RESEARCH DATA ALLIANCE

Interest Group Big Data Analytics

Co-Chair Dr. – Ing. Morris Riedel, Forschungszentrum Juelich

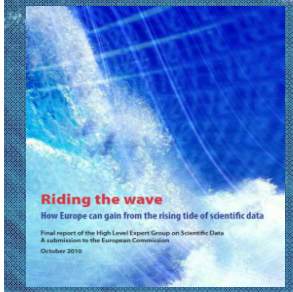
research data sharing without barriers

rd-alliance.org

13th July 2014

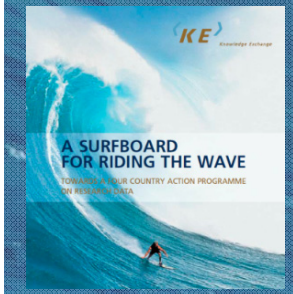
IGARSS Conference, Quebec, Canada

„Scientific Big Data Analytics“
Relevance for Scientific Research



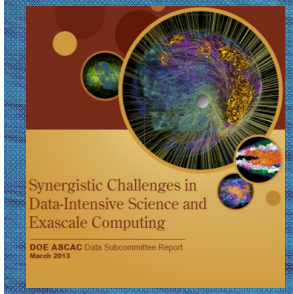
‘… problems that require high-performance data storage, **smart analytics**, transmission and mining to solve.’

[1] John Wood et al.



‘In the data-intensive scientific world, **new skills are needed for** …, **analysing**, and making available large amounts of data…’

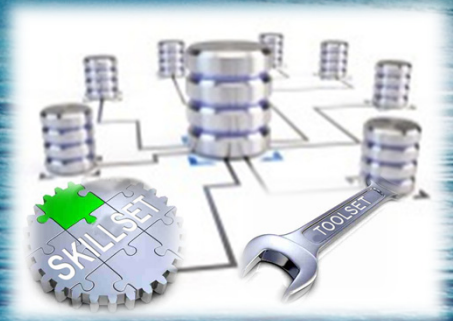
[2] KE Partners



‘Integration of **data analytics** with exascale simulations represents a new kind of workflow…’

[3] DOE ASCAC Report

Combine New & Old Approaches



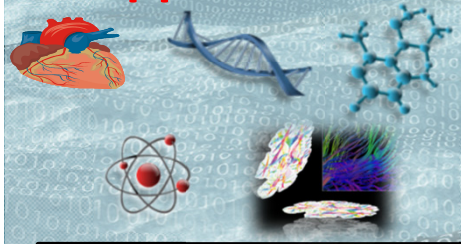
The Complex „Big Data“…

… requires concentration on most relevant areas for progress in scientific research

Hadoop 1.0 Hadoop 2.0 Spark Google DataFlow >#200 NoSQL Databases

only industrial relevant cases

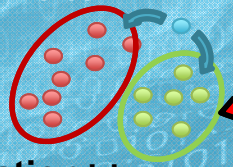
„Bottom-Up“ Scientific Data Applications



Scientific Computing

“Statistical Data Mining”
Machine Learning & Statistics
Dimensionality Reductions
Principles of Parallelization
New HPC/HTC Algorithms
Applicable & Scalable Tools

“Big Data”



Classification++

Group Focus

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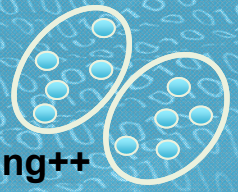
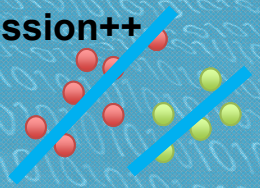
Big Data Analytics

Clustering++



Regression++



Big Data Analytics Interest Group

Facts

Members: ~60
Founded in 1st Plenary (Göteborg)
Telcons: ~1-2x / Month
Co-chairs:
Morris Riedel (JUELICH)
Kuo Kwo-Sen (NASA)
Peter Baumann (UNI BREMEN)

Concete Datasets
(& source/sensor)

Algorithms &
Methods

Technologies &
Ressources

Scientific Data Applications

Big Data Analytics Gruppenprozess

„Best Practices“

Community-based practice & recommendations

„Reference Data Analytics“ for reusability & learning

CRISP-DM Report	Openly Shared Datasets	Running Analytics Code

Big Data Analytics Interest Group

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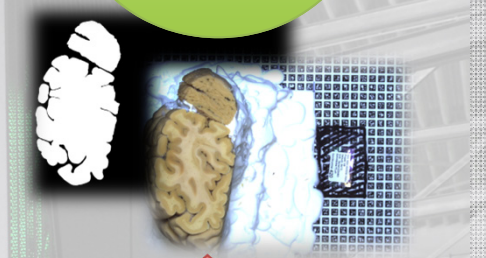
Example

Brain Data Analytics



JÜLICH FORSCHUNGSZENTRUM

UNIVERSITY OF ICELAND
SCHOOL OF ENGINEERING AND NATURAL SCIENCES
FACULTY OF INDUSTRIAL ENGINEERING, MECHANICAL ENGINEERING AND COMPUTER SCIENCE

[6] G. Cavallaro & M. Riedel et al., 'Smart Data Analytics Methods for Remote Sensing Applications', IEEE IGARSS, Quebec, Canada

Sattelite Data (Quickbird)

Parallel Support Vector Machines (SVM)

HPC/MPI, Map-Reduce & GPGPUs

Classification Study of Land Cover Types

„Best Practices"

Community-based practice (e.g. PCA, dim. reduction) & recommendations

„Reference Data Analytics" for reusability & learning

CRISP-DM Report	Openly Shared Datasets	Running Analytics Code

B2SHARE Store and Share Research Data

[5] EUDAT B2SHARE

πSVM

[4] piSVM

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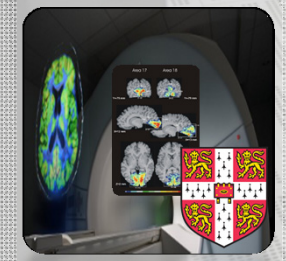
Other Scientific Data Applications

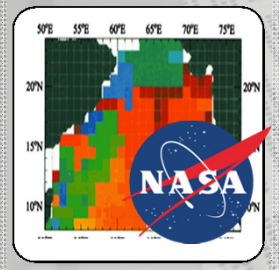
MARUM BREMEN

- Problem: „Outlier detection for automatic quality control“
- Large quantity of datasets of measurements (e.g. PANGAEA Collection)
- Tech: HPC/HTC (map-reduce?), Sybase In-DB Analytics?, …



UoCAMBRIDGE

- Problem: „High Precision Radiotherapy Treatment“
- Combined analysis of data (CT Scans, X-Rays, MRI scans, PET images)
- Tech: HPC/HTC, In-Memory/NoSQL- Datebases – which makes sense?



NASA - MSFC

- Problem: „Event tracking analytics“ (bspw. Entstehung von Somali Jets)
- Satellite datasets (‘search events with changes geolocations‘)
- Tech: HPC/HTC (map-reduce?), Twister/Harp?, SCIDB, NASA software,…

Thanks for your attention

Join us in the Sessions @ 4th Plenary Meeting Amsterdam

References

[1] John Wood et al., 'Riding the Wave –How Europe can gain from the rising tide of scientific data', EC Report, 2010
[2] KE Partners, 'A Surfboard for Riding the Wave - Towards a four country action programme on research data', November 2012
[3] DOE ASCAC Data Subcommittee Report, 'Synergistic Challenges in Data-Intensive Science and Exascale Computing', 2013
[4] piSVM Sourceforge Open Source Tool for Parallel Classification, Online: http://pisvm.sourceforge.net
[5] EUDAT European Data Infrastructure, B2SHARE Tool, Online: https://b2share.eudat.eu/
[6] G. Cavallaro & M. Riedel et al., 'Smart Data Analytics Methods for Remote Sensing Applications', IEEE IGARSS, Quebec, Canada