报告题目与摘要

11 月 30 日上午

Space-Time swap, machine learning and dynamical predictions based on partial information
夏志宏

摘要：Without Newton (Newtonian mechanics, universal gravitation and calculus), can we predict the positions of n-body problem from observational data, even if these data are incomplete, involving positions only? The answer is yes! We design a machine learning algorithm to learn complex systems from partial observables. We show that, any finite dimensional complex systems can be reconstructed from generic observables. We called it the principle of space-time swap, it is potentially applicable to a wide range of problems.

行星演化中的动力学问题
周济林

摘要：TBD

Non-resonant Hopf links near a Hamiltonian equilibrium
刘磊

摘要: The aim of this talk is to present explicit conditions on the Birkhoff-Gustvason normal form of a two-degree-of-freedom Hamiltonian system near an equilibrium point, then ensure the existence of infinitely many periodic orbits on every sphere-like component of the energy surface near the equilibrium point. The equilibrium is supposed to be a nondegenerate minimum of the Hamiltonian. Every sphere-like component of the energy surface that sufficiently close to the equilibrium will contains at least two periodic orbits forming a Hopf link. The method is to check a certain non-resonance condition in HMS2015 on the rotation numbers for the Hopf link, and then infinitely many periodic orbits follow. This method is not making use of any global surface of section, as in HWZ1998. This results is then applied to the spatial isosceles three-body problem and Hill's lunar problem (Joint with C. Grotta-Ragazzo and P. A. S. Salomao).

11 月 30 日下午

On the vertical libration of Maxwell's ring configuration with a quasi-homogeneous potential 拟齐次力势下麦克斯韦环构型的垂直平动问题研究
徐兴波

摘要：We discuss Maxwell's ring model with a quasi-homogeneous potential of the dominant mass, and specially study the vertical libration of Maxwell's ring configuration with a Manev potential. There are two kinds of periodic vertical libration, which are
non-alternating and alternating cases. The Hamiltonian is highly symmetric and can be

reduced to a simple form with two degrees of freedom. Then the Hamiltonian is expanded near the planar circular relative equilibria. By the Lie transformation technique, the birkhoff norm form up to the fourth order is calculated. When the mass ratio between the ring and the dominant mass, and the coefficient of the second term in a Manev potential are both small enough, the nonlinear stability for the vertical libration of Maxwell's ring configuration with a Manev potential is then proved according to Arnold's stability theorem.

Some stability results in double-averaged three-body problem
盛凯程

摘要：Averaged models play an important role in celestial mechanics. In this talk, we deal with the averaged model used to study the secular effects in the motion of a body of the negligible mass in the context of a restricted three-body problem. We will review the stabilities in planar problems as will as the spatial circular problem. Then some linear and nonlinear stability results of the spatial double-averaged elliptic restricted three-body problem will be introduced.

Periodic and quasi-periodic solutions for systems with certain symmetries
周婷洁

摘要：We study the symmetric central configurations in the n-body problem where n equal masses are placed at the vertices of a regular n-gon. Since the Hessian matrices at these configurations are typically very large, computations of their eigenvalues present a challenging problem. By decomposing the action of the dihedral groups into irreducible representations, we show that the Hessians can be simplified to a block-diagonal matrix with small blocks, of the sizes at most 2*2 and the eigenvalues can be explicitly obtained. Meanwhile, observing the Newtonian n-body problem is invariant under rigid rotations, it turns out that quasi-periodic trajectories are much more prevalent than periodic ones. We generalize Poincaré method to Lagrangian systems and Hamiltonian systems where there are some natural symmetries. We construct a basic framework and provide general technical conditions for the existence and continuation of families of quasi-periodic trajectories. We apply our method to simple systems like Harmonic oscillator and pendulum systems, and to complicated systems such as the three-body problem to obtain quasi-periodic figure-eight orbits and quasi-periodic first-kind solutions of Poincaré.

12 月 1 日上午

开普勒问题和相对论里的对称群
孟国武

摘要：开普勒问题是最简单的太阳系的数学模型。该模型的巨大成功使牛顿实现了物理学的第一次伟大统一。大约十年前，本演讲者发现狭义相对论里的未来光锥和洛伦兹群隐藏在开普勒问题背后。最近，基于对称性比动力学更本质的这一思路，本演讲者在研究 Moser regularization 时观察到开普勒问题中的一个数学对应关系。此对应关系， 类似于黎曼几何

里的紧对称空间和非紧对称空间的对应，告诉我们在广义相对论的研究中出现的德西特对称群和反德西特对称群也隐藏在开普勒问题背后。如果时间容许， 也会展示庞加莱群如何出现在开普勒问题中。

广义椭圆型 Sitnikov (N + 1)体问题中对称周期解稳定性

程旭华

摘要：本报告讨论了广义椭圆型 Sitnikov (N+1)体问题中对称周期解的稳定性。首先，根据势能与周期的关系得到周期作为能量的函数所具有的性质；其次，根据所得到的周期的性质以及对称周期解的稳定性判据，探究了当离心率比较小时广义椭圆型 Sitnikov (N+1)体问题中奇偶两类-2np,p)对称周期解的稳定性。

太阳系小天体共振动力学

黎健

摘要：TBD