



LEARNING, APPLYING, MULTIPLYING BIG DATA ANALYTICS

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LAMBDA Deliverable 3.8

Belgrade BDA School (Report 3)

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| Dissemination Level | | |
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Executive Summary

The 3rd edition of LAMBDA Big Data Analytics Summer School was organized by the LAMBDA consortium partners – the Institute Mihajlo Pupin (PUPIN), the Fraunhofer Institute for Intelligent Analysis and Information Systems (Fraunhofer/IAIS), the Institute for Computer Science - University of Bonn (UBO) and the Department of Computer Science - University of Oxford (UOXF) from June 15th to June 17th, 2021. Because of the COVID-19, the event took place online.

The website of the summer school, <https://project-lambda.org/Summer-School-2021>, provides more details about the organization and topics discussed at the school.

The final version of the program is available at the following links

- [Agenda - 15 June and 16 June 2021](#)
- [Agenda \(Ph.D. Workshop\) - 17 June 2021](#)

Similarly, as in the previous years, more than sixty participants were present at the event from eleven different countries. This year the percentage of attendees from abroad has increased (40 % of them from Serbia and 60 % from abroad).



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Abbreviations and Acronyms

| | |
|-------------|----------------------------|
| BDA | Big Data Analytics |
| EU | European Union |
| NoE | Network of experts |
| OERs | Open Educational Resources |
| WP | Work Package |

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1. Introduction

In 2019, as part of the **LAMBDA WP3 Cooperation for Teacher and Student Training** activities, in order to facilitate the knowledge transfer between EU experts and Ph.D. students from Serbia and the Region, the LAMBDA consortium started with the organization of an annual event - the Belgrade Summer School on Big Data Analytics in the third week of June.

More information about the year 2019 and year 2020 events can be found at the following links

- <https://project-lambda.org/Summer-School-2019>
- <https://project-lambda.org/Summer-School-2020>

The Web site of the Summer School 2021 is <https://project-lambda.org/Summer-School-2021> (see Figure 1).

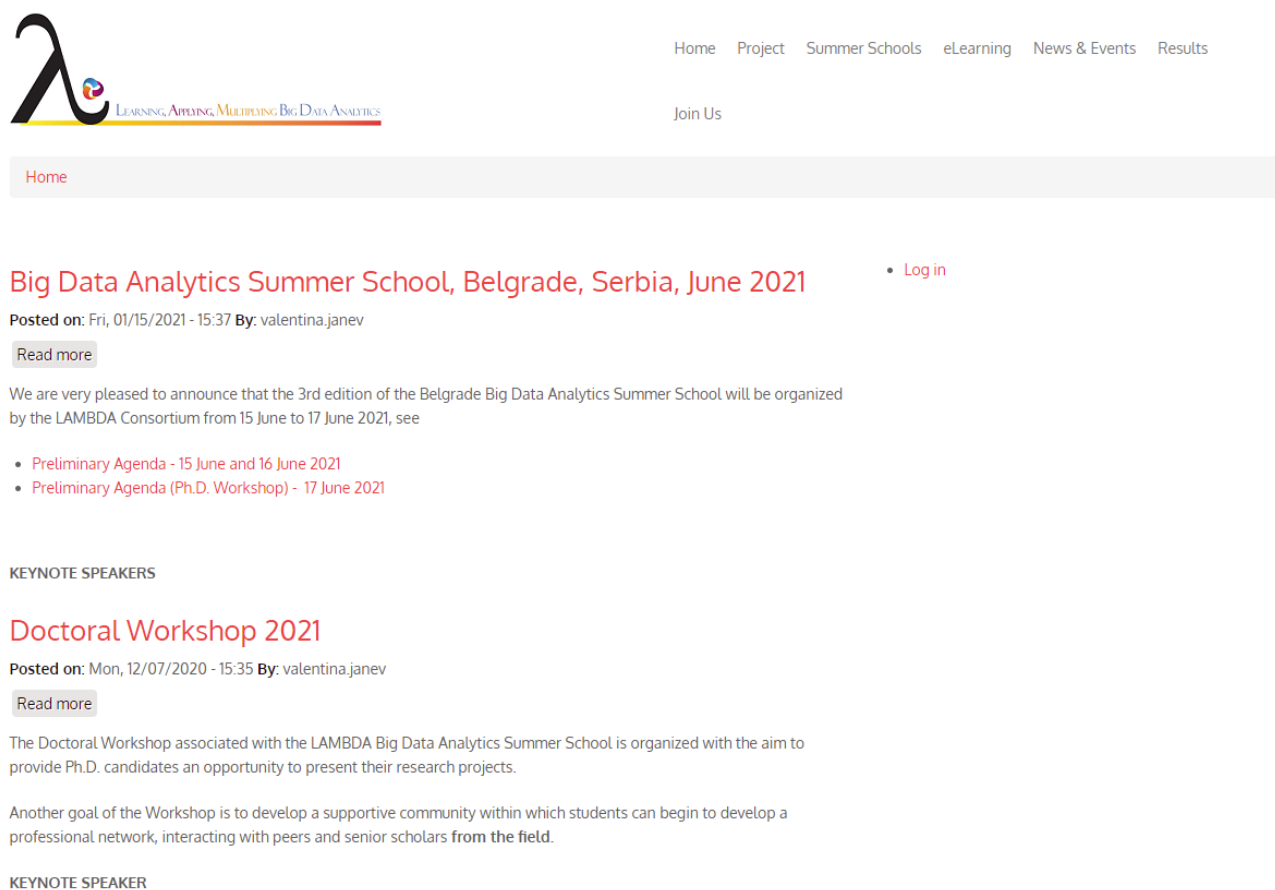


Figure 1. BDA School 2021 – announced on LAMBDA Website



1.1 Relation to Other Deliverables

This Deliverable is related to other WP3 deliverables, please check

1. [Deliverable 3.5 Belgrade BDA School \(Report 1\)](#)¹ that summarizes the organization of the 1st BDA School;
2. [Deliverable 3.6 Belgrade BDA School \(Report 2\)](#)² that summarizes the organization of the 2nd BDA School; and
3. [Deliverable 3.7 Belgrade BDA School \(Sustainability Plan\)](#)³.

1.2 Structure of the Deliverable

This Deliverable is the eight document delivered in WP3 framework and presents the following points:

- The Program of the LAMBDA Summer School 2021 (Section 2);
- The Program of the Ph.D. Workshop (Section 3);
- The Lectures prepared from PUPIN staff for the BDA School and other stakeholders (including the translated documents in Section 4);
- Example of communication activities related to the events in Serbia (Section 5).

¹ <https://project-lambda.org/D3.5>

² <https://project-lambda.org/D3.6>

³ <https://project-lambda.org/D3.7>



2. Summer School Program and Key Activities

Preparation of LAMBDA lectures is an activity that goes on continuously, from the very beginning of the project. The preparation of BDA School 2021 started at the end of 2020. The date was fixed in the beginning of year 2021, while the Program was defined during the regular monthly calls that were organized online.

Originally, it was planned to be a live event at the Mihajlo Pupin Institute's premises. However, due to COVID-19, the decision was made to hold an online 3-day event, see

- [Big Data Analytics Summer School, Belgrade, Serbia, June 2021](#)
- [Doctoral Workshop 2021](#)

2.1 Preparatory Activities

The Program of the BDA School 2021 (15 – 16 June 2021) was decided by the core LAMBDA Team including the following members in the **Organizing Committee**:

- [Valentina Janev, Institute Mihajlo Pupin](#)
- [Diego Collarana, Fraunhofer IAIS](#)
- [Jens Lehmann, University of Bonn](#)
- [Emanuel Sallinger, University of Oxford](#)

This year, for the first time, the LAMBDA project organized a Ph.D Workshop (17 June 2021) where LAMBDA researchers were involved in the **Organizing Committee**:

- Heba Mohamed, University of Bonn
- Nikola Tomašević, Institute Mihajlo Pupin
- Marko Batić, Institute Mihajlo Pupin

LAMBDA Advisory Board members served as a **Steering Committee**:

- [Sören Auer, Director, German National Library for Science and Technology](#)
- [Atanas Kiryakov, CEO, OntoText](#)
- [Maria Esther Vidal, Head of Scientific Data Management Research Group, German National Library for Science and Technology](#)
- [Daniel Pop, Research Institute e-Austria Timisoara](#) / [West University of Timisoara](#)
- [Gabriel Iuhasz, West University of Timisoara](#)
- [László Kovács, Hungarian Academy of Sciences](#)

The event was supported by other EU research and innovation projects, where partners served as members in the **International Doctoral Committee**:

- Valentina Janev, Institute Mihajlo Pupin, Serbia (Chair)
- Sanja Vraneš, Institute Mihajlo Pupin, Serbia
- Lazar Berbakov, Institute Mihajlo Pupin, Serbia
- Emanuel Sallinger, University of Oxford, UK
- Anastasia Dimou, imec and Ghent University, Belgium
- Diego Collarana, Fraunhofer IAIS, Germany
- Maria-Esther Vidal, German National Library of Science and Technology, Leibniz University Hannover, Germany
- Jens Lehmann, University of Bonn, Germany

- Damien Graux, ADAPT SFI Centre, Trinity College Dublin, Ireland
- Hajira Jabeen, CEPLAS - Cluster of Excellence in Plant Sciences. Technische Universität Dresden, Germany
- Andrej Čampa, ComSensus, Slovenia
- Marcus Keane, National University of Ireland, Galway, Ireland
- Dimitar Trajanov, Ss. Cyril and Methodius University, Skopje, North Macedonia
- Johannes Stöckl, Austrian Institute of Technology, Austria
- Federico Seri, National University of Ireland, Galway, Ireland
- Luis Miguel Blanes Restoy, National University of Ireland, Galway, Ireland
- Brankica Pažun, School of Engineering Management, Serbia
- Neven Vrček, Faculty of Organization and Informatics, University of Zagreb, Croatia
- Paulo Lissa, National University of Ireland, Galway, Ireland

The program of the school was decided and agreed by the PUPIN top management⁴. The status of preparatory activities was regularly checked at weekly meetings; see a photo from the last meeting in May 2021, Figure 2.



Figure 2. Weekly meetings at the Institute Mihajlo Pupin

⁴ <https://www.pupin.rs/en/management/>



2.2 BDA School Programme

The BDA School program was organized into 5 sections

- Day 1 Sessions (Keynote session, EU Data Ecosystem, Environment Monitoring), see Table 1;
- Day 2 sessions (Managing Knowledge in Energy Data spaces; SINERGY session), see Table 2;

with additional 2 sections where Ph.D. students presented their work, see Table

Table 1. BDA School Programme – Day 1

Day 1

| Session 1: Tuesday, June 15, 10:00am-12:30pm | | |
|--|--|--|
| 10:00 | Establishing connections (see instructions below) | |
| 10:15 | Welcome speech and Introducing the Programme | Chair: Valentina Janev, Institute Mihajlo Pupin, Serbia |
| 10:30 | Digital PLATform and analytical TOOLs for eNergy | Philippe Calvez, ENGIE, France |
| 11:15 | Break | |
| 11:30 | Scalable Reasoning in Knowledge Graphs: Theory, Practice and Use Cases of Modern Artificial Intelligence | Emanuel Sallinger, University of Oxford, UK; TU Wien, Austria |
| 12:30 | Lunch Break | |
| Session 2: Tuesday, June 15, 13:30pm-16:30pm | | |
| 13:30 | Introducing the Programme | Chair: Diego Collarana, Fraunhofer IAIS, Germany |
| 13:35 | Financial Privacy with Knowledge Graphs | Luigi Bellomarini, Bank of Italy |
| 13:55 | IDS and GAIA-X: Sovereignty-preserving Data Exchange in Cloud Ecosystems | Sebastian Bader, Fraunhofer IAIS, Germany |
| 14:25 | Managing Knowledge in Energy Data Spaces | Valentina Janev; Maria-Esther Vidal Institute Mihajlo Pupin; German National Library of Science and Technology and L3S Research Center, Germany |
| 14:50 | INTERSTAT: a framework for Open Statistical Data interoperability | Martino Maggio, Engineering Ingegneria Informatica SPA, Italy |
| 15:20 | Break | |
| Session 3: Tuesday, June 15, 15:30pm-16:30pm | | |
| 15:30 | Introducing the Programme | Chair: Milena Jovašević-Stojanović, Vinča Nuclear Research Institute, Serbia |
| 15:35 | High resolution Urban Air Quality Monitoring: Hierarchical IoT Architecture and Edge AI Pipeline for Citizen Science | Saverio De Vito, Agenzia Nazionale Nuove Tecnologie Energia e Ambiente, Italy |
| 16:00 | Probabilistic empirical modelling of air pollution | Juš Kocijan, Jožef Stefan Institute, Slovenia |
| 16:25 | Q & A | |



16:30 **End of the Programme**

Table 2. BDA School Programme – Day 2

Day 2

| Session 4: Wednesday, June 16, 9:30am-12:30pm | | |
|--|--|--|
| 09:30 | Establishing connections (see instructions below) | |
| 09:45 | Managing Knowledge in Energy Data Spaces – Serbian Pilot (Discussion) | Valentina Janev; Maria-Esther Vidal Institute Mihajlo Pupin; German National Library of Science and Technology and L3S Research Center, Germany |
| 10:00 | PLATOON Analytics Toolbox | Erik Maqueda Moro, Tecnalia, Spain |
| 10:30 | Edge computing in Energy Systems | Andrej Čampa, ComSensus, Slovenia |
| 11:00 | Break | |
| 11:15 | PLATOON Semantic Models | Sarra Ben Abbes, Lynda Temal, ENGIE, France |
| 11:45 | Semantic Data Lakes: Semantic-based Virtual Data Lakes for Data Science | Kemele Endris, Maria-Esther Vidal German National Library of Science and Technology and L3S Research Center, Germany |
| 12:15 | Lunch Break | |
| Session 5: Wednesday, June 16, 13:30pm-17:00pm | | |
| 13:30 | Introducing SINERGY | Chair: Nikola Tomašević |
| 13:50 | Modern ICT/Automation Approaches for Smart Grids and Industrial Environments | Thomas Strasser, AIT |
| 14:30 | Reference architectures for Smart Grids | Friederich Kupzog, AIT |
| 15:10 | Break | |
| 15:20 | Temperature Sensing Optimization for Home Thermostat Retrofit | Federico Seri, NUIG |
| 16:00 | Reduced-Order Models as Web Application for Energy Management: Barriers and Challenge | Luis M. Blanes, NUIG |
| 16:40 | Q&A Session | |
| 17:00 | End of the Programme | |

2.3 Ph.D. Workshop Programme

Table 3. Ph.D. Workshop Programme – Day 3



Session 1: Thursday, June 17, 9:30am-12:30pm

| | | |
|--------------|---|---|
| 09:00 | Establishing connections (see instructions below) | |
| 09:30 | Welcome speech and Introducing the Programme | Chair: Sahar Vahdati, Institut für Angewandte Informatik, Germany |
| 09:35 | Keynote | Damien Graux, INRIA Sophia Antipolis – Méditerranée, France |
| 10:20 | Semantic Web Analysis with Flavor of Micro-Services | Farshad Bakhshandegan Moghaddam, Carsten Draschner, Jens Lehmann and Hajira Jabeen University of Bonn, Germany |
| 10:40 | Semantic Analytics in the Palm of Your Browser | Carsten Felix Draschner, Farshad Bakhshandegan Moghaddam, Jens Lehmann and Hajira Jabeen University of Bonn, Germany |
| 11:00 | Break | |
| 11:20 | Detecting Related Sustainable Development Indicators Through Text | Ana Gjorgjevikj, Kostadin Mishev, Dimitar Trajanov and Ljupco Kocarev Ss. Cyril and Methodius University, North Macedonia |
| 11:40 | Experimental Evaluation of Scalable Infrastructure for Text to Speech Synthesis in Macedonian Language | Kostadin Mishev, Ana Gjorgjevikj and Dimitar Trajanov Ss. Cyril and Methodius University, North Macedonia |
| 12:00 | A blockchain-based Platform for Keeping Logs of Citizens' Consents | Marija Popović and Nikola Tomašević, Institute Mihajlo Pupin, Serbia |
| 12:20 | Lunch Break | |

Session 2: Thursday, June 17, 13:25am-16:00pm

| | | |
|--------------|--|--|
| 13:25 | Introducing the Programme | Chair: Lazar Berbakov, Institute Mihajlo Pupin, Serbia |
| 13:30 | Numerical Tools Developed to Predict the Combustion Behavior Inside a 20 kW Pellet Boiler | João Pedro Silva, Senhorinha Teixeira and José Teixeira, University of Minho, Portugal |
| 13:50 | PMU-based Fault Localization in Distribution Networks | Denis Sodin, Jožef Stefan Institute, Slovenia |
| 14:10 | Traveling-wave Event Detection and Localization on Power Cables | Marko Hudomalj, Jožef Stefan Institute, Slovenia |
| 14:30 | Break | |
| 14:40 | Machine Learning Based Wind Turbine Production Forecaster | Dea Pujić and Valentina Janev, Institute Mihajlo Pupin, Serbia |
| 15:00 | The Cloud-based Control Platform for Multi-source Renewable Energy System | Katarina Stanković, Marko Jelić and Marko Batić, Institute Mihajlo Pupin, Serbia |
| 15:20 | Energy Efficiency Benchmarking for Smart Homes | Marko Jelić, Dea Pujić and Marko Batić, Institute Mihajlo Pupin, Serbia |
| 15:40 | Coordination Platform for Handling Emergencies and Restoration of Power Grid | Dušan Popadić and Marko Batić, Institute Mihajlo Pupin, Serbia |
| 16:00 | End of the Programme | |



2.4 Links to Video Lectures and other Teaching Materials

The easiest way to retrieve the materials from the 3rd Big Data Analytics Summer School is to use the Search functionalities of the LAMBDA Platform under this link <https://project-lambda.org/Knowledge-repository/Lectures>

The user has three options (see Figure 3):

- Search by topic (MODULE)
- Search by event (select BDA School 2021)
- Search by year



[Home](#) [Project](#) [Summer Schools](#) [eLearning](#) [News & Events](#) [Results](#)

[Join Us](#)

[Home](#)

Select MODULE

[Log in](#)

Select Event

Select Year

| Year | Module | Lecture | Presented at event | Contributed by |
|------|---------------------------------|--|--------------------|----------------|
| 2021 | Enterprise Knowledge Graphs | Semantic Data Models for Energy domain | BDA School 2021 | ENGIE |
| 2021 | Enterprise Knowledge Graphs | Scalable Reasoning in Knowledge Graphs: Theory, Practice and Use Cases of Modern Artificial Intelligence | BDA School 2021 | UOXF |
| 2021 | Semantic Big Data Architectures | Edge Computing in Energy Systems | BDA School 2021 | ComSensus |
| 2021 | Enterprise Knowledge Graphs | Scalable Reasoning in Knowledge Graphs: Theory, Practice and Use Cases of Modern Artificial Intelligence | BDA School 2021 | UOXF |

Figure 3. BDA School 2021 - Lectures

Video lectures will be uploaded to the LAMBDA YouTube Chanel, <https://www.youtube.com/channel/UC9BCAGX1dzCI2akuRxILq6Q/> and are embedded in pages on the LAMBDA platform.



The screenshot shows a GoToMeeting interface. The main presentation slide is titled "Reasoning Rec" and lists six types of reasoning:

1. **Recursive** Reasoning: *full recursion*
2. **Ontological** Reasoning: *object creation*
3. **Numerical** Reasoning: *numeric comparison*
4. **Probabilistic** Reasoning: *uncertainty*
5. **Subsymbolic** Reasoning: *low-dimensional spaces*
6. **Temporal** Reasoning: *reasoning over time*

On the right, there is a participant grid showing 24 participants with initials. Below the grid is a chat window with messages from Katarina Stankovic, Dusan Popadic (IMP), and Des Pujic (IMP).

Figure 4. Keynote Lecture (Dr. Emanuel Sallinger)

The screenshot shows a GoToMeeting interface. The main presentation slide is titled "What is GAIA-X? – It's an Infrastructure..." and features a diagram of the GAIA-X architecture. The diagram is divided into three main layers:

- Data Ecosystem** (top): Includes Identity & Trust, Federated Catalogue, Advanced Smart Services, Data Spaces, Sovereign Data Exchange, and Compliance.
- Infrastructure Ecosystem** (middle): Includes Policy Rules & Architecture of Standards, Interconnection.
- Participants** (bottom): Includes Provider, Consumer, and Both.

On the right, there is a participant grid showing 37 participants. Below the grid is a chat window with messages from Dusan Popadic (IMP) and Marija Popovic.

Figure 5. IDS and GAIA-X: Sovereignty-preserving Data Exchange in Cloud Ecosystems (Dr. Sebastian Bader)



GoToMeeting REC

Talking: Valentina Janev View Everyone

Chat

Valentina Janev to Everyone 9:34 AM
Dear all, Good morning !

Valentina Janev to Everyone 9:35 AM
Could You please switch the camera on for a Group photo at 9:45

Session 4

Session 4: Wednesday, June 16, 9:30am-12:30pm

| Time | Topic | Speaker |
|-------|---|---|
| 09:30 | Establishing connections (see instructions below) | |
| 09:45 | Managing Knowledge in Energy Data Spaces – Serbian Pilot (Discussion) | Valentina Janev; Maria-Esther Vidal Institute Mihajlo Pupin; German National Library of Science and Technology and L3S Research Center, Germany |
| 10:00 | PLATOON Analytics Toolbox | Erik Maqueda Moro, Tecnalia, Spain |
| 10:30 | Edge computing in Energy Systems | Andrej Čampa, ComSensus, Slovenia |
| 11:00 | Break | |
| 11:15 | PLATOON Semantic Models | Sarra Ben Abbes, Lynda Temal, ENGIE, France |
| 11:45 | Semantic Data Lakes: Semantic-based Virtual Data Lakes for Data Science | Kemele Endris, Maria-Esther Vidal German National Library of Science and Technology and L3S Research Center, Germany |
| 12:15 | Lunch Break | |

Valentina Janev is presenting.

Activate Windows
Send to Settings to activate Windows.

Everyone

29°C Sunny 9:46 AM 6/16/2021

Figure 6. Managing Knowledge in Energy Data Spaces – Serbian Pilot (Discussion) (Dr. Valentina Janev)



2.5 Questions and Answering (Q&A) Sessions

This year the question and answering sessions were organized after each presentation. Questions and feedback from participants were collected via the GoToMeeting Chat and the PUPIN mailing server, see example questions in Table 4.

Table 4. Example Questions from Participants

| No # | Project / Presentation | Question |
|------|------------------------|---|
| 1 | PLATOON (Keynote 1) | <ul style="list-style-type: none">• Since there are 7 pilots, have you created a generic semantic model for all of them, and if so did you have and which difficulties building a generic semantic model for all different pilots?• "How are you planning to utilize both physical and data-driven models and what is the motivation? Are you going to try to combine physical-based and data-driven models for some of the analytics services and are you going to make a comparison between them?" |
| 2 | Keynote 2 | <ul style="list-style-type: none">• In case when you have utilized KGs for detecting money laundering, how much time was needed for system to detect money laundering and how extensive architecture has been used? |



Table 5. Impressions from the BDA School 2021

| Organization / Sector | Feedback collected |
|-------------------------------|---|
| PUPIN student | The SINERGY Session was the most interesting one. How can I contact the speaker? |
| PUPIN student | Она што би ве прашале, а воедно замолиле, е дали има можност да добиеме сертификат за учество на работилницата. Сертификатите ни се потребни како доказ за учество во рамки на досието кое го води нашата институција. |
| Potential adopter of Lectures | Našim doktorandima sam i prije mjesec dana stavila informaciju u Forum doktorskog studija, a sada sam stavila i ovu informaciju. Nadam se da će biti zainteresiranih za praćenje, ako se već nisu javili na radionicu. Stavila sam informaciju i na našu mailing listu za nastavnike. Želim i ove godine uspješnu školu i žao mi je da nismo kod vas u Beogradu. Nosimo lijepe uspomene s prve škole. |
| Potential adopter of Lectures | Da li postoji mogucnost da se napravi ista ona potvrda za ucesce ove godine... |

2.6 Statistics about Speakers and Participants

More than sixty participants were present at the event from eleven different countries, 40 % of them from Serbia and 60 % from abroad.

Table 6. Speakers at the BDA School 2021

| Speakers at the BDA School 2020 and Ph.D. Workshop | | | |
|--|-----------------|---|-------|
| Country | Organization | Name | Total |
| Austria | AIT | Thomas Strasser, Friederich Kupzog | 3 |
| France | ENGIE | Philippe Calvez, Sarra Ben-Abbes, Lynda Temal | 3 |
| | INRIA | Damien Graux | 1 |
| Ireland | NUIG | Federico Seri, Luis M. Blanes | 2 |
| Italy | ENG | Martino Maggio | 1 |
| Germany | TIB | Maria Esther Vidal, Kemele Endris | 2 |
| | UBO | Carsten Felix Draschner, Farshad Bakhshandegan Moghaddam | 2 |
| | Fraunhofer IAIS | Sebastian Bader, Diego Collarana | 2 |
| Portugal | UMIN | João Pedro Silva | 1 |
| Serbia | PUPIN | Valentina Janev, Nikola Tomašević (speakers and session chairs) Marko Batić, Lazar Berbakov, Sanja Vraneš (local organizers) | 5 |
| | PUPIN | Ph.D. students: Marko Jelić, Dea Pujić, Dušan Popadić, Katarina Stanković, Marija Popović | 5 |
| North Macedonia | FEIT | Ana Gjorgjevikj, Kostadin Mishev | 2 |
| Slovenia | IJS, ComSensus | Andrej Čampa, Denis Sodin, Marko Hudomalj | 3 |
| Spain | TECNALIA | Erik Maqueda Moro | 1 |
| UK | UOXF | Emanuel Sallinger | 1 |



Table 7. Statistics on Participants by country

| Country | Number |
|-----------------|---------------|
| Austria | 3 |
| Croatia | 2 |
| France | 4 |
| Germany | 9 |
| Ireland | 2 |
| Italy | 8 |
| North Macedonia | 3 |
| Portugal | 2 |
| Serbia | 26 |
| Slovenia | 3 |
| Spain | 1 |
| UK | 1 |
| | 64 |



2.7 Networking with other EU projects

The LAMBDA School as a knowledge transfer event was an opportunity to gain an insight in the results of other H2020 projects including

- [PLATOON – Digital PLATform and analytical TOOLS for eNergy](#)
- [SINERGY – Capacity building in Smart and Innovative eENERGY management](#)
- [TRINITY – TRansmission system enhancement of regioNal borders by means of Intelligent market technologY](#)
- [IDEAS – Novel building Integration Designs for increased Efficiencies in Advanced climatically tunable renewable energy Systems](#)
- [RESPOND - Integrated demand REsponse Solution towards energy POSitive Neighbourhoods](#)
- [INTERSTAT - Open Statistical Data interoperability framework](#)
- [HIT2GAP - Highly Innovative building control Tools Tackling the energy performance GAP](#)
- [ARTEMIS - ARTificial Intelligence in Energy Management Innovative Services](#)

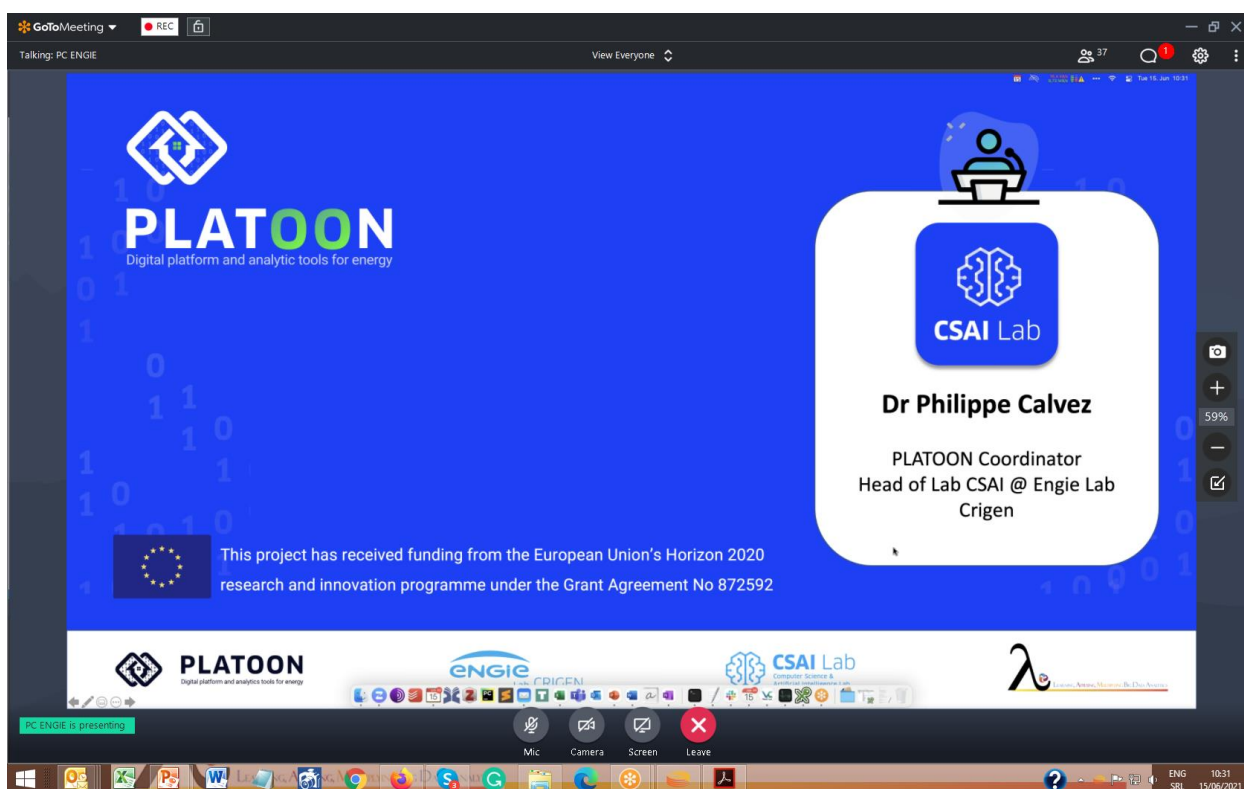


Figure 7. PLATOON Project (Dr. Philippe Calvez)



The screenshot shows a GoToMeeting window with a presentation slide. The slide is titled "INTERSTAT: a framework for Open Statistical Data interoperability" and includes the INTERSTAT logo. Below the title, it says "LAMBDA Summer School - 15 June 2021" and "Martino Maggio (Engineering Ingegneria Informatica SpA)". At the bottom of the slide, there is a small logo for the European Union and text indicating co-financing by the Connecting Europe Facility. On the right side of the meeting interface, a list of participants is visible, including Katarina Stankovic, Marko Jelic, Nikola (IMP), Valentina Janev, B P, Carsten Draschner, Dea Pujic, Dejan Paunovic, Diego Collarana, Dusan Popadic, Emanuel Sallinger, Farshad Moghaddam, Federico Seri, Heba Mohamed, João Pedro Silva, Lianlong Wu, Luigi Bellomarin, and Luis Miguel Blanes Restoy. The meeting ID is 629 502 005.

Figure 8. INTERSTAT Project (Martino Maggio)

The screenshot shows a GoToMeeting window with a presentation slide titled "NO2 Mapping Results". The slide features a map of an urban area with a color-coded concentration pattern of NO₂ (ug/m³). The map is labeled with "Latitude" and "Longitude" axes. To the right of the map, there are four bullet points summarizing the results: "Significant spatial variance", "Avg Concentration above those in LD phase 1 but well under regulatory limits", "Several hotspot detected", and "Mostly expected (close to crossroads and steep streets) and compatible with transport models." On the right side of the meeting interface, a chat window is open, showing messages from participants. The chat messages include: "Sorry I have to leave for another call. Thank you very much", "Valentina Janev - Institute Mihajlo Pupin to Everyone I will make Saverio presenter", "Marko Jelic (PUPIN) to Everyone Q: Having in mind increasing levels of air pollutions within cities each year (Belgrade appears to be a good example for this unfortunately), do you see a future in which some type of large-scale air quality improvement assets will be deployed to fix air pollution or are there some different strategies foreseen as of now?", and "Katarina Stankovic to Everyone How the non-linearity of the air pollution phenomenon has been addressed within the concrete AI models? Is there a way to overcome frequent needs for calibration?". The slide also includes the ENEC logo and the text "S. De Vito - Lambda Summer School 2021".

Figure 9. High resolution Urban Air Quality Monitoring (Dr. Saverio De Vito)



3. Ph.D. Workshop – Abstracts

| | |
|-----------------|--|
| Title | Semantic Web Analysis with Flavor of Micro-Services |
| Authors | Farshad Bakhshandegan Moghaddam, Carsten Draschner, Jens Lehmann and Hajira Jabeen University of Bonn, Germany |
| Abstract | <p>The last decades witnessed a significant evolution in terms of data generation, management, and maintenance, especially in the RDF format. Moreover, in the energy domain, semantic data is finding its way and can be used for various data analytics tasks. However, since data set sizes are increasing and can now be enormous, technologies are evolving to scale with the increasing data set sizes. In this regard, tools and frameworks such as SANSA have been emerged to facilitate the analytic over semantic data. SANSA is using big data technologies such as Apache Spark (as an analytics engine for large-scale data processing) and Apache Hadoop (as a distributed file system) in its backbone to be able to perform analytics in a distributed manner over a cluster of nodes. However, to be able to use SANSA, one should set up a cluster of nodes with enabled Spark and Hadoop. This requires extensive knowledge and expertise in computer systems, networking, distributed computing and etc. Moreover, in case of having sufficient technical knowledge, setting up such a cluster consumes huge manpower and is labor-intensive. To tackle the aforementioned issues, in this paper we introduce a micro-service architecture that easily brings the power of SANSA and distributed semantic data analysis in the end-user ecosystem, without having technical knowledge in the mentioned areas. The introduced architecture is based on Docker technologies and can be installed on-premise or in the cloud systems.</p> |

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| Title | Semantic Analytics in the Palm of Your Browser |
| Authors | Carsten Felix Draschner, Farshad Bakhshandegan Moghaddam, Jens Lehmann and Hajira Jabeen University of Bonn, Germany |
| Abstract | <p>Linked open data sources and the semantic web has become a precious data source for data analytics tasks and data integration. The growing data set sizes of RDF Knowledge Graph data need scalable processing and analytics techniques. The processing power of in-memory frameworks which can perform scalable distributed semantic analytics like SANSA, make use of Apache Spark and Apache Jena to provide start-to-end extensive scalable analytics on RDF knowledge graphs. The setup of a technical system with all dependencies and environments can be a tough challenge and might also require sufficient available processing power. To reduce the entry barriers for getting started in evaluating and testing all opportunities of the SANSA framework and even bring this technology to production only from the browser. We introduce within this paper how to get the SANSA stack running within Databricks, with no need for special Apache Spark skills or any installations. This simplified usage offers distributed large-scale processing of RDF data from mobile devices. In addition, the availability of Hands-On Sample Notebooks increases the reproducibility of complex framework evaluation experiments. This paper shows that the startup of a very complex scalable semantic data analytics stack framework does not need to be complicated.</p> |



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| Title | Detecting Related Sustainable Development Indicators Through Text |
| Authors | Ana Gjorgjevikj, Kostadin Mishev, Dimitar Trajanov and Ljupco Kocarev Ss. Cyril and Methodius University, North Macedonia |
| Abstract | The 2030 Agenda for Sustainable Development of the United Nations (UN) aims at ensuring the planet and humanity's well being by addressing the most crucial issues that affect it. A well-defined set of indicators measures the progress towards the achievement of the Agenda, but it may be useful to relate this set to other global and community level indicators associated with different aspects of sustainable development. The purpose of this paper is to analyze if the relatedness of two sustainable development indicators can be inferred through analyses of their titles, present implementation of one possible solution, discuss the results and challenges. |

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|-----------------|---|
| Title | Experimental Evaluation of Scalable Infrastructure for Text to Speech Synthesis in Macedonian Language |
| Authors | Kostadin Mishev, Ana Gjorgjevikj and Dimitar Trajanov Ss. Cyril and Methodius University, North Macedonia |
| Abstract | Text-to-speech (TTS) synthesis is emerging into an assistive technology that aims to facilitate the web content presentation to persons with visual impairments. Nowadays, many text-to-speech models are based on Deep Learning (DL) methodologies that produce human-like, high-quality, intelligent, and emotional speech. The main issue using these DL-based models is their autoregressive generative nature which introduces a time-series dependence. Therefore, they cannot be calculated in parallel, resulting in slow inference speed. This study tackles the aforementioned problem using horizontal scalability enabled by micro-service architecture and application servers that provision the TTS model and provide parallel speech generation. The model which is used in the evaluation is the first TTS engine that supports the Macedonian language named Makedonka. The results show inference improvement in performances during the process of audiobook generation tested on a single multi-core computer machine. |

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| Title | A blockchain-based Platform for Keeping Logs of Citizens' Consents |
| Authors | Marija Popović and Nikola Tomašević, Institute Mihajlo Pupin, Serbia |
| Abstract | The development of ICTs (Information and Communication Technologies) and the usage of personal data for both research and commercial purposes over the last years have brought the question of the protection of personal data. The GDPR (General Data Protection Regulation) has defined the ways how personal data should be treated, but the application of these requirements still remains an open issue. This paper is dedicated to the research of the blockchain advantages when it comes to providing the transparency of the usage of personal data and provides proof of concept where it demonstrates the application of blockchain in working with users' consents. Hyperledger Fabric was chosen as the development platform which proves as a suitable choice when it comes to achieving transparency, immutability, and modularity. |

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| Title | Numerical Tools Developed to Predict the Combustion Behavior Inside a 20 kW Pellet Boiler |
| Authors | João Pedro Silva, Senhorinha Teixeira and José Teixeira, University of Minho, |



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| | Portugal |
| Abstract | This research project aims to eliminate the industrial paradigms around the biomass combustion process to produce heat, giving scientific explanations to the phenomena identified in the process, being possible to anticipate errors and defects that can occur during the combustion inside an industrial boiler. Through the combination between the experimental research and the development of two different numerical tools, it is expected to reduce pollutant emissions and costs, leading to the improvement of the process that is used in commercial pellet boilers. This is an ambitious project that, even though it will focus on a specific industry, it pretends to provide relevant answers to other applications that biomass as fuel to produce energy. In that sense, the knowledge obtained with the numerical tools developed in this project will be implemented in a 20 kW prototype pellet boiler. |

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| Title | PMU-based Fault Localization in Distribution Networks |
| Authors | Denis Sodin, Jožef Stefan Institute, Slovenia |
| Abstract | In this paper, a fault localization method for distribution networks, based on PMU measurements and compensation theory, is presented. Voltage and current phasors of pre-fault and post-fault are used to determine the faulted bus in the network. The method was verified using the Real Time Digital Simulator (RTDS) with the simulation of real electric power system. |

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| Title | Traveling-wave Event Detection and Localization on Power Cables |
| Authors | Marko Hudomalj, Jožef Stefan Institute, Slovenia |
| Abstract | This paper presents the traveling-wave method for detection and localization of events on the power grid. The presented method determines frequency-dependent electromagnetic wave propagation velocity for the power cable. Results were obtained with the use of frequency-dependent transmission line model in Simulink. Simulated results were compared to frequency-dependent propagation velocity calculated from transmission line parameters. |

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| Title | Machine Learning Based Wind Turbine Production Forecaster |
| Authors | Dea Pujić and Valentina Janev, Institute Mihajlo Pupin, Serbia |
| Abstract | Given the fact that renewable energy sources are increasing their share in the electricity market, in order to maintain the stable grid, i.e. match the production and the demand, it is crucial to have accurate prediction of the expected accessible energy. Therefore, this paper is focused on providing the model for wind turbine production short-term forecast. The model is deep neural network which includes LSTM, convolutional and dense layers, trained by the real world data obtained from the wind farm in Krnovo, Montenegro. The model was successful in a goal of providing competent prediction, so performances and results of the proposed model are given in this paper. |

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| Title | The Cloud-based Control Platform for Multi-source Renewable Energy System |
| Authors | Katarina Stanković, Marko Jelić and Marko Batić, Institute Mihajlo Pupin, Serbia |
| Abstract | Intermittent renewable energy supply combined with electric and thermal energy storage technologies can cover the highest possible share of |



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| | <p>electricity, heating and cooling needs. However, their integration within the HVAC (Heating, Ventilation and Air-Conditioning) systems could result in far too complex installations, requiring intelligent energy management platforms for achieving their energy-efficient work. This paper introduces a cloud-based control platform, deployed to one such multi-source/sink renewable energy system, that performs all control and monitoring tasks through its hierarchically organized algorithm structure. This cascade control paradigm entails conventional control enrichment by more intelligent superior optimization, which evaluates not only the current energy demand and state of resources but also the inherent flexibility on the demand side and predictive aspects of the local energy production from renewables. On the other hand, the control system layered architecture relies on SCADA system solution, with proven modularity, flexibility and connectivity, making the system easily upgradeable and accessible by the end-users.</p> |
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| Title | Energy Efficiency Benchmarking for Smart Homes |
| Authors | Marko Jelić, Dea Pujić and Marko Batić, Institute Mihajlo Pupin, Serbia |
| Abstract | <p>Numerous strategies were developed over the years in order to encourage users to reduce energy consumption and bolster energy efficiency. However, with increasing levels of efficiency achieved by most household appliances and high-consumption devices, one of the most impactful approaches that remain as a means to further increase energy efficiency is attempting to encourage users to behave in an energy efficient manner. More precisely, positive behavior change can be motivated through the creation of unique social pressure and competition. Namely, the idea of the methodology presented in this paper is providing a fair, normalized, comparable ranking (benchmark) between different energy consumptions of different users. Therefore, the ranking is supposed to motivate them to either retain a leading position in the ranking or to attempt to improve their behaviour and advance within the ranking.</p> |

| | |
|-----------------|---|
| Title | Coordination Platform for Handling Emergencies and Restoration of Power Grid |
| Authors | Dušan Popadić and Marko Batić, Institute Mihajlo Pupin, Serbia |
| Abstract | <p>Transmission service operators (TSOs), regional security centres (RSCs), distribution service operators (DSOs), generation units (GUs) and balancing service providers (BSPs) need quick and reliable way of communication in order to secure power grid balance. They need to exchange information about grid stability, problems on the grid and defence plans in an easy and traceable way. In this paper we present software solution for handling these situations efficiently.</p> |



4. PUPIN Lectures prepared in 2021

Preparation of LAMBDA lectures is an activity that goes on continuously, from the very beginning of the project.

In 2021 new lectures were prepared. Some of the lectures were presented at the BDA School, please check:

- [Managing Knowledge in Energy Data Spaces](#)
- [Machine Learning Based Wind Turbine Production Forecaster](#)
- [A blockchain-based Platform for Keeping Logs of Citizens' Consents](#)
- [The Cloud-based Control Platform for Multi-source Renewable Energy System](#)
- [Energy Efficiency Benchmarking for Smart Homes](#)
- [Coordination Platform for Handling Emergencies and Restoration of Power Grid](#)

Additionally, lectures were prepared for high-level school teachers (in Serbian) and other stakeholders, please check

- [DBpedia and the Serbian Language Chapter](#)
- [Apache Hadoop](#) (in Serbian)
- [GraphDB](#) (in Serbian)
- [DCAT Application profile](#)
- [Using Semantic Web technologies in the public sector](#)



Home » Node » GraphDB

Posted on: Wed, 05/12/2021 - 16:24 By: valentina.janev

• [Log in](#)

U ovoj lekciji biće opisani principi funkcionisanja semantičkog veba. Definisaće se značenja ontologija, taksonomija i ostalih izraza koji se često koriste. Praktična upotreba ovih tehnologija biće pokazana korišćenjem alata GraphDB kompanije Ontotext. Kroz primere u alatu GraphDB biće objašnjeno kako se pišu upiti za pretraživanje informacija u bazama podataka korišćenjem jezika SPARQL. Grafovi znanja i povezani podaci biće objašnjeni korišćenjem ovog alata.

Preuzmite [Izveštaj](#).

Module

[Foundations](#) (in Serbian)

Figure 10. LAMBDA Lectures in Serbian



5. Communication Activities

The BDA School and the Ph.D. Workshop were announced for the first time in February 2021 via mail (see Figure 11), the LAMBDA web site (Figure 12) and via the social media channels.

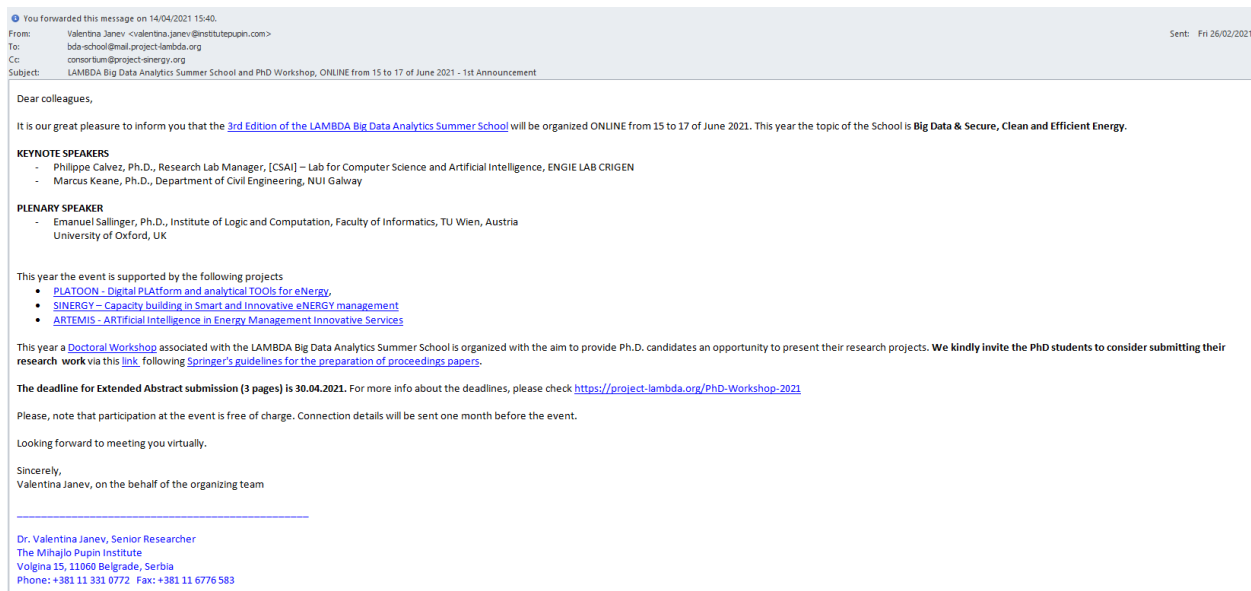


Figure 11. LAMBDA BDA School Announcement (via mail)

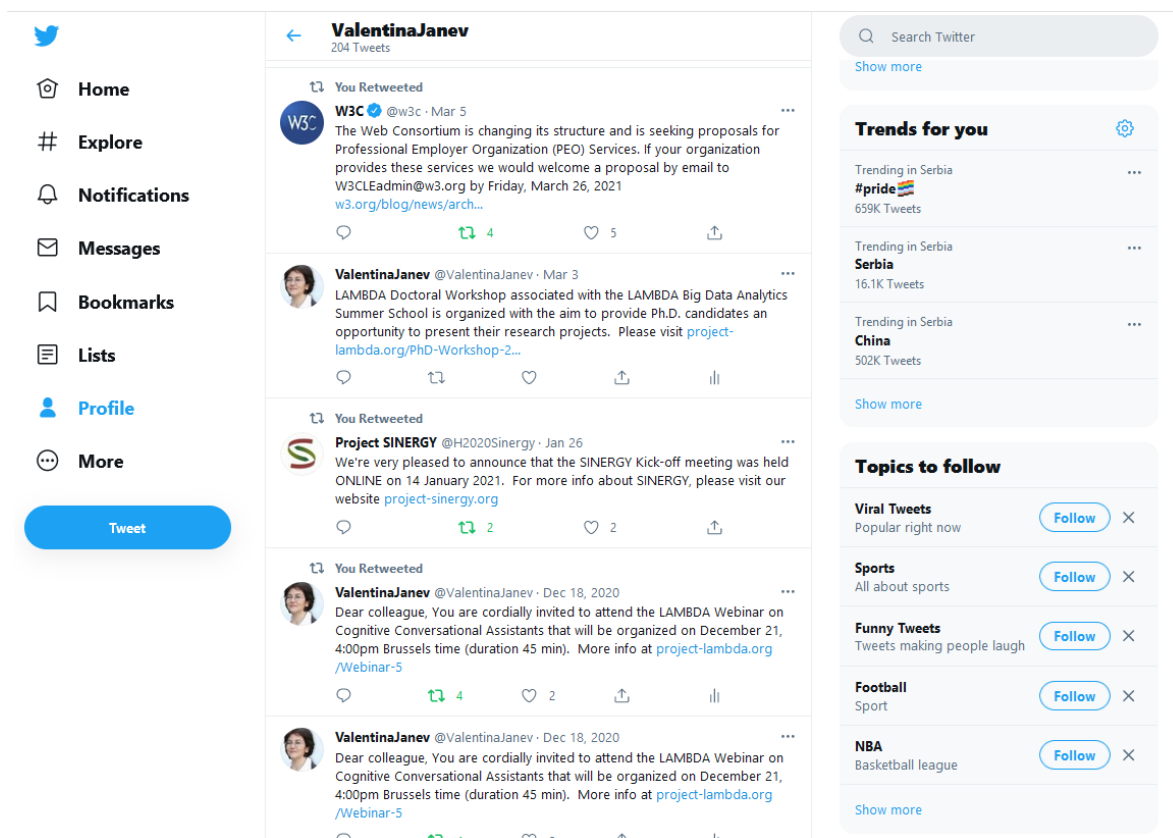


Figure 12. LAMBDA BDA School Announcement (via social media)