emph{et al.}, a model for deforming the spherical Koning-Delaroche optical potential as function of quadrupole and hexadecupole deformations is also proposed. We demonstrate that the obtained results of calculations for total, elastic and inelastic cross sections, as well as elastic and inelastic angular distributions correspond to a remarkably good agreement with experimental data for scattering energies above around a few MeV.

Cite as: arXiv:1311.1735 [nucl-th]
(or arXiv:1311.1735v1 [nucl-th] for this version)

3+1 dimensional viscous hydrodynamics at high baryon densities

Iu. Karpenko, M. Bleicher, P. Huovinen, H. Petersen

We apply a 3+1D viscous hydrodynamic + cascade model to the heavy ion collision reactions with $\sqrt{sNN}=6.3…39$ GeV. To accommodate the model for a given collision energy range, the initial conditions for hydrodynamic phase are taken from UrQMD, and the equation of state at finite baryon density is based on Chiral model coupled to the Polyakov loop.
We study the collision energy dependence of pion and kaon rapidity distributions and mT-spectra, as well as charged hadron elliptic flow and how shear viscosity affects them. The model calculations are compared to the data for Pb-Pb collisions at CERN SPS, as well as for Au-Au collisions in the Beam Energy Scan (BES) program energies at BNL RHIC. The data favours the value of shear viscosity $\eta/s\gtrsim 0.2$ for this collision energy range.

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Polytropic process and tropical Cyclones

Alejandro Romanelli, Italo Bove, Juan Rodríguez

We show a parallelism between the expansion and compression of the atmosphere in the secondary cycle of a tropical cyclone with the fast expansion and compression of wet air in a bottle. We present a simple model in order to understand how the system (cyclone) draws energy from the air humidity. In particular we suggest that the upward (downward) expansion (compression) of the warm (cold) moist (dry) air follows a polytropic process, $PV\beta$= constant. We show both experimentally and analytically that β depends on the initial vapor pressure in the air. We propose that the adiabatic stages in the Carnot-cycle model for the tropical cyclone be replaced by two polytropic stages. These polytropic processes can explain how the wind wins energy and how the rain and the dry bands are produced inside the storm.

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Heat flux scaling in turbulent Rayleigh-Bénard convection with an imposed longitudinal wind

Andrea Scagliarini, Armann Gylfason, Federico Toschi

We present a numerical study of Rayleigh-B\'enard convection disturbed by a longitudinal wind. Our results show that under the action of the wind, the vertical heat flux through the cell initially decreases, due to the mechanism of plumes-sweeping, and then increases again when turbulent forced convection dominates over the buoyancy. As a result, the Nusselt number is a non-monotonic function of the shear Reynolds number. We provide a simple model that captures with good accuracy all the dynamical regimes observed. We expect that our findings can lead the way to a more fundamental understanding of the of the complex interplay between mean-wind and plumes ejection in the Rayleigh-B\'enard phenomenology.

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Search for Natural SUSY with inclusive search strategies at the LHC using the CMS detector

Sezen Sekmen

Natural SUSY suggests the existence of light stop quarks, accessible at the LHC, which are the focus of a dedicated CMS search program. I present two inclusive CMS searches that look for TeV scale colored sparticles in final states with jets, b-tagged jets and missing transverse energy performed using up to 19.4fb-1 of 8TeV LHC proton-proton data. No deviation from the Standard Model was observed in these searches, and the implications for this was shown for several simplified model scenarios and phenomenological MSSM.

Cite as: arXiv:1311.1847 [hep-ex]
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Transverse Target Spin asymmetries in exclusive ρ0 muoproduction

Katharina Schmidt

Generalized Parton Distributions (GPDs) provide a dynamical picture of the nucleon. The exclusive production of $\rho 0$ mesons on a transversely polarised target is sensitive to the nucleon helicity-flip GPDs E which are related to the total angular momentum of quarks and gluons. In 2007 and 2010 the COMPASS experiment at CERN collected data by scattering a 160 GeV/c muon beam off a transversely polarised $NH3$ target. The final state particles were detected with the two-stage spectrometer with high resolution tracking. In this talk new results for the azimuthal asymmetries AUT and ALT are presented.

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A precise measurement of the W-boson mass with the Collider Detector at Fermilab

T. Aaltonen, S. Amerio, D. Amidei, A. Anastassov, A. Annovi, J. Antos, G. Apollinari, J.A. Appel, T. Arisawa, A. Artikov, J. Asaadi, W. Ashmanskas, B. Auerbach, A. Aurisano, F. Azfar, W. Badgett, T. Bae, A. Barbaro-Galtieri, V.E. Barnes, B.A. Barnett, J. Guimaraes da Costa, P. Barria, P. Bartos, M. Bauce, F. Bedeschi, D. Beecher, S. Behari, G. Bellettini, J. Bellinger, D. Benjamin, A. Beretvas, A. Bhatti, I. Bizjak, K.R. Bland, B. Blumenfeld, A. Bocci, A. Bodek, D. Bortoletto, J. Boudreau, A. Boveia, L. Brigliadori, C. Bromberg, E. Brucken, J. Budagov, H.S. Budd, K. Burkett, G. Busetto, P. Bussey, P. Butti, A. Buzatu, A. Calamba, S. Camarda, M. Campanelli, F. Canelli, B. Carls, D. Carlsmith, R. Carosi, S. Carrillo, B. Casal, M. Casarsa, A. Castro, P. Catastini, D. Cauz, V. Cavaliere, M. Cavalli-Sforza, et al.

We present a measurement of the W-boson mass, MW, using data corresponding to 2.2/fb of integrated luminosity collected in ppbar collisions at $s\sqrt{}$ = 1.96 TeV with the CDF II detector at the Fermilab Tevatron. The selected sample of 470126 $W\rightarrow e\nu$ candidates and 624708 $W\rightarrow\mu\nu$ candidates yields the measurement $MW=80387\pm12$ (stat) ±15 (syst)$=80387\pm19$ MeV/$c2$. This is the most precise single measurement of the W-boson mass to date.

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Polynomial solutions for a class of second-order linear differential equations

Nasser Saad, Richard L. Hall, Victoria A. Trenton

We analyze the polynomial solutions of the linear differential equation $p2(x)y''$ $+p1(x)y'+p0(x)y=0$ where $pj(x)$ is a jth-degree polynomial. We discuss all the possible polynomial solutions and their dependence on the parameters of the polynomials $pj(x)$. Special cases are related to known differential equations of mathematical physics. Classes of new soluble problems are exhibited. General results are obtained for weight functions and orthogonality relations.

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Plan for VLBI observations of close approaches of Jupiter to compact extragalactic radio sources in 2014-2016

Anastassia Girdiuk, Oleg Titov

Very Long Baseline Interferometry is capable of measuring the gravitational delay caused by the Sun and planet gravitational fields. The post-Newtonian parameter γ is now estimated with accuracy of $\sigma\gamma=2\cdot10-4$ using a global set of VLBI data from 1979 to present (Lambert, Gontier, 2009), and $\sigma\gamma=2\cdot10-5$ by the Cassini spacecraft (Bertotti et. al, 2003). Unfortunately, VLBI observations in S- and X-bands very close to the Solar limb (less than 2-3 degrees) are not possible due to the strong turbulence in the Solar corona. Instead, the close approach of big planets to the line of sight of the reference quasars could be also used for testing of the general relativity theory with VLBI. Jupiter is the most appropriate among the big planets due to its large mass and relatively fast apparent motion across the celestial sphere. Six close approaches of Jupiter with quasars in 2014-2016 were found using the DE405/LE405 ephemerides, including one occultation in 2016. We have formed tables of visibility for all six events for VLBI radio telescopes participating in regular IVS programs. Expected magnitudes of the relativistic effects to be measured during these events are discussed in this paper.

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Semiclassical quantization of classical field theories

Alberto S. Cattaneo, Pavel Mnev, Nicolai Reshetikhin

These lectures are an introduction to formal semiclassical quantization of classical field theory. First we develop the Hamiltonian formalism for classical field theories on space time with boundary. It does not have to be a cylinder as in the usual Hamiltonian framework. Then we outline formal semiclassical quantization in the finite dimensional case. Towards the end we give an example of such a quantization in the case of Abelian Chern-Simons theory.

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Rota-Baxter operators on sl(2,C) and solutions of the classical Yang-Baxter equation

Jun Pei, Chengming Bai, Li Guo

We explicitly determine all Rota-Baxter operators (of weight zero) on $sl(2,C)$ under the Cartan-Weyl basis. For the skew-symmetric operators, we give the corresponding skew-symmetric solutions of the classical Yang-Baxter equation in $sl(2,C)$, confirming the related study by Semenov-Tian-Shansky. In general, these Rota-Baxter operators give a family of solutions of the classical Yang-Baxter equation in the 6-dimensional Lie algebra $sl(2,C)\ltimes \mathrm{ad}^*sl(2,C)^*$. They also give rise to 3-dimensional pre-Lie algebras which in turn yield solutions of the classical Yang-Baxter equation in other 6-dimensional Lie algebras.

Cite as: arXiv:1311.0612 [math-ph]
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The Population of Giant Clumps in Simulated High-z Galaxies: In-situ and Ex-situ, Migration and Survival

Nir Mandelker, Avishai Dekel, Daniel Ceverino, Dylan Tweed, Christopher E Moody, Joel Primack

We study the properties of giant clumps and their radial gradients in high-z disc galaxies using AMR cosmological simulations. Our sample consists of 770 snapshots in the redshift range z=4-1 from 29 galaxies that at z=2 span the stellar mass range $(0.2-3)\times 10^{11} M_\odot$. Extended gas discs exist in 83% of the snapshots. Clumps are identified by gas density in 3D and their stellar and dark matter components are considered thereafter. While most of the overdensities are diffuse and elongated, 91% of their mass and 83% of their star-fromation rate (SFR) are in compact round clumps. Nearly all galaxies have a central, massive bulge clump, while 70% of the discs show off-center clumps, 3-4 per galaxy. The fraction of clumpy discs peaks at intermediate disc masses. Clumps are divided based on dark-matter content into in-situ and ex-situ, originating from violent disc instability (VDI) and minor mergers respectively. 60% of the discs are in a VDI phase showing off-center in-situ clumps, which contribute 1-7% of the disc mass and 5-45% of its SFR. The in-situ clumps constitute 75% of the off-center clumps in terms of number and SFR but only half the mass, each clump

containing on average 1% of the disc mass and 6% of its SFR. The in-situ clumps have young stellar ages, 100-400 Myr, and high specific SFR (sSFR), 1-10 Gyr^{-1}. They exhibit certain gradients resulting from inward clump migration, where the inner clumps are somewhat more massive and older, with lower gas fraction and sSFR and higher metallicity. Similar observed gradients indicate that the clumps survive outflows. The ex-situ clumps have stellar ages 0.5-3 Gyr and sSFR 0.1-2 Gyr^{-1}, and they exhibit weaker gradients. Massive clumps of old stars at large radii are most likely ex-situ mergers, though half of them share the disc rotation.

Cite as: arXiv:1311.0013 [astro-ph.CO]
(or arXiv:1311.0013v1 [astro-ph.CO] for this version)

Abstraction and the Standard Model

Subhajit Ganguly

Description:

We study the Standard Model in light of the Zero-Postulation of the Theory of Abstraction. Yukawa Coupling, chiral superfields, the SUSY model, Interacting Boson Models (IBMs), Clebsch-Gordan coefficients, Interacting Boson-Fermion Model (IBFM), etc., are some of the concepts that we study in this paper. Non-commutative geometry seems to come very handy in describing the quantum world. Bosons and fermions both seem to be governed by the rules of such geometry. The principle of conservation of boson number inside a system is seen to follow directly from the Abstraction Model. The IBMs are seen to obey the Laws of Physical Transaction that follows from Zero-Postulation. The chaotic superfields at the requisite scaling-ratio yields necessary equation-parameters needed to describe them at that given scaling-ratio. This is seen to be independent of the choice of scale, but at smaller scaling-ratios, we have less loss of information. At a higher scale, we seem to have less number of parameters required to describe them.

Cite as: Ganguly, Subhajit (2013): Abstraction and the Standard Model, fig**share**.

http://figshare.com/articles/Abstraction_and_the_Standard_Model/848625

Maxwell's Equations, The Euler Index and Morse Theory

Carlos Valero

We show show that the singularities of the Fresnel surface for Maxwell's equation on an anisotrpic material can be accounted from purely topological considerations. The importance of these singularities is that they explain the phenomenon of conical refraction predicted by Hamilton. We show how to de-singularise the Fresnel surface, which will allow us to use Morse theory to find lower bounds for the number of critical wave velocities inside the material under consideration. Finally, we propose a program to generalise the results obtained to the general case of hyperbolic differential operators on differentiable bundles.

Cite as: arXiv:1311.0569 [math-ph]
(or arXiv:1311.0569v1 [math-ph] for this version)

The uniform measure for discrete-time quantum walks in one dimension

Norio Konno

We obtain the uniform measure as a stationary measure of the one-dimensional discrete-time quantum walks by solving the corresponding eigenvalue problem. As an application, the uniform probability measure on a finite interval at a time can be given.

Cite as: arXiv:1311.0427 [math-ph]
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On the Minimum Core Mass for Giant Planet Formation at Wide Separations

Ana-Maria A. Piso, Andrew N. Youdin

Description:

In the core accretion hypothesis, giant planets form by gas accretion onto solid protoplanetary cores. The minimum (or critical) core mass to form a gas giant is typically quoted as 10 Earth masses. The actual value depends on several factors: the location in the protoplanetary disk, atmospheric opacity, and the accretion rate of solids. Motivated by ongoing direct imaging searches for giant planets, this study investigates core mass requirements in the outer disk. To determine the fastest allowed rates of gas accretion, we consider solid cores that no longer accrete planetesimals, as this would heat the gaseous envelope. Our spherical, two-layer atmospheric cooling model includes an inner convective region and an outer radiative zone that matches onto the disk. We determine the minimum core mass for a giant planet to form within a typical disk lifetime of 3 Myr. The minimum core mass declines with disk radius, from ~8.5 Earth masses at 5 AU to ~3.5 Earth masses at 100 AU, with standard dust opacities. Lower temperatures in the outer disk explain this trend, while variations in disk density are less influential. At all distances, a lower dust opacity or higher mean molecular weight reduces the critical core mass. Our non-self-gravitating, analytic cooling model reveals that self-gravity significantly affects early atmospheric evolution, starting when the atmosphere is only ~10% as massive as the core.

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