PhD scholarships bound to specific research topics/areas:

2 scholarships bound to a specific research topic with a minimum of a study period abroad of at least 6 months pursuant to MD 360/2024 funded by the European Union – NextGenerationEU:

Project C1: Anomaly Detection and Segmentation in X-ray CT scans
Supervisor: Oswald Lanz
Project Description: Computed Tomography (CT) produces a three-dimensional (3-D) computer model of the imaged volume of a sample. Contrast between different components is based on how strong they absorb X-rays, which is typically a function of elemental composition and density. The technique is generally non-destructive and reveals the internal structure of the scanned sample.

This PhD project aims at developing, implementing, and testing computer vision and deep learning-based methods for anomaly classification and segmentation in CT. It will do so by leveraging the existing expertise of the research group in the video analysis domain, and by advancing upon our recent developments in data-efficient deep learning on volumetric data inspired from the video domain that were already successfully tested on a public benchmark of organ segmentation in CT.

Developments will be tested on data from selected industrial use cases provided by the industrial partner MICROTEC SRL. Technology maturation and transfer to industry will be supported by Covision Lab, of which MICROTEC is shareholder. This project will impact on (i) automated quality inspection capabilities in the automotive, food, wood, and 3-D printing industries, on (ii) production efficiency resulting from a reduced pseudo-scrap rate and enable (iii) transparent data-sharing between suppliers and customers to mitigate potential drawbacks such as customer dissatisfaction and complaints. Consequently, it is set out to impact on (iv) productivity and competitivity of firms in the above listed industry sectors.

Required mandatory skills: PhD topics resides at the intersection of computer vision and machine learning. The candidate has undertaken computer vision and deep learning courses with proficiency. Ideally the MSc thesis is in the field of deep learning and computer vision. Solid programming skills and experience with deep learning frameworks such as pytorch are requested.

Desirable (optional) skills: MSc thesis as valuable background experience to start the PhD research. Ideally the MSc thesis has led or will lead to a publication.

Project C2: Data Based Actions: A Recommender System for Sustainable Sinter Component Production
Supervisor: Zanker Markus, prof. Angelika Peer
Project Description: In the realm of sinter component production, despite increased automation, the initial setup and major adjustments of compaction presses remain largely manual. Skilled setters play a pivotal role, necessitating years of training to meet the demands of producing increasingly complex parts efficiently. To address this challenge, a recommender system tailored for setters should be developed.

Recommendation systems are very popular applications of AI that traditionally support users in domains such as e-commerce, e-tourism, or social media. Conceptualizing and designing such systems for industrial environments is, however, rather novel. This innovative system should continuously monitor compaction press behaviour and automatically propose actions to setters based on real-time data. By minimizing the time lag between detecting deviations and implementing (manual) countermeasures, this approach should significantly reduce inefficiencies and notably contribute to substantial savings in raw materials and energy.

Moreover, the recommender system should enable less experienced setters to handle intricate issues effectively. This not only conserves valuable resources, but also facilitates on-the-job training, elevating the qualification levels of the workforce. Ultimately, the data-driven solution should lead to a more sustainable, resource-efficient, and skill-enhancing approach to sinter component production.

Required mandatory skills: Good programming skills; Good communication and writing skills.

Desirable (optional) skills: Interest in planning and running human subject experiments and interviews, Knowledge on AI methods.