

Teme Licență | Bachelor Diploma Topics | 2019-2020

Dificultate mică - Low Difficulty:

Titlu: Strategii în jocuri cu mai mulți jucători

Coordinator/Contact: Prof. dr. ing. Adina Magda Florea (adina.florea@cs.pub.ro)

Descriere: Tema implică implementare și evaluarea critică a diferitelor strategii în jocuri, cum ar fi strategiile Max-n, Paranoic, Monte Carlo Tree search.

Titlu: Prelucrarea datelor de test pentru masina autonoma UPB

Coordinator/Contact: Prof. dr. ing. Adina Magda Florea (adina.florea@cs.pub.ro)

Descriere: Tema presupune organizarea unei colectii de date captate de camere video în campusul UPB, prelucrarea lor pentru pregătirea antrenării unei rețele neurale și adnotarea imaginilor.

Dificultate medie - Medium Difficulty:

Title: Classifying Activities of Daily Living from ambient sensor triggers by combining Complex Event Processing and Machine Learning methods

Coordinator/Contact: dr. ing. Alexandru Sorici (alexandru.sorici@cs.pub.ro)

Description:

In the domain of Ambient Intelligence, one of the often-encountered subjects of project and development is that of recognizing activities of daily living (ADL - e.g. sleeping, toileting, preparing food, eating, watching TV). Recognizing and monitoring these activities is especially useful in extending the care for elderly people at their own home.

In order to support privacy, activity detection is performed on hand of ambient sensors installed in the user homes (e.g. motion sensors, cupboard/door/window opening sensors, item removal/return sensors).

Using existing datasets (e.g. [CASAS](#)), the aim of this project proposal is to incorporate data-driven (Machine Learning based) inference capabilities into the context inference process. The purpose is to develop online-learning based algorithms that can in time learn the pattern of sensor activations for individual activities and individual users. These must then be coupled with knowledge-driven approaches that can, for example, precisely cue, when a shift in context (i.e. possible person activity/interest) has happened (e.g. by change of position from one room to another).

Title: Real-time fire detection for video surveillance using neural networks

Coordinators/Contacts: dr. ing. Mihai Trăscău (mihai.trascau@cs.pub.ro),
drd. ing. Mihai Nan (mihai.nan.cti@gmail.com)

Description:

In video surveillance or in automatic video content rating, the detection of fire breakouts is a relevant subject. A number of datasets (e.g. [Fire Detection Image Dataset](#), [Fire detection dataset](#)) of both static (images) and dynamic (video) modalities are available where fires of different magnitudes, intensity and location are recorded.

The prospective candidate is expected to create a uniform benchmark dataset out of the multiple input sources and provide a categorization based on type and location. On hand of the created benchmark dataset, the objective of the project is to use Computer Vision and Machine Learning algorithms to detect fires in videos and test the performance of the algorithm on the different categories of fire images (e.g. indoor, outdoor, large/small fire).

Title: Dialogue Management Service supporting the Romanian language in assistive robotics scenarios

Coordinators/Contacts: dr. ing. Alex Awada (alex.awada@cs.pub.ro),
dr. ing. Alexandru Sorici (alexandru.sorici@cs.pub.ro)

Description:

A dialogue management system, in the context of assistive robotics, is an application that models and guides a conversation carried out between a human user and a robot, by means of multiple modalities (e.g. written text, voice interaction), taking into account external cues (e.g. environment state, user fatigue or emotional state).

The purpose of this project is to develop a dialogue management service that works across different platforms and supports the Romanian language.

The service will be built in a modular, micro-service oriented architectural style, making use of existing web APIs that facilitate text-to-speech and speech-to-text processing for the Romanian language. The dialogue management service is expected to enable scriptable interaction scenarios, whereby the answers given by the robot are informed by both conversational context, as well as emotional state of the user (i.e. the response in the dialogue depends on what the user has said previously and on how he is feeling).

At the same time, the start of a dialogue can be triggered by contextual cues (e.g. the light is turned on in a room, a motion sensor is triggered), apart from direct voice interaction.

Title: Enhancing the functionality of the AMIRO User Interface

Coordinators/Contacts: dr. ing. Alex Awada (alex.awada@cs.pub.ro),
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Description:

AMIRO (AMblent RObotics) is a ROS-based system enabling monitoring (e.g. detecting when the door of the lab is opened or closed) and actuation (e.g. raise or lower the blinds in the lab, turn the smart lights on/off or change their color) of an indoor lab environment, as well as access to external context information (e.g. health parameters of lab personnel) by a socially assistive robot.

The service also defines basic robot behaviors (e.g. navigating to a given position, identifying a person, searching for an object, speaking or listening for a voice command) that can be composed in a hierarchical manner to create more elaborate human-robot interaction scenarios (e.g. guiding a user to a location, finding a person in the lab to inform them of a notification).

The purpose of this project is to enhance the current UI (user interface) for the AMIRO system by creating a back-end tool (robot behavior management) that allows the creation of different robot behaviors by dragging, dropping and linking different elements (such as: predefined behaviors, predefined or new animations and dialogs, custom Python codes, etc.) into a scene. The tool output must support the export of constructed behavior compositions into tasks executable through the AMIRO system.

Titlu: Recunoașterea gesturilor utilizatorului

Coordinator/Contact: Prof. dr. ing. Adina Magda Florea (adina.florea@cs.pub.ro)

Descriere: Tema are ca scop recunoașterea gesturilor unui utilizator din secvențe video.
<https://towardsdatascience.com/tutorial-using-deep-learning-and-cnns-to-make-a-hand-gesture-recognition-model-371770b63a51>
<https://arxiv.org/abs/1901.10323>

Title: 3D Mapping of the Environment for Humanoid Assistive Robots

Coordinator/Contact: Prof. dr. ing. Adina Magda Florea (adina.florea@cs.pub.ro)

Description: The main objective is to develop a robust 3D Mapping application for social robotics using the Pepper Humanoid robot in conjunction with RGB-D or 3D LiDAR sensors (e.g. Kinect). Specifically, the developed application has to create a 3D map of the environment that can be continuously updated in order to support Long-Term operation for a venue assistant humanoid robot.

https://en.wikipedia.org/wiki/Simultaneous_localization_and_mapping

Titlu: Agentul care învață

Coordinator/Contact: Prof. dr. ing. Adina Magda Florea (adina.florea@cs.pub.ro)

Descriere: Tema implica implementarea unui agent bazate pe învățarea prin recompense (RL) îmbogățită cu o rețea neural adanca, DQN.

<https://medium.com/@markus.x.buchholz/deep-reinforcement-learning-introduction-deep-q-net-work-dqn-algorithm-fb74bf4d6862>

Dificultate mare - High Difficulty:

Titlu: Detecția somnolenței șoferilor

Coordinator/Contact: Prof. dr. ing. Adina Magda Florea (adina.florea@cs.pub.ro)

Descriere: Tema are ca scop aplicarea metodelor de vedere computerizată pentru a detecta semne de somnolență a șoferilor la volan.

<https://arxiv.org/ftp/arxiv/papers/1811/1811.01627.pdf>

Titlu: Predicția mișcării utilizatorului

Coordinator/Contact: Prof. dr. ing. Adina Magda Florea (adina.florea@cs.pub.ro)

Descriere: Tema are ca scop predicția mișcărilor următoare pe termen scurt ale unui om pe baza mișcării curente.

https://arxiv.org/abs/1810.00781?utm_source=feedburner&utm_medium=feed&utm_campaign=Feed%3A+arxiv%2FQSXk+%28ExcitingAds%21+cs+updates+on+arXiv.org%29
https://zpascal.net/cvpr2017/Martinez_On_Human_Motion_CVPR_2017_paper.pdf

Title: AI based assistant for smart fridges

Coordinators/Contacts: dr. ing. Mihai Trăscău (mihai.trascau@cs.pub.ro),
dr. ing. Alexandru Sorici (alexandru.sorici@cs.pub.ro)

Description:

Topic designed in partnership with Infosys Consulting Romania

Along with the expansion of IoT solutions many *smart things* have made their way into people's houses. One such item is the *smart fridge* a connected appliance which is equipped with various sensors: video, temperature, status, door open-close, etc. Even though information becomes

easily available given the connectivity and the variety of sensors, the need to interpret the data requires intelligent algorithms. In this project we will explore two tasks related to a smart fridge:

- Detect products inside and keep track of their quantity and usage by employing computer vision techniques
- Analyze activity sequences regarding the contents of the fridge and its utilization using machine learning methods

The partner company (Infosys) is providing an instance of a smart fridge, equipped with the type of sensors mentioned previously (in particular, an RGB camera). Prospective students have the opportunity/requirement to integrate their work on a real device.

<https://foodai.org/#index>

Title: Filtering of emotionally stressing scenes from video clips

Coordinators/Contacts: dr. ing. Mihai Trăscău (mihai.trascau@cs.pub.ro),
drd. ing. Alexandru Gavril (alexandru.gavril@cti.pub.ro)

Description:

In parental control applications, street surveillance applications or in the classification of movies into content rating categories, identification of scenes that can cause emotional distress (e.g. scenes of physical or verbal violence) is highly relevant.

On hand of available datasets (e.g. Violent Scenes Dataset, UCF101), the objective of this project is to identify the start time and duration of violent scenes in short video sequences using Computer Vision and Machine Learning Techniques.

Title: High-action activity classification of commercial video clips

Coordinators/Contacts: dr. ing. Mihai Trăscău (mihai.trascau@cs.pub.ro),
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Description:

The task of automatic video classification is a difficult task with more than one way to tackle. The purpose of this task is to classify the start and end point of certain types of scenes (action, romance, cooking etc.) starting from available short-duration videos of the Youtube 8M or Kinetics dataset. The project proposal assumes analysis of multiple video modalities (e.g. sound, image, transcriptions) to help classify the types of scenes.

Prospective students are expected to start from existing baseline implementations of image-based action classification and expand them to:

- Include additional modalities (e.g. sound);
- Detect the start and end of a class of activity (e.g. cooking: based on actions such as opening the fridge, open/close the water tap, pick up a spoon, etc.).

Title: Car crash detection in video using neural networks

Coordinators/Contacts: dr. ing. Mihai Trăscău (mihai.trascau@cs.pub.ro),
drd. ing. Mihai Nan (mihai.nan.cti@gmail.com)

Description:

Increasing the number of cars and excessive traffic congestion in cities is a major problem in the current time. Statistics show that more and more accidents happen daily, and many of these could be avoided.

We aim to develop a system capable of detecting the possibility of an accident by analyzing a video sequence. Starting from the available datasets (ex. [CADP](#), [CarCrashDetector](#)), we propose to implement a system that combines Computer Vision and Machine Learning techniques to identify possible car crash.

Title: Error analysis in neural-network-based image classifiers

Coordinators/Contacts: dr. ing. Alexandru Sorici (alexandru.sorici@cs.pub.ro),
drd. ing. Mihai Nan (mihai.nan.cti@gmail.com)

Description:

Image classification is an important task with many practical applications. These applications can be part of the scenarios that are used in sensitive or critical circumstances. Thus, it has become crucial to rigorously test the image classifiers to ensure high performance.

The objective of this project is to choose a benchmark used for image classification (ex. [CIFAR-10](#), [CIFAR-100](#)) and test multiple architectures of neural networks (ex. [VGG16](#), [LeNet5](#)) to identify test examples that are misclassified. Thus, we want to identify the causes of these errors and possible methods by which they could be corrected.

<https://towardsdatascience.com/error-analysis-in-neural-networks-6b0785858845>

[Dificultate foarte mare - Very High Difficulty:](#)

Titlu: Recunoașterea activităților umane din secvențe video

Coordinator/Contact: Prof. dr. ing. Adina Magda Florea (adina.florea@cs.pub.ro)

<https://escholarship.org/uc/item/2mr798mn>

<http://blog.qure.ai/notes/deep-learning-for-videos-action-recognition-review>