2022 MATH + X Symposium
on Matter under Extreme Conditions in Solar System Giant Planets
and Exoplanets, Inverse Problems and Deep Learning

Las Catalinas, Guanacaste, Costa Rica · November 6–9

Agenda

Sunday, November 6 Santarena, Rooftop Terrace
7:00pm reception

Monday, November 7 Santarena, The Conservatory
6:30am breakfast, Ponciana
8:15am opening remarks de Hoop, Chaves
    Chair: Bruna

8:30am Keynote: Why Multicomponent Systems and their Phase Diagrams are Essential for Understanding Planets Stevenson
8:30am Scalars are Universal: Equivariant Machine Learning, Structured Like Classical Physics Villar
10:15am coffee/juice break
10:45am Inverse Problem for the Wave Equation on Lorentzian Manifolds Oksanen
11:30am Spotlight: Linking planetary diversity to planet formation processes using machine learning Cambioni
11:45am From Slow to Fast Rates in Active Learning Kpotufe
12:30pm  lunch, Ponciana Terrace
3:30pm  coffee/juice break

Chair: Weiss

4:00pm  Giant Exoplanet Population Physics  Thorngren
4:45pm  Spotlight: Inverse source problems for the system of elastic-gravitational equations  Baldassari
5:00pm  Multiscale Inverse Problem, from Schrödinger to Newton to Boltzmann  Li
5:45pm  discussion
6:00pm  adjourn
7:30pm  dinner, Plaza Danta

Tuesday, November 8  Santarena, The Conservatory

Chair: Ceperley

6:30am  breakfast, Ponciana

8:30am  Keynote: Generation and Inverse Problems with Deep Wavelet Conditional Models  Mallat
9:30am  First-Principles Equation of State Calculations and Application to Jupiter and Saturn  Militzer
10:15am  coffee/juice break
10:45am  Designing Universal Causal Deep Learning Models: The Case of Infinite-Dimensional Dynamical Systems from Stochastic Analysis  Kratsios
11:30am  Spotlight: The Non-Abelian X-Ray Transform  Grebnev
11:45am  Phase Diagram and Optical Properties of Hydrogen under Extreme Conditions  Pierleoni
12:30pm  lunch, Ponciana Terrace
3:30pm  coffee/juice break

Chair: van der Hilst

4:00pm  Keynote: Machine Learning Based Ab-initio Molecular Dynamics  Car
5:00pm  Spotlight: Generalized Optimizer for Unsupervised Deep Assignment  Jasperson
5:15pm  Inverse Problems for Graphs and Discrete Spaces  Lassas
6:00pm  adjourn
8:00pm  symposium dinner, The Plaza
Wednesday, November 9 Santarena, The Conservatory

6:30am  breakfast, Ponciana

8:30am  **Keynote:** Mapping the Complex Chemistry of Dense Matter  
         Pickard

9:30am  Learning Graphs, Manifolds and Bundles by Playing Trumpets and Pooling Walks  
         Dokmanić

10:15am  *coffee/juice break*

10:45am  Spectral Rigidity of Radial Planets  
         Ilmavirta

11:30am  **Spotlight:** Quantitative Unique Continuation for Wave Equations, Seismicity and the Kinematic Inverse Rupture Problem  
         Lu

11:45am  Evaluating Unsupervised Denoising Requires Unsupervised Metrics  
         Fernandez-Granda

12:30pm  *lunch, Ponciana Terrace*

2:00pm  Unveiling Jupiter’s Interior with Juno  
         Guillot

2:45pm  **Spotlight:** Implicit Neural Representation and Lens Rigidity Unveiling Planetary Interiors  
         Nguyen

3:00pm  **Spotlight:** Deep Invertible Approximation of Topologically Rich Maps between Manifolds and Uncertainty Quantification  
         Puthawala

3:15pm  Principled Simplicial Neural Networks for Trajectory Prediction  
         Segarra

4:00pm  *adjourn*

7:00pm  *dinner, Ponciana Terrace*