



Faculty of Electrical Engineering
and Informatics

Department of computers and informatics

Spracovanie vesmírnych dát, Letné školy, stáže

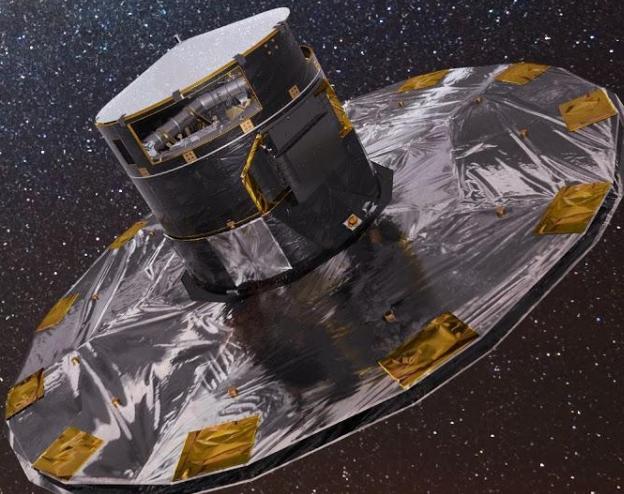


Image: ESA/ATG medialab; background: ESO/S. Brunier

Kurz - Spracovanie vesmírnych dát (SVD)

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- Cieľ je oboznámiť študentov s prístupom k dátam z rôznych vesmírnych misií a spracovaním týchto dát (špeciálna pozornosť bude venovaná misiám, na ktorých participuje Európska vesmírna agentúra).
- Témy, by mali pripraviť študentov na diplomovú prácu v tejto oblasti, alebo aj ďalšiu prácu na ESA projektoch, napríklad aj ako praktikant v programe [Young Graduate Trainee](#) alebo [ESAC Trainee Project](#).
- Predmet sa bude venovať problémom ako **filtrácia a klasifikácia dát, vizualizácia dát**, ale aj napríklad využitiu **strojového učenia**.
- Na cvičeniaci sa budú používať viaceré postupy a softvér z oblasti vedy o údajoch (data science), teda praktické úlohy môžu byť pre študentov **užitočné aj v prípade, že by sa spracovaniu vesmírnych dát nevenovali**.
- Práca začatá na tomto predmete, môže **pokračovať ďalej v rámci diplomovej práce**.

Kurz - Spracovanie vesmírnych dát (SVD)

1. Introduction and **AMON**
2. Basic data science packages
3. **Earth Observation - Copernicus I.**
4. Earth Observation - Copernicus II.
5. Earth Observation - Copernicus III.
6. *Time allocated for catching-up in case of missed or problematic topics*
7. **Astronomy, astrometry - Gaia**
8. Astronomy, astrometry - Herschel, Hubble space telescope, TESS
9. *Time allocated for catching-up in case of missed or problematic topics, discussion about semester projects*
10. Magnetosphere field - Swarm
11. Heliophysics - Parker Solar Probe
12. Cosmic ray physics - PAMELA, Voyager (cosmic ray oriented measurements)
13. *Presentation of student projects and time allocated for catching-up in case of missed or problematic topics*

Everything related to the course: <https://spaceforum.sk/en/space-data-analysis-course/>

Kurz - Spracovanie vesmírnych dát (SVD)

- **Prvý rok - prvý pokus**
 - Malo by sa to odzrkadliť na nižšej kritickosti hodnotenia,
 - Pravdepodobne, bude sa hodnotiť viac aktivita ako výsledok
- **Práca na semestrálnom projekte**
 - Možnosť pokračovať so zadaním v rámci **diplomovej práce**
 - Pozývam k diskusii študentov, ktorí majú záujem venovať sa tématom ktorým sa predmet venuje (michal.vrabel@tuke.sk)
- Prednášky - základné pojmy a oblasti týkajúce sa témy
- Cvičenia - praktická aktivita s dátami z danej oblasti (satelitu, detektoru, ...)

Lectures

1. Introduction ([Slides](#)), AMON ([Slides](#))
2. Basic data science packages ([Slides](#), [Recording](#))
3. Copernicus programme I. ([Slides 1](#), [Recording](#))
4. Copernicus programme II. ([Slides 2](#), [Recording](#))
5. Copernicus programme III. ([Slides 3](#), [Recording](#))
6. *Copernicus programme – Lab exercises, discussion ([Recording](#))*
7. *Copernicus programme – Lab exercises, discussion ([Recording](#))*
8. Astrometry – Gaia ([Slides](#))
9. Astronomy – Herschel, Hubble space telescope, TESS ([Slides](#))
10. *Astrometry/Astronomy/Exoplanets – time allocated for catching-up in case of missed or problematic topics, discussion about semester projects*
11. Magnetosphere field – Swarm, magnetosphere models ([Slides](#))
12. Heliophysics – Parker Solar Probe ([Slides](#))
13. Cosmic ray physics – PAMELA, AMS, EUSO ([Slides](#))
14. *Presentation of student projects and time allocated for catching-up in case of missed or problematic topics*

Labs

1. [Introduction, AMON](#)
2. Basic data science packages ([Slides](#), [Recording](#))
3. [Copernicus programme I. \(Recording\)](#)
4. [Copernicus programme II. \(Recording\)](#)
5. [Copernicus programme III. \(Recording\)](#)
6. *Copernicus programme – Lab exercises, discussion ([Recording](#))*
7. *Copernicus programme – Lab exercises, discussion ([Recording](#))*
8. [Astrometry – Gaia](#)
9. [Astronomy – Herschel, Hubble space telescope, TESS](#)
10. *Consultations related to semester projects, time allocated for catching-up in case of missed or problematic topics.*
11. [Geomagnetospheric field – Swarm, magnetosphere models](#)
12. [Heliophysics – Parker Solar Probe](#)
13. [Cosmic ray physics – PAMELA](#)
14. *Consultations related to semester projects, time allocated for catching-up in case of missed or problematic topics.*

Pondelok a utorok o 7:30
<https://tuke.webex.com/tuke/j.php?MTID=mf4bf51b6798247cb4dae349418baeac1>

Pre prístup k nahrávkam:
michal.vrabel@tuke.sk

Semester projects

During the semester, besides the lab activities, students work on their projects. Each project is assigned to a pair of students, except when a student continues with the project in the following two semesters as his diploma thesis topic.

The topics of projects selected for the summer semester 2020/2021 are the following:

- [Automatic identification of stars in AMON data](#)
- [Generating airglow images and star identification in AMON ACC data](#)
- [Cloud coverage identification over a parameterized area](#)
- [Land classification using Sentinel-2 data](#)
- [Selecting satellite data under the ISS orbital track](#)
- [A comparison of cloud detection methods on Sentinel-2 data](#)
- [Visualization of Normalized Satellite indexes using Sentinel-2 data](#)
- [Identification of solar wind detected on Earth in Voyager data](#)
- [Unsupervised classification of Earth Observation data](#)

General organizational notes:

- There is a **private Gitlab group for each project**. Project members should have access to it.
- Students should **create at least one Gitlab project** (git repository) inside the group mentioned above. It should be the main git repository of the project.
- **The main repository of the project should contain `CHANGELOG.md` file.** The changelog should report on changes to the code but also **any activity related to the project**. There should be at least **one report per week**. Read [about changelogs](#).
- If students are working on **a review of the state of art** as a part of the project activities, the review can be in any format. It does not need to be saved in the repository, but then there needs to be provided URL address of this review in the changelog and maybe also in `README.md`.
- Each team should prepare **a presentation of their project** – something to say, show, a few supporting slides. This will be presented during the last week of the course.

Aktuálne témy diplomových prác (semestrálny projekt)

- Mapping of cloud and meteorological measurements into observations of Mini-EUSO detector
- Development of autonomous operation of a full-sky airglow camera
- Detection of meteors in measurements of Mini-EUSO experiment using machine learning methods
- Processing of data from EUSO experiments using neural networks
- Management of simulations in COR system

Mattermost

<https://mattermost.kpi.fei.tuke.sk/svd>

Town Square - SVD GitLab Ma +

mattermost.kpi.fei.tuke.sk/svd/channels/town-square

OS SVD @mv120fd PUBLIC CHANNELS +
Off-Topic Town Square Zadania More...
PRIVATE CHANNELS +
A comparison of cloud ... Automatic identificatio... Cloud coverage identifi... Generating airglow Ima... Identification of solar w... Land classification usin... Selecting satellite data ... Unsupervised classifica... Visualization of Normal...
DIRECT MESSAGES +
Lukáš Tresa Matúš Sabat More...

☆ Town Square Add a channel description

21 1 Search

Thursday

S Stanislav Kocan 6:56 PM
zdravim, mal by som zopar otazok tykajucich sa "Per-pixel classification - 1. preparation of datasets - PART2"
1) V Tasku #4 som dostal vysledok (01.png). Je to ok, popr. v akom tvare ma byt ten vysledok ? Spravil som tam to, ze som si vytvoril 2 body zo suradnic v "lms_data_of_interest_total_bounds" a tie som transformoval na EPSG:4326. Hodnoty v tom tvare som si ulozil naspasť do lms_data_of_interest_total_bounds, teda na screenshote je vypis tejto premennej.
2) V Tasku #5 z akych bodov sa ma spravit ten poligon ? Mame nejaký využitie body minx, miny, maxx, maxy? Alebo len box takze v tvare stvorca, ako je na tej URL adrese ktoru ste priložili ?
3) V casti "Open Hub search via OpenSearchAPI query" som sa prihlásil, no pri ziskavaní dat do premennej "products_of_Interest" to zlyha (ked si vypisem hodnotu, dostavam len OrderedDict()). Nasledne v casti "Saving the search results table into a file" (03.png) mi to hzadze chybu ValueError: Cannot write empty DataFrame to file, pretože products_of_Interest...
Dakujem.
(edited)

01.PNG PNG 7KB 03.PNG PNG 63KB

Friday

M Ing. Michal Vrábel 9:05 AM
1) vyzerá to nejako zvláštne.
`lms_data_of_interest_total_bounds` neodporúčam meniť. Len by som ich pretransformoval do EPSG:4326, teda longitude a latitude.
`longitude` by malo byť niečo takéto
`array([20.83750699, 21.547319])`
`latitude` by malo byť niečo takéto
`array([48.85782719, 49.14725104])`
teda longitude je `x_min, x_max`
latitude je `y_min, y_max`
To či sú tie hodnoty správne by malo byť pozorovateľné aj na neskôrších vizualizáciach `bounding_box_polygon` a potom tohto polygónu na mape Slovenska.
(edited)

M Ing. Michal Vrábel 9:13 AM
2) Ten polygon by mal byť vytvorený práve `z_longitude` a `z_latitude`.
Je potrebné pamätať v akom poradí sú parametre funkcie `shapely.geometry.box`.
Potom je tam vizualizácia, kde je tento polygón vykreslený nad mapou Slovenska (viď priložený obrázok)
`polygon_slovakia.png`

17°E 18°E 19°E 20°E 21°E 22°E

Write to Town Square Help

Spracovanie vesmírnych dát

git.kpi.fei.tuke.sk/svd

Spracovanie vesmírnych dát

GitLab Projects Groups Snippets Help Search or jump to... Sign in

SVD Spracovanie vesmírnych dát

Group overview Details Activity Issues Merge Requests Kubernetes Packages & Registries Members Settings

SVD Spracovanie vesmírnych dát Group ID: 6870

Subgroups and projects Shared projects Archived projects

Search by name Name

	Name	Created
	Lab - AMON	★ 0 4 weeks ago
	LAB - Cosmic Rays	★ 0 1 week ago
	LAB - Earth Observation	★ 0 1 week ago
	LAB - Gaia	★ 0 4 weeks ago
	LAB - Heliophysics	★ 0 2 weeks ago
	LAB - Swarm	★ 0 39 minutes ago

Verejne dostupné podklady
<https://git.kpi.fei.tuke.sk/svd>

10

Semináre

Kontakt: michal.vrabel@tuke.sk

- Kozmické žiarenie
 - Rozpoznávanie vzorov v experimente JEM-EUSO
 - Simulácie sekundárnych častíc kozmického žiarenia
-
- 5×90 min seminár/workshop
 - Pripravené prostredie pre prácu (nie je potrebné inštalovať veci na vlastné PC)
 - Odhadovaný začiatok - koniec letného semestra, možno skôr (podľa potreby a záujmu)

Možnosti stáží v ESA

- Young Graduate Trainees
- The ESAC Trainee Project
- ESA Student Placement
([http://www.esa.int/About_Us/Careers at ESA/Student Internships2](http://www.esa.int/About_Us/Careers_at_ESA/Student_Internships2))

Young Graduate Trainees

- Who can apply?
 - A student in the **final year of a Master's degree** at university or an equivalent institute or have just graduated.
- What we offer
 - A unique professional experience
 - A great opportunity to gain extensive experience
 - A one-year contract (with possible extension for a second year)
 - A salary of €2300 - €2700 per month

ESA YGT recruitment timeline:

- **February – March: Publication of YGT opportunities on Careers at ESA**
- March – May: Pre-selection and interviews of shortlisted candidates
- June: Outcome of interviews and final selection made by ESA
- September - October: Take up duty for successful candidates

https://www.esa.int/About_Us/Careers_at_ESA/Graduates_Young_Graduate_Trainees

The ESAC Trainee Project

Who Can Apply?

- Applicants should be in the last few years of their Bachelors degree or be studying a Master's degree. You need to **at least be a student (either undergraduate or Master's student) when you apply.**

Conditions

- Traineeships last from three to six months.
- Traineeships are unpaid, however, a **monthly allowance of €600** for non-residents and €300 for residents is granted

How To Apply

- an online application form, which will be available when projects are advertised in Autumn
- **The 2022 projects will be advertised in Autumn 2021.**

2021 Esac Trainee Projects

<https://www.cosmos.esa.int/web/esac-trainees/project-2021>

<https://www.cosmos.esa.int/web/esac-trainees/training-opportunities>

ESA Student Internships

Every year in autumn, 100 student internships opportunities topics are published on our website and remain open for a month for students to apply. Opportunities are available in engineering, science, IT, business and administration services.

- Three to six month internships.
- Internships are unpaid, however, a monthly allowance of €600 for non-residents and €300 for residents is granted.

Recruitment process

- Once published, you will be able to browse the ESA list of opportunities:
<https://jobs.esa.int/>

Recruitment timeline

- November: call for applications
- December/January: shortlisting and selection of candidates
- February: earliest start date for internships.

TUKE SPACE FORUM

- Projekt zastrešujúci popularizáciu vesmírneho výskumu a využitia vesmírnych dát na TUKE,
- Projekt je podporovaný Európskou vesmírnou agentúrou
- Časti:
 - Séria diskusií s vedcami z misií v oblasti vesmírneho výskumu
 - Záznamy diskusií sú na Youtube: [TUKE Space Forum](#)
 - Facebook: <https://www.facebook.com/TUKESpaceForum>
 - Semináre venujúce sa tématam nášho výskumu KPI a ÚEF SAV
 - Predmet: Spracovanie vesmírnych dát (SVD)
- <https://spaceforum.sk/> <https://www.meetup.com/TUKE-Space-Forum/>