

Data Discovery

new results

Scientific

computing

GPU Day 2023
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Why to meet DSC?



Core topics

- New AI paradigm
 - Complex systems, brain network analysis
 - Cognitive & computational neuroscience
 - Unique event detection
 - Causality analysis
 - Theory of quantum computing
 - Neurorehabilitation
-
- Massive use of grid and GPU power
 - *Use our methods*
 - *Give us challenging data to analyze*

Highlights from the results

Towards applications

Unique event detection

Time series mining

for financial anomaly detection

Highlights from the results

Towards applications

Causality Analysis

Cause effect discovery in plasma

Highlights from the results

Towards applications

Causality Analysis

Detection Illegal bank manipulations

Gravitational wave detection

Epilepsy focus localization

Possible industrial application:

Root cause analysis

in large experiments,
scale industrial plants
communication networks

Anomaly detection - find a unicorn



- Not necessarily very different
- But unique!
- How to define uniqueness in continuous variables?
- **Unicorn** : *a state if all the spatial neighbors are temporal neighbors as well. (The system doesn't return to the spatial neighborhood)*

$$TOF = \sum_{i \text{ } kNN \text{ in space}} (t - t_i)^2$$

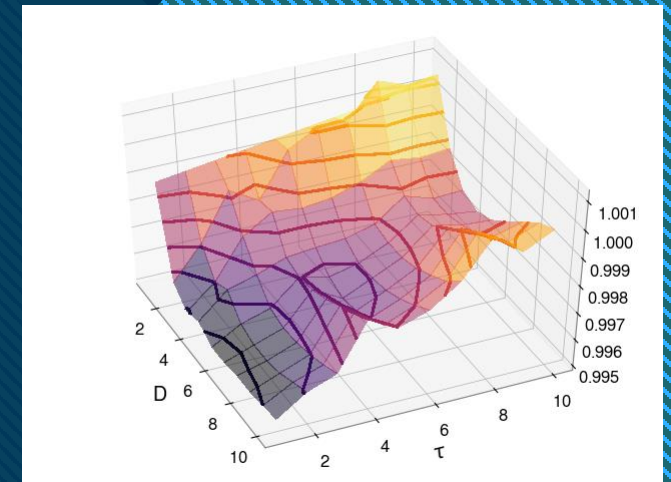
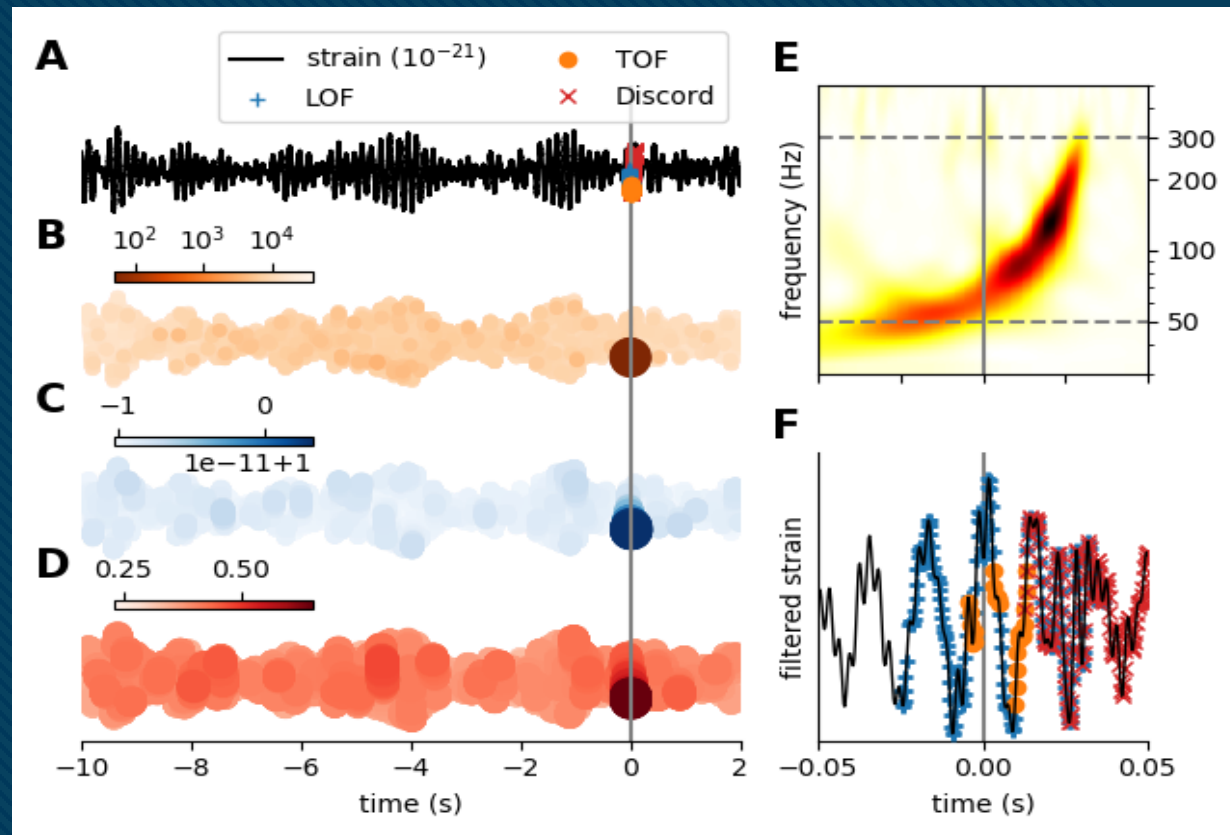


Anomaly detection - find a unicorn



What is already known: GW 170817

Gravitational waves of the merger neutron stars



Causality discovery in dynamic systems (dss)

Three new method has been developed

Two for deterministic dss :

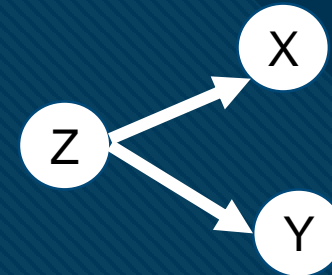
- dimensional causality

- code compression based causality

One for stochastic dss

- Markov modelled recursions $x_{n+1}=f(x_n, \epsilon_{n+1})$

NEW Feature: they reveal hidden common cause



Inside the plasma in COMPASS tokamak

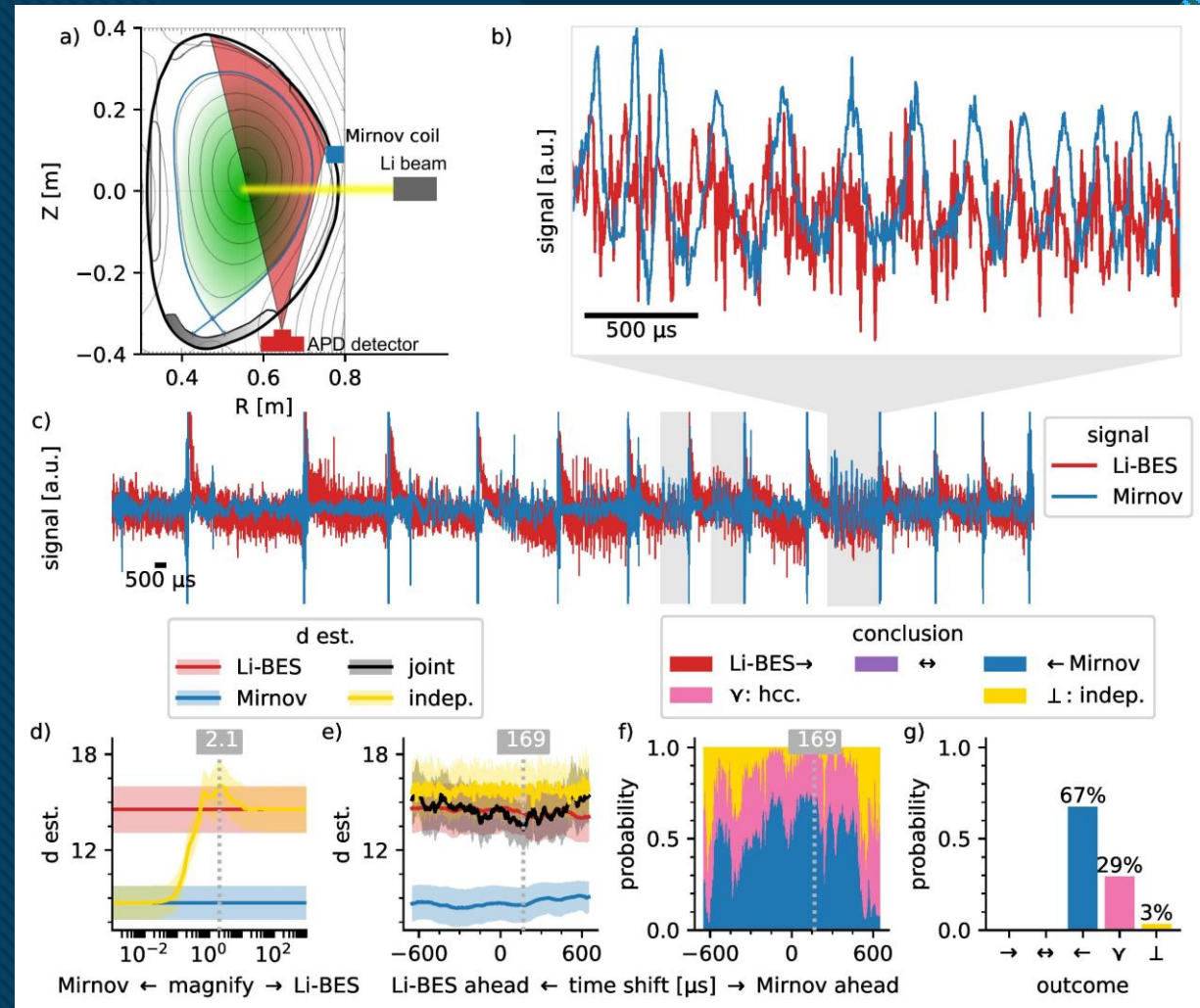
Lithium Beam Emission Spectroscopy
(Li-BES) signal as a proxy for

local plasma density

and

Mirnov coil signal as an approximation
of non-local

magnetic field strength



Scientific computing

Society under registration:

Scientific computing

Society under registration:

Join us:

with declaration of interest or
signing membership application

WHY?

Scientific computing embraces among others:

- Data science
- Data Mining
- Statistics
- Computational
 - Chemistry
 - Economics
 - Mathematics
 - Neuroscience
 - Physics
 - Sociology
- Machine learning
- Artificial Intelligence

The society

- Serves as a professional community platform
- Organizes professional forums
- Help to access Computing Facilities (CF)
- Provides support in using CF
- Provides support to students and early career researches

Service providers

- Computing resources
- Education center, mentor portal
- Job market
- Conference / workshop center

Education

- Junior research projects(intern)
- Junior research competition
- Thesis, diploma supervision
- PhD. supervision
- Advanced Computing Courses

Membership

Founding members (by default regular members)

Associated fellows (limited rights membership, later as acknowledgement of the activity after one or two years promoted to regular membership)

Fellows (regular members)

Honorary fellows (members of National or European Academy etc)

Eternal fellows (title given for long outstanding service)

Supporting fellows (limited rights membership, contribute with financial or nonfinancial support as declared, accepted by the Presidency and covered by contract)

Mission

- The Society promote the establishment scientific computing
- Support the community by
 - organizing professional forums
 - providing communication channel for the community
 - providing access to computing resources
 - promoting career of students and junior researcher

Vision

- Scientific computing occupies a central role in scientific research.
- It's contribution to research and well being of the society became indispensable.

Values

- Scientific rigor,
- ethical conduct of research and publication,
- support of the next generation researchers,
- social responsibility