

MBDH Big Health Data Pillar: *Open Biomedical Team Science*



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Statistics Online Computational Resource
Michigan Institute for Data Science


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<https://SOCR.umich.edu>


Slides Online:
"SOCR News"



Pillars of Open-Science



Meta Data Design Sources
HW SW Tools Infrastructure
Cloud Services Collabs Findings
Pubs Share



Advanced Computational
Neuroscience Network (ACNN)

- ❑ Health Data Resources & Analytical Tools
- ❑ De-Identification of Sensitive Data
- ❑ Clinical Decision Support Systems
- ❑ Crosscutting Themes
 - ❑ Data Science Education / Workforce Development
 - ❑ Cyberinfrastructure and Data Sharing



Big Biomed & Health Data Sources

Data

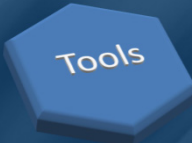
- ❑ UKBB <https://www.ukbiobank.ac.uk>
- ❑ MIMIC-III <https://mimic.physionet.org>
- ❑ SOCR Data Archives
https://wiki.socr.umich.edu/index.php/SOCR_Data
- ❑ NIH Databases https://eresources.nlm.nih.gov.nlm_eresources

Data Source	Sample Size/Data Type	Summary
UK Biobank	Demographics: > 500K cases Clinical data: > 4K features Imaging data: T1, resting-state fMRI, task fMRI, T2_FLAIR, dMRI, SWI Genetics data SARS-CoV-2 virus tests	The longitudinal archive of the UK population (NHS)
MIMIC-III	ADMISSIONS, DIAGNOSES, ICUSTAYS, MICROBIOLOGY, PRESCRIPTIONS, PROCEDURES_ICD, SERVICES	ICU Data for over 40K patients
NIH Databases	100's of open-access DBs	

FAIR = Findable + Accessible + Interoperable + Reusable



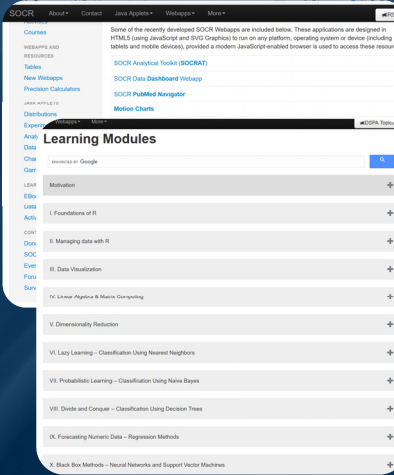
Exploratory & AI Analytical Tools




- SOCR Webapps
 (HTML-based) <https://socr.umich.edu/HTML5>

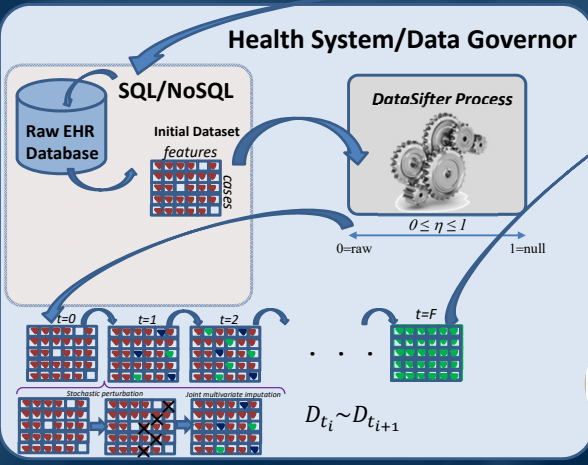
- Data Science and Predictive Analytics (DSPA)
 (R-based) <https://dspa.predictive.space>

- Spacekime analytics: <https://spacekime.org>





DataSifter: Reliable, Effective & Secure Data Sharing



$D_{t_i} \sim D_{t_{i+1}}$


User: Jane

- Initial Query
- Data Retrieval
- Interrogation
- Refined/Mod Query Results

User: Joe

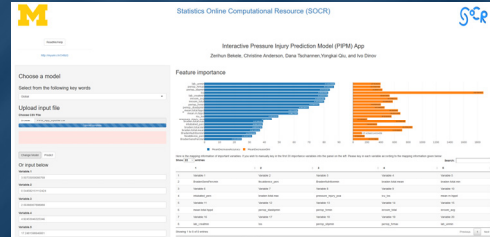
- Initial Query
- Data Retrieval
- Interrogation
- Refined/Mod Query Results

<http://DataSifter.org> US patent #10,776,516 Marino, et al., JSCS (2019)



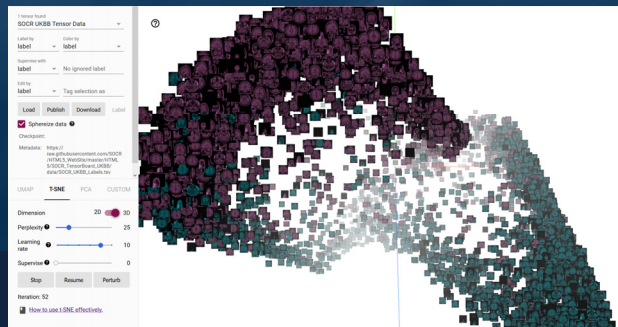
Clinical Decision Support Systems

- Pressure Injury Prediction Model (PIPM) <https://myumi.ch/O49zG>



- SOCR TensorBoard (10K*200 tensor)

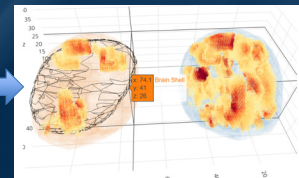
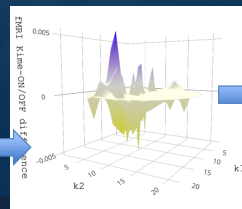
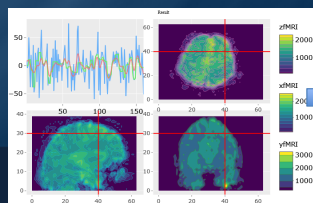
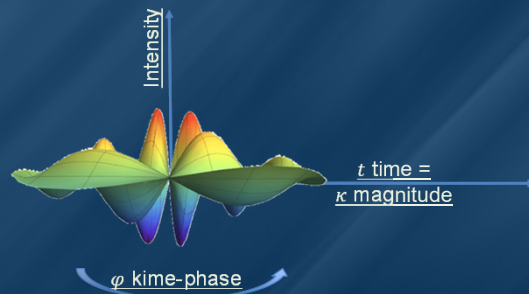
https://socr.umich.edu/HTML5/SOCR_TensorBoard_UKBB



Spacekime Analytics: Longitudinal Time-series → Kime Surfaces

In the 5D spacekime manifold, time-series curves extend to kime-series, i.e., surfaces parameterized by kime-magnitude (t) and the kime-phase (φ).

Kime-phase aggregating operators that can be used to transform standard time-series curves to spacekime kime-surfaces, which can be modeled, interpreted, and predicted using advanced spacekime analytics.



Dinov & Velez (2021) De Gruyter | <https://spacekime.org>



Data Science Education / Workforce Development

- ❑ Education Activities, e.g.,
 - ❑ MOOCs: <https://midas.umich.edu/certificate/approved-courses>
 - ❑ Certificates: <https://midas.umich.edu/certificate>
 - ❑ Doctoral Training Program: Biomedical Informatics and Data Science Training Program (BIDS-TP)
- ❑ Workshops & Symposia, e.g.,
 - ❑ ISI/WSC Training and Education Bootcamp on Data Science and Predictive Analytics (DSPA)
 - ❑ MIDAS Data Science for Biomedical Scientists Bootcamp
- ❑ EBooks: https://wiki.socr.umich.edu/index.php/SOCR_Books



Acknowledgments

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<https://SOCR.umich.edu>

