



Thesis and Diploma Work Topics 2023 / 2024 Spring

University of Debrecen, Faculty of Informatics

Department of Computer Science

Supervisor: Dr. Bujdosó Gyöngyi

1. Webdesign, web development

Degrees: Business Informatics (BSc, MSc), Computer Science Engineering (BSc), Computer Science (BSc), Information Technology Teacher (MSc)

Details: You can focus on the following topics: – Design of the website structure and layout – Website development – Digital Marketing – User Experience Design – Human-Computer Interaction

Languages: HTML, CSS, PHP/Java/JavaScript/Python.

Students in Business Informatics can focus on digital marketing strategy and its implementation and website design and development.

Computer Science and Computer Science Engineering students can focus on website structural and functional design and development.

Information Technology Teacher students can focus on information transfer as well as website design and development in educational methods.

2. Digital Marketing

Degrees: Business Informatics (BSc)

Details: A thesis on this topic can deal with several areas of digital marketing. Main areas: Designing the structure and layout of a website from a marketing point of view - E-mail Marketing - Mobile Marketing - Search Engine Marketing - Social Media Marketing - User Experience Design (UXD) for a brand or service - Human-Computer Interaction (HCI) design. The development of the digital marketing strategy/campaign and the presentation of some parts of it on a used interface, for example for designing and creating a website in a framework, or the design of a mobile application and the illustration of some parts. In addition, the topic can be the creation of a digital marketing survey and analysis related to an online service.

Supervisor: Dr. Fazekas Attila

1. Real-time Sign Language Recognition Using Image Processing Techniques

Degrees: Computer Science (MSc)

Details: The topic of the thesis is mapping the possibility of computer recognition of sign language, and then creating a program that can recognize sign language on video streams under limited conditions.

Supervisor: Dr. Herendi Tamás

1. Protecting personal data

Degrees: Business Informatics (BSc, MSc), Computer Science Engineering (BSc, MSc), Computer Science (BSc, MSc), Information Technology Teacher (MSc)



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University of Debrecen, Faculty of Informatics

Department of Computer Science

2. Media processing using artificial intelligence

Degrees: Business Informatics (BSc, MSc), Computer Science Engineering (BSc, MSc), Computer Science (BSc, MSc), Information Technology Teacher (MSc)

3. Cryptographic algorithms

Degrees: Business Informatics (BSc, MSc), Computer Science Engineering (BSc, MSc), Computer Science (BSc, MSc), Information Technology Teacher (MSc)

4. Random number generators

Degrees: Business Informatics (BSc, MSc), Computer Science Engineering (BSc, MSc), Computer Science (BSc, MSc), Information Technology Teacher (MSc)

5. Cooperative operation of smart devices

Degrees: Business Informatics (BSc, MSc), Computer Science Engineering (BSc, MSc), Computer Science (BSc, MSc), Information Technology Teacher (MSc)

6. Discrete optimization

Degrees: Business Informatics (BSc, MSc), Computer Science Engineering (BSc, MSc), Computer Science (BSc, MSc), Information Technology Teacher (MSc)

Details: Problems and solutions in the field of discrete optimization. Suboptimal solutions.

7. Randomized algorithms

Degrees: Business Informatics (BSc, MSc), Computer Science Engineering (BSc, MSc), Computer Science (BSc, MSc)

8. Number representation in nontraditional number systems

Degrees: Business Informatics (BSc, MSc), Computer Science Engineering (BSc, MSc), Computer Science (BSc, MSc), Information Technology Teacher (MSc)

9. Artificial intelligence based optimization of traffic control

Degrees: Business Informatics (BSc, MSc), Computer Science Engineering (BSc, MSc), Computer Science (BSc, MSc), Information Technology Teacher (MSc)



Thesis and Diploma Work Topics 2023 / 2024 Spring

University of Debrecen, Faculty of Informatics

Department of Computer Science

Supervisor: Dr. Horváth Géza

1. Comparative analysis of stream ciphers

Degrees: Computer Science (BSc, MSc)

Details: Stream ciphers have a history of more than 100 years. The aim of this thesis is to present and compare the evolution of these algorithms through a few examples, starting from the Vernam system, which is more than 100 years old and still popular today, to the most recent 21st century systems. The comparison is based on the security of the systems, of course, but also on the complexity of the operations used, the time required to run them, the complexity and length of the code, and the amount of memory required.

2. The RSA algorithm and factorisation

Degrees: Computer Science Engineering (MSc), Computer Science (MSc)

Details: The RSA algorithm is the first and still the most popular public key cryptosystem. A crucial factor in the security of the RSA algorithm is the difficulty of finding the prime factors of the large number it uses, which is the product of two large prime numbers. There are currently many known factorisation algorithms, which can be basically divided into two groups. The first group consists of general-purpose factorization algorithms, which work with similar efficiency for numbers of the same length. The second group consists of special-purpose factorization algorithms, which work with high efficiency in certain cases. The aim of this thesis is to provide a comparative analysis of certain classes of these factorisation algorithms in terms of speed, and then to investigate the potential for further optimisation.

3. Analysis of Iteration Lemmas for Context-Free Languages

Degrees: Computer Science (MSc)

Details: There are many known iteration lemmas for context-free language class. In this thesis work, the candidate is going to investigate the effectiveness of the above mentioned pumping lemmas. The job is to find or define simple languages that satisfy the conditions of one lemma but not the conditions of the other lemma.

Supervisor: Dr. Kádek Tamás

1. Smart route planning for citizens with disabilities

Degrees: Business Informatics (BSc), Computer Science Engineering (BSc), Computer Science (BSc)

Details: The candidate must develop an application that provides route plans for citizens with disabilities, considering the challenges they face. The resulting software must include the implementation of corresponding AI-related algorithms or techniques necessary for the planning. The central part of the thesis consists of the problem's formal description and detailed presentation of the AI-related algorithms used in the final software product.



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University of Debrecen, Faculty of Informatics

Department of Computer Science

2. Cost-effective route planning in local areas public transport

Degrees: Business Informatics (BSc), Computer Science Engineering (BSc), Computer Science (BSc)

Details: The candidate must develop an application that provides cost-effective route plans for citizens at a local level public transport system. The resulting software must include the implementation of corresponding AI-related algorithms or techniques. The central part of the thesis consists of the problem's formal description and detailed presentation of the AI-related algorithms used in the final software product.

3. Implementation of a solution for an AI problem using Java and Prolog

Degrees: Business Informatics (BSc), Computer Science Engineering (BSc), Computer Science (BSc)

Details: The thesis is based on an application developed by the candidate. The thesis consists of a formal description of the problem, a detailed description of integrating the Prolog program into Java, and typical documentation of the application development process.

Supervisor: Dr. Vaszil György

1. Implementation of membrane systems in the P-lingua programming language.

Degrees: Business Informatics (BSc), Computer Science Engineering (BSc), Computer Science (BSc)

Details: The topic assumes the intention to learn the basics of membrane computing (see https://en.wikipedia.org/wiki/Membrane_computing for more information), the goal is to implement a membrane algorithm for the solution of a particular computational problem with P-lingua (see http://www.p-lingua.org/wiki/index.php/Main_Page for more information).



Thesis and Diploma Work Topics 2023 / 2024 Spring

University of Debrecen, Faculty of Informatics

Department of Data Science and Visualization

Supervisor: Bodroginé Dr. Zichar Marianna

1. Automated Data Analysis and Visualization Techniques for Stock Market Prediction

Degrees: Business Informatics (BSc)

Supervisor: Bogacsóvics Gergő

1. Reinforcement learning with Unity

Degrees: Business Informatics (BSc, MSc), Computer Science Engineering (BSc, MSc), Computer Science (BSc, MSc)

2. State-of-the-art image processing using diffusion models

Degrees: Computer Science (BSc, MSc)

3. Artificial intelligence for robotics

Degrees: Business Informatics (BSc, MSc), Computer Science Engineering (BSc, MSc), Computer Science (BSc, MSc)

4. Deep learning for medical image processing

Degrees: Business Informatics (BSc, MSc), Computer Science Engineering (BSc, MSc), Computer Science (BSc, MSc)

5. Prompt engineering for large language models

Degrees: Business Informatics (BSc, MSc), Computer Science Engineering (BSc, MSc), Computer Science (BSc, MSc)

Supervisor: Dr. Harangi Balázs

1. Cell segmentation and tracking on microscopic images

Degrees: Computer Science Engineering (MSc), Computer Science (MSc)

Details: Today, it is crucial that new methods can be used to speed up and automate drug development and help health researchers. The aim of this thesis is to develop an easy-to-use software prototype to support the analysis of microscopic images in pharmaceutical research.

2. Medical image processing for automated screening systems

Degrees: Computer Science (BSc, MSc)

Details: Implement medical decision support system based on medical image processing and artificial intelligence.



Thesis and Diploma Work Topics 2023 / 2024 Spring

University of Debrecen, Faculty of Informatics

Department of Data Science and Visualization

3. Artificial Intelligence-based agent development for games

Degrees: Business Informatics (BSc), Computer Science Engineering (BSc), Computer Science (BSc)

Details: The aim is to develop and design artificial intelligence-based agents for solving game problems that can be described by traditional state-space representations, introducing both traditional and novel tools for game and agent implementation.

Supervisor: Dr. Kovács László

1. Generative AI, HD map and Virtual Reality with Nvidia

Degrees: Business Informatics (BSc, MSc), Computer Science Engineering (BSc, MSc), Computer Science (BSc, MSc)

2. Autonomous (model sized) vehicles development with deep learning solutions

Degrees: Business Informatics (BSc), Computer Science Engineering (BSc, MSc), Computer Science (BSc, MSc)

Supervisor: Oláh Norbert

1. Phishing Detection and Defense Using Machine Learning

Degrees: Computer Science (BSc)

Details: Phishing is a type of cyber attack that tricks people into giving away personal information through fraudulent websites and emails. Phishing is a fast-growing internet crime compared to other forms of internet threats, such as hacking and viruses. In the broad usage of the internet as a significant form of communication, phishing can be implemented in different ways, such as the following: - Email-to-email - Email-to-website - Website-to-website - Browser-to-website Different types of anti-phishing measures are being used to prevent phishing. For example, the Anti-Phishing Working Group is an industry group that formulates phishing reports from various online incident resources and makes them available to paying members. Many researchers have focused on improving the accuracy of detecting website phishing using various techniques. They have employed several classifiers such as Naïve Bayes, K-Nearest Neighbor, Linear Regression, C5.0, Artificial Neural Networks, and Support Vector Machine (SVM) to train datasets for identifying phishing websites. These classifiers can be grouped into two techniques: probabilistic or machine learning. Using these algorithms, researchers have solved different problems related to phishing website detection. To evaluate their effectiveness, some of these algorithms were assessed using four metrics: precision, recall, F1-Score, and accuracy.

The student's thesis requires selecting, testing, and implementing a spam detection technique.



Thesis and Diploma Work Topics 2023 / 2024 Spring University of Debrecen, Faculty of Informatics

Department of Data Science and Visualization

Supervisor: Takács Viktor László

1. Implementation of Business Intelligence

Degrees: Business Informatics (BSc, MSc)

Details: The implementation of business intelligence (BI) has become a critical tool for companies to improve their performance. By leveraging BI, companies can effectively collect, analyze, and interpret data to gain competitive advantages. This thesis aims to investigate the implementation of BI in companies, focusing on how it can be used to optimize operations, increase profitability, and enhance customer satisfaction. The thesis will also explore the challenges and opportunities associated with BI adoption, and provide recommendations for companies to develop effective BI strategies.

Supervisor: Tóth János

1. Data visualization with Power BI

Degrees: Business Informatics (BSc, MSc), Computer Science Engineering (BSc, MSc), Computer Science (BSc, MSc), Information Technology Teacher (MSc)

Details: The aim of the work is to develop data visualization applications based on relational databases using Microsoft Power BI, primarily for business decision support purposes. Once the topic and the specific task have been agreed upon, the student must collect, prepare, and organize the necessary data into a relational database and create the visualizations.

Supervisor: Ujvári Balázs

1. Create a user interface for monitoring environmental data

Degrees: Computer Science Engineering (BSc), Computer Science (BSc)

Details: We measure various parameters in our environment (temperature, particulate matter, air pressure, humidity...) with networked measuring stations, and develop applications to install them and access the data.

2. Big Data solutions for the forecast of the air pollution

Degrees: Computer Science Engineering (BSc, MSc), Computer Science (BSc, MSc)

Details: Analysing the data of several PM sensors we will work on the methodology of the air pollution forecast

3. Big Data solutions for the forecast of the air pollution

Degrees: Computer Science Engineering (BSc, MSc), Computer Science (BSc, MSc)

Details: Analysing the data of several PM sensors we will work on the methodology of the air pollution forecast



Thesis and Diploma Work Topics 2023 / 2024 Spring

University of Debrecen, Faculty of Informatics

Department of Data Science and Visualization

Supervisor: Dr. Virágos Márta

1. Knowledge and Information Management

Degrees: Business Informatics (BSc), Information Technology Teacher (MSc)

Details: Transformation of the company's operations and organization in the information economy. Strategic knowledge management perspectives. Knowledge management tools, component technologies: ontology and taxonomy, information-retrieval tools, knowledge discovery in databases.. Organizational learning. Knowledge management in corporate practice. Knowledge transfer. The influence of Internet of Things on industry (tourism, business, services)

2. Research Data Management

Degrees: Business Informatics (BSc, MSc), Information Technology Teacher (MSc)

Details: The various aspects of Research Data Management (RDM). Research data lifecycle. Data manipulation and analysis techniques and tools. Best practices for data structures, types, formats, vocabularies, ontologies and metadata. Data management plans and DMP tools. Data citation and referencing practices. Data linking and data integration techniques. Data repository and storage platforms.



Thesis and Diploma Work Topics 2023 / 2024 Spring

University of Debrecen, Faculty of Informatics

Department of Information Technology

Supervisor: Dr. Adamkó Attila Tamás

1. Web Standards (HTML5, Websocket, SSE, microformats, ...)

Degrees: Business Informatics (BSc, MSc), Computer Science Engineering (BSc, MSc), Computer Science (BSc, MSc)

Details: Actual Web technologies discussed.

2. Modern Operating Systems (Windows, RHEL, ...)

Degrees: Business Informatics (BSc), Computer Science Engineering (BSc), Computer Science (BSc)

Details: Discussion on Modern Operating Systems (Windows, RHEL, ...)

3. Advanced Software Engineering in practice

Degrees: Business Informatics (MSc), Computer Science Engineering (MSc), Computer Science (MSc)

Details: Advanced Software Engineering in practice.

4. Application development and/or modeling on a chosen domain (like information, registration, other systems).

Degrees: Business Informatics (BSc, MSc), Computer Science Engineering (BSc, MSc), Computer Science (BSc, MSc)

5. NoSQL solutions

Degrees: Business Informatics (BSc, MSc), Computer Science Engineering (BSc, MSc), Computer Science (BSc, MSc)

Details: NoSQL solutions in practice.

6. Application Development (Web / Mobile / Desktop)

Degrees: Business Informatics (BSc, MSc), Computer Science Engineering (BSc, MSc), Computer Science (BSc, MSc)

Supervisor: Dr. Biró Piroska

1. Mobile application development

Degrees: Business Informatics (BSc, MSc), Computer Science Engineering (BSc, MSc), Computer Science (BSc, MSc)



Thesis and Diploma Work Topics 2023 / 2024 Spring

University of Debrecen, Faculty of Informatics

Department of Information Technology

Supervisor: Dr. Gilányi Attila László

1. Computer Science in Sport

Degrees: Business Informatics (BSc), Computer Science Engineering (BSc, MSc), Computer Science (BSc, MSc)

2. Game Theory and Computer Science

Degrees: Business Informatics (BSc), Computer Science Engineering (BSc, MSc), Computer Science (BSc, MSc)

3. Virtual Reality Systems

Degrees: Business Informatics (BSc), Computer Science Engineering (BSc, MSc), Computer Science (BSc, MSc)

4. Computer-Assisted Methods in Mathematical Models

Degrees: Business Informatics (BSc), Computer Science Engineering (BSc, MSc), Computer Science (BSc, MSc)

Supervisor: Dr. Godó Zoltán Attila

1. Web-based application development

Degrees: Computer Science Engineering (BSc), Computer Science (BSc)

Details: Implementation of new ideas on the web interface. Competence: JavaScript, PHP, CSS, HTML.

Supervisor: Dr. Ispány Márton

1. Traffic simulation and analysis for Smart Cities

Degrees: Computer Science Engineering (BSc, MSc), Computer Science (BSc, MSc)

2. Solving text mining problems in Python

Degrees: Business Informatics (MSc), Computer Science Engineering (MSc), Computer Science (MSc)

Supervisor: Dr. Jeszenszky Péter

1. Web application development

Degrees: Computer Science (BSc, MSc)



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University of Debrecen, Faculty of Informatics

Department of Information Technology

2. AI Tools in Software Development

Degrees: Computer Science (BSc, MSc)

Supervisor: Szabó Máté

1. Web development

Degrees: Computer Science Engineering (BSc), Computer Science (BSc)

Details: Computer Science and Computer Science Engineering students can focus on web application development with a chosen framework like Spring, Angular, React.

Supervisor: Tóth Róbert

1. Implementing business logic using modern technologies

Degrees: Computer Science (BSc)

Details: The goal is to design, implement, and present a real, working application that is related to the job or the hobby of the student. The application should contain a business logic that can be tested; thus, a simple CRUD application is not acceptable.

Supervisor: Dr. Vágner Anikó Szilvia

1. Web application development (CSE BSc)

Degrees: Computer Science Engineering (BSc)

Details: For a given topic (i.e.: travel planning) the student will write a web application with a backend part, where the backend can be a database (relational, NoSQL, etc.) or contain some other stronger functionality (i.e.: a game with computer opponent with artificial intelligence).

2. Webapplication development using Apache Solr

Degrees: Computer Science (BSc)

Details: Apache Solr is a search engine, namely, it stores documents and it can build indices on the documents. The task is to build a search engine for a given topic (i.e. cook recipe) and write to an easy frontend to help the search.

3. Webapplication development (CS BSc)

Degrees: Computer Science (BSc)

Details: For a given topic (i.e.: travel planning) the student will write a web application with a backend part, where the backend can be a database (relational, NoSQL, etc.) or contain some other stronger functionality (i.e.: a game with computer opponent with artificial intelligence).



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Department of Information Technology

4. Application development for a NoSQL database (CS BSc)

Degrees: Computer Science (BSc)

5. Application development for a NoSQL database (CS MSc)

Degrees: Computer Science (MSc)

Details: The student writes an application in the programming language of their choice in which at least one NoSQL database is used. To the MSc level there can be two options: - the student can use a NoSQL database which is less mentioned in the NoSQL database course (i.e. ArrangoDB) - or the student can use a learnt NoSQL database but together with its advanced tool(s) (ie. clustering of MongoDB or Cassandra). The application should be concrete, ie. a system for a bakery.



Thesis and Diploma Work Topics 2023 / 2024 Spring

University of Debrecen, Faculty of Informatics

Department of IT Systems and Networks

Supervisor: Dr. Bérczes Tamás Márton

1. Project development using Artificial Intelligence

Degrees: Business Informatics (BSc, MSc), Computer Science Engineering (BSc, MSc), Computer Science (BSc, MSc), Information Technology Teacher (MSc)

2. Web project development in Blazor environment

Degrees: Business Informatics (BSc, MSc), Computer Science Engineering (BSc, MSc), Computer Science (BSc, MSc)

3. Web project development in Angular and C # environments

Degrees: Computer Science Engineering (BSc), Computer Science (BSc)

Supervisor: Dr. Gál Zoltán

1. Routing Technics in Wireless Sensor Networks

Degrees: Computer Science Engineering (BSc, MSc), Computer Science (BSc, MSc)

Details: In wireless sensor networks (WSN), routing plays a critical role in the quality of service of the system. The qualitative and quantitative characteristics of various WSN communication mechanisms and routing techniques must be examined in a simulation environment. Power consumption of the WSNs makes the routing more complex than in the classical networks. More metrics are required to consider for a multidimensional, complex algorithm evaluation. The thesis includes a comparison of the actual routing mechanisms in the WSNs.

2. High Speed Communication and Switching Technologies

Degrees: Computer Science Engineering (BSc, MSc), Computer Science (BSc, MSc)

Details: Modern, high-efficiency packet switches prioritize the processing required for transmission at the firmware and hardware level. Testing solutions modelled in a graph theory or virtualized network environment is necessary to quickly implement frame extensions that meet various criteria. The switch fabric solution and the connection and efficiency of standard, high-speed system rails are analyzed during the execution of the thesis.

3. Application of the Swarm Intelligence in Wireless Sensor Networks

Degrees: Computer Science Engineering (MSc), Computer Science (MSc)

Details: Biologization became one of the most important pulling forces of engineering applications. Swarms operate in common algorithms based on optimal survival solutions of life requirements. Dozens of algorithms are implemented in different programming languages, which are usable in the efficiency enhancement of distributed communication systems. Usage of the swarm intelligence (SI) in Wireless Sensor Networks requires considerable analysis in the thesis work of these algorithms.



Thesis and Diploma Work Topics 2023 / 2024 Spring

University of Debrecen, Faculty of Informatics

Department of IT Systems and Networks

4. QoS Technologies and Services in Edge/Fog Computing

Degrees: Computer Science Engineering (BSc, MSc), Computer Science (BSc, MSc)

Details: The simultaneous operation of heterogeneous services on a common packet-switched network infrastructure assumes the active existence of QoS (Quality of Service) mechanisms. Data, voice and video can be processed on the common network according to different traffic characteristics. The analysis of DiffServ and IntServ methods in different network topologies and virtualized systems enables the optimal design of priority traffic profiles. Measurements and analyzes carried out in a real network environment are presented in the thesis.

Supervisor: Dr. Sütő József

1. Development of embedded systems (hw + sw)

Degrees: Computer Science Engineering (BSc, MSc)

Supervisor: Dr. Tóth Ádám

1. Designing and analyzing an arbitrary distributed system

Degrees: Computer Science Engineering (BSc, MSc), Computer Science (BSc)

Details: Building and presenting an environment where the student uses open standards such as Apache Hadoop or Openstack.

2. Performance analysis of infocommunication systems

Degrees: Computer Science Engineering (BSc), Computer Science (BSc)

Details: Arbitrary queuing model programming for a real environment or case simulation.

3. Building and analyzing arbitrary cloud-based networks

Degrees: Computer Science Engineering (BSc, MSc), Computer Science (BSc, MSc)

Details: Presentation and construction of an environment built in any cloud environment, which goes beyond what was learned in the basic Introduction to Cloud Technologies or Introduction to the AWS Cloud courses.