



# Thesis and Diploma Work Topics 2023 / 2024 Spring

University of Debrecen, Faculty of Informatics

## Department of Applied Mathematics and Probability Theory

**Supervisor:** Dr. Baran Sándor

**1. Stochastic algorithms: case studies**

**Degrees:** Computer Science (MSc)



# 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. Advanced Image Processing Techniques for Wildlife Monitoring and Conservation

**Degrees:** Computer Science (MSc)

**Details:** The aim of the thesis is to use image processing techniques for the automatic processing of wildlife cameras, which enables the recognition and accounting of wild animals in the given area.

### 2. 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.



# Thesis and Diploma Work Topics

## 2023 / 2024 Spring

University of Debrecen, Faculty of Informatics

## Department of Computer Science

**Supervisor:** Dr. Herendi Tamás

### 1. Media processing using artificial intelligence

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

### 2. Cryptographic algorithms

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

### 3. Random number generators

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

### 4. Cooperative operation of smart devices

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

### 5. Protecting personal data

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

### 6. Randomized algorithms

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

### 7. Number representation in nontraditional number systems

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

### 8. 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)

### 9. 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.



# Thesis and Diploma Work Topics 2023 / 2024 Spring

University of Debrecen, Faculty of Informatics

## Department of Computer Science

**Supervisor:** Dr. Horváth Géza

### 1. 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.

### 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. 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.

**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.



# Thesis and Diploma Work Topics 2023 / 2024 Spring

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](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](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:** Al-Hamadani Mokhaled Noori Abd Allah

### 1. Reinforcement Learning Over Cell Growth Data.

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

**Details:** Cell growth data is valuable in various fields, such as crop production, the food industry, pharmaceutical research, and patient care. Therefore, the goal of this research is to design and develop a reinforcement learning algorithm that can learn optimal policies to understand cell growth data, predict cell growth patterns, and potentially control cell growth dynamics.

### 2. Reinforcement Learning Using Synthetic Data for Cell Growth.

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

**Details:** The goal of this research is to create synthetic cell growth data as an alternative to real-world cell growth data, which can be challenging or expensive to collect. The synthetic data will be used to train reinforcement learning models to understand, predict, and potentially influence cell growth dynamics.

### 3. Reinforcement Learning for Object Grasping and Manipulation.

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

**Details:** The objective of this research is to create a simulation environment in which robots can learn how to grasp and manipulate objects.

**Supervisor:** Bodroginé Dr. Zichar Marianna

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

**Degrees:** Business Informatics (BSc)

**Supervisor:** Bogacsóvics Gergő

### 1. State-of-the-art image processing using diffusion models

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

### 2. Artificial intelligence for robotics

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

### 3. Prompt engineering for large language models

**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 Data Science and Visualization

### 4. Reinforcement learning with Unity

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

### 5. Deep learning for medical image processing

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

**Supervisor:** Dr. Harangi Balázs

### 1. 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.

### 2. 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.

### 3. 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.

**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)



# Thesis and Diploma Work Topics

## 2023 / 2024 Spring

University of Debrecen, Faculty of Informatics

## Department of Data Science and Visualization

**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.

**Supervisor:** Dr. Pintér-Husztai Andrea

### 1. Usable security

**Degrees:** Computer Science (BSc)

**Details:** Usable security refers to the practice of preventing threats to user security and privacy. It focuses on users, analyzing their behavior, mental models, and decision-making processes to provide feedback on computer system design, implementation, and operation, thereby improving user security and privacy. Balancing usability and security poses challenges: the more secure the systems, the less usable they will be. Thus, usable security aims to make security measures more effective by minimizing user errors and increasing user compliance with security protocols. The topic covers the basic aspects of usable security and the implementation of a concrete solution.

### 2. Decentralized Autonomous Organization (DAO)

**Degrees:** Business Informatics (MSc)

**Details:** DAOs are blockchain-native, decentralized organizations collectively owned and managed by their members via smart contracts. DAOs may introduce a new era in organizational economics, transforming the global corporate landscape from hierarchical organizations to democratic and distributed organizations powered by organizational entrepreneurship and innovations. The topic covers the main security challenges of DAOs and examines effective coordination technologies while maintaining decentralized management. It focuses on access control and decentralized identity-based solutions.





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

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

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

### 2. NoSQL solutions

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

**Details:** NoSQL solutions in practice.

### 3. Application Development (Web / Mobile / Desktop)

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

### 4. 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.

### 5. 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)

### 6. Advanced Software Engineering in practice

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

**Details:** Advanced Software Engineering in practice.

**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. Virtual Reality Systems

**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. Computer Science in Sport

**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, MSc), Computer Science (BSc, MSc)

**Details:** Implementing innovative ideas on the web. Implementation of interesting websites. Competence: Web programming skills and interest.

**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. AI Tools in Software Development

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



# Thesis and Diploma Work Topics

## 2023 / 2024 Spring

University of Debrecen, Faculty of Informatics

## Department of Information Technology

### 2. Web application development

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

**Supervisor:** Major Sándor Roland

### 1. Building an E-Commerce Website with AI Integration for a Family Business

**Degrees:** Computer Science (BSc)

**Details:** Hallgató által hozott saját téma: weboldal készítő alkalmazások összehasonlítása. Az elkészült weboldalt a saját családi vállalkozásuk fogja használni.

**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. 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.



# Thesis and Diploma Work Topics 2023 / 2024 Spring

University of Debrecen, Faculty of Informatics

## Department of Information Technology

### 2. 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).

### 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).

### 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 students 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. 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.

### 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. 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.



# 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. Efficiency investigation of artificial neural networks on accelerator (TPU) devices

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

**Details:** To speed up the decision time of artificial neural networks the big IT companies developed different accelerations especially to single-board computers. Different accelerators have different hardware architectures and therefore different characteristics and performance. The student's task is to investigate the computing capabilities of a special acceleration device, for a wide range of convolutional neural networks.

### 2. Developement of control systems to autonomous vehicles

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

**Details:** The goal of this thesis topic is to develop and compare more controllers systems on a RC car. In the car, the machine vision based navigation software is extended with a controller unit and we will measure how the controller unit improves the lane keeping ability of the vehicle.

### 3. Automated puzzle game solver

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

**Details:** The idea of this thesis topic is to develop a small camera-based system which helps to find the right location of puzzle game pieces. The computer vision algorithm behind the system is based on image segmentation and image matching.

### 4. Developement of embedded systems (hw + sw)

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

**Supervisor:** Dr. Tóth Ádám

### 1. 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.





# Thesis and Diploma Work Topics 2023 / 2024 Spring

University of Debrecen, Faculty of Informatics

## Department of IT Systems and Networks

### 2. 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.

### 3. 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.