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10th and 11th May

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Please pay attention to your time limit!

Every speaker must introduce the next speaker (name, surname and title)

Pitches will be graded by a jury composed of professors and public



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10th and 11th May

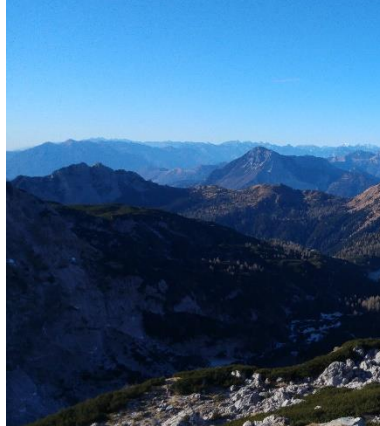
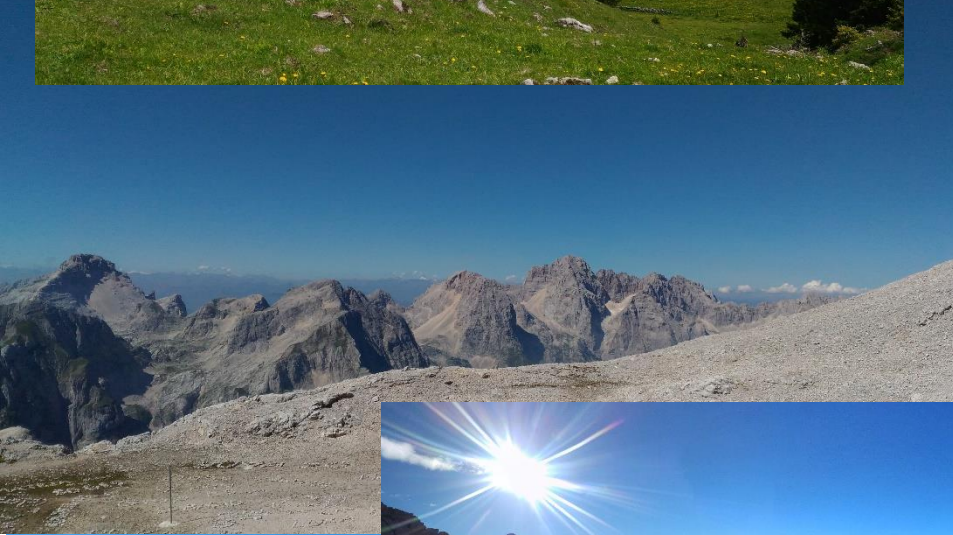
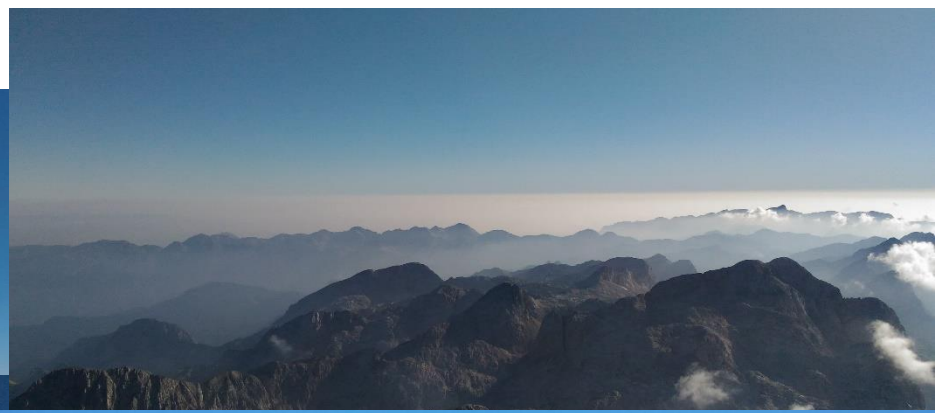
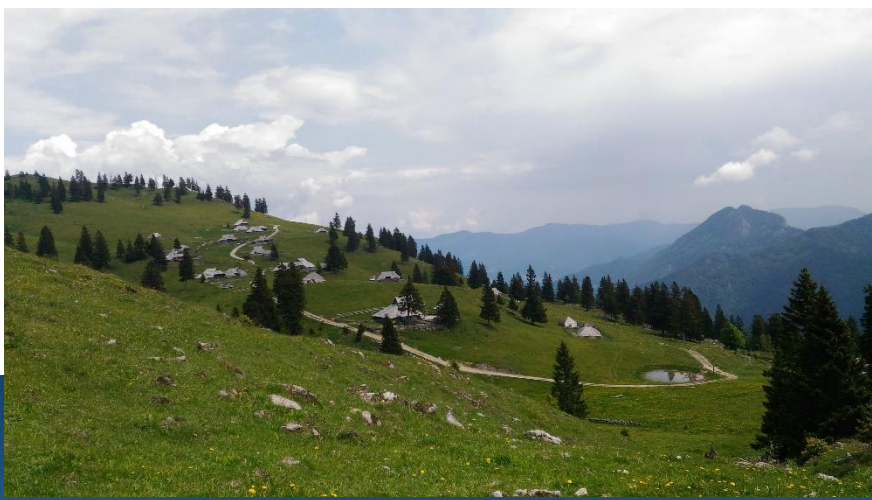
Earth, how old are you?

Leja Rovan

Department of Environmental Sciences,

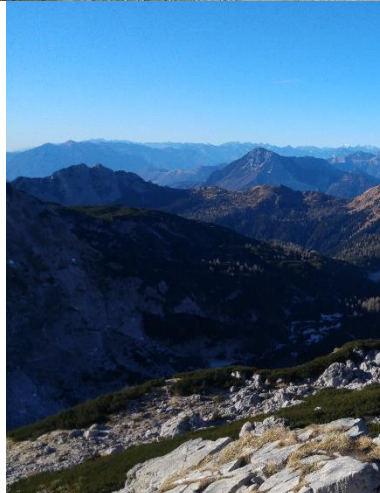
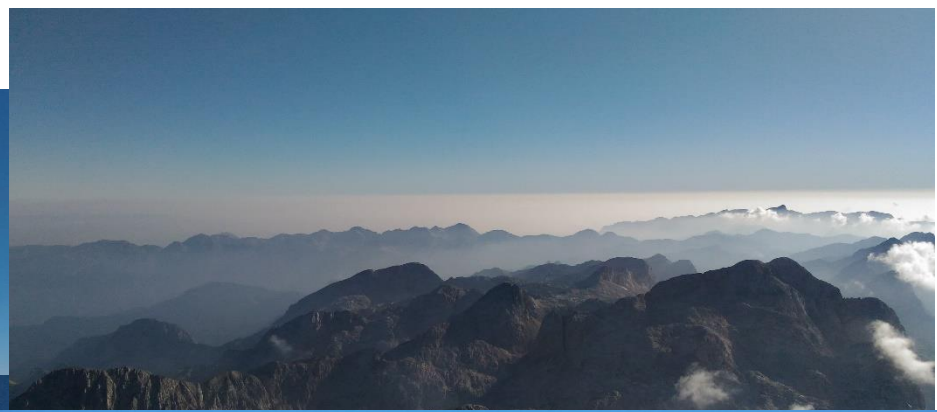
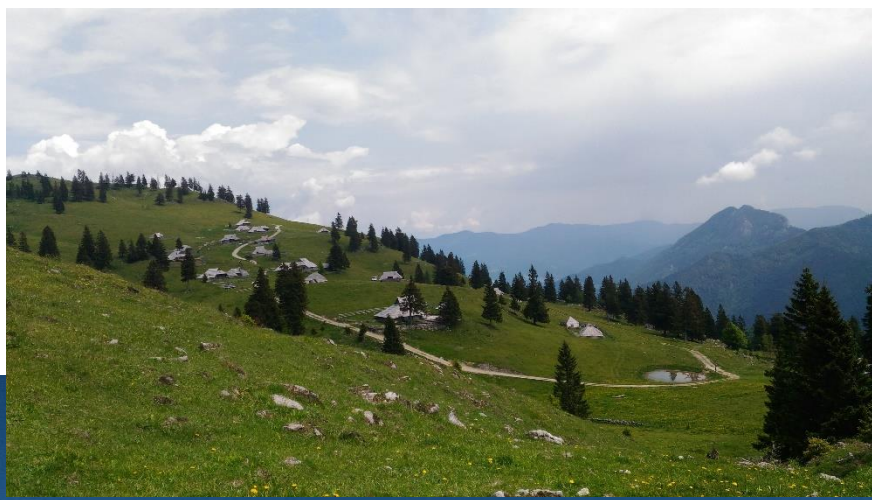
Jožef Stefan Institute

Poster number: 39



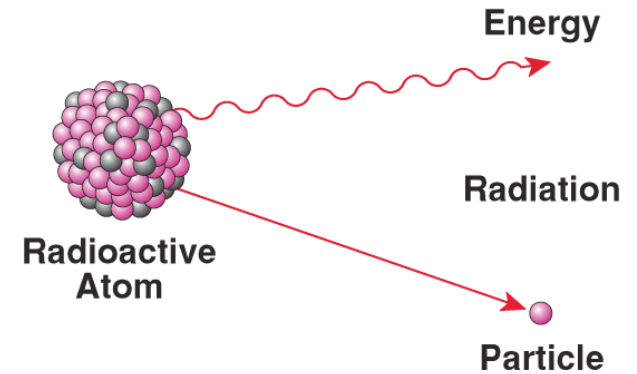
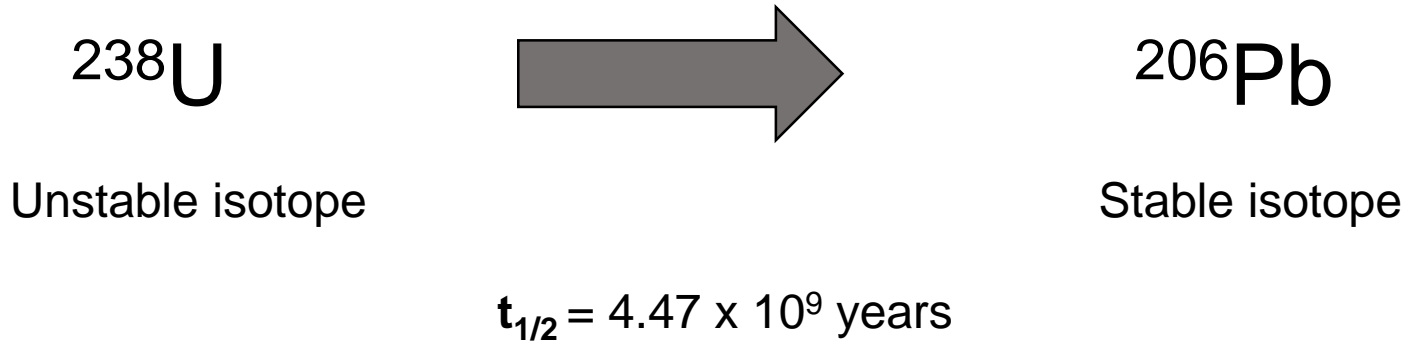
Radiometric dating

?



Radiometric dating

- ❖ Radioactive process
- ❖ **Uranium – lead dating:**



- ❖ Mineral zircon:



Analytical procedure

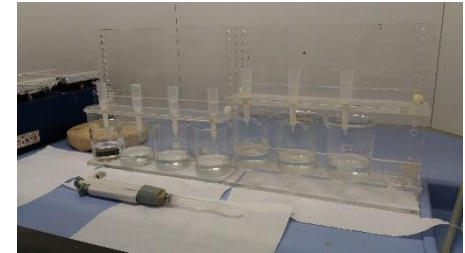
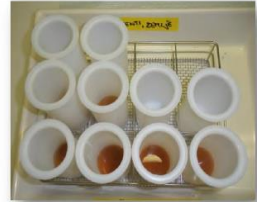
❖ Sample preparation

❖ Pre-concentration or digestion

❖ Chemical separation

❖ Measurement

❖ Multi-collector inductively coupled plasma mass spectrometry → **MC-ICP-MS**



Analytical procedure

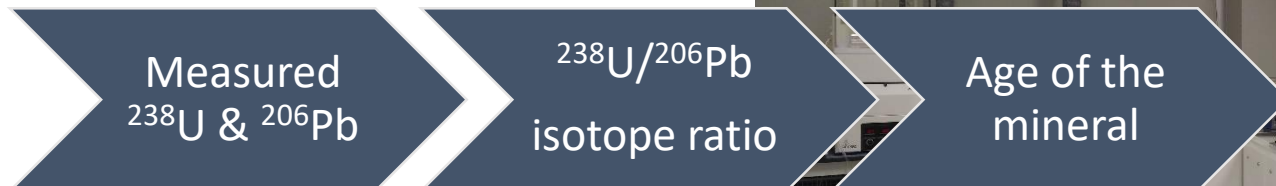
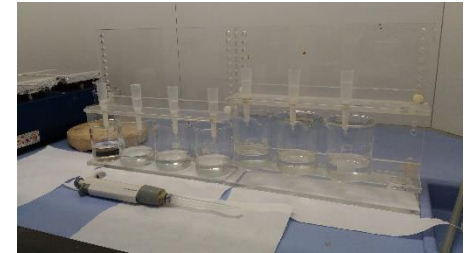
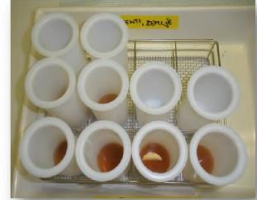
❖ Sample preparation

❖ Pre-concentration or digestion

❖ Chemical separation

❖ Measurement

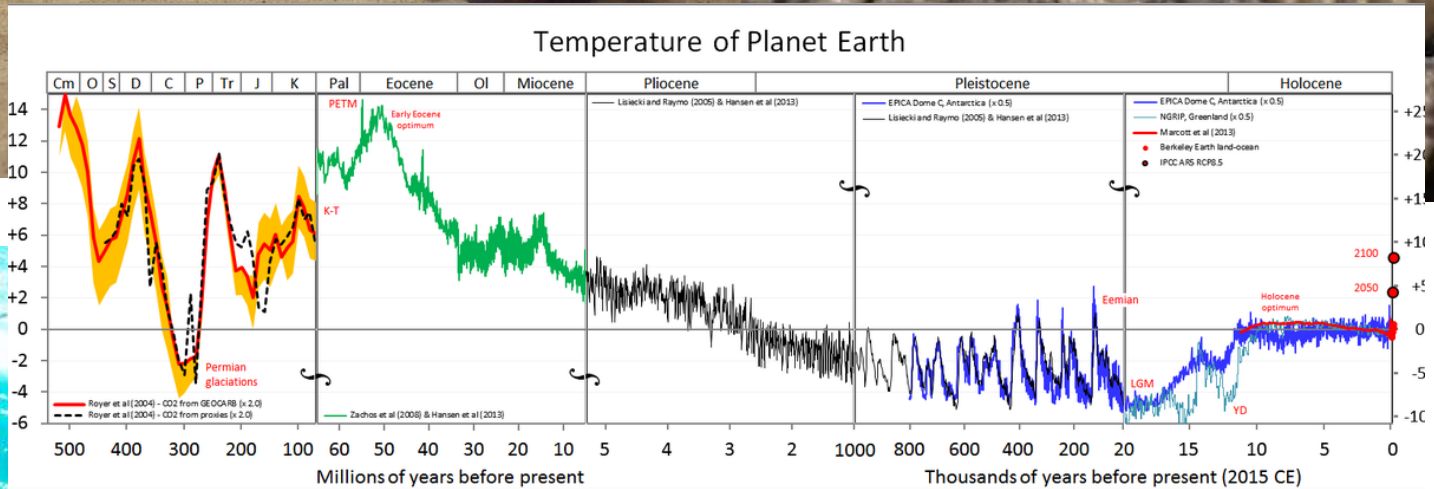
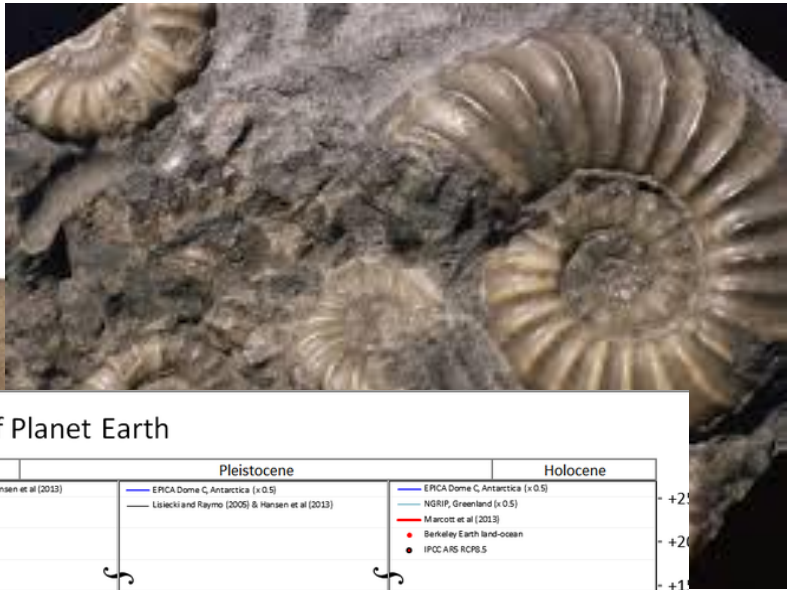
❖ Multi-collector inductively coupled plasma mass spectrometry → **MC-ICP-MS**



Age of the earth:
4.54 billion years!



Pfff, I'm old...



Thank you for
your attention!

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10th and 11th May

Neurodegenerative Diseases Data Ontology

Ana Kostovska, Ilin Tolovski

*Department of Knowledge Technologies, Jožef Stefan Institute, Ljubljana,
Slovenia*

Jožef Stefan International Postgraduate School, Ljubljana, Slovenia

Poster number: 7

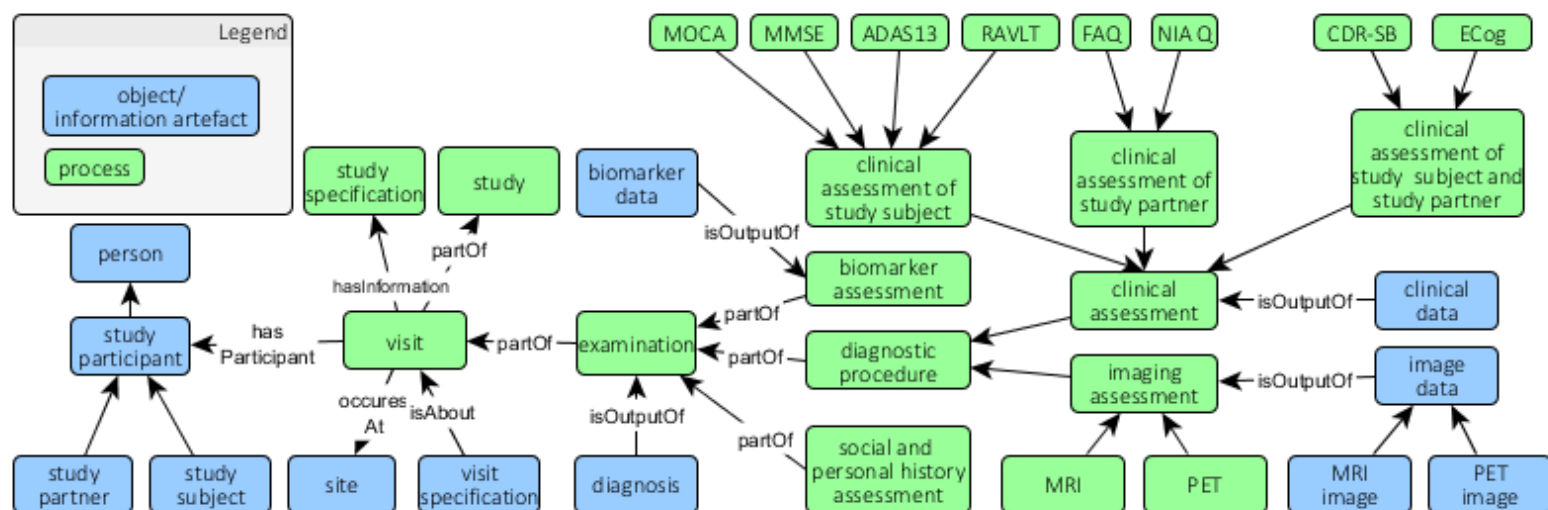
Introduction

- ***Heterogeneous group of disorders that are characterized by the progressive degeneration of the structure and function of the central nervous system or peripheral nervous system***
 - ***Alzheimer's disease - Irreversible neurodegenerative disease that results in a loss of mental function due to the deterioration of brain tissue***
 - ***Parkinson's disease - Disorder of the central nervous system that results from the loss of cells in various parts of the brain, categorized as a movement disorder***
- ***Ontology***
 - ***A set of concepts and categories in a subject area or domain that shows their properties and the relations between them***

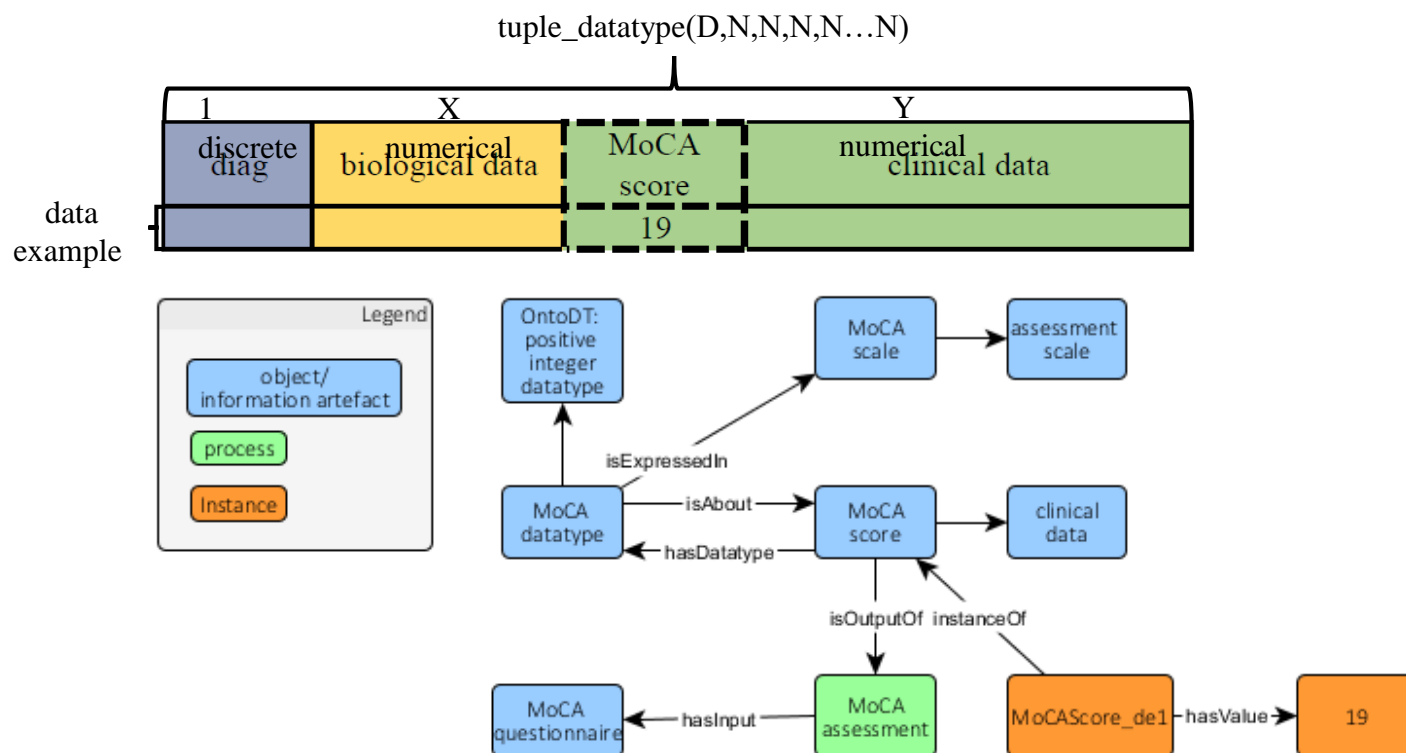
Motivation

- Large number of clinical studies of neurodegenerative diseases
- Need for a unified representation of the neurodegenerative diseases data originating from different studies (or hospitals)
- We addressed the task of designing and implementing an ontology for describing data on patients with neurodegenerative diseases
- ***Having an ontology for describing data on patients is important from two different perspectives:***
 - *from a viewpoint of ontology-based data access (ODBA) it would allow federation queries on data produced and stored at different hospitals;*
 - *from viewpoint of data analytics it would allow (semi) automatic creation of data analysis workflows based on the datatypes that occur in the datasets, annotated with ontology terms.*

NDDO basic scheme



Example of semantic annotation



***Thank you for your
attention!***

Can magnets be a cure for cancer?

Effect of barium-hexaferrite nanoplatelets in low-frequency magnetic field on cancer cells

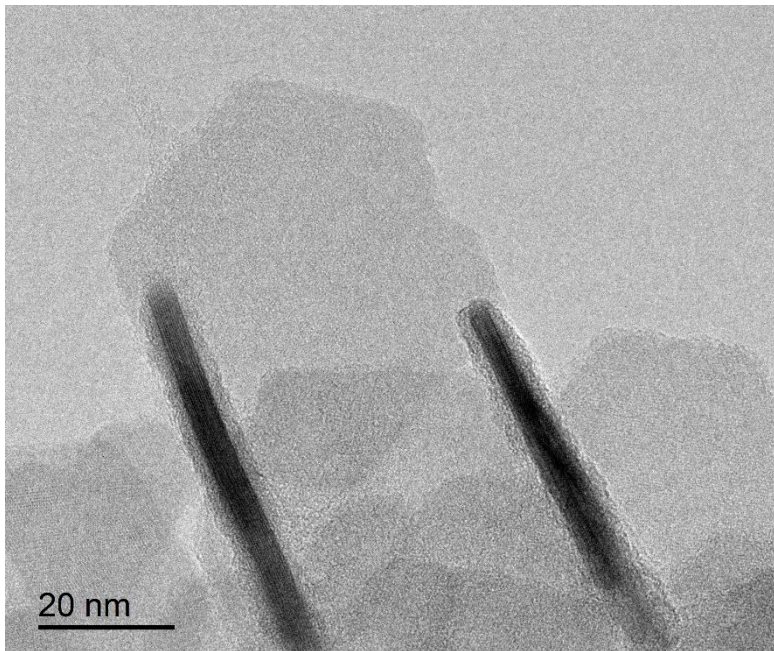
Tanja Goršak,

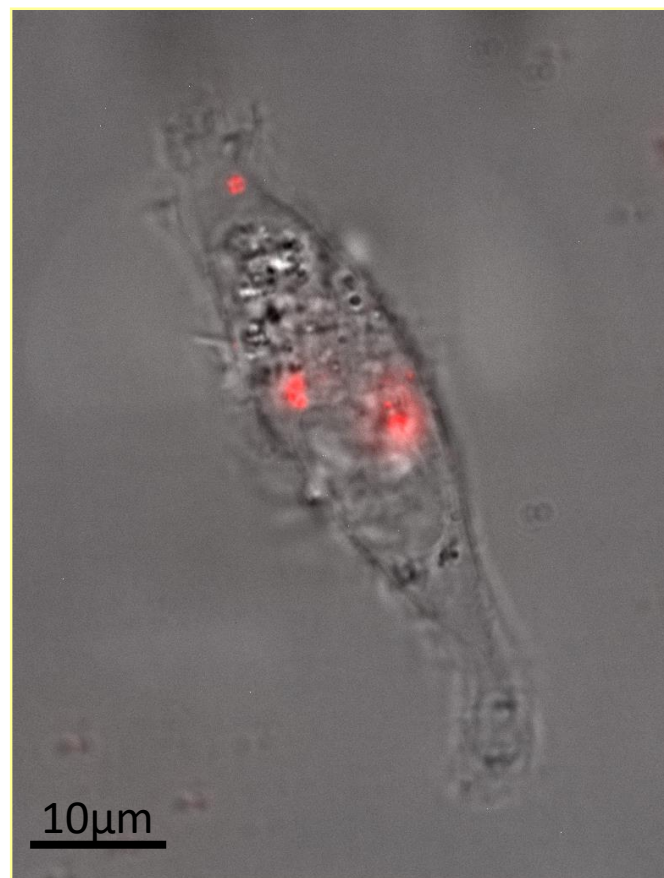
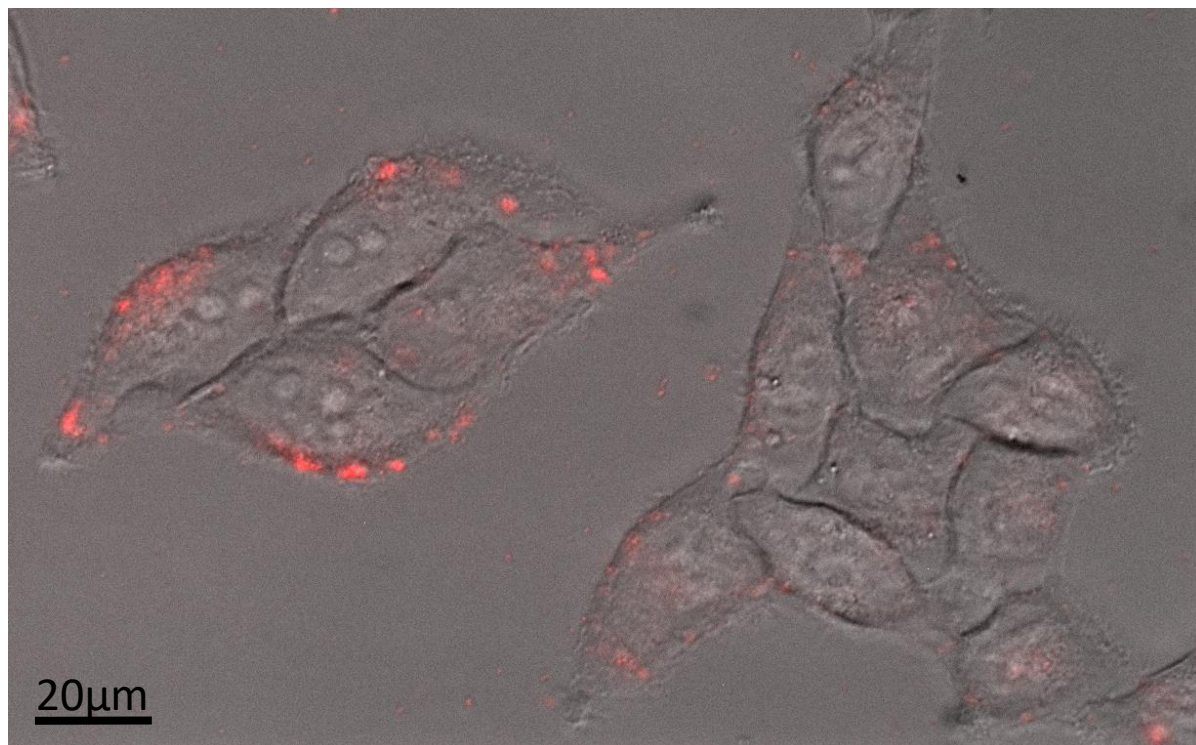
Department for Materials Synthesis,

Jožef Stefan Institute

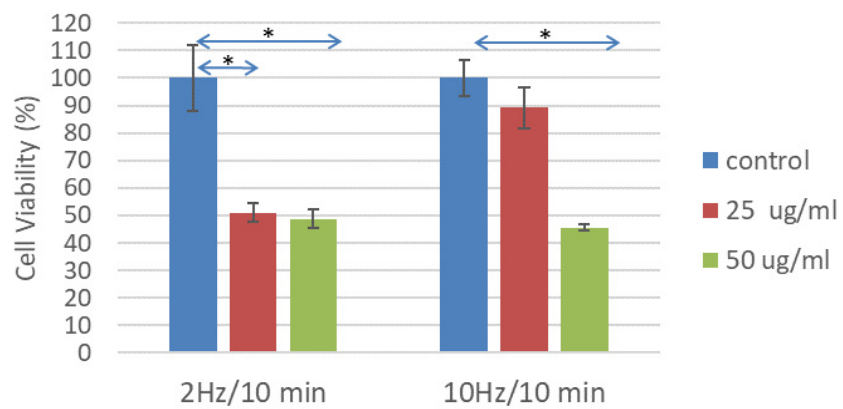
Poster number: 29



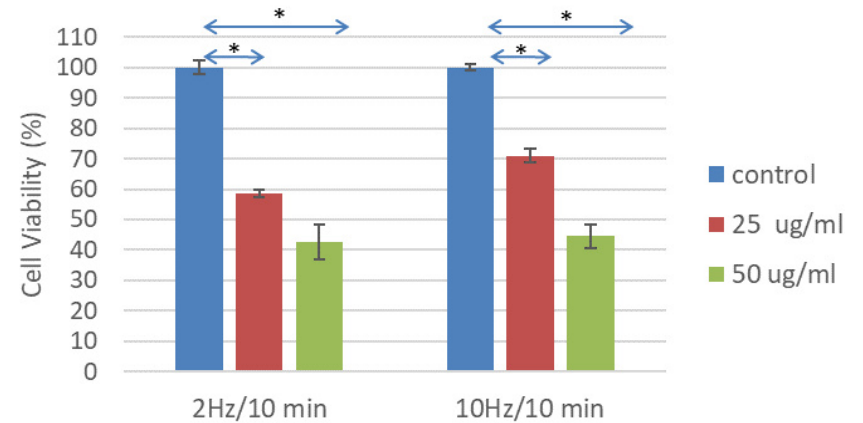




HeLa + BFNPs



MDA-MB-231 + BFNPs



Thank you for your attention

Questions: Poster 29

Email: tanja.gorsak@ijs.si



Now Bring Me That Horizon

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Authenticity assessment of fruit aroma compounds

Lidija Strojnik,

***Department of Environmental Sciences, Jožef Stefan
Institute***

Jožef Stefan International Postgraduate School

Poster number: 8



=



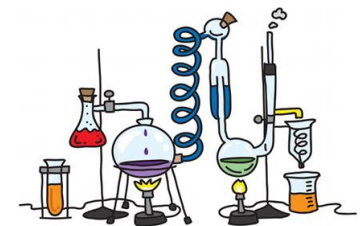
+



+



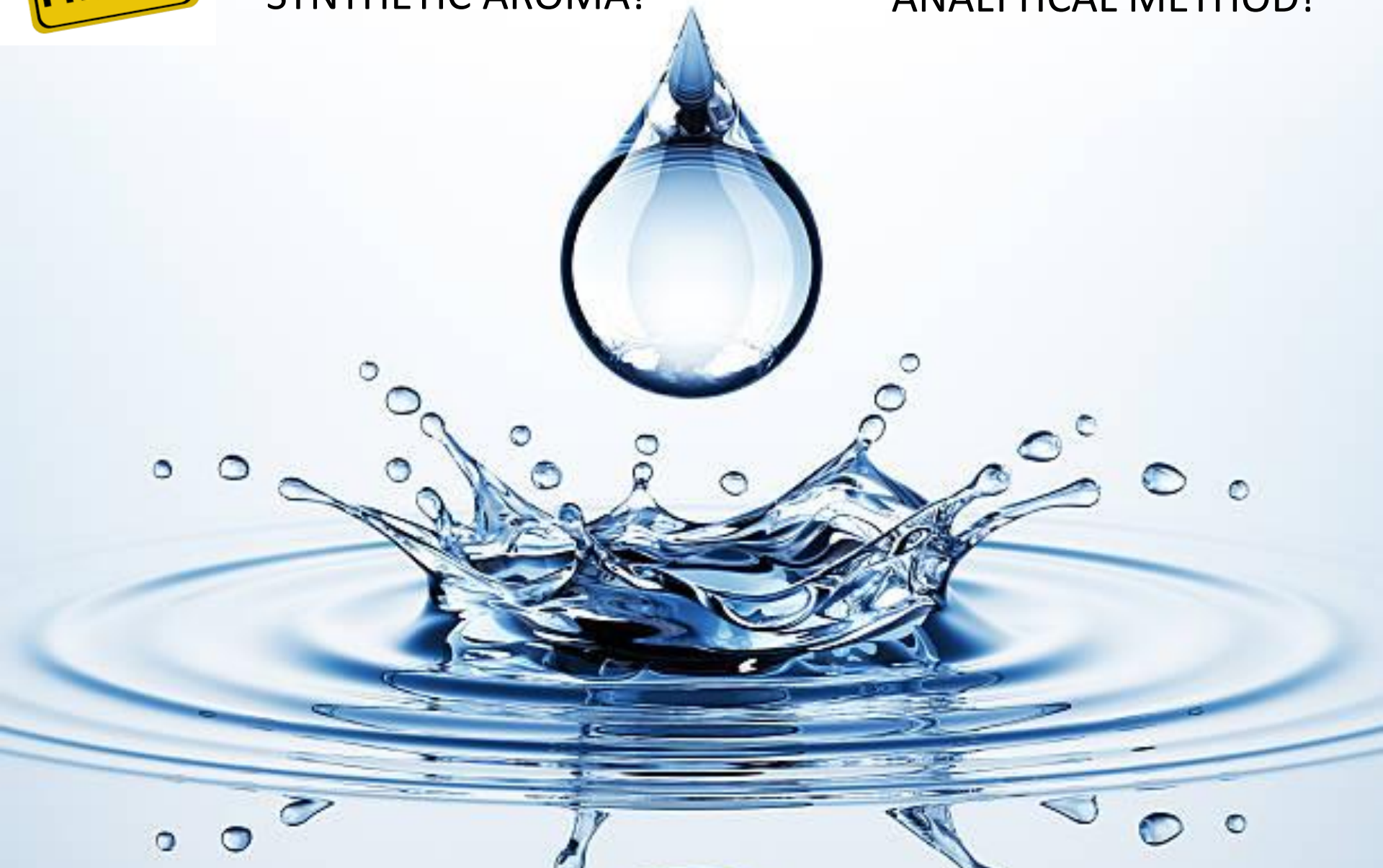
NATURAL
FLAVOUR ?!





PRICE OF NATURAL VS
SYNTHETIC AROMA!

NO ESTABLISHED
ANALYTICAL METHOD!



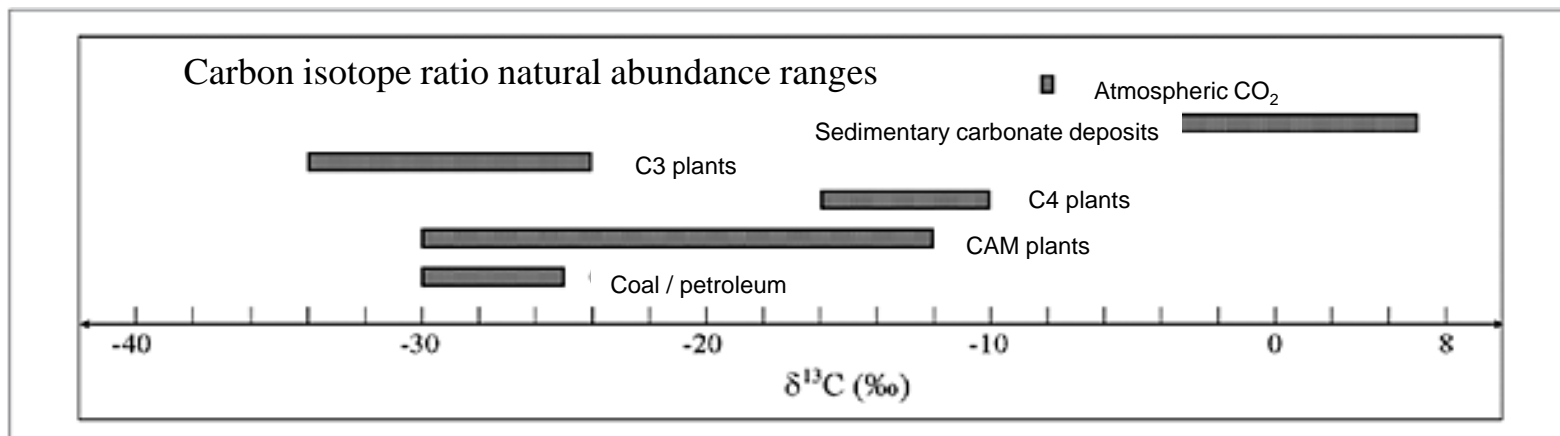


The use of discriminating analytical methodology

Carbon isotopes as tracers



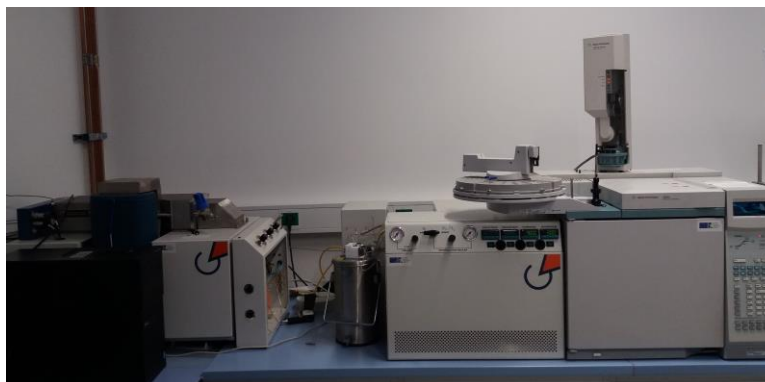
Gas Chromatography-Combustion-Isotope Ratio Mass Spectrometry (GC-C-IRMS)



RESEARCH
PROCEDURE

AUTHENTIC
SAMPLES AND
STANDARDS
SELECTION

SAMPLE
PREPARATION
(SPME)



AUTHENTICITY
ASSESSMENT

COMPOUNDS
IDENTIFICATION
(GC-MS)

COMMERCIAL
SAMPLES
MEASUREMENTS

COMPOUND
SPECIFIC $\delta^{13}\text{C}$
MEASUREMENTS
(GC-C-IRMS)

DATABASE
CREATION

Characterization of Slovenian apple and strawberry aromas for authenticity assessment using stable isotope approach

Strojnik Lidija^{1,2}, Stopar Matej³, Darinka Koron³, Zlatič Emil⁴, Kokalj Doris⁴, Naglič Gril Mateja⁵, Ženko Bernard⁶, Žnidaršič Martin⁶, Bohanec Marko⁶, Mileva Biljana⁶, Luštrek Mitja⁷, Gradišek Anton⁷, Potočnik Doris^{1,2}, Ogrinc Nives^{1,2}

¹Department of Environmental Sciences, Jožef Stefan Institute, Ljubljana, Slovenia, 1000; ²Jožef Stefan International Postgraduate School, Ljubljana, Slovenia, 1000; ³Agricultural Institute of Slovenia, Ljubljana, Slovenia, 1000; ⁴Biotechnical Faculty, University of Ljubljana, Ljubljana, Slovenia, 1000; ⁵Phytonom Dool, Štefija vas, Slovenia, 3221; ⁶Department of Knowledge Technologies, Jožef Stefan Institute, Ljubljana, Slovenia, 1000; ⁷Department of Intelligent Systems, Jožef Stefan Institute, Ljubljana, Slovenia, 1000

INTRODUCTION

Present work deals with the authenticity of raw materials such as natural flavourings. While natural aromas are becoming extensively used and natural raw materials are becoming more expensive, there is increasing pressure on prices and pronounced quality. Thus, many natural materials show the need for control of authenticity, as they are commonly being falsified in terms of dilution, mixing, or incorrect declaration of origin of natural resources. At the moment, gas chromatography isotope ratio mass spectrometry (GC-C-IRMS) is perhaps one of the most specific and sophisticated method for determining food authenticity.

METHODOLOGY

For authenticity assessment of aroma compounds several steps need to be taken, including optimization of extraction procedure; identification of aromatic components with GC-MSD; selection of working standard for $\delta^{13}\text{C}$ measurements; $\delta^{13}\text{C}$ measurements (component specific on GC-C-IRMS); database creation from the obtained $\delta^{13}\text{C}$ values. The authenticity of the aroma compounds can then be verified by comparison of $\delta^{13}\text{C}$ of the analysed sample with the values from a created database. The established protocols and methods were also used in our study to investigate natural and commercially available apple and strawberry aroma distillates.

1) SAMPLES AND STANDARDS SELECTION



10 distillates from natural samples
15 commercial distillates

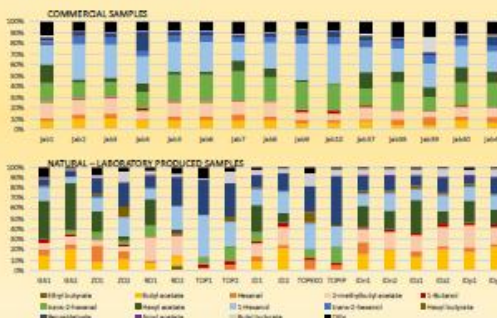


8 distillates from natural samples
3 commercial distillates

3) EXTRACTION PROCEDURE (HS-SPME CONNECTED WITH GC-IRMS)

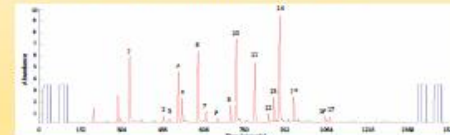


2) COMPOUND IDENTIFICATION

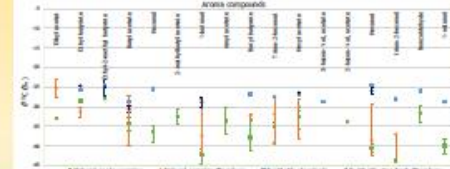


Relationship between peak areas of aroma compounds in the commercially/laboratory produced recovery analyses obtained by HS-SPME GC-IRMS.

4) $\delta^{13}\text{C}$ COMPONENT SPECIFIC MEASUREMENTS ON GC-C-IRMS

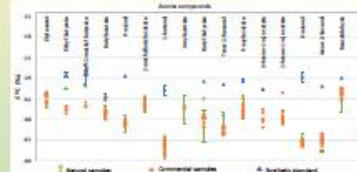


5) $\delta^{13}\text{C}$ VALUES DATABASE CREATION FROM NATURAL AND SYNTHETIC SAMPLES



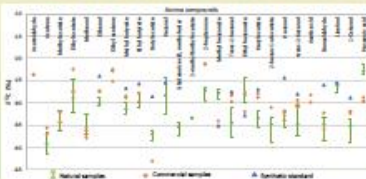
RESULTS

$\delta^{13}\text{C}$ VALUES OF NATURAL AND COMMERCIAL APPLE DISTILLATES



The laboratory-produced apple and strawberry distillates were used to determine $\delta^{13}\text{C}$ ranges of authentic aroma compounds. $\delta^{13}\text{C}$ values of aroma compounds from commercial distillates, labelled as natural, were compared to our authentic database. Despite that most of the compounds were in proposed ranges some possible falsifications were identified, especially for strawberry samples.

$\delta^{13}\text{C}$ VALUES OF NATURAL AND COMMERCIAL STRAWBERRY DISTILLATES



CONCLUSIONS

Initial results show that GC-C-IRMS analysis of key volatile compounds is an appropriate tool for authenticity assessment of apple and strawberry distillates. Since many different compounds with different concentration are present in one sample, the selection of reference material and appropriate processing and interpretation of the results obtained is crucial. Finally, values of some aroma compounds in commercial samples indicate possible adulteration. To gain more confidence in the interpretation of measured values, an extensive database, which is under construction is required. We also noticed some deviation between natural apple and strawberry distillates for the same aroma compound. Differences may be in our future work better explain with the chemometrics and metabolomics approach.

Poster number: 8

Classification of stellar types based on RAVE stellar spectra morphology

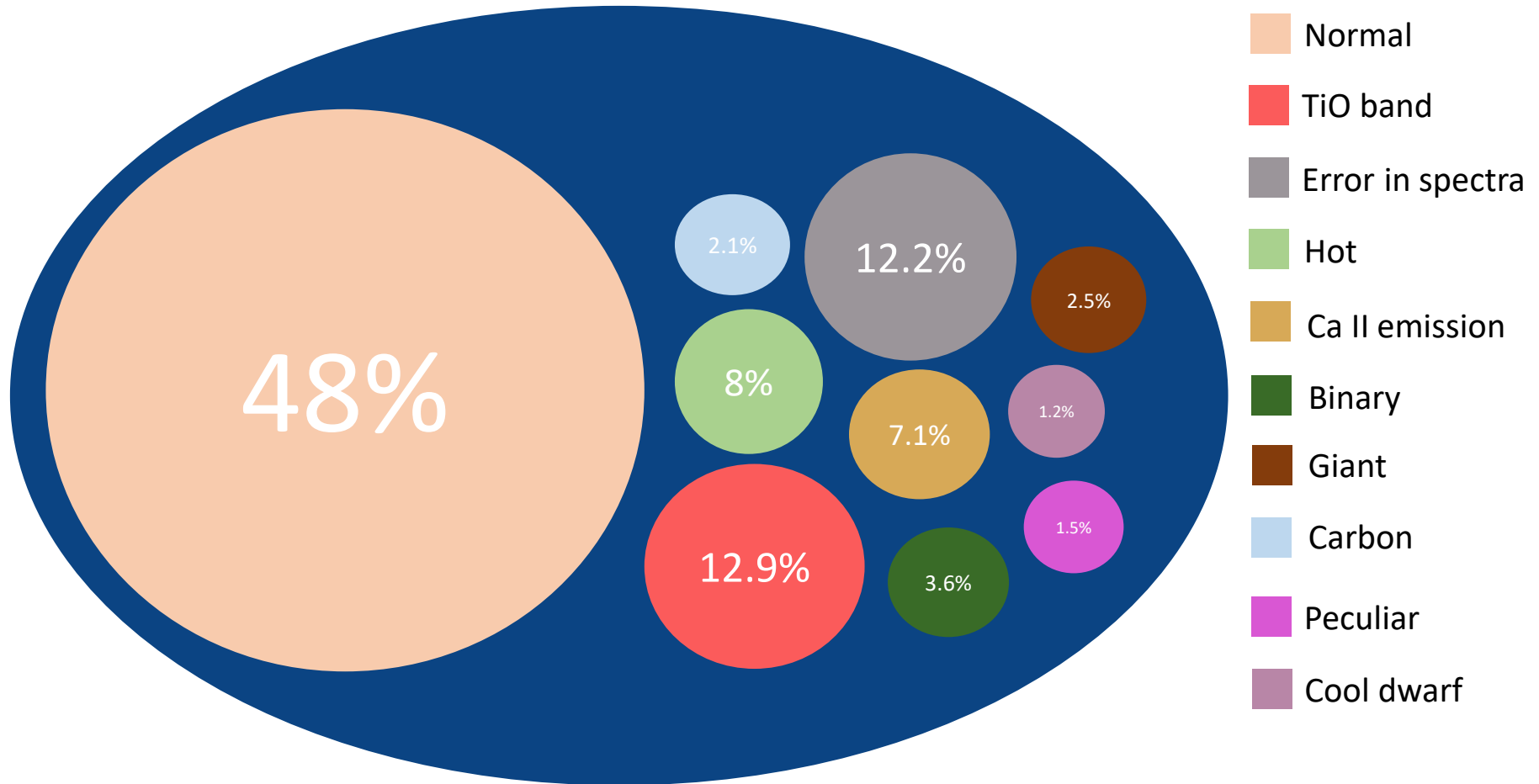
Ilin Tolovski

International Postgraduate School Jožef Stefan
Department of Knowledge Technologies, Jožef Stefan Institute

Problem & data description

- RAVE (RAAdial Velocity Experiment) Survey of the Milky Way
- Through these observations we study the history & morphology of the Milky Way
- Our dataset consists of stellar spectra described via:
 - 1522 (numeric) descriptive attributes
 - 1500 wavelengths
 - 19 linear integrals
 - 3 magnitudes of colors
 - 1 discrete target attribute
 - 4942 instances
- We used this data to predict the stellar type (12 classes)

The challenge



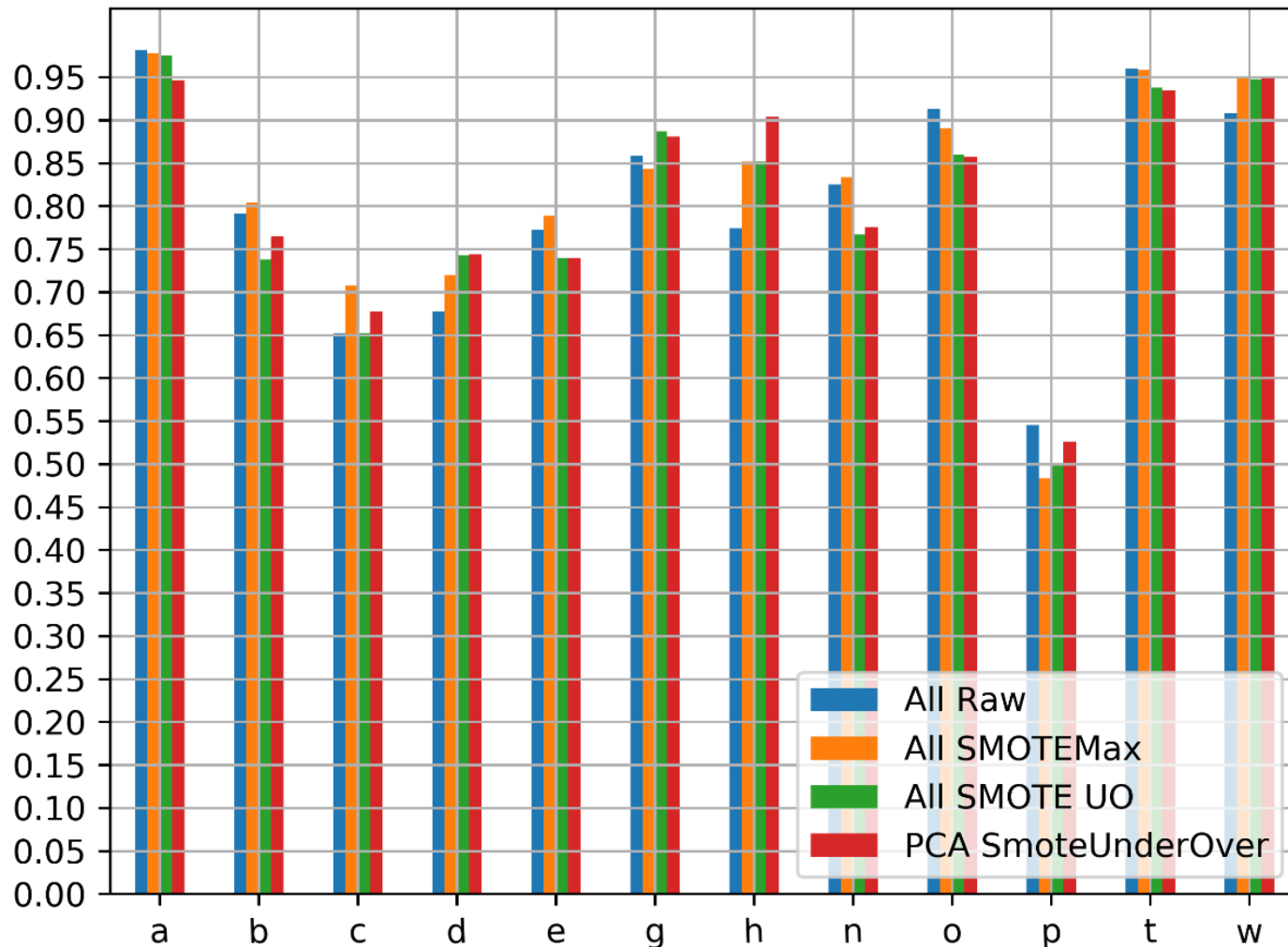
Methodologies

- Synthetic Minority Over-sampling Technique (SMOTE)
- Under-sampling
- Combination of under-sampling and SMOTE
- Dimensionality reduction (Principal Component Analysis)
- Data mining methods used for building predictive models:
 - Random Forest
 - Ensemble of Bagged Trees
- We use Matthews Correlation Coefficient (MCC) as the evaluation metric

$$MCC = \frac{TP * TN - FP * FN}{\sqrt{(TP + FP)(TP + FN)(TN + FP)(TN + FN)}}$$

- Model evaluation through 10-fold cross-validation

Results & comparison of approaches



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Machine learning and non-target GC-EI-MS/MS environmental analysis – Do we have the perfect match?

Milka Ljoncheva

PhD fellow, Department of
Environmental Sciences,
Jožef Stefan Institute

Poster number : 38

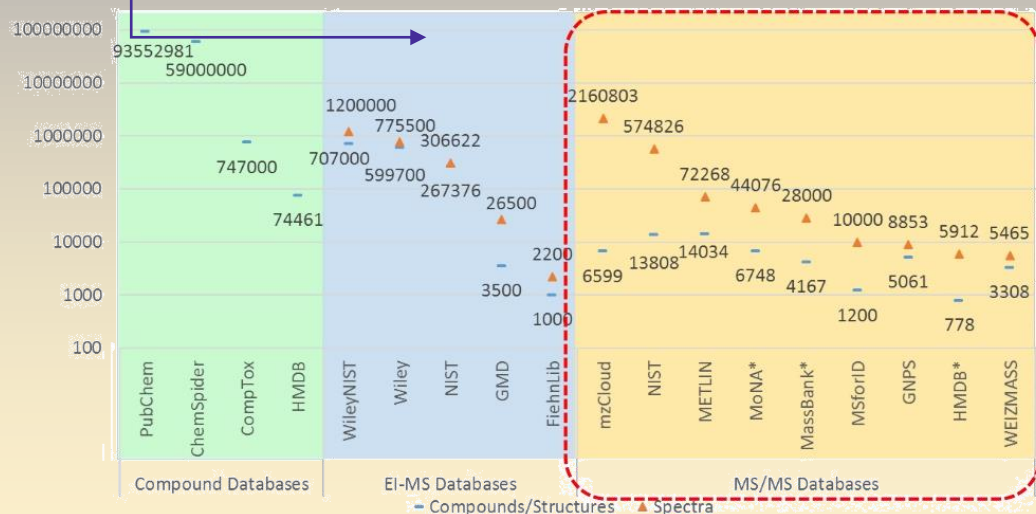
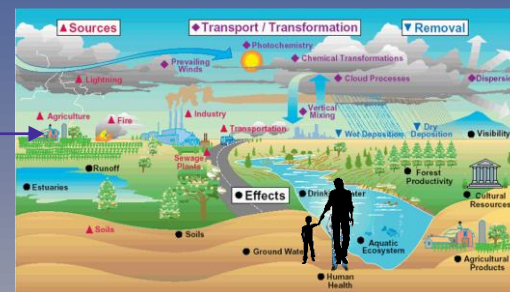
Identification of contaminants of emerging concern (CECs)– big problems?

10^{60} possible chemicals

1.3×10^8 compounds in CAS Registry

9×10^6 compounds possibly found in the environment

605 000 compounds in mass spectral libraries



How to annotate the unknowns?

How to squeeze the lemon properly?

Manual MS/MS interpretation?



Semi-automated approaches?



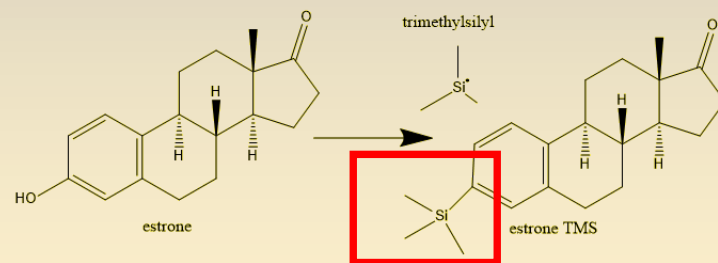
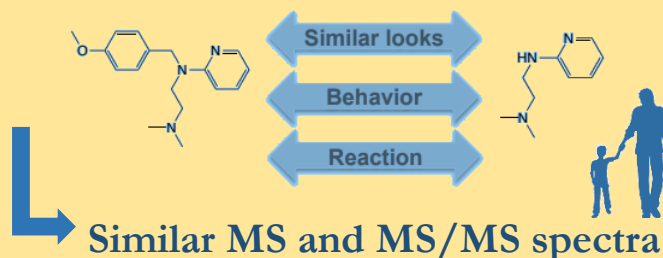
Fully-automated approaches!



Machine-learning model based on Input-output kernel regression (IOKR)



Non-target environmental analysis using GC-MS/MS analysis of TMS derivatives



Identification of contaminants of emerging concern-big problems?—**OPPORTUNITIES!**

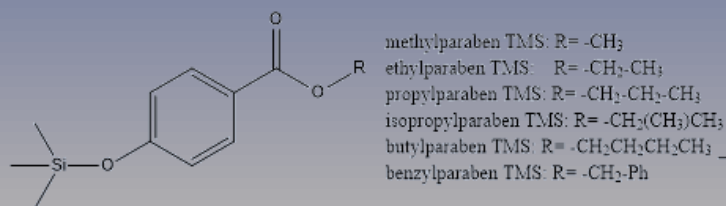
Generation of test dataset



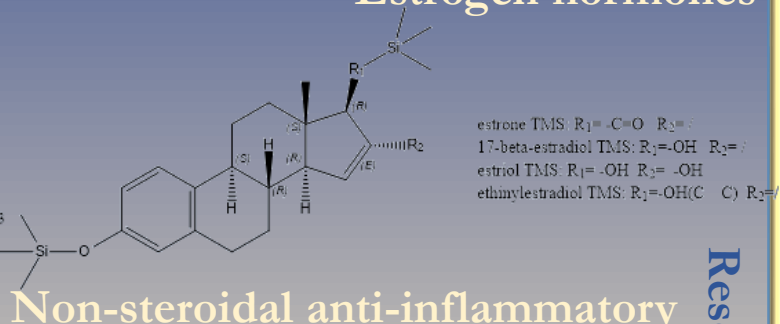
GC-EI-MSD
MS¹

CECs of interest: 110 compounds, 20 compounds analyzed
60 EI-MS and 40 EI-MS/MS spectra generated

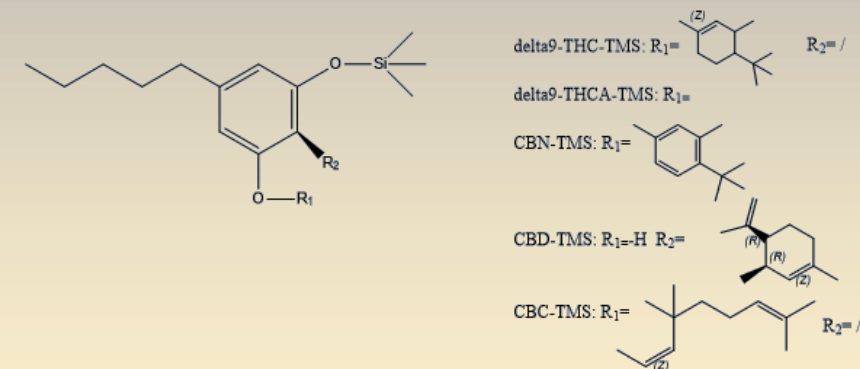
Parabens



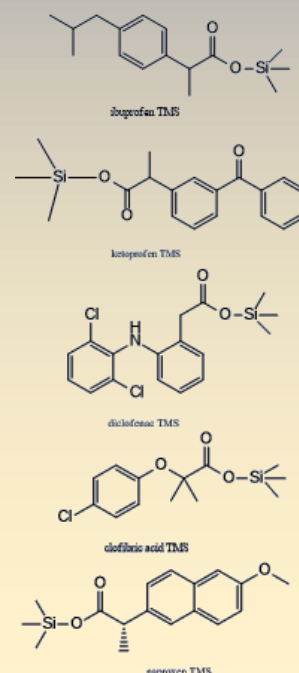
Estrogen hormones



Natural cannabinoids



Non-steroidal anti-inflammatory drugs (NSAIDs)



Resolution and possibilities



GC-EI-QqQ
MS¹, MS²



GC-EI-Ion Trap
MS¹, MS²....MSⁿ



Generation of training dataset



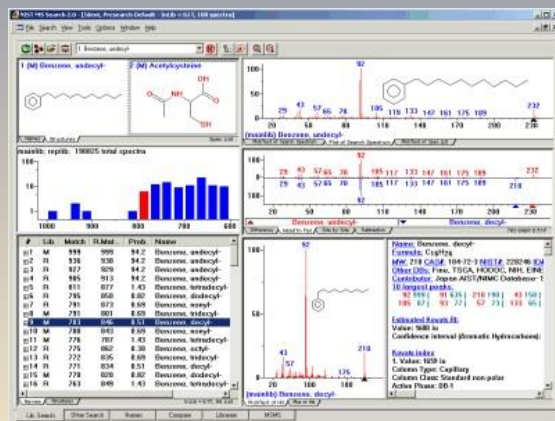
Literature (2014-2018), prediction systems,
library of transformations



In-house database of most important
CECs (~6300 compounds)



NIST Mass spectral library 2017



Mission complete !



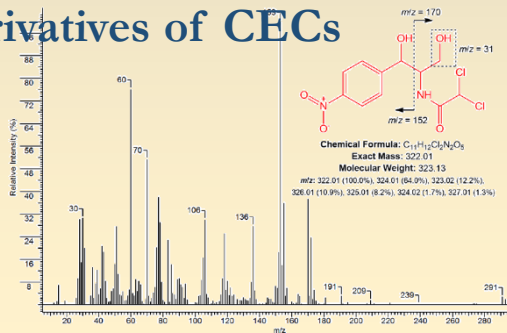
Use the IOKR model on real
non-target environmental
analysis



Evaluate and validate CECs
identification performance of the
developed method



Extract MS/MS spectra of TMS
derivatives of CECs



Thank you for your attention !

For more info, visit poster no.38

Science never solves a problem without creating ten more.

-George Bernard Shaw

Alternative method for advanced tissue healing using piezoelectric materials

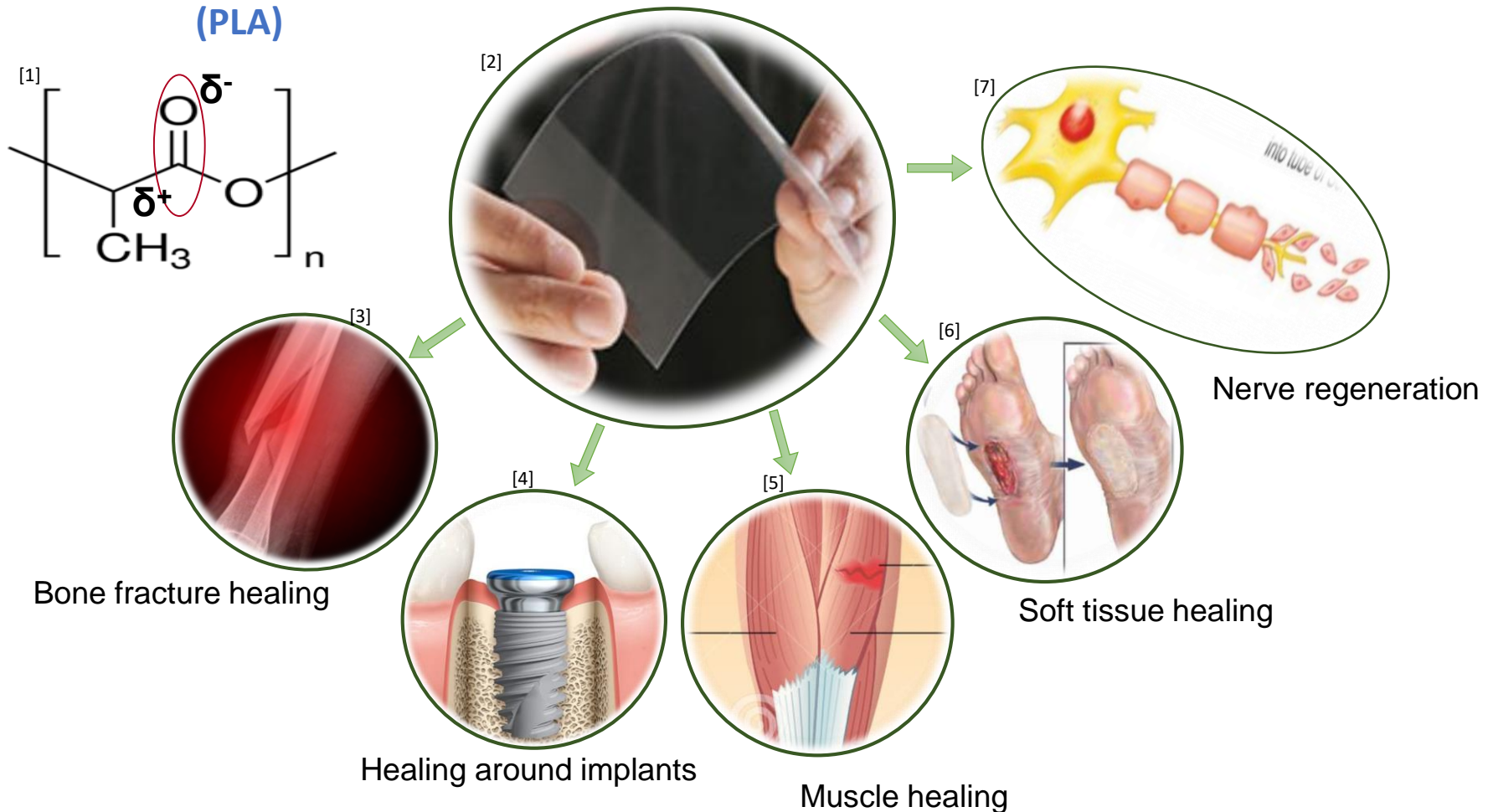
Lea Udovč,

*Advanced Materials Department K9, Jožef Stefan Institute, and
Jožef Stefan International Postgraduate School*

Poster number: 27

WHAT?

Polylactic acid film (PLA) → piezoelectric, biocompatible, **biodegradable**, flexible

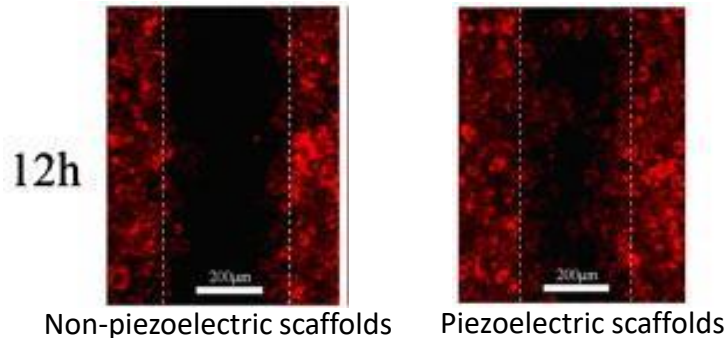


[1] https://www.researchgate.net/figure/Molecular-structure-of-PLA_fig1_261102190; [2] <http://www.piezofilms.com/>; [3] <http://dwtnews.com/after-a-leg-break/>; [4] <https://www.nobelbiocare.com/au/en/education/dental-implantology-courses/implant-placement-courses.html>; [5] <https://www.dreamstime.com/stock-illustration-calf-muscle-tear-medical-illustration-symptoms-image68893791>; [6] <http://www.europeanmedical.info/tissue-engineering/twodimensional-clinical-tissue-engineering.html>; [7] <http://slideplayer.com/slide/10750224/>

WHY?

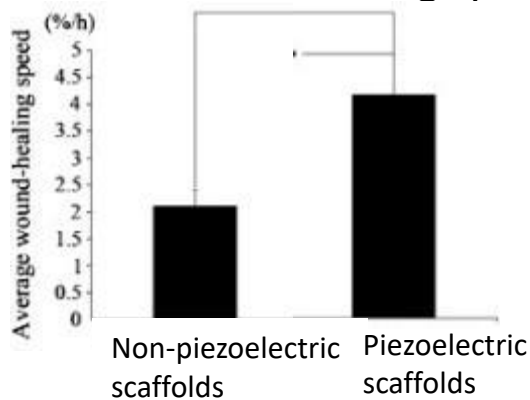
Positive effect of piezoelectricity (*In vitro*):

Increased fibroblast migration



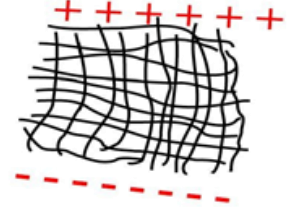
[9]

Increased wound-healing speed



[9]

Piezoelectric Scaffold

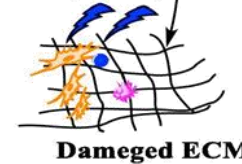


Mechanical Load (Body)



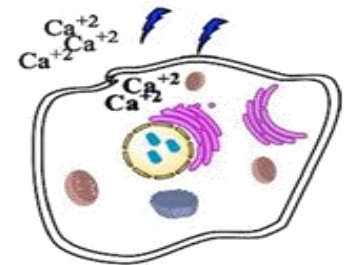
Damaged Bone / Cartilage

Potential Difference

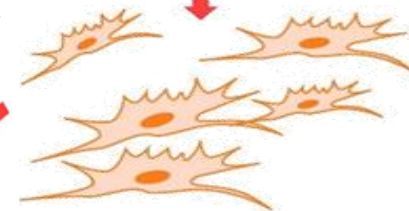


Implantation

Electrical Stimulation



Cell Proliferation



[8]

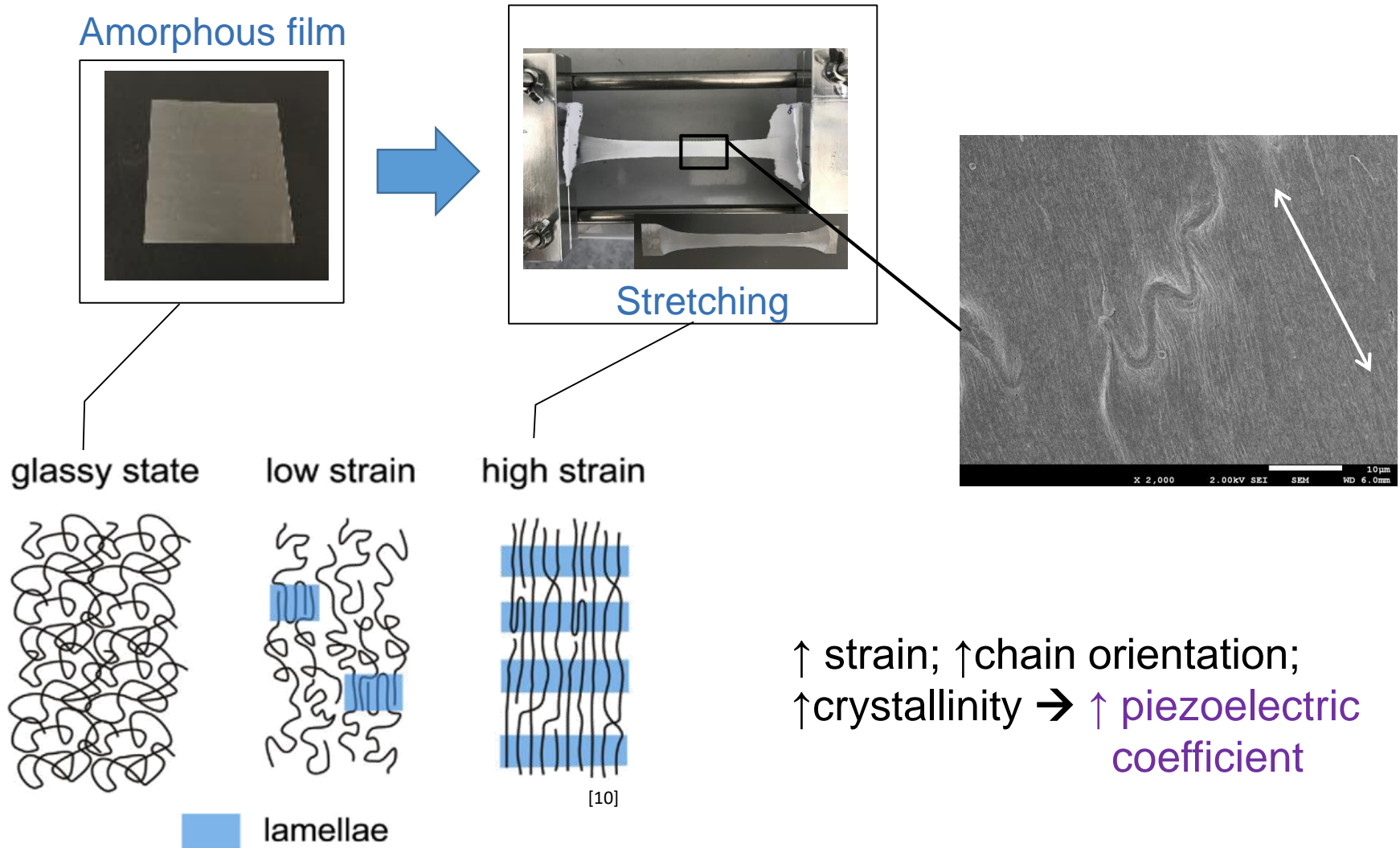
Repair Bone / cartilage

[8] N. More, G. Kapusetti, Medical Hypotheses, 2017, 108, 10-16;

[9] H. F. Guo, Z. S. Li, S. W. Dong, W. J. Chen, L. Deng, Y. F. Ying, Colloids and Surfaces B: Biointerfaces, 2012, 96, 29-36

HOW?

Strain induced crystallization of PLA



Thank you for your attention!

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10th and 11th May

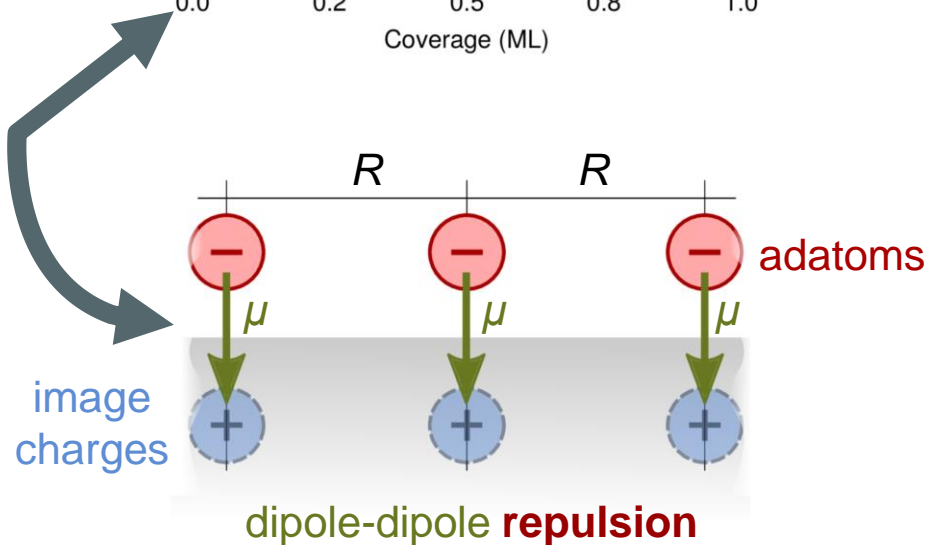
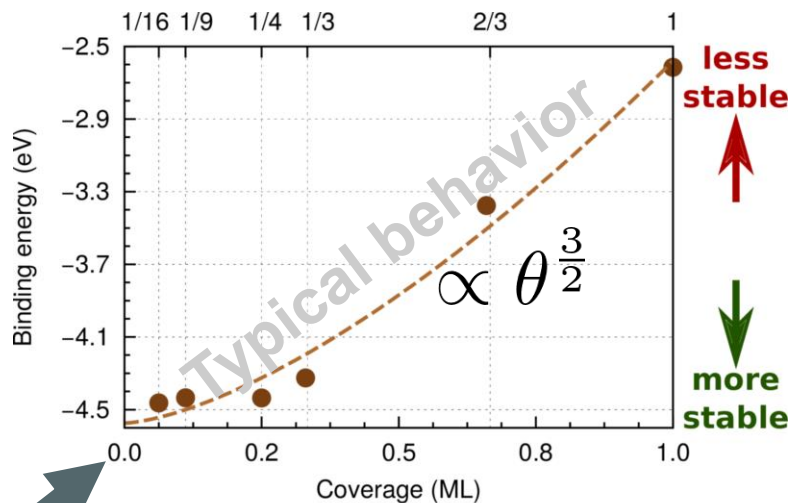
***Opposite charges attract and like
charges repel. Do they always?***

***Matic Poberžnik,
Jožef Stefan Institute***

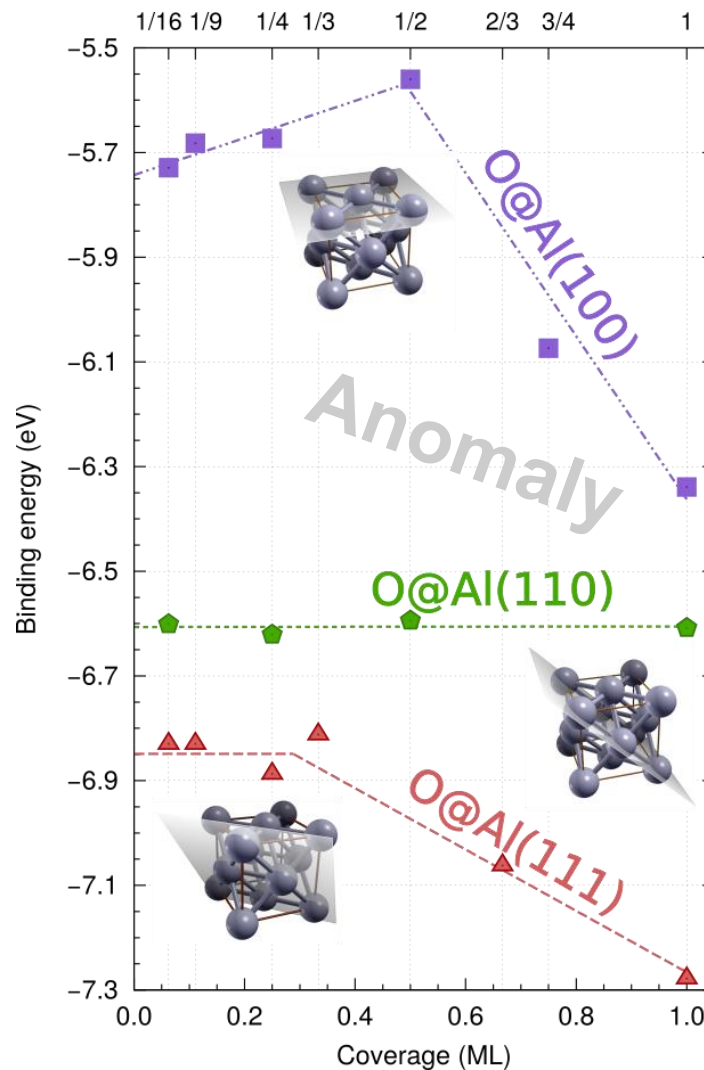
Poster number: 03

PROBLEM

O @ Cu(111)



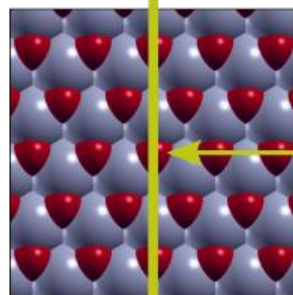
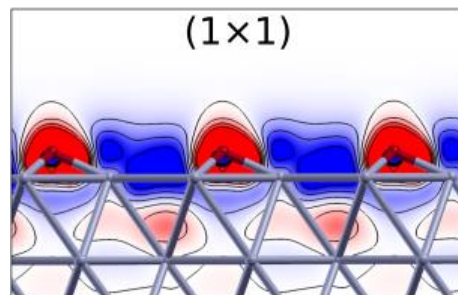
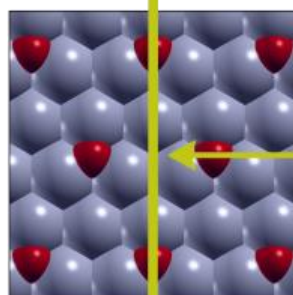
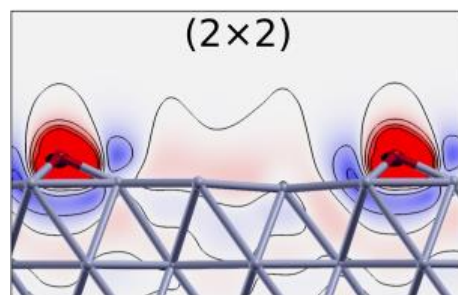
O @ Al(hkl)



ANALYSIS

Charge density difference

$$\Delta\rho_{\text{O/Al}}(\mathbf{r}) = \rho_{\text{O/Al}}(\mathbf{r}) - \rho_{\text{O}}(\mathbf{r}) - \rho_{\text{Al}}(\mathbf{r})$$

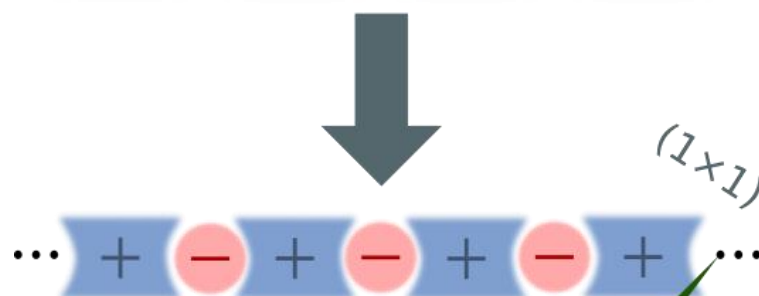
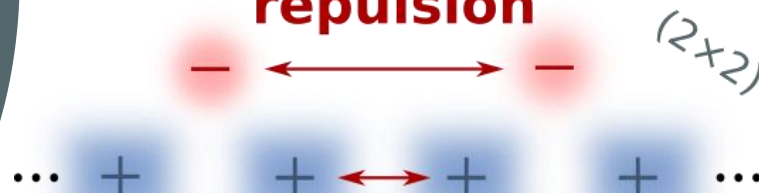


Electron deficit

Electron excess

Hypothesis

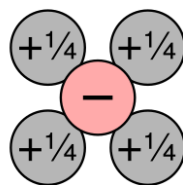
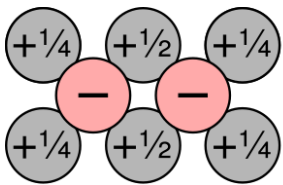
repulsion



stabilization

EXPLANATION

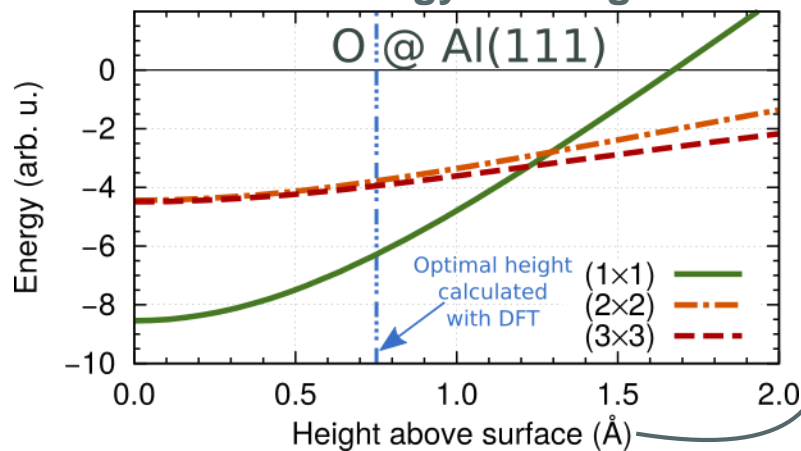
Simple ionic model



Charge is distributed proportionally among nearest neighbors

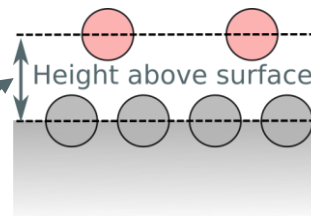
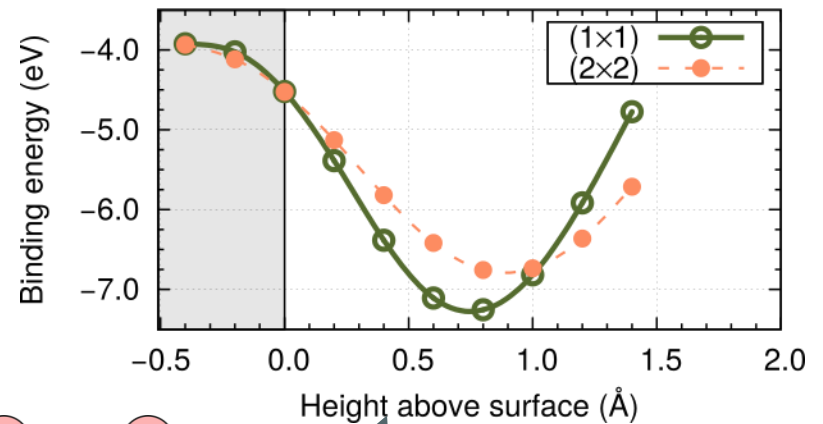


Energy vs. height



Conformation with DFT

O @ Al(111)



Adatoms must be close to the surface for stabilization to occur!

Blood Pressure Prediction Using Data Mining Algorithms

Ana Kostovska,

***Department of Knowledge Technologies, Jožef Stefan Institute,
Ljubljana, Slovenia***

Jožef Stefan International Postgraduate School, Ljubljana, Slovenia

Poster number: 2

Problem description

- ***Hypotension (low blood pressure) and especially hypertension (high blood pressure) are heart diseases of global health concern.***
- ***Chronic exposure to these medical conditions can gradually damage the entire body.***
- ***To improve the treatment, it's crucially important to monitor the blood pressure on a regular basis.***
- ***We develop models that give an approximate estimate of the blood pressure in real time using personal data and data collected from sensors.***

Data description & evaluation metric

- ***The dataset consists of:***
 - ***1429 data points***
 - ***18 descriptive features***
 - ***3 target features: systolic, diastolic & pulse***
 - ***Measurements from 96 different patients***
 - ***Multiple measurements per patient***
- ***For evaluating the performance of the models, we measure the Mean Absolute Error (MAE)***
- ***We use the leave-one-patient-out validation approach***

Methodology and results

Data mining methods used for building predictive models:

- **Linear Regression (LR)**
- **Bagging of Regression Trees (BRT)**
- **Gradient Boosting of Regression Trees (GBRT)**
- **Bagging of Model Trees (BMT)**
- **Bagging of Random Subspaces with Model Trees (BRSMT)**

	Systolic pressure	Diastolic pressure	Pulse pressure	Systolic and diastolic pressure	Systolic and pulse pressure
ZeroR	14.9524	9.3724	13.2530	---	---
LR	11.6538	8.5061	11.3592	---	---
BRT	11.5864	9.1573	11.2947	11.3963	11.2832
GBRT	10.6130	8.8098	10.9169	---	---
BMT	11.3998	9.1103	11.2965	---	---
BRSMT	10.9649	8.855142	11.0889	---	---

An anatomical illustration of a human heart, showing its complex network of arteries and veins. The heart is depicted in a realistic, slightly translucent style, revealing internal structures. The major vessels, including the aorta and pulmonary artery, are clearly visible. The background is a soft, reddish-pink gradient, complementing the color of the heart and its vessels.

Thank you for your
attention!



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10th and 11th May

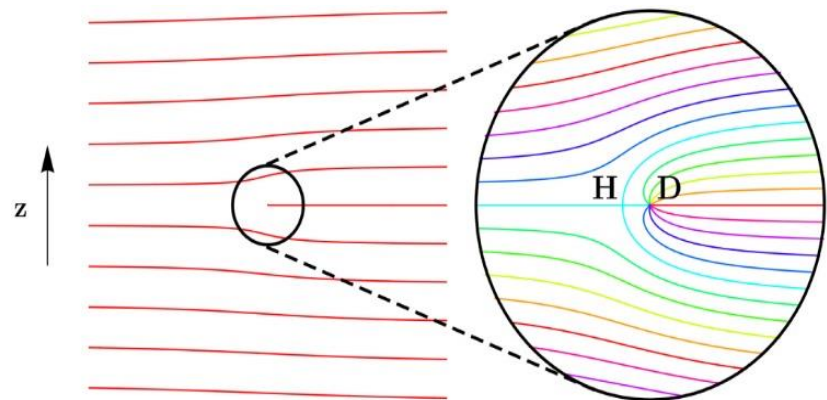
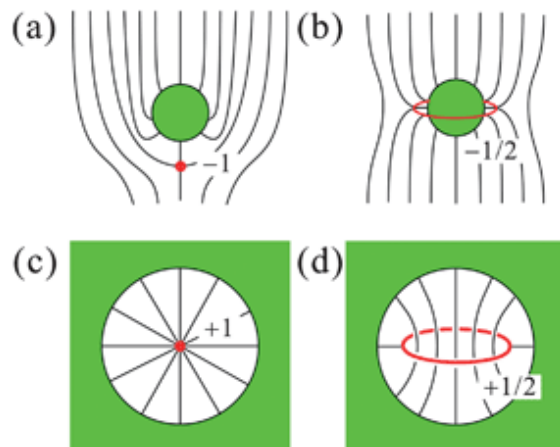
Topological defects in smectic ordering.

***Apparao Gudimalla,
Jozef Stefan International Postgraduate
School***

Poster number: 30

Introduction

- Topological defects (TDs) are ubiquitous in nature, which is commonly introduced bulk ordering properties
- An isolated TD could not be destroyed if the field is not melted due to the topological reasons
- TDs are generated by symmetry breaking mechanism (systems with broken symmetries are described by non-vanishing order parameter).
- TDs are experimentally accessible, so that different liquid crystal phases are an ideal choice



Modeling of dislocations in smectic A liquid crystals

$$f = f_c + f_e^{(n)} + f_e^{(s)}$$

$$f_e^{(s)}$$

$$= \alpha(T - T_c)|\varphi|^2 + \beta|\varphi|^4 + C_{\parallel} |(iq_0 \vec{n} - \nabla)\varphi|^2 \\ + C_{\perp} |(\vec{n} \times \nabla)\varphi|^2$$

$$f = \alpha_0 (T - T_c)|\varphi|^2 + \beta|\varphi|^4 + \frac{\hbar^2}{4m} \left| \left(\nabla - \frac{2ie}{\hbar C} \vec{A} \right) \varphi \right|^2 + \frac{|\nabla \times \vec{A}|^2}{8\pi\mu_0}$$

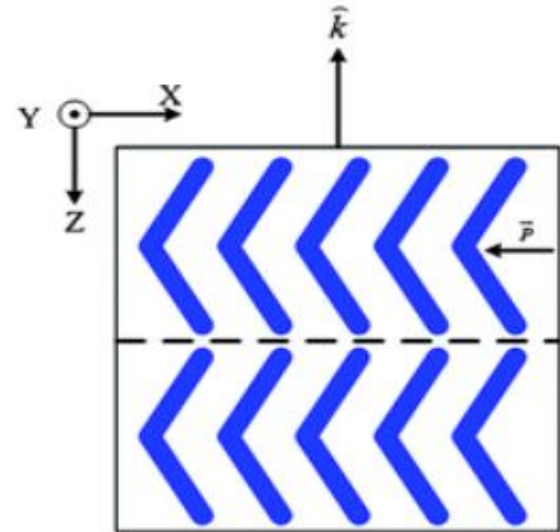
Introducing the edge dislocations

- The system avoided strong local bend distortion by melting
- Another possible scenario is that lattice of edge dislocation is introduced
- Ratio of smectic-A phase

$$\delta = \lambda / \xi$$

$$\lambda = \sqrt{\frac{K}{2C_{\perp} \eta^2 q_0^2}}$$

$$\xi = \sqrt{\frac{2C_{\perp}}{\partial^2 f_c / \partial \eta^2}}$$



Conclusion

- Similar free energy expression for the smectic and superconducting ordering suggest that also another solution to the problem
- Smectic-A phase characterized by $\lambda/\xi > 1/\sqrt{2}$ smectic bend imposed frustration could be resolved by a lattice edge dislocations
- The present problem that I am going to explore theoretically and experimentally

Thank you

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10th and 11th May

Hybrid sol-gel coatings for corrosion protection of aluminum alloy AA7075

Urša Tiringer

***Jožef stefan institute, Department of Physical and Organic Chemistry,
Ljubljana, Slovenia***

***Jožef Stefan International Postgraduate School, Nanoscience and
Nanotechnology***

Ljubljana, Slovenia

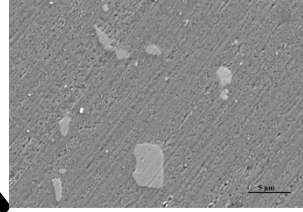
Poster number: 24



transportation industry

intermetallic
particles

AA7075



not corrosion resistant

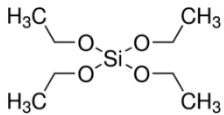
Aluminum alloys (AA)

CCCs = toxic corrosion protection

development of CCCs
alternative technologies

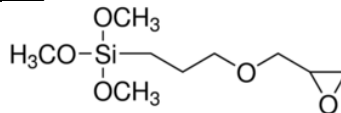
HYBRID SOL-GEL COATINGS

TEOS



+

GPTMS



+

SiO₂
nanoparticles

+

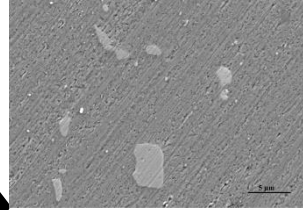
Ce(NO₃)₃



transportation industry

intermetallic
particles

AA7075



not corrosion resistant

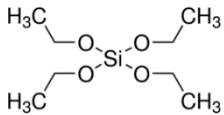
Aluminum alloys (AA)

CCCs = toxic corrosion protection

development of CCCs
alternative technologies

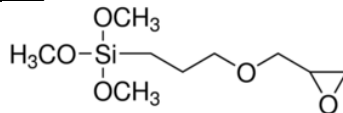
HYBRID SOL-GEL COATINGS

TEOS



+

GPTMS



+

SiO₂
nanoparticles

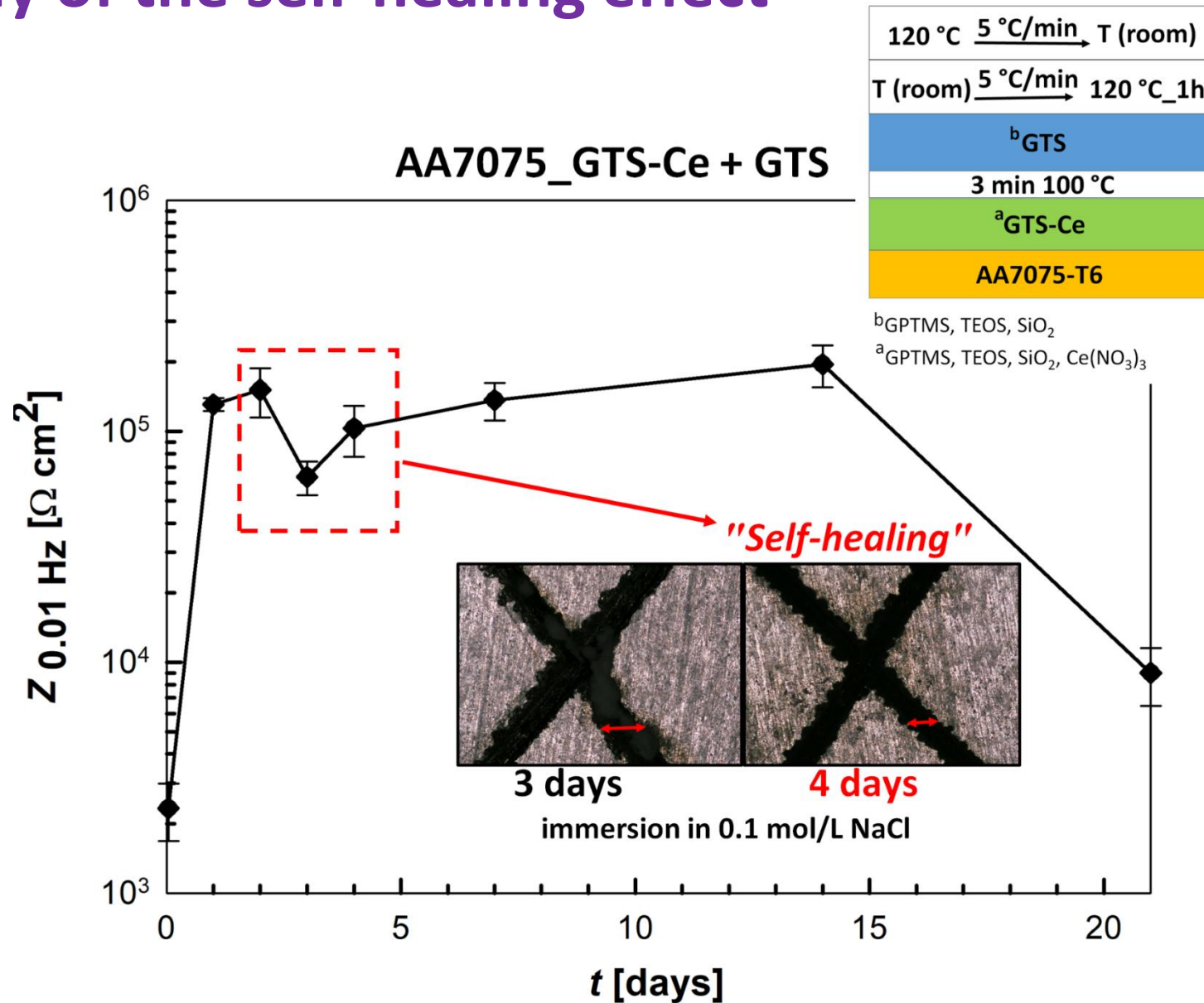
+

Ce(NO₃)₃

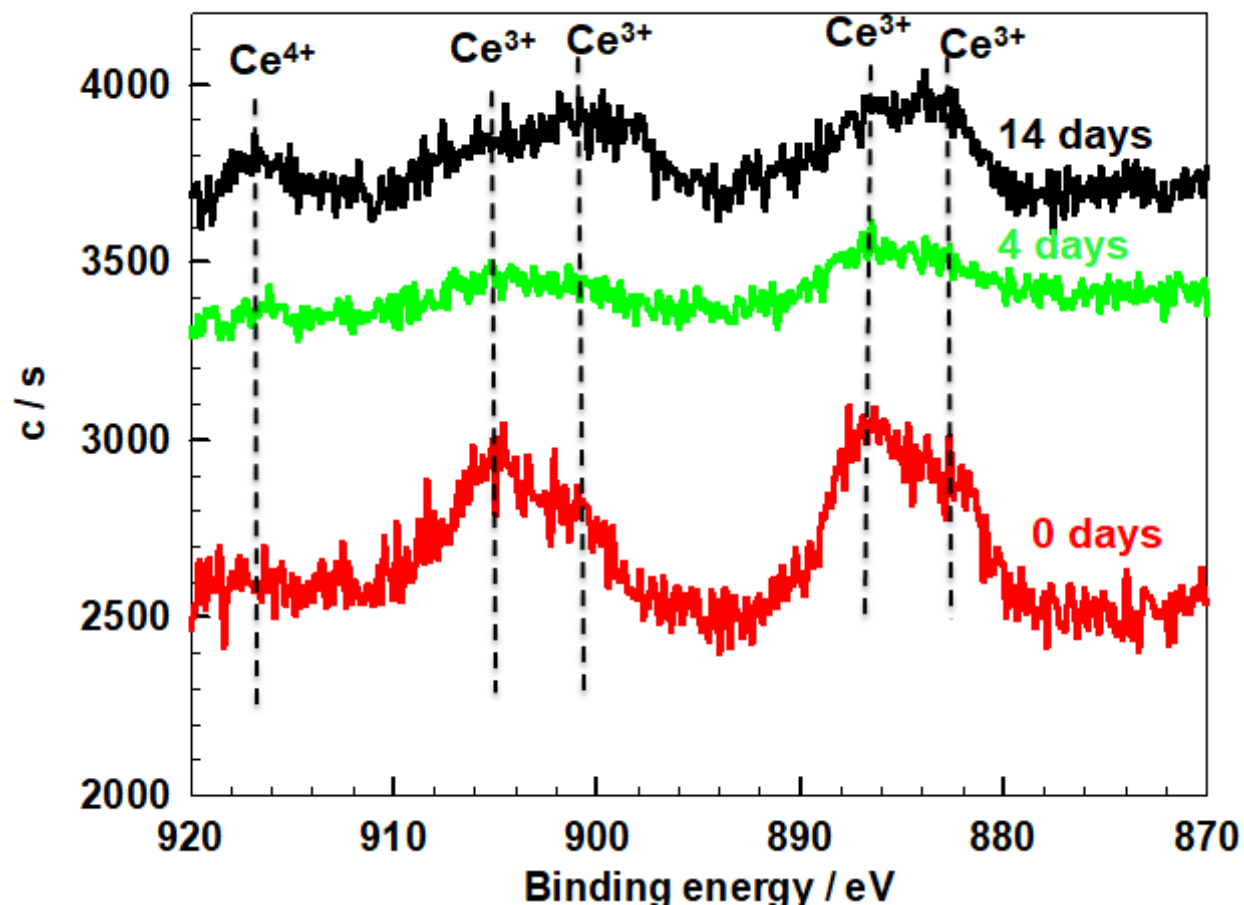


Self-healing until Ce³⁺ are present in the coating

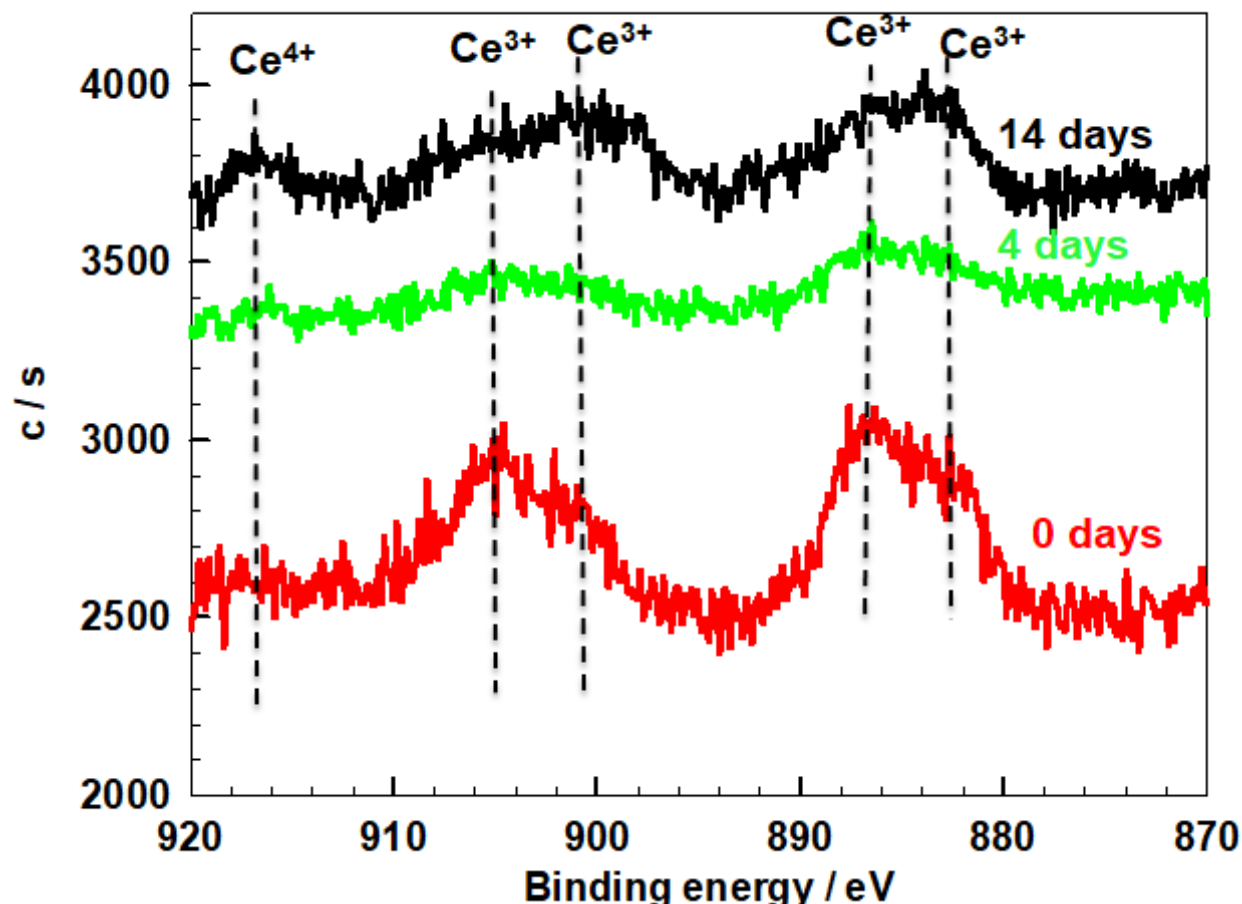
Study of the self-healing effect



High resolution spectra of Ce 3d on scribe of GTS-Ce + GTS immersed in 0.1 M NaCl for different times



High resolution spectra of Ce 3d on scribe of GTS-Ce + GTS immersed in 0.1 M NaCl for different times



*Self-healing is efficient
after 14 days of immersion!*

A Semi – Automatic Approach for Borrowing Missing Nutrient Values in Food Composition Databases

Gordana Ispirova

*Computer Systems Department, Jožef Stefan Institute, Ljubljana
Slovenia*

Jožef Stefan International Postgraduate School, Ljubljana, Slovenia

Poster number: 34

Food Composition Databases (FCDBs)

Pro:

- very useful tool

Con:

- a lot of limitations

Nutrient	Unit	1 Value Per100 g	1 cup, quartered or chopped 125g	1 cup slices 109g	1 large (3-1/4" dia) 223g	1 medium (3" dia) 182g	1 small (2-3/4" dia) 149g	1 extra small (2-1/2" dia) 101g	1 NLEA serving 242g
Proximates									
Water	g	85.56	106.95	93.26	190.80	155.72	127.48	86.42	207.06
Energy	kcal	52	65	57	116	95	77	53	126
Protein	g	0.26	0.33	0.28	0.58	0.47	0.39	0.26	0.63
Total lipid (fat)	g	0.17	0.21	0.19	0.38	0.31	0.25	0.17	0.41
Carbohydrate, by difference	g	13.81	17.26	15.05	30.80	25.13	20.58	13.95	33.42
Fiber, total dietary	g	2.4	3.0	2.6	5.4	4.4	3.6	2.4	5.8
Sugars, total	g	10.39	12.99	11.33	23.17	18.91	15.48	10.49	25.14
Minerals									
Calcium, Ca	mg	6	8	7	13	11	9	6	15
Iron, Fe	mg	0.12	0.15	0.13	0.27	0.22	0.18	0.12	0.29
Magnesium, Mg	mg	5	6	5	11	9	7	5	12
Phosphorus, P	mg	11	14	12	25	20	16	11	27

Problem definition

Scenario: Using a FCDB

Problem: Missing values

	Apple	Pear	Peach
Na	?	1	?
K	107	116	190
Mg	5	7	?

Problem definition

Scenario: Using a FCDB

Problem: Missing values

	Apple	Pear	Peach
Na	?	1	?
K	107	116	190
Mg	5	7	?



Borrow from another
FCDB

Problem definition

Scenario: Choosing a FCDB
for borrowing

~~Problem:~~ PROBLEMS!

The FCDB for borrowing must:
1. Contain recent data.
2. Be of high quality.
3. Contain the foods and nutrients of interest.
4. Be from a country similar in geographic location.

Problem definition

Scenario: Choosing a FCDB
for borrowing

~~Problem:~~ **PROBLEMS!**

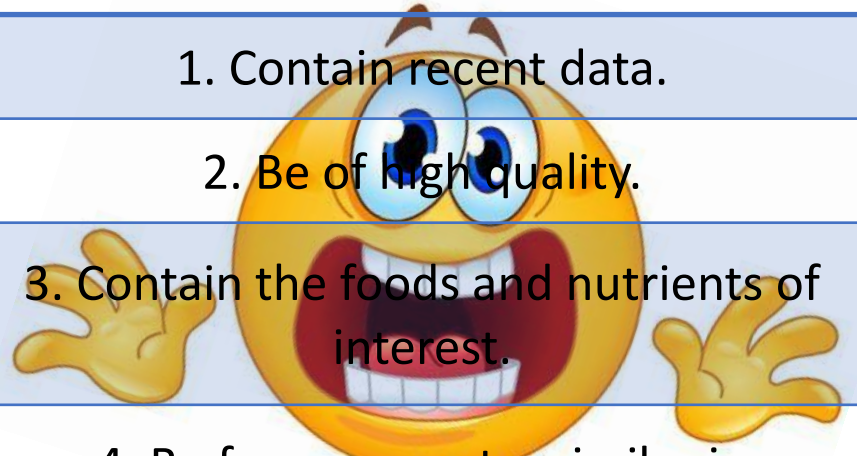
The FCDB for borrowing must:

1. Contain recent data.

2. Be of high quality.

3. Contain the foods and nutrients of interest.

4. Be from a country similar in geographic location.



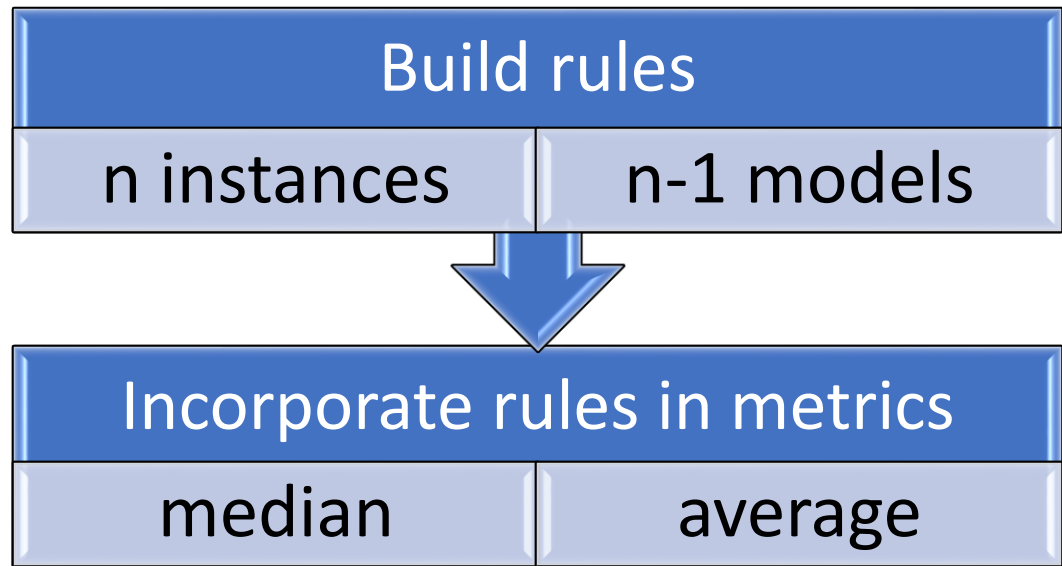
Solution?!

Method

Data:

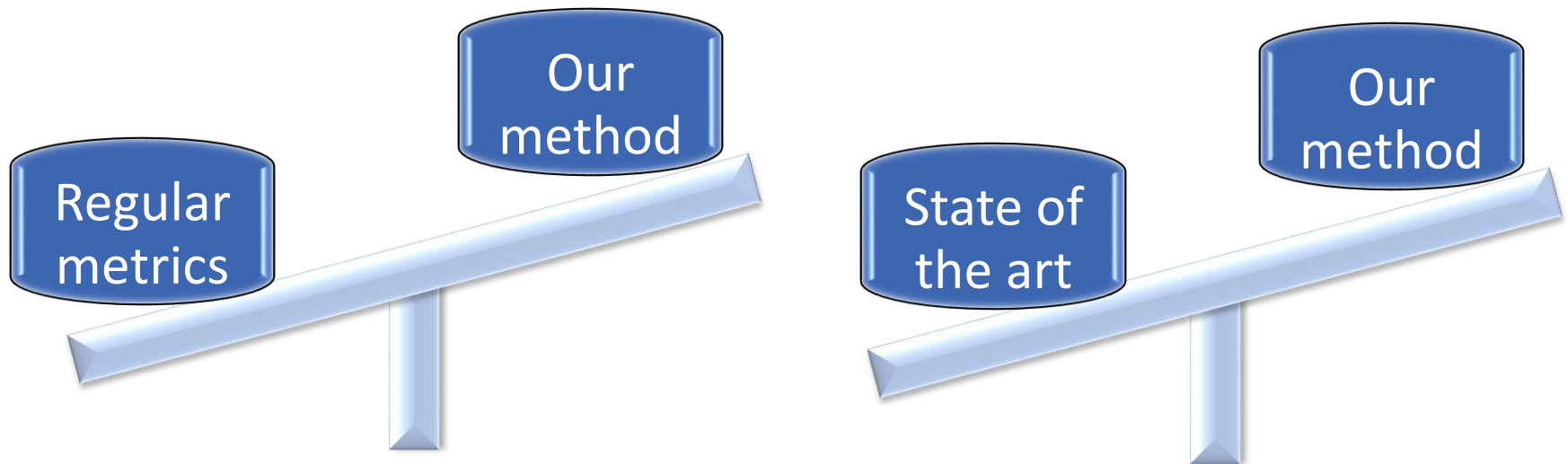
	Country ₁	Country ₂	...	Country _m
Nutrient ₁	Value ₁₁	Value ₁₂	...	Value _{1m}
⋮	⋮	⋮	...	⋮
Nutrient _n	Value _{n1}	Value _{n2}	...	Value _{nm}

Methodology:



Results

- Leave-one-out-cross-validation
 - **14** nutrients in **Beef Fillet** from FCDBs of **10** countries
- Evaluation



THANK YOU FOR YOUR ATTENTION!



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10th and 11th May

Highly Efficient Carbon Nanostructures:- Exciting Solution For The Energy Storage Devices

Neelakandan Marath Santhosh

***Jožef Stefan International Postgraduate School
(IPS),***

Ljubljana, Slovenia

Poster number: 04



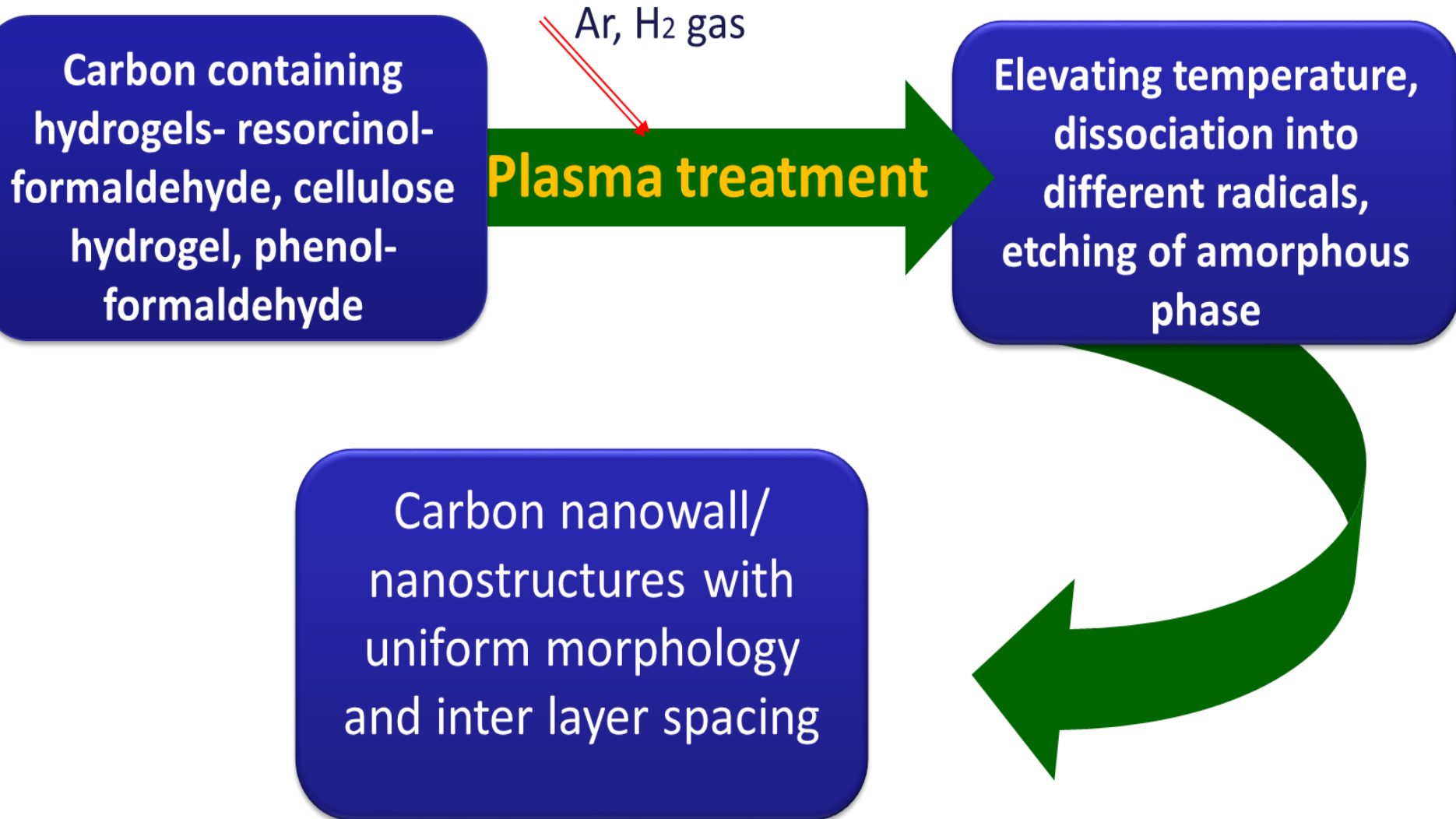
Problems



Efficient solution

CARBON NANOSTRUCTURES

Our Suggestion:- 2D Carbon Structures



Advantages of Our Technique

- ❖ ***One-step low time synthesis technique***
- ❖ ***Possibility to control the morphology***
- ❖ ***Chances for the various carbon nanostructure(carbon nanowall, carbon nanosheets, etc.)***
- ❖ ***In-situ plasma assisted surface modification***
- ❖ ***Easier and safer technique***

Applications

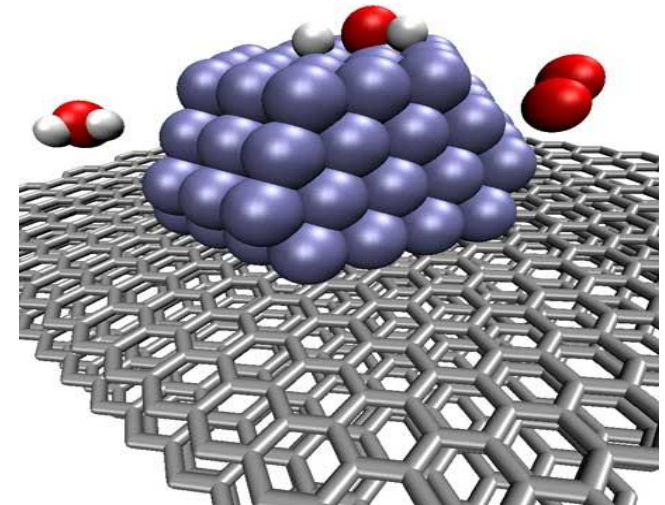
Energy storage devices (electrodes)



**Super
capacitors**



**Lithium
Battery**



**Catalyst supporter
for fuel cells**

- ❖ **Recharge an electronic device (smart phone, laptops, cameras) within minutes ?**
- ❖ **Requires advanced material for short-term power boosting in space applications ?**
- ❖ **Making an eco-friendly fuel cells and replace the toxic lead-acid batteries.**

Thanks For Your Kind Attention

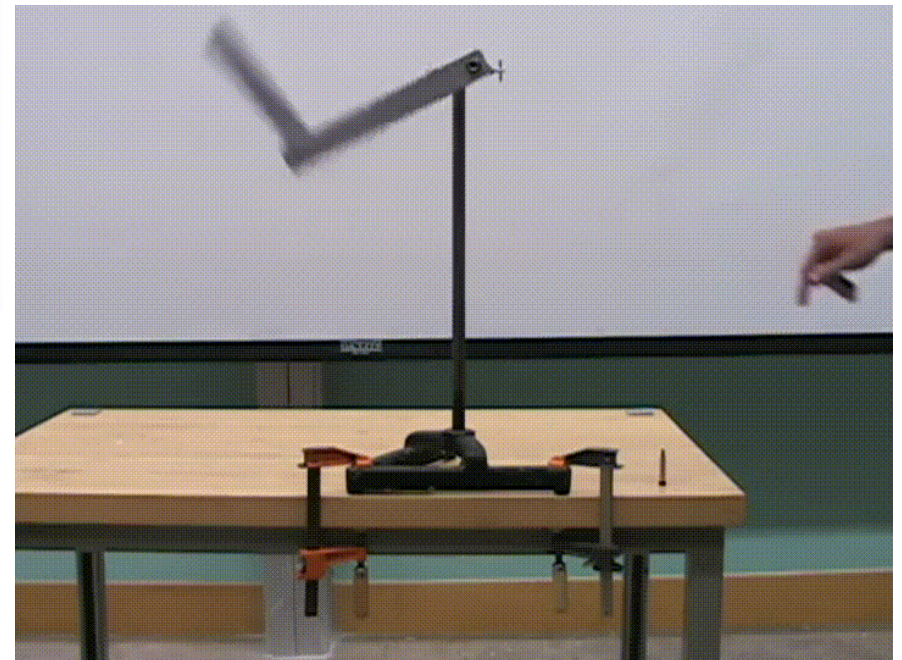
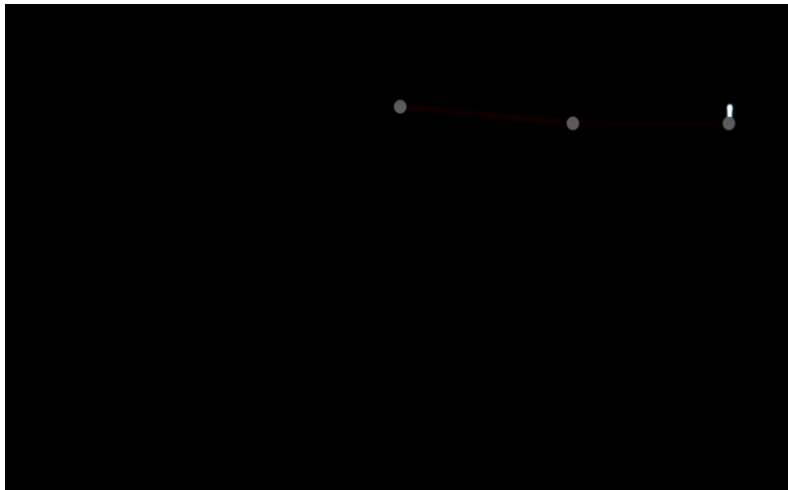
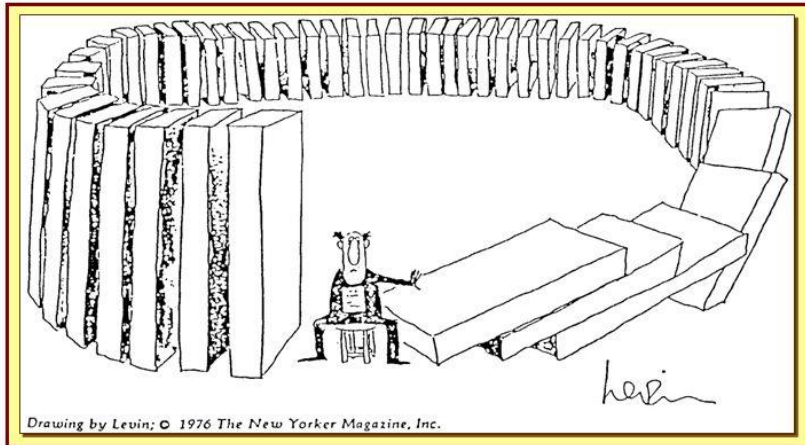
***Identification of a Nonlinear
Dynamical Benchmark
System using Process-
Based Modeling***

***Gjorgi Peev,
Department of Knowledge Technologies,
Jožef Stefan Institute, Ljubljana, Slovenia***

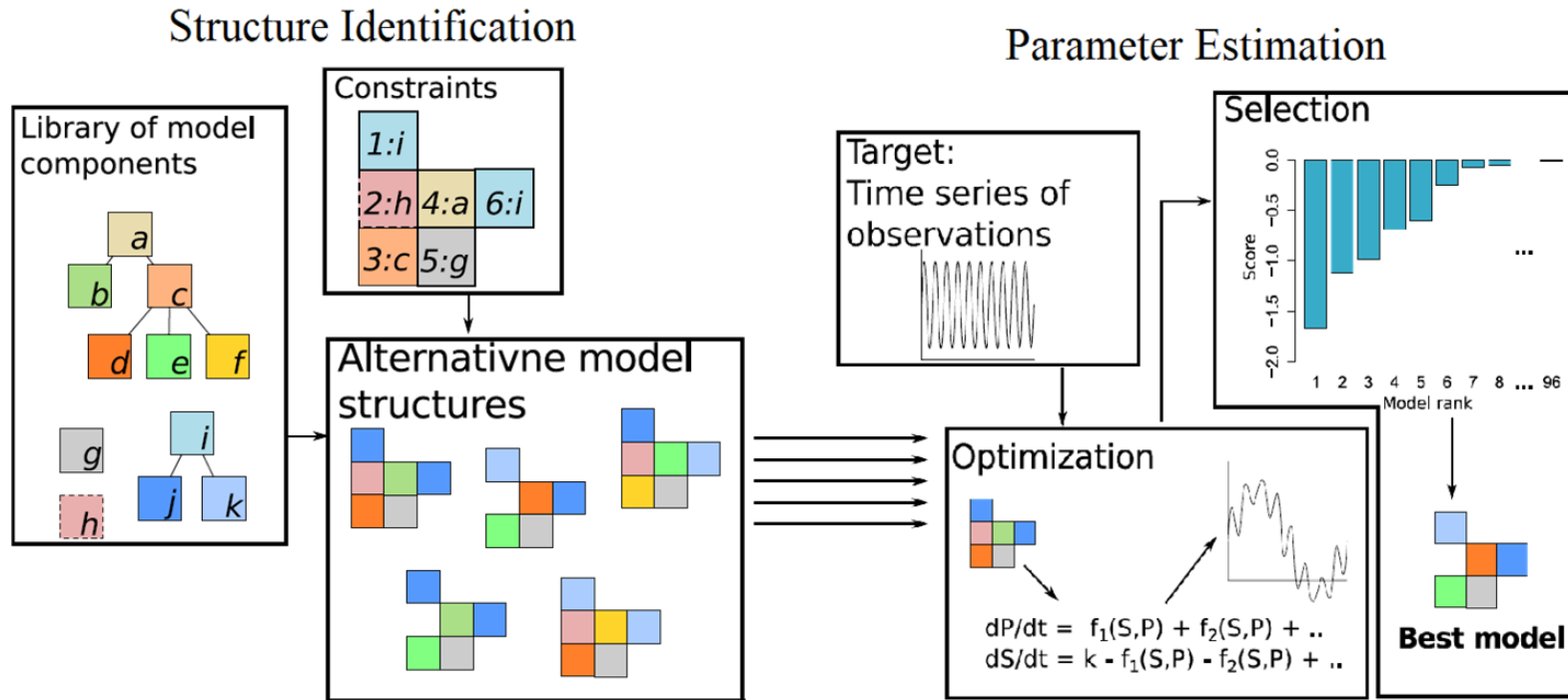
Poster number: 37

Dynamical systems

Dynamic Complexity is All Around Us



Process-Based Modeling



Case study



model SilverBoxIncomplete : SilverBox;

//Entities

entity b1 : Box {

```
vars:
    k { role: endogenous; initial: 0.0;},
    y { role: endogenous; initial: 0.0093978;},
    z { role: endogenous; initial: 0.0;},
    m = 2.1318082350899394;

consts:
```

entity Uin : Input {

```
vars:
    u { role: exogenous;}}
```

//Processes

```
process init(b1) : InitBox {}
```

```
process input(Uin, b1) : BoxInput {}
```

```
process activatebox(b1) : DuffingOscillator {
```

```
consts:
    a = 0.8668088621998951,
    b = 0.1,
    d = 0.2612436284277873;}
```

library SilverBox;

//Entity templates

template entity Box {

```
vars:
    k { aggregation: sum},
    y { aggregation: sum},
    z { aggregation: sum};
consts:
    m { range: <0.1,100>;}
vars:
    u { aggregation: sum;}}
```

template entity Input {

```
vars:
    u { aggregation: sum;}}
```

// Process templates

template process InitBox(b: Box) {

```
equations:
    td(b.y) = b.z;
```

template process BoxInput(v: Input, b: Box) {

```
equations:
    td(b.z) = (v.u) / b.m;}
```

template process BoxAction (b: Box) {}

template process DuffingAndSimple : BoxAction {

```
consts:
    a { range: <0.1,100>;},
    b { range: <0.1,100>;}

equations:
    b.k = a + b * pow(b.y,2);}
```

template process HarmonicAndUniversal : BoxAction {

```
consts:
    ksi { range: <0.1,100>;}

equations:
    b.k = 0;}
```

template process DuffingOscillator: DuffingAndSimple {

```
consts:
    d { range: <0.1,100>;}

equations:
    td(b.z) = (- b.k * b.y - d * b.z) / b.m;}
```

template process SimpleOscillator: DuffingAndSimple {

```
equations:
    td(b.z) = (- b.k * b.y) / b.m;}
```

template process HarmonicOscillator: HarmonicAndUniversal{

```
consts:
    omega { range: <0.1,100>;}

equations:
    td(b.z) = (-ksi*omega*b.z - pow(omega,2)*b.y);}
```

template process UniversalOscillator: HarmonicAndUniversal {

```
consts:
    q { range: <0.1,100>;}

equations:
    td(b.z) = (-ksi*b.z - q);}
```

Thank you for your attention

- For more information, visit poster #37

#GrazieRagazzi

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coffee break