

JOINT EUFEPS / ÖPhG Meeting 2025
Pharmaceutical Sciences in the Heart of Europe



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**Pharmaceutical Sciences
in the Heart of Europe**

February 19 – 21, 2025

in Vienna, Austria

EUFEPS PhD Students Competition 2025

Moderator: Prof. Dr. Anke-Hilse Maitland-van der Zee

Jury: Prof. Dr. Gerd Folkers, ETH Zürich, Switzerland

Dr. Mareike Lutz, Chalmers, Sweden

Prof. Dr. Thierry Langer, University of Vienna, Austria

11:30 – 11:35	Welcome and short introduction
11:35 – 11:40	Rathna Mathiyalagan, Finland Semi-Solid Extrusion 3D Printed Tablets for Tailored Drug Delivery Systems
11:40 – 11:45	Laura Gómez Lázaro, Spain Lipid Nanocarriers for Brain Tumor Treatment
11:45 – 11:50	Riccardo Caraffi, Italy Self-Assembling Lactoferrin-Based Nanomedicines for Gene Delivery
11:50 – 11:55	Marta Kozakiewicz –Latafa, Poland Application of additive manufacturing technologies for oral drug formulations
11:55 – 12:00	Maximilian Molitor, Germany Targeting cysteines of human 5-lipoxygenase with cyanoacrylate comprising inhibitors
12:00 – 12:05	Setenay Özer-Önder, Turkey Development and In Vitro-In Vivo Evaluation of SARS-CoV-2 Spike Protein Containing Chitosan-Based Intranasal Subunit Vaccine Formulation
12:05 – 12:10	Lu Turkovic, Croatia Development of a Bioanalytical Method for the Determination of Cyclin D Dependent Kinase 4 and 6 Inhibitors and Other Drugs in Therapeutic Combinations for HR+/HER2– Breast Cancer Treatment
12:10 – 12:15	Ikbel Ben Alaya, Portugal Polysaccharides of natural origin for site-specific drug release modulation
12:15 – 12:20	Marina-Ionela Nedea, Romania Synergistic antifungal activity of fluconazole and cinnamon oil against <i>Candida auris</i>
12:20 – 12:25	Orsolya Péterfi, Hungary Artificial intelligence-based endoscopic imaging system for monitoring particle size and shape in real-time during pharmaceutical manufacturing
12:25 – 12:30	Joanneke Overbeek, The Netherlands Off-label, but on-target: alternative dosing regimens in oncology

Artificial intelligence-based endoscopic imaging system for monitoring particle size and shape in real-time during pharmaceutical manufacturing

Orsolya Péterfi¹, Nikolett Kállai-Szabó², Dorián László Galata¹, Zsombor Kristóf Nagy¹

¹ *Department of Organic Chemistry and Technology, Faculty of Chemical Technology and Biotechnology, Budapest University of Technology and Economics, Műegyetem rkp. 3., H-1111 Budapest, Hungary*

² *Department of Pharmaceutics, Semmelweis University, H-1092 Budapest, Hőgyes Endre street 7-9, Hungary*

Particle size is a critical quality attribute in pharmaceutical processes that must be monitored during crystallization, granulation and pelletization. Traditional end-point determination methods do not allow for real-time feedback control, and even small deviations in critical process parameters can lead to altered product quality. In-line monitoring of pharmaceutical processes provides real-time information about the system, enabling timely intervention in the case of out-of-specification products. In the current work, an artificial intelligence-based image analysis method is proposed to monitor particle size and morphology during fluid-bed processes, including pelletization and granulation.

The key components of the direct imaging system are a rigid fiber-optic endoscope, a light source and a high-speed camera, which allow for real-time particle monitoring. Convolutional neural network (CNN)-based instance segmentation algorithms were employed, utilizing two distinct models that were created specifically for pellets and granules to ensure particle-specific analysis. The trained CNN models were able to successfully detect the particles in focus and to exclude particles that are only partially or poorly visible. Comparison with reference measurements, including laser diffraction and dynamic image analysis, confirmed the reliability of the obtained particle size data. The instance segmentation approach also allowed for the assessment of shape characteristics (circularity, convexity, aspect ratio) that influence particle flow properties. The endoscopic system was tested in-line at a larger scale during the drug layering of inert pellet cores. The particle size data acquired in real-time with the endoscopic imaging system corresponded with the reference methods, demonstrating the feasibility of the proposed machine vision-based method as a process analytical technology tool for in-line process monitoring.

The developed system offered valuable insight into the dynamics of particle size increase during granulation and pellet layering. The machine vision-based endoscopic system can ultimately be used as an in-line sensor to monitor fluid-bed processes and to detect the end-point. Furthermore, product failures such as pellet agglomeration, which can affect product quality, can also be detected by the imaging system, enhancing its ability to identify and monitor critical issues during manufacturing.