ADA
ADVANCED DATA ANALYTICS IN BUSINESS
Co-funded by the Erasmus+ Programme of the European Union

Analysis of status of various courses related to business analytics at Serbian universities

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The basic details on activity and team members

Work Package 1 (WP1): Development of a new program in Advanced Data Analytics in Business

Activity 1.1: Analysis of best practice and comparative analysis

Task 3: Analysis of status of various courses related to business analytics at Serbian universities

Responsible partner	University of Niš
Starts	Y1/M1
Ends	Y1/M4
The team that prepared the report	1. Jelena Stanković 2. Marija Džunić 3. Marko Petković 4. Vinko Lepojević 5. Srđan Marinković

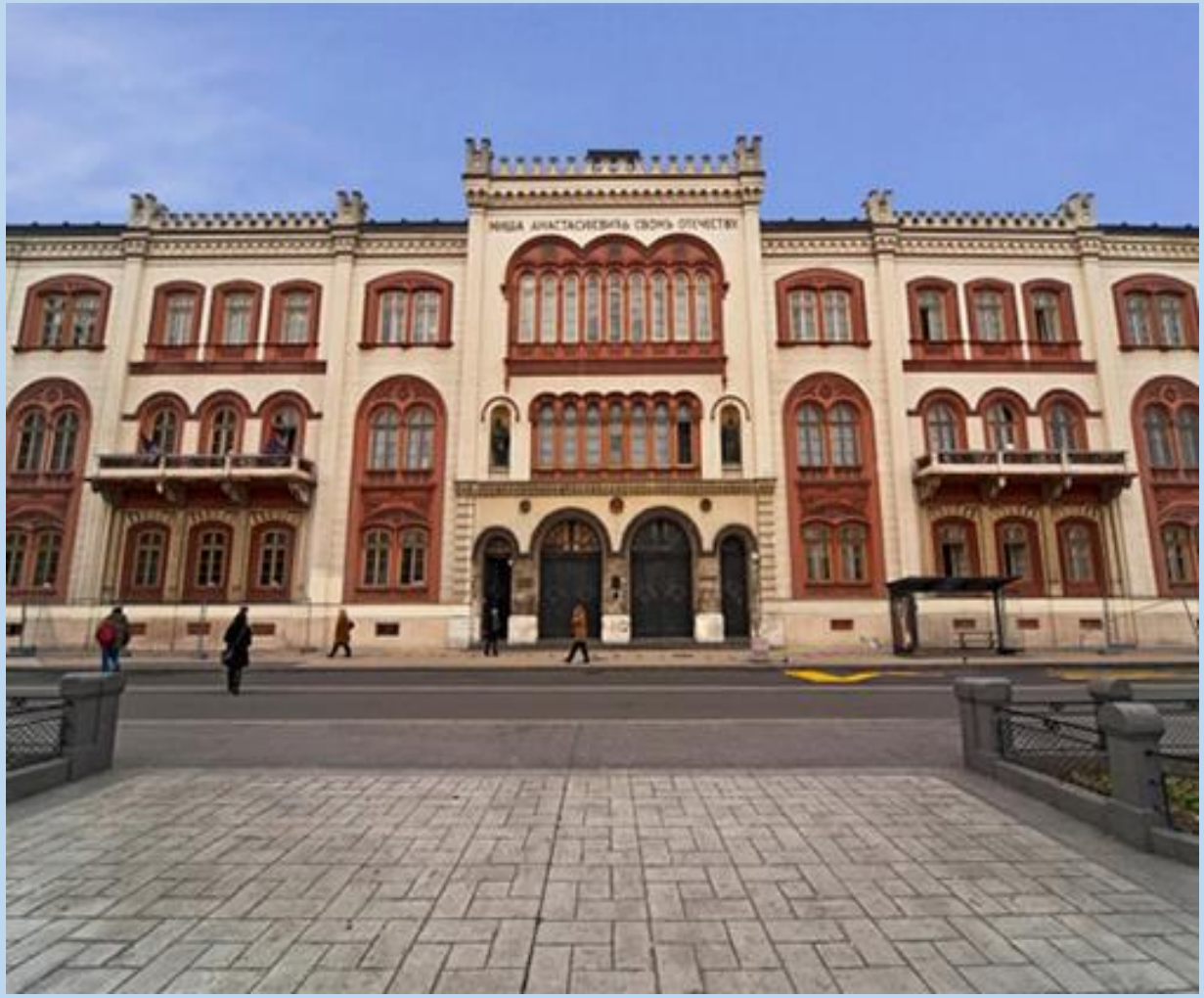
Universities in Serbia and the scope of the analysis

Analysis of the status and content of various master courses related to business analysts refers to the four largest universities in Serbia:

- University of Belgrade,
- University of Novi Sad,
- University of Kragujevac and
- University of Niš.

University of Belgrade

- Faculty of Economics, University of Belgrade, http://www.ekof.bg.ac.rs/?lang=en
- Faculty of Organizational Science, University of Belgrade, http://www.fon.bg.ac.rs/eng/
- Faculty of Mathematics, University of Belgrade, http://www.matf.bg.ac.rs/eng/
- School of Electrical Engineering, University of Belgrade, https://www.etf.bg.ac.rs/en



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Faculty of Economics

Quantitative Analysis

Overview: An umbrella program containing 6 different modules (Econometrics, Statistics, Operational research, Demographics, Actuarial mathematics, Informatics and cybernetics). The modules share the same structure and offer very similar list of courses. Mainly differ in courses' status (core or elective).

Language of study: Serbian

Staff: Local

ECTS: 60

Duration: 1 academic year (no part time option)

Obligatory master thesis: Yes (18 ECTS)

Number of students according to accreditation: total 50 (10 pay no fee)

Admissions requirements: 240 ECTS on undergraduate studies (not restrictive in terms of majors), obligatory entrance exam, and tuition fee (if applied).

Tuition fee (approx.): EUR 1.500

Module of Econometrics (representative):

Curriculum structure: 3 core courses and 3 electives (out of 15), each 7 ECTS.

Core courses: 1. Statistics, 2. Econometric models of cross-sectional and panel data, 3. Applied analysis of time series

Elective courses (not exhaustive): 1. Mathematics, 2. Informatics, 3. Business decisions information systems, 4. Operational research, 5. Mathematical programing, 6. Game theory, 7. Statistics, 8. Multivariate analysis, 9. Time series analysis, etc.

Module of **Statistics** core courses: 1. Mathematics, 2. Statistics, 3. Statistics II.

Module of **Operational research** core courses: 1. Mathematics, 2. Operational research, 3. Mathematical programming.

International Master Quantitative Finance (IMQF)

Overview: Started in year 2003, advertised as one of the most innovative finance programs in Europe. Integrated with learning how to program in Wolfram Language (of which Mathematica is the predecessor).

Language of study: English

Staff: International and local (balanced)

ECTS: 60 (coursework and master thesis)

Duration: 1 academic year (no part time option)

Obligatory master thesis: Yes (15 ECTS)

Number of students according to accreditation: total 25 (tuition fee applied)

Admissions requirements: 240 ECTS on undergraduate studies (not restrictive in terms of majors, but in terms of academic reputation of institution that awarded degree), two letters of recommendation, applicant's knowledge assessment applied, and tuition fee.

Tuition fee (max.): EUR 6.000 (reductions applied up to 50 percent)

Curriculum structure: 7 core (required) courses and 2 electives (out of 4), each 5 ECTS.

Core courses: 1. Mathematics and modeling for finance, 2. Microeconomic theory, 3. Financial statements, valuation, and corporate finance, 4. Investment and Introduction to programming in Wolfram language (WL), 5. Financial economics and mathematics of financial markets (WL), 6. Financial derivatives and fixed income securities (WL), 7. International finance.

Elective courses: 1. Advanced economic research methods with applications in finance, 2. Finance risk management with preparation for FRM and FRM certificates (WL), 3. Advanced risk modelling.

Faculty of Organisational Science

Master program **Business Analytics** with two study groups: Operational Research and Business Statistics.

Duration: 2 semesters

ECTS: 60

Courses: 2 compulsory + 3 elective (6 ECTS each)

Other ECTS activities: compulsory internship (4 ECTS), preparatory paper (8 ECTS) and master thesis (18 ECTS)

Accreditation: 2014, 35 students, TT field

Language: Serbian, English

Obligatory courses include: Business Analytics and Optimization and Business Statistics.

One elective course is chosen among 7 options. Study group ***Operational research*** offers the following electives: Games Theory and Business Strategies, Risk Management, Process Analysis and Petri Nets, Combinatorial Optimization and Metaheuristics, Measuring the Efficiency of Business Systems, Advanced Planning and Scheduling and Measuring the Preferences of Business Systems.

Study group ***Business Statistics*** includes the 7 following elective courses: Statistics in Management – selected chapters, Biostatistics and Telemedicine, Time Series Analysis and forecasting, Data Analysis and R-software, Econometrics of Financial Markets, Multivariate Analysis – selected chapters and Computational Statistics.

For both study groups, **two electives** are chosen among 23 courses (including afore mentioned 14): Data Mining, Business Intelligence Systems, Data Warehouse, Advanced Planning in Marketing, Simulation Models in Finance, Supply Chain Management 2, Numerical Methods in Finance, Theory of Algorithms, and Mathematical Programming.

Faculty of Mathematics

- **Statistics, actuary and financial mathematics**

Referent subjects: Life insurance and Selected topics on mathematical statistics, probability theory and random processes.

- **Computer Science**

Referent subjects: Data mining, Text processing and Data mining in bioinformatics.

School of Electrical Engineering

- All master programs are too technically oriented, they relate exclusively to programming knowledge and as such are not comparable to the potential learning outcomes of the master course we are developing within the ADA project

University of Novi Sad

- Faculty of Economics in Subotica, University of Novi Sad, http://www.ef.uns.ac.rs/english/index.php
- Faculty of Sciences, Department of Mathematics and Informatics, University of Novi Sad, http://www.dmi.uns.ac.rs/en/
- Faculty of Technical Sciences, University of Novi Sad, http://www.ftn.uns.ac.rs/n1386094394/faculty-of-technical-sciences

Faculty of Economics

Business Information Systems

The program is accredited in 2014. It enrols 35 students. The program lasts two semesters and carries 60 ECTS.

Language of study: Serbian

Staff: Local

ECTS: 60

Duration: 1 academic year (no part time option)

Obligatory study research (on the basis of master thesis): Yes (6 ECTS)

Obligatory master thesis: Yes (12 ECTS)

Mandatory subjects (8 or 6 ECTS each)**:** Methodology of scientific research, Business Process Modelling, Methods and Techniques for Business Data Analysis and Management of Information Systems Project

Subject elective block (2 subjects to choose, 6 ECTS each): Performance management systems, E - Supply Chain Management, Business Negotiation and Financial Reporting by Business Segments.

Quantitative Economy

Study program is accredited in 2010 but there are no students, it is not active.

Faculty of Sciences, Department of Mathematics and Informatics

- **Applied Mathematics, Data Science**.

The subjects that correspond to our field of interests are: Programming for data science, Shape recognition and machine learning, Big scale data analysis, Statistical theory of machine learning and signal processing and Big data analysis in medicine and biology.

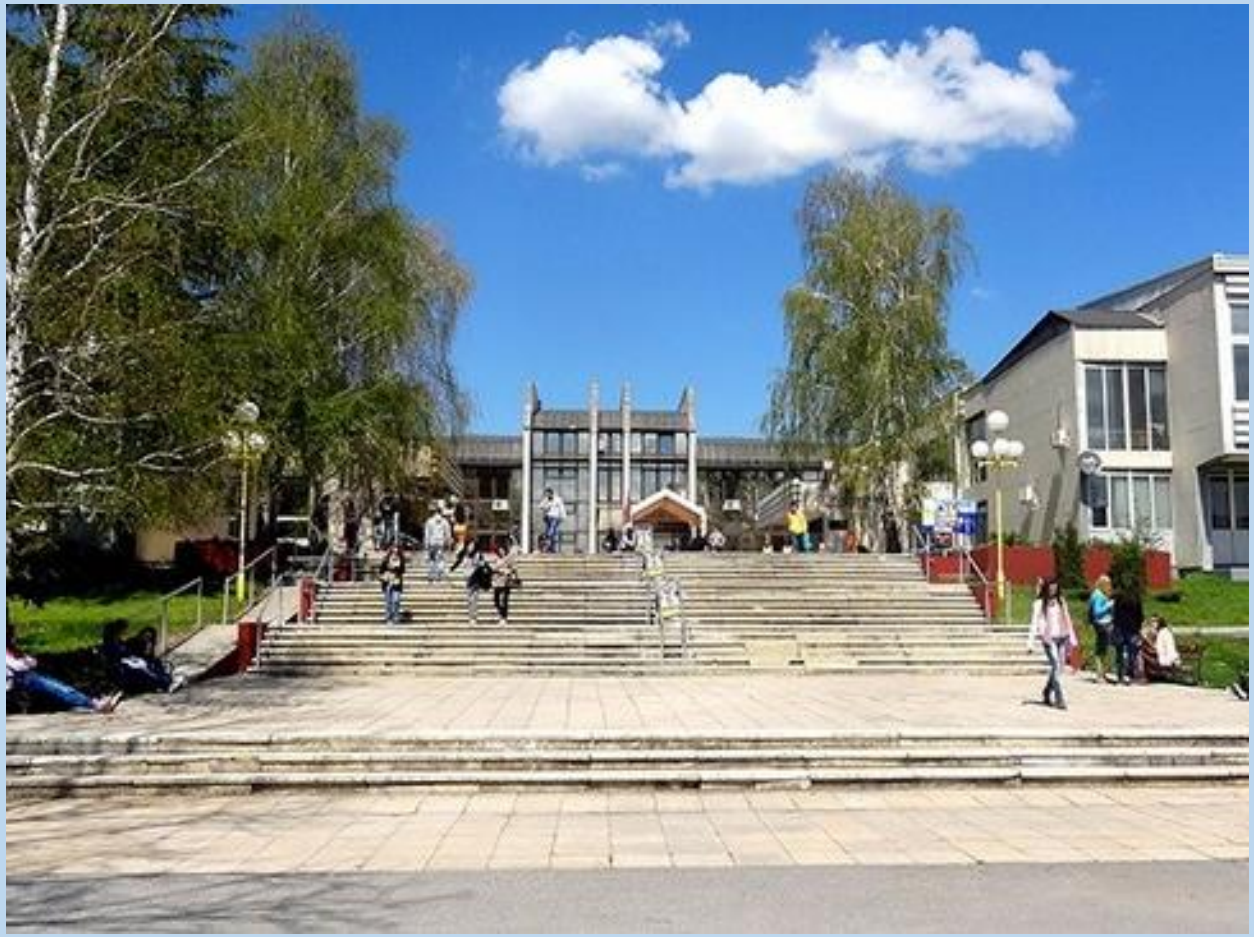
Faculty of Technical Sciences

- **Information engineering** and
- **Information and analytic engineering**

Subjects that that correspond to our field of interests are: Systems for data exploring and analysis, Detection and estimation, Neural networks, Quantitative methods for risk management, Stock market business, Computational text analysis and Financial mathematics.

University of Kragujevac

- Faculty of Economics, University of Kragujevac http://www.ekfak.kg.ac.rs/en/
- Faculty of Sciences, Department of Mathematics and Informatics, University of Kragujevac https://www.pmf.kg.ac.rs/?id=30



Faculty of Economics

Master course **Electronic Business** is a part of Business Economics and Management:

Language of study: Serbian

Staff: Local

ECTS: 60

Duration: 1 academic year (no part time option)

Obligatory master thesis: Yes (20 ECTS)

Mandatory subjects (8 ECTS each): Electronic trade, Management Information Systems and Electronic payment systems

Subject elective block 1 (one subject to choose, 8 ECTS): Risk management of financial institutions and Quantitative Analysis in Marketing

Subject elective block 2 (one subject to choose, 8 ECTS): Quantitative methods and models in economics, Financial derivatives and Business Intelligence

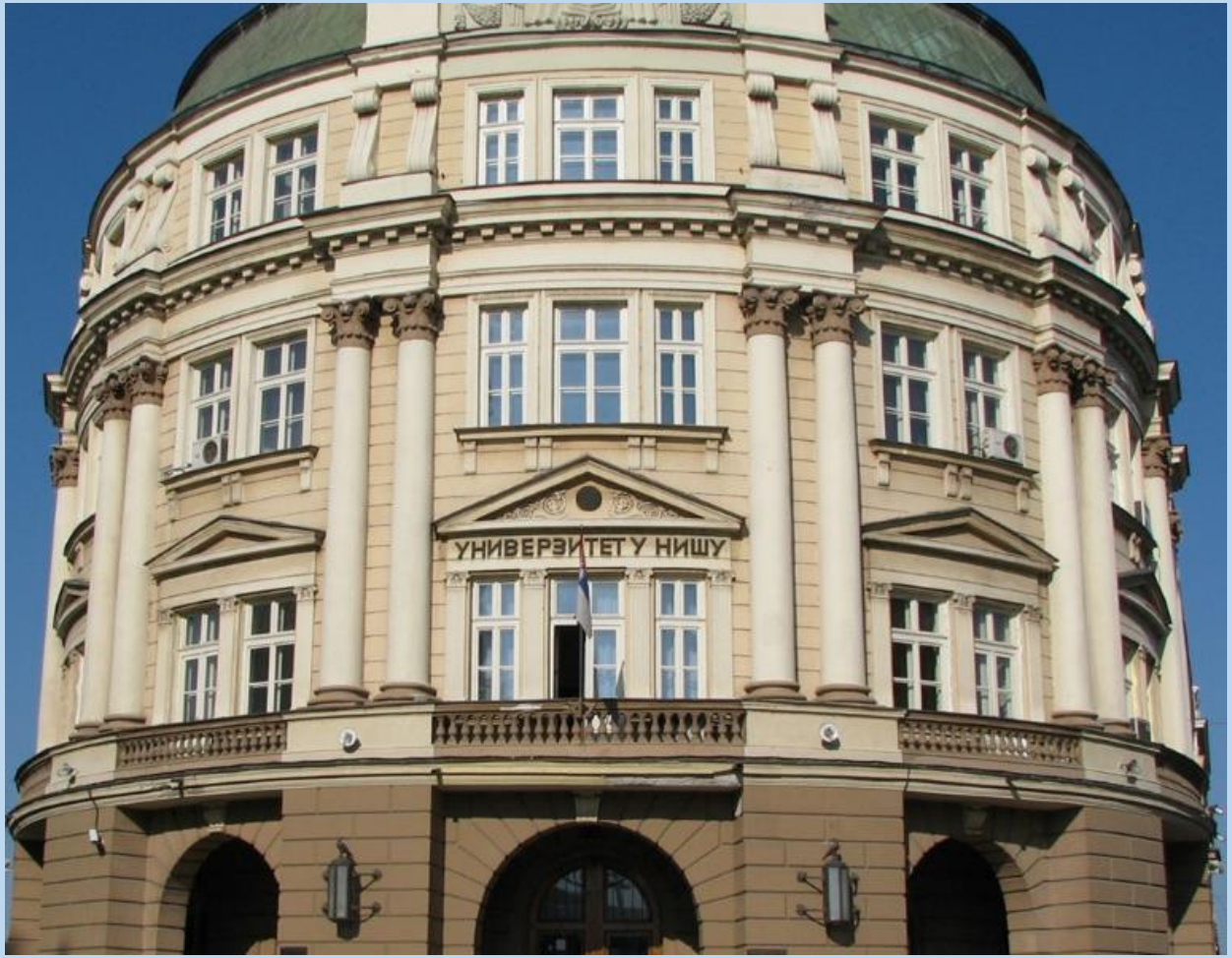
Faculty of Sciences, Department of Mathematics and Informatics

Study program Computer science, master course **Data science** (one year, 60ECTS, 2 core + 3 electives).

The subject comparative to the study program we are developing are: Machine learning 1, Data preparation, Machine learning 2, Deep learning, Big data analysis, Financial modelling, Intelligent informational systems.

University of Niš

- Faculty of Economics, University of Niš http://www.eknfak.ni.ac.rs/en/
- Faculty of Sciences and Mathematics, University of Nis https://www.pmf.ni.ac.rs/
- Faculty of Electrical Engineering, University of Nis http://www.elfak.ni.ac.rs/en/



Faculty of Economics

Faculty of Economics Niš has one study programme Economics at the graduate academic (Master's course) level. Within the programme Economics there are seven modules: (1) General Economics, (2) Accounting, Auditing and Financial Management, (3) Finance, Banking and Insurance, (4) Enterprise Management, (5) Marketing, (6) International Management and (7) Tourism Management.

None of the offered modules is related to a business analytics and subjects related quantitative economic analysis on these modules are electives.

Faculty of Science and Mathematics

At the Department of Computer Science master course **Information Processing.**

Referent subjects: Intelligent data processing, Natural language processing, Deep neural networks, Probability, Statistics,

At the Department of Mathematics master course **Financial Mathematics.**

Referent subjects: Actuary mathematics, Financial mathematics, Risk theory, Regression analysis in finance, Econometrics

Faculty of Electrical Engineering

Master course **Informatics and computing**.

Referent subjects Intelligent systems (i.e. machine learning), Intelligent transport systems, Natural language processing, Intelligent informational systems, Systems for big data analysis

Concluding remarks

University	Faculty	Master courses included in analysis	Strengths and weaknesses of existing master courses	Competitive advantage of the proposed master program Advanced Analytics Data
University of Belgrade	Faculty of Economics	Quantitative Analysis International Master Quantitative Finance	Recognizable master programs with traditionally great interest of students.	The field of business analytics is broader than quantitative finance and includes other areas of business.
	Faculty of Organizational Science	Business Analytics (with two study groups: Operational Research and Business Statistics)	The only master course that is entirely focused on business analytics. A smaller number of compulsory subjects and a wide range of elective.	The new approach, with a greater number of compulsory subjects which provide a stronger basis of data analysis.
	Faculty of Mathematics	Statistics, actuary and financial mathematics Computer Science	Focused on mathematics, just a few subjects related to data analysis.	Different learning outcomes.
	School of Electrical Engineering	-	All master programs are too technically oriented and relate exclusively to programming knowledge.	Different learning outcomes.
University of Novi Sad	Faculty of Economics in Subotica	Business Information Systems Quantitative Economy	Study program is focus on e-business and management information systems.	The master program introduces new knowledge in the field of business analytics as well as tools that are not studied within the existing master course.
	Faculty of Sciences, Department of Mathematics	Applied mathematics, data science	Focused on mathematics, just a few subjects related to data analysis.	Different learning outcomes.
	Faculty of Technical Sciences	Information engineering Information and analytic engineering	Learning outcomes are technically oriented.	Different learning outcomes.
University of Kragujevac	Faculty of Economics	Electronic Business	Study program is focus on e-business, e-trade and management information systems.	The master program introduces new knowledge in the field of business analytics as well as tools that are not studied within the existing master course.
	Faculty of Sciences, Department of Mathematics	Data Science	Focused on mathematics, just a few subjects related to data analysis.	Different learning outcomes.
University of Niš	Faculty of Economics	-	No master course that is related to business data analytics.	Possibility to introduce a completely new study program, which has no competition at the University of Niš.
	Faculty of Sciences and Mathematics	Information Processing Financial Mathematics	Focused on mathematics, just a few subjects related to data analysis.	Different learning outcomes.
	Faculty of Electrical Engineering	Informatics and Computing	Learning outcomes are technically oriented.	Different learning outcomes.









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